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The Engineering and Mining Journal

9

ISSUED WEEKLY

VOLUME XCIV

July 1 to December 31, 1912

129285
16/9/13.

Hill Publishing Co.
505 PEARL STREET
NEW YORK

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v.94

THE ENGINEERING AND MINING JOURNAL

INDEX TO VOLUME 94

July 1 to December 31, 1912

Illustrated Articles are Designated by an Asterisk (*). Names of Books are Indicated by a Dagger (†).

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Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres Rob't McKean, Sec'y
505 Pearl St., New York

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94. JULY 6, 1912. No. 1

Pig Iron Production

The production of pig iron in the United States has been increasing for several months past and in May it was at the rate of over 30,000,000 tons a year. Unless some unexpected condition arises, the make for 1912 will be the greatest in our history. This is equivalent to saying that the production of iron and steel for the year will be the largest ever reported. The great consumption of the metals which started up with the reduction of prices and the substitution of an open market for the attempt to maintain controlled prices has continued, and the country is absorbing steel at a rate which promises to continue for some time. The recent advances in price have not been sufficient to check this movement.

It is noticeable that the greatest increase in the production of pig has been at the steel furnaces; that is, at the furnaces which are owned or controlled by the large steel companies and which make iron chiefly or entirely for conversion into steel. The merchant furnaces, which are the chief makers of foundry and forge iron have been comparatively less active and the increase in the number in blast has not been so great. This would tend to show that the consumption of finished steel has increased much more rapidly than that of cast iron and foundry products and this conclusion is confirmed by other facts. At the present time the most active section of the foundry trade is in cast-iron pipe for which there has been an unprecedented demand, owing to the extraordinary increase in local water and gas plants in large and small cities.

Prices of pig iron on the market have remained at a moderate level and advances have not been large. These prices, as quoted in the markets, mainly refer really to foundry and forge iron. There is a nominal level for steel-making irons but this does not greatly affect the merchant furnaces, since so large a proportion of that kind of iron is made by the steel-company furnaces, and whatever their systems of bookkeeping may be the price to them is really the cost of operating.

Already we hear complaints of the scarcity of coke and the difficulty of obtaining sufficient supplies for the furnaces. This has been to some extent exaggerated and has served its purpose of advancing prices. Nevertheless, the supply of coke must necessarily put a limitation on the activity of the blast furnaces and that supply cannot be increased beyond a certain point at short notice. Another complaint made is of a shortage of labor and this applies both to the furnaces and to the coke ovens.

The unsold or unused stocks of pig iron, which were so heavy at the close of 1910, were in some degree eliminated in the course of 1911 and have been, during the five months of the present year, reduced closely to the normal level which it is necessary to carry at all times. The furnaces of Eastern Pennsylvania and of the Mahoning and Shenango Valleys, as well as the Lake district, have been pretty well cleaned out of surplus stocks.

Some still remain in Virginia and Alabama, but these are rapidly disappearing and after a month or two may be eliminated entirely from the market. It is a difficult matter to ascertain the exact amount of these stocks, but these statements are based upon the best opinions obtainable in the different districts. There is still some reserve of blast furnace capacity which is not active; but production at the rate we have named above would indicate that over 80% of our available furnaces must be at work. Quite a large proportion of the remainder are so placed that they cannot be expected to go into operation profitably except at a higher rate of prices than prevails at present. Some advances are now being asked to cover the advance in coke and the increase in wages which come furnaces have found necessary.

Zinc Dust as a Precipitant

The rapidity with which the zinc-dust process of precipitation in cyaniding is being adopted, especially in the new mills, makes any information on the subject of interest. Much of the progress in this branch has been in the line of improved apparatus for applying the zinc dust, as is shown by the many types of zinc-dust feeders that have been produced. The time seems to have arrived when greater attention should be given to the precipitant itself.

The method of buying fuel and other supplies by specification should find application in cyanide mills, and would be particularly advantageous in the purchasing of zinc dust. In the case of cyanide this method is virtually used, for the price is based on the percentage of potassium cyanide or equivalent present. With zinc dust it is not so easy, owing to the difficulty of stating the requirements. A lot of zinc dust might contain no metal impurity but still be low in precipitating power because of the form in which the zinc occurs. Further, the presence of a metallic impurity such as lead is generally of advantage. Obviously then the mere designation of "pure" zinc dust would not insure obtaining a good precipitant.

A consideration of the source of zinc dust is sufficient to show that its composition is subject to variations. While this general fact is known, the extent to which such changes affect the precipitating properties is not well understood. Since as high as 20% difference in precipitating efficiency is sometimes observed in practice, with two lots of zinc dust used under the same conditions, it is evident that the constitution of this form of precipitant is highly important. This also leads to the conjecture that zinc-dust precipitation in certain instances may have been condemned when the unsatisfactory results obtained were largely attributable to the poor quality of zinc dust used.

Of particular interest, therefore, are the investigations of W. J. Sharwood, the results of which were published in a recent issue of the JOURNAL. Some of the chemical and physical properties of zinc dust which affect its precipitating qualities were given, together with methods for making tests. By following the line of research indicated by Mr. Sharwood the cyanider should be well prepared to attack his particular precipitating problems. By determining whether the precipitant or the method of manipulation is responsible for the results obtained, the operator gains a distinct advantage in the control of this branch of the process.

Modern Lead Smelting

One of the metallurgical difficulties of former times was the treatment of lead-copper ores. The copper smelter was not keen about buying them, because he would lose the lead; and, while the lead smelter would take them and ultimately recover both metals, that was accomplished only by a long drawn-out process and by suffering a large loss of the metals, especially of the lead. Several years ago, however, the problem of converting lead-copper matte and collecting the lead fume by bag filtration was successfully worked out at the Omaha plant of the American Smelting & Refining Co., and also at the Perth Amboy plant of the same company, and we suppose that a similar procedure would now be followed in any new smelting works. In the conducting of a customs business, especially, it is nowadays rather essential to possess a combination plant, a copper smelter who is unable to receive lead-bearing ore being at a disadvantage. This was fully recognized by Mr. Mathewson in his designing of the Tooele plant of the International Smelting and Refining Co., and was undoubtedly one of the reasons leading that company into the lead business.

This company provided itself with adequate means for the treatment of lead-copper matte, which is no longer a bugbear. Such matte at Tooele is blown up without reconcentration, the lead being partly collected as fume from the filtering bags (of wool) and partly being scorified, entering the converter slag, which latter is of a sufficient tenor in lead to be returned to the lead-smelting furnaces. The Tooele plant is reported in other respects to be an exhibition of the most modern development of lead smelting practice. Dwight & Lloyd sinterers take the place of the old-fashioned roasting furnaces. The blast furnaces are large and of uptodate design. Fumes are filtered through bags. And, finally, as an innovation, the time-honored practice of bedding the furnace charges has been discarded in favor of an actual weighing out of each constituent. The last feature results in a perfection of mixture which is said greatly to promote the running of the blast furnaces which, of course, is in the line of what ought to be expected.

Low Grade Iron Ores of Lake Superior

An event of more than local interest occurred recently when the Wisconsin Steel Co. placed in operation its iron-ore washery at Nashwauk, on the Mesabi Range in Minnesota. This is the second installation of its kind on that range, the Coleraine plant of the Oliver Iron Mining Co., having been in operation for several years. Although of commercial size, the installation at Coleraine was avowedly an experiment. In view of the construction of the Nashwauk plant, along the same lines, after a lapse of a few years, it is logical to suppose that the process has been found successful.

On this supposition, the direct meaning is, that another process has been added to the list of those having for their purpose the successful treatment of various kinds of low-grade iron ores. Experiments along these lines are keenly watched in the Lake Superior region, as their success means much to the district as a whole. It is well understood, of course, that the known deposits of low-grade iron ore on the Lake Superior ranges that are at present unmarketable in their natural condition, are enormous. It is not to be expected, either, that any one process will ever be successful in making all of these low-grade ores available.

These ores can, however, be classified into several groups, having common characteristics, and the problem of finding processes to meet the necessities of the several groups seems to be meeting with some success, as in the Coleraine and Nashwauk plants. The Jones step process, which has been undergoing experimentation at several Michigan points for some time, was designed primarily to handle ores widely different from those that the two plants mentioned above are treating. At the Moose Mt. Ltd., in Ontario, the American Gröndal process is being installed. The latter, of course, is in successful operation in other places. The Lake Superior ranges offer a rich field for work of this kind and it is clearly evident that the experimenters are aware of this.

The Steel Corporation and Its Employee

The report of the committee appointed to consider conditions among the employees of the Steel Corporation has been sent out to stockholders, accompanied by a letter from Chairman E. H. Gary, summing up its chief points. The report covers four subjects enumerated as follows by the committee: (*a*) The seven-day week and long turn. (*b*) The eleven-hour day. (*c*) The speeding of the workmen. (*d*) The repression of the men. Briefly stated, the findings of the committee upon these four subjects are as follows:

Seven-Day Week and Long Turn.

1. With respect to the seven-day week and long turn the committee says: The records of today indicate that with the exception of two or three plants the seven-day week has been relegated to the past. The committee adds that this should be absolutely enforced at all times in all mines, shops, railroads, docks and works of the Steel Corporation.

The Finance Committee recommended the elimination of seven-day labor as early as 1907, and the stockholders' committee reports that this recommendation is being observed; but to leave no room for doubt, the Finance Committee has now adopted the following resolutions:

"*Resolved*, That in accordance with the spirit of the resolution adopted by this committee on April 23, 1907, seven-day labor should be eliminated in all mines, mills, shops, railways, docks and works of the Steel Corporation, except under special circumstances and then only upon the consent of this committee.

"*Resolved*, That the so called long turn, formerly followed in the change of shifts in continuous-process work, shall be eliminated or reduced in all cases where it now continues among employees of the subsidiary companies, except under special circumstances and then only upon the consent of this committee.

"*Resolved*, That conscientious effort should be made by all to reduce to a minimum any unusual length in work hours that emergencies and unforseen conditions may sometimes demand.

"*Resolved*, That copies of these resolutions be sent to the presidents of all the subsidiary companies with the recommendation that all operating officials be governed accordingly."

Twelve-Hour Day, Open Shop and "Speeding"

2. With respect to the 12-hr. day, the stockholders' committee says that steps should be taken now that shall have for their purpose and end a reasonable and just arrangement to all concerned of the problems involved in this question—that of reducing the long hours of labor—we would respectfuly recommend to the intelligent and thoughtful consideration of the proper officers of the corporation.

In response to this recommendation, the Finance Committee has passed the following resolution:

"*Resolved*, That the chairman, Mr. Roberts, and the president of the corporation be appointed a committee to consider what, if any, arrangement with a view to reducing the 12-hr. day, in so far as it now exist among the employees of the subsidiary companies, is reasonable, just and practicable.

"3. With respect to the alleged 'speeding of the workmen,' the stockholders' committee says: Our observation of labor conditions in the mills of the Steel Corporation does not lead us to believe that there is either desire or tendency on the part of the foremen and superintendents to pursue these policies to a point that would mean harm or injury to the men under their charge.

"4. With respect to the so-called 'repression of the men,' the stockholders' committee find that the Steel Corporation, in view of the practices often pursued by labor organizations in steel mills in past years, is justified in the position it has taken. That position is an adherence to the principle of the open shop which permits any workman to labor whether he is a member of a union or not."

Large Outlays

The report of the stockholders' committee contains a summary of certain plans which the Corporation has put in force for the benefit of its workmen, namely, accident prevention, accident relief, pensions, sanitation and welfare and employees' stock subscription. It is proper that the stockholders should know what is being spent annually for thus bettering the conditions of the workmen. This aggregate annual expenditure, which would otherwise be available for dividends, is as follows: Relief for men injured and the families of men killed, which is paid in all cases regardless of legal liability, costs each year, approximately $2,000,000; accident prevention, probably the most effective system in the United States, costs each year, approximately $750,000; sanitation and welfare work of all sorts, now developing, costs already each year, approximately $1,250,000; the pension fund, which provides support for superannuated employees, requiring each year: (*a*) for pension payments, approximately $200,000; (*b*) for the creation of a permanent fund to be completed in 13 years, $500,000; the employees' stock subscription plan costs each year, approximately, $750,000; total annual expenditures for improving the conditions of workmen, approximately $5,450,000.

Wages have not been reduced, but on the contrary have been increased nearly 25% since the Corporation was organized; and the workmen have not been required to contribute in any way to the expenditures for their benefit.

Report To Stockholders

In conclusion, the stockholders' committee recommends that hereafter and at stated periods correct and reliable first hand information as to these matters and the advancement and betterments being effected be furnished to all stockholders. This recommenation is under consideration by the Finance Committee, which has directed a plan to be prepared and reported to it.

Review of Porcupine

Special Correspondence

Holders of Porcupine securities appear to have given up hope of there being a boom in stocks, and are basing their hopes on the expectation of a revival of interest in properties. There seems to be some basis of fact for this, and despite the general business depression, the outlook for the working properties has never been so bright. The period of depression has not been an unmixed evil, as it has resulted in eliminating the great majority of the wildcats which flourished so extensively about a year ago. It has also had a decided effect on the price of mining properties, and owners are now generally willing to give a free option for a sufficient length of time to enable the prospective purchaser to determine the value of the tract. Unfortunately, however, the properties available for purchase which are worthy of consideration, are few and far between.

Three Sections in District.

The Porcupine district can roughly be divided into three sections, the Pearl Lake, Dome and North Whitney. Of these the first two are much the most important. The last embraces the Crown Chartered, Scottish-Ontario, Hughes and several other properties. None of these is as yet beyond the prospect stage.

In the Dome section the only properties working are the Dome, Dome Lake, North Dome and Dome Extension, and these are mentioned in the order of importance. The Dome is now working to full capacity and is treating approximately 10,000 tons per month. Development work on the 100-ft. level is being vigorously prosecuted, and the incline between the 45- and 100-ft. levels will be in operation in a few months. The headframe over No. 2 shaft is under construction and when completed the shaft will be sunk to the 400-ft. level and the ground to the east opened. About 250 men are employed. The other three properties in this section are in the prospect stage. The Dome Lake, while small, shows considerable promise, and good ore has recently been opened on the 100-ft. level. The company is considering the erection of a 10-stamp mill, and while plans for it have been drawn, the work of construction has not been started. The North Dome is doing work and some good ore has recently been encountered on the 50-ft. level. The grade of the ore, however, is believed to be erratic. The Dome Extension's hopes seem to be largely based on the possibility of getting the extension of the Dome orebody. Ore has been opened in one of the shafts but the grade is low, and the company has not yet succeeded in finding the Dome orebody in its own workings, although diamond drilling has given them some encouragement.

PEARL LAKE SECTION.

In point of richness and the number of promising properties, the Pearl Lake section is undoubtedly the best in the district. This embraces the Hollinger, Vipond, McIntyre, Jupiter, McEnaney, Plenaurum, Miller-Middeton and Dixon. The last two are owned by the Hollinger interests and may eventually be consolidated with that property. The Hollinger has a 40-ft. stamp mill in operation, and is doing a large amount of underground development. This work has increased the reserves to some extent and has borne out the possibilities of the property as given in Mr. Robbins' report. Sinking below the 200-ft. level will be carried on from four points.

The McIntyre has had a 10-stamp mill in operation for some months, and has succeeded in opening some good ore underground. It is probable, however, that the mill was started before the mine was ready for it, and operations have been hampered by lack of sufficient development work on the orebodies.

The Vipond mill has recently been started and while as yet it is too early to make predictions, the results to date are stated to be satisfactory. The mill is using rolls and ball mills instead of stamps, and the process consists of amalgamation and concentration. A considerable tonnage has been developed on the 100- and 200-ft. levels, the average stoping width being about 6 ft. Work is now being carried on at the 300-ft. level. The Jupiter appears to be a property of considerable promise and has developed pay ore down to 300 ft., the lowest working at present. The property is controlled by the Drummonds, of Montreal. Recent developments on the McEnaney, owned by the Crown Reserve, have also been encouraging, and an orebody has been opened on the 300- ft. level. The Plenaurum has also been showing up well under development.

The two large mines of the Porcupine district are of course the Dome and the Hollinger and these two alone would be sufficient to confer distinction upon the camp. The mills at present in operation will treat approximately 800 tons per day, and there is reason to believe that a number of small mills will be built in the near future.

June Mining Dividends

United States mining dividends for June show a total of $5,645,993, a sum which is over half due to three copper companies, Calumet & Hecla, Utah Copper and Nevada Consolidated. The last two have paid only their usual dividends, while Calumet & Hecla, under influence of the rising copper market, has moved its dividend up to $10 quarterly. Quincy has also increased its dividend, while Superior & Pittsburg, and Calumet & Arizona still continue their old rates, being apparently deterred from too great disbursements by the thought of the large construction expenditures necessary in the near future. These six companies alone paid a total of $4,164,851.

United States Mining Companies	Situation	Per Share	Total
Bing-New Naven, c	Utah..	$0.10	22,869
Bunker Hill Con., g	Calif..	0.07½	15,000
Bunker Hill & Sull., l. s.	Ida...	0.20	65,400
Calumet & Ariz., c.	Ariz...	1.00	596,353
Calumet & Hecla, c	Mich..	10.00	1,000,000
Colorado, l. s. g	Utah..	0.03	30,000
Doe Run, l	Mo...	1.50	98,673
El Paso, g	Colo..	0.01	24,500
Federal M. & S., l. s.	Ida...	1.50	180,000
Fremont, g	Calif..	0.02	4,000
Frontier, z	Wis....	2.00	2,500
Gold Dollar, g	Colo..	0.00½	12,500
Golden Cycle, g	Colo..	0.02	30,000
Hecla, l. s.	Ida...	0.02	20,000
Homestake, g	S. D..	0.50	109,200
Hazel, g	Calif...	0.01	9,000
Montana-Tonapoh, g. s.	Nev....	0.10	100,000
New Idria, q	Calif...	0.30	30,000
Nevada Con., c	Nev....	0.37½	749,773
North Star, g	Calif...	0.30	75,000
Qiuncy, c	Mich..	1.25	187,500
St. Joseph, l	Mo...	0.15	150,000
Superior & Pitts., c	Ariz....	0.30	449,938
United Verde, c	Ariz....	0.75	225,000
Utah Copper, c	Utah..	0.75	1,181,287
Yukon Gold, g	Yukon	0.07½	262,500
Wasp No. 2, g	S. D..	0.03	15,000

Coal, Iron, Industiral and Holding Companies	Situation	Per Share	Total
Am. Sm. & Ref., com	U. S.	1.00	500,000
Am. Sm. & Ref., pfd	Mex.	1.75	875,000
Crucible Steel	U. S..	1.75	427,638
General Asphalt pfd	U. S.	1.25	164,120
Gen. Chem., com	U. S..	1.50	122,269
Harbison-Walker	Penn..	0.50	90,000
Inter. Nickel, com.	U. S..	7.00	810,784
Inter. Sm. & Ref.	U. S..	2.00	200,000
Nat'l Lead, com	U. S..	0.75	154,914
Nat'l Lead, pfd	U. S...	1.75	426,433
Phelps Dodge	U. S... Mex..	4.50	2,025,000
Texas & Pacific Coal	Tex...	1.50	37,500
U. S. Steel, com	U. S..	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Crown Reserve, s	Ont...	0.10	100,000
Esperanza, s. g.	Mex..	0.36	165,847
Hedley, g	B. C..	0.50	60,000
Kerr Lake, s	Ont...	0.25	150,000
Tem. & Hud. Bay, s.	Ont...	3.00	23,283
Tretheway, s	Ont...	0.10	100,000

What is also equivalent to a copper dividend is that of Phelps Dodge & Co., which has made its regular 2½% quarterly payment plus an extra dividend of 2%, a total of $2,025,000. This is, however, classed with our metallurgical and holding companies, whose payments reach the sum of $12,187,439, of which sum $6,353,781 is due to the 1¼% quarterly disbursement on Steel common. Dividends reported to the JOURNAL by Mexican and Canadian companies amount to only $599,130 for the month. The Mexican troubles still are affecting the companies to the South. Esperanza has gone on a basis of 7½% semi-annually.

Federal has done what has been expected for some time and has reduced its preferred dividend to 1½% quarterly. The stock is a 7% cumulative issue. The common has not paid since January, 1909.

Mining dividends declared by United States companies making public reports amount to $27,693,598 for the half year ended June 30, 1912, and those of mining, metallurgical and allied companies amount to $84,736,670.

Chronology of Mining for June, 1912

June 1—United States Smelting, Refining & Mining Co. secured control of the Consolidated Fuel Co.'s lands in Utah, comprising about 5000 acres.—Trial run on Giroux Consolidated ore started at Steptoe concentrator.

June 2—A 7000-bbl. gusher of the Pacific Crude Oil Co., in California caught fire and burned six days before extinguished.—Announcement of formation of the Canadian Mining & Exploration Co., Ltd., with a capital of $5,000,000, divided into shares of $5000 par value.

June 5-6—Fighting occurred between revolutionists and the employees at the property of the Cuba Copper Co. near Santiago de Cuba.

June 10—Operators in the Globe-Miami district, Arizona, granted concessions to employees, embodying increase in wages or reduction of working hours.

June 13—The Interstate Commerce Commission ruled that interstate pipe lines are common carriers and subject to the provisions of the Interstate Commerce Law.—The United States Court at Wilmington, Del., issued a final decree ordering the dissolution of the so called powder trust and a division of the business among three companies.—Announcement of the awarding of $400,000 damages to the Smuggler-Union company, in Colorado, in its suit against the Liberty Bell mine for trespass.

June 15—The Hollinger mill at Porcupine started operation.

June 18—Settlement of the strike at the refinery of the American Smelting & Refining Co., at Perth Amboy, N. J.

June 19—An explosion in the Hastings mine of the Victor-American Fuel Co., in Colorado, killed 12 men and injured one.

The Van Ryn Gold Mines Estate, Ltd., has declared a dividend of 22½%, payable to stockholders of June 30, 1912. This makes a total of 45% for the year.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

As to Prospecting

I wish to make a few remarks, relative to Mr. Ropes' criticism (Eng. and Min. Journ., June 1, 1912), of my article. I am glad to have awakened one man, who has held a government position.

There is no object in quoting the statutes, so long as each political incumbent of the Land Office construes them as he pleases. One has only to review the ruling of the department for a number of years in order to verify this. Notwithstanding that there may be nothing in the law and rulings of the Land Office to drive the prospector from the Forest Reserves, it is true that the arbitrary action of the ranges, in many cases, has done it, until there is a general disposition and belief that there is no use trying to prospect on the Reserves. The conditions are somewhat similar to the attorney and his client who was in jail; the former insisted that the law could not place the latter there.

I would also ask Mr. Ropes, how much time generally intervenes, with the red tape of the office, from the filing of the charges by the ranger, until final dismissal by the Land Office? It would appear that the poor prospector's "mental anguish" may be prolonged several months, at least.

On the other hand, what is the use and public benefit of these reserves, in this arid-basin country, where there is scarcely a stick of timber fit for a stull in a mine, except in some deep, inaccessible cañon? The general impression is that it only affords fat jobs to the reserve employees, who can keep the poor prospector from cutting old, dead piñon trees for fuel, and also collect 50c. per cord from every poor man for his firewood. The main object seems to be to make more political offices and patronage.

Three-fourths of the mines in Cripple Creek could not be patented today; but how has the general public been injured by what was possibly a liberal construction of the mining laws? The same conditions apply at Leadville. Each has produced its hundreds of millions, to the general welfare of the country. Nor were these mines obtained, in the first place, by large corporations. Many a poor man made a stake from his locations in Cripple Creek. Stratton had been a prospector for 20 years, prior to his location of the Independence.

I believe that the apex law should be abandoned. It has caused the greatest part of all mining litigation, and the poor man usually loses out. If one has a rich mine, advantage is taken of it to commence litigation, if only to force a compromise. It is not fair to others, as Mr. Ropes suggests, that the original discoverer should have time (often months or years) to determine the dip of his vein, reserving in the meantime two or three claims wide from location by someone else.

From several years' experience with mining laws of Mexico, in various parts, I know that the law in which vertical planes govern gives general satisfaction. In the first instance, one can locate his claim with the vein at the extreme edge, if he desired.

Again, no one is permitted even to locate a claim, overlying another only to his side line. If he finds from development that his vein is dipping out of his side line, he is or should be the first to know it. Except in proved or congested areas, the ground adjoining generally remains open. Until the recent revolutions, there were far more Americans prospecting in Mexico than in the United States. If we would do away with the apex law, and allow no claim to be located on another, it would do away with nine-tenths of mine litigation, and materially expedite the development of many mines and districts. Generally, nowadays, the mining man dare not open up his mine until he gets a patent, and unless he has bonanza ore on the surface, it is hard to get one.

It would not be fair to the poor man to compel him to patent his claim in a certain short time (or any limited time) or lose his property. It is often the case that the poor man in doing his annual assessment work has found pay ore, and has been able to develop his mine. Make the laws so that this $100 worth of work must be done, not skimped; or the mine relocated by interested parties.

We freely agree with Mr. Ropes that interest in the prospect (which means more encouragement to the prospector) must be revived, or mining will die a natural death; but for the causes of its decline, we think that the Government's action, from the Secretary of the Interior to the ranger on the Reserves, has had more to do with it than any or all other reasons.

G. L. Sheldon.

Ely, Nev., June 7, 1912.

Leasing at Cripple Creek

In the Journal of May 11, 1912, the Denver correspondent says of the Cripple Creek district: "It is said that many of the large companies are leasing their best orebodies at high royalties, as they have found their profits are greater by this method than if worked on company account. Of course, the leaser works more economically and is more careful of the ore than the day's-pay miner, and moreover pays no salaries or office rent."

This impression seems to be gaining ground among mining men who are not in actual touch with the leasing system and who are influenced largely by local papers which boost the leasing business and sometimes greatly exaggerate the profits to the company from its leasers.

A little information in reference to the leasing system as operated by most of the mines in the Cripple Creek district may not come amiss to the mining public, so I will endeavor to throw some light upon a subject that has been sadly neglected by technical publications.

Mines doing a leasing business may be divided into the following classes: (1) Virgin or slightly developed property; (2) mines partially developed or nearly worked out and leased to large companies; (3) mines operated by the owning corporation and leased in small blocks.

Class (1) includes all property lying idle through lack of funds or otherwise, upon which little development work has been done. This character of ground is usually leased in large blocks for periods of time ranging from two to five years and at low royalties varying from 10 to 20%, as the location of the ground justifies. The leasers are required to furnish their own hoists, compressors and other equipment, if the same is not already upon the property, and in case they should be fortunate enough to discover ore in paying quantities must erect their own ore houses, etc., all of which equipment, with the exception of the machinery, must remain on the property at the expiration of the lease. Leasers of this character are a great benefit to the district at large and the leased property in particular, as such operations require considerable money to push them through to completion and in many cases productive mines are the result.

Class (2). It often happens that mines which have been partially developed, worked out or closed down on account of poor management are leased to a large company, which takes the property under royalties varying from 15 to 25% of the net mill or smeltery returns and for a period of from two to five years.

In case any ore is exposed this ground is reserved for the leasing concern and the remainder of the property opened for sublease. The terms and conditions under which the subleasers operate vary considerably, the leaser sometimes offering to furnish hoisting, powder, machines, air and all other supplies in consideration of 50% of the returns of the ore so mined, after treatment and royalty charges have been deducted; sometimes charging the subleaser for these services and supplies, and adding 5 to 10% to the royalty for their profit.

In the former case the company secures more development than in the latter as the subleaser, if he is unsuccessful in his search, loses nothing but his labor, while under the latter system he loses both labor and expenses for hoisting, etc. On the other hand, the returns to the company are larger, and to the subleaser smaller, if the first system is followed and the ore is encountered.

Old nearly worked-out mines operated in this way often make good profits, and occasionally open new ore of considerable value, but rarely reach the productiveness of the mines as worked under company management. Of course, this is largely due to the fact that the better orebodies have been worked out, but still the fact remains that larger returns could be made if the owning company should work the property in the same manner.

Class (3). Many of the larger mines have, after extracting the major part of the ore, leased all or part of their territory out in blocks. Royalties are usually graded from 10 to 15% on low-grade ore (under $10 per ton) to 50% on ore over $100 per ton, while some companies charge a flat royalty of 33% and add excess royalties if the lease nets more than wages to the leaser.

As the average leaser cannot be depended upon for any large amount of development work the company must either do this work or hold out inducements to the leaser to do it, such as free hoisting, etc., or carrying him for these items until ore is opened.

That the operating costs of a large plant are not entirely met by the leasers at the rates usually charged is shown by the report of one company for 1911, which states that the company contributed 37% of the total operating cost of the surface plant, thus cutting down funds received from royalties to such an extent that the mine earned only about 6% of the gross value of the ore shipped. In this connection it must be borne in mind that during the year the company was doing no work on its own account and that the capital was being exhausted at the rate of about $250,000 per year to gain this small profit.

It is admitted that for some classes of mining the leasers will make a larger saving than by direct company work, but this only applies to small, narrow, or spotted oreshoots and old mines which have been practically worked out by the company. Large amounts of broken rock are often left in the workings, track and pipe line shot, and timbering left in bad condition by irresponsible leasers, and this must be cleaned out and put in shape at considerable cost to the company.

Where the owners have good bodies of ore they are rarely ever leased even on high royalties, unless the workings are dangerous or the work difficult of supervision, as the owner in a sense loses control of the property, and high-grading, poor timbering and slovenly work of all kinds usually result.

E. A. Colburn, Jr.

Victor, Colo., June 3, 1912.

Lluvia de Oro Refining

I am much interested in Mr. Conklin's article on refining bullion at the Lluvia de Oro mine, but think there is room for improvement in some of the work. Noting his question as to lining the furnace, why does not he try magnesite brick? The first cost is high, but the repair charges are correspondingly low. Some people are laying these bricks in a mixture of linseed oil and ground magnesite, but I believe a better mixture is found in a mush of ground magnesite and 20% sodium-silicate solution. A magnesite lining must be kept dry after it is put in use, but alternate wetting and heating furnishes a good way of "rotting out" an old lining, when one wishes to take it out. In case it is desired to put magnesite bricks and silica bricks in the same lining, put in a course of chrome brick between them. The ordinary magnesite brick will expand more on heating than the acid or neutral bricks. About ¼ in. per ft. should be allowed. I am sure the magnesite brick will be found superior to any sort of rammed lining, and probably better than firebrick.

Magnesite as a Neutralizer

Here is a little chemical suggestion for Mr. Conklin. If he ever adopts magnesite brick and tries it out, will he please advise the readers of the Journal. In time, with a magnesite lining, he will certainly acquire some old cobbing from his furnace. By feeding this cobbing into his ball mills, will he not do away with any necessity of adding lime in the cyanide process? The only objection I can see to this is the possibility that the magnesite will not all go into solution, and will concentrate out with the present ore concentrates. Those concentrates will be unhappy things to smelt in that case. In that event, the magnesite cobbing would probably have to be treated with the iron slags from the concentrate smelting.

Air Pipes in Refining Furnaces

The compressed-air jet in the refining operation strikes me as worth further trial. The copper and silver refiners could not keep house without it. It may be that the iron pipes burn off too rapidly in his charge.

This could possibly be alleviated by turning in a little jet of steam with the compressed air. In this case a bleeder valve must be placed in the steam line just before it unites with the air, and the steam should be run in just before the furnace. The reason for this statement can be seen when one considers the probable effect of shooting a chunk of water down into the molten bath. It might even be possible, with the small furnace at Lluvia de Oro, to use steam only as the converting agent. Theoretically it is possible, but the reaction would require a large amount of heat.

It may be found that with the use of a little steam in the air the simplest way is just to hitch the iron pipe on a rubber hose and jab the pipe down into the bath. If the pipes are threaded and pipe connections used, the old pieces can always be screwed onto a new one, and used up completely. The only variation on this I can suggest, if the consumption of iron pipe is too costly, is to follow the Japanese method, and simply blow a jet of air down into the bullion without the pipes ever being actually introduced into it. At this point I am reminded that advice is delightfully easy to give, when one is not up against the operating problem of taking it.

F. M. S.

Chicago, Ill., June 17, 1912.

The Ton

I should be pleased to have any reasonable explanation given as to the adoption of the long ton by the U. S. Geological Survey. I can remember when the long ton was mentioned in American publications only as an interesting survival of barbarism, like £, s., d., and the Beefeaters. Indeed, there were some optimists who hoped we ourselves would sometime emerge into the full light of the metric system. Now I note the Survey always specifies "short" tons, if 2000 lb. is meant, while lead, copper or coal, is as likely as not to be given us in 2240-lb. tons. Why? Is this a result of the "hands-across-the-sea" movement, and will the Survey shortly inflict cwt. of 112 lb. upon us, and "stones," and quintals of no one knows what weight?

American.

Chicago, Ill., June 7, 1912.

The Electric Smelting of Zinc Ore

By W. R. Ingalls

A summary of the present state of this art, with a recital of analogies to and differences from the ordinary method of smelting, a discussion of the blue-powder condensation in electric smelting and the indication that this is a chief obstacle.

Note.—A paper read at the meeting of the Canadian Mining Institute, at Toronto, Mar. 8, 1912.

The electric smelting of zinc ore during recent years has engaged much attention. It is not a new idea. The Cowles brothers tried it in 1885, which was the first attempt (so far as I am aware), and since then numerous experimenters have undertaken it. It is not my intention in this paper to trace their work, or go further into the history of the subject. It is sufficient for my present purpose to mention that C. P. G. De Laval was the first to erect an electric zinc-smelting furnace on a commercial scale, this having been done in Scandinavia in 1901. Works were later erected at Sarpsborg, in Norway, and at Trollhättan, in Sweden. I do not know precisely the dates of their erection, but they were in operation as early as 1905. It was attempted at first to smelt ore, but for a long time this was not commercially successful, the product being chiefly zinc powder, which had to be subjected to resmelting, giving an impure spelter, which had to be refined. The works were continued in operation in a more or less irregular way and spelter from them came on the market, but this was the product of smelting dross, scrap and other secondary products rather than ore. Some progress in ore smelting was made, however, and during 1911 a considerable quantity of ore was smelted by a method, to which I shall refer subsequently.

There is much misconception respecting both the ordinary art of zinc smelting, and the possibilities of electric smelting. In the first place, the ordinary art of zinc smelting is not extraordinarily backward, in spite of the small retorts to which we are limited; and although we are attracted by the possibility of conducting the distillation in a relatively large apparatus, electrically heated, I am not yet by any means prepared to say that electric smelting will offer any advantage over existing methods, even if the difficulties that are now in view can be overcome. In the second place, electric smelting is not to be expected to accomplish the establishment of any radically new metallurgical principle. If there be any dreams of an electric furnace analogous to the blast furnace, in which run-of-mine ore may be charged roughly and from which spelter, lead and perhaps also copper matte, may be obtained concurrently, I fear that there will be no realization of them.

Garbon Reduction and Iron Decomposition

Whatever be done in electric smelting is generally expected to be based on the reduction of zinc oxide (or its compounds) by carbon (and carbon monoxide); but the decomposition of zinc sulphide by iron has also been contemplated. The former is the basis of ordinary practice. The latter has been exploited in the electric smelting of Coté-Pierron and of Imbert-Thomson-Fitzgerald. While the decomposition of zinc sulphide by iron has not found application in ordinary furnace work, it has been repeatedly suggested. Indeed, the Imbert process was originally such a suggestion, the use of an electric furnace for its execution being an afterthought. The Coté & Pierron process was tried experimentally at Lyon, France, in 1906, and in 1907 at Arudy, in the Basses-Pyrenees, and was ephemerally the subject of many articles in the technical press, but lately it has not been mentioned, and I am inclined to think that the results were not satisfactory. The Imbert-Thomson-Fitzgerald furnace has been in trial at Hohenlohehütte, Upper Silesia, during the last two years. No authoritative reports of the results recently obtained there have been made public. The imperfect news that seeps through professional and commercial channels is conflicting. I shall not in this paper discuss either the Coté-Pierron or the Imbert-Thomson-Fitzgerald proposals, but shall confine myself to a consideration of the reduction of zinc oxide by carbon. In this discussion I shall draw upon general metallurgical experience, upon the information obtained in experimental electric zinc-smelting at McGill University, and upon the authentic reports of work that has been done elsewhere.

The reduction of zinc oxide is an endothermic process, i.e., heat must be supplied to it. This may be done either by the external heating of the retort containing the charge by the combustion of coal, or by internal heating by means of the electric current. The theoretical advantage of the latter rests in the possibility of developing the heat in the midst of the charge, i.e., in the heart of the place where the work is to be done, a condition that does not exist in ordinary external heating. The electric furnace may be of two types, namely, the arc furnace and the resistance furnace. To draw a familiar analogy, the arc furnace is exemplified by the ordinary arc lamp used for illumination; the resistance furnace by the ordinary incandescent lamp. Another type of furnace, namely, the induction furnace, will not here be taken into consideration.[1]

Types of Furnaces

The original De Laval furnace was a simple arc furnace, in which the heat of an electric arc, formed between electrodes projecting horizontally into the furnace, acted upon the charge of ore lying under it. Among the various types of resistance furnace we may have that in which the current passes through a resistor of carbon (as in the Imbert-Thomson-Fitzgerald), or that in which the electrodes dip into the charge to be smelted, or into a bath of slag which serves as the resistor. It will be unnecessary for the present consideration to go any further into the subject of the types and design of furnaces. It is the fundamental metallurgical principles upon which it is still most important to center attention. In the present status of the art of electric zinc-ore smelting, the functions of the electrician are subordinate to those of the metallurgist.

In the earliest attempts to smelt zinc ore electrically, the conception was of an apparatus similar to an ordinary retort, but electrically heated. In some of our early experiments at McGill University, we used furnaces of analogous character. The rate of reduction in these furnaces was about on a parity with the rate in the ordinary retort, temperatures being equal, which was, of course, what was to be expected. These experiments, made primarily for another purpose, confirmed the idea that if electric smelting were to offer any advantage, it must be conducted continuously. Here is introduced a departure from the conditions of ordinary smelting, which is an intermittent operation, conducted in two stages, the first comprising the expulsion of aqueous vapor, and the decomposition of hydrocarbons and carbonates; and the second being that of the reduction of the metallic oxides. If zinc smelting is to be done continuously, it seems that the operation must be confined to the second stage, which implies that the things that ordinarily happen in the first stage must be caused to take place by a previous preheating. With such a preheating the actions in the furnace become essentially the same, but there are certain important differences.

Differences from Ordinary Practice

One of these differences pertains to the carbonaceous reduction material that is mixed with the ore. It has been shown by Boudouard that the permissible limit of carbon dioxide in the gas of the zinc retort is very low; varying with the temperature, but still very low at the very high temperature of 1500 deg. C., a temperature that is not attained in practice. When the permissible limit is exceeded, carbon dioxide acts oxidizingly upon the zinc, and coating the condensing globules of the latter prevents coalescence and forms powder.

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[1] An induction furnace has been proposed by G. Gin, but it has not been tried, so far as I am aware.

The gas issuing from the zinc retort of practice is within the permissible limit of carbon dioxide, or nearly within it, and the zinc is condensed chiefly as molten metal. Conversely, all attempts to smelt zinc ore in the blast furnace have resulted only in the production of powder because of inability to control the percentage of carbon dioxide. Small quantities of molten zinc have been occasionally found in the blast furnace, undoubtedly due to the accidental occurrence of favorable conditions.

The uniformly favorable conditions of the ordinary zinc retort are due to its small size, its confined character, and the presence of an immense excess of carbon in the charge. Carbon dioxide, resulting from the reduction of zinc oxide, and from other reactions, is immediately exposed to the great surplus of finely divided, intimately admixed, incandescent carbon, and is reduced by it to monoxide.

Continuous charging implies discharging of the residue without interrupting the smelting operation. This in turn implies the discharging of the residue as a slag that will run. Both conditions imply the absence of any great excess of carbon, which cannot be slagged and cannot be permitted to accumulate in the furnace. In this important particular, the internally heated, continuously operated retort or furnace differs materially from the externally heated, intermittently operated retort.

Carbon Dioxide

In our experimental work at McGill University, we have commonly found high percentages of carbon dioxide in the gases from the furnace, much higher than exist in the gases from the ordinary retort. Besides this difference we have observed the presence of considerable quantities of carbon and ore-dust in the condensers, indicating another variation from the conditions of the ordinary retort. In the continuous feeding of the charge into the electric furnace, there is naturally stirred up some dust which may be, and probably is, carried out into the condenser by the relatively strong outrush of gas and vapor; the latter may indeed entrain some dust from the surface of the charge in the furnace. There may be some other physical disturbances.

The effect of the carbon dioxide in the gas has been recognized by Coté & Pierron, by Johnson, and by other investigators who have caused the gas and vapor from the retort to pass through a column of incandescent carbon, the purpose of which is to act as a secondary reducer. This is believed to be, at least, ameliorative.

Except for the metallurgical differences that have been previously pointed out herein, the reactions and condition in the internally heated retort are essentially the same, providing that the charge introduced into the former be preheated to a degree corresponding to the preheating that takes place in the first stage of the intermittent process. The gradually introduced charge, with its interstitial air, should not involve any new conditions, except those previously noted, inasmuch as the gas inside of the furnace displaces the interstitial air before the charge enters into the smelting chamber. The reduction of lead and iron, developing carbon dioxide, and the multiplicity of complex side-reactions, take place in one kind of retort as well as in the other.

There is no positive evidence that the electric current passing through a furnace plays any metallurgical part other than thermic. Harbord reports no observed difference between the actions of the arc furnaces at Sarpsborg and the resistance furnaces at Trollhättan, except in the efficiency of the energy supplied. At McGill University we observed arcking in the furnace when a resistor of fragments of carbon was used; and this arcking was followed by disturbance in the furnace that we have been unable to explain; but there was no such occurrence in a furnace with a continuous resistor of carbon, in which furnace the reduction of zinc oxide appeared to take place regularly and normally. This particular furnace was provided with a peep hole (closed by mica), through which the process of distillation could be observed. The resistor was vertical in position, the charge surrounding it. The distillation proceeded most actively around the resistor, the heating element, the charge coning down toward this as the zinc was expelled, and the interior of the furnace maintaining an even incandescence.

Speed of Reduction

Our attempts at McGill University to reduce zinc oxide in an intermittently charged, electrically heated retort, resulted in so slow a reduction that the prospect of advantage seemed to be insignificant. I refer to a retort in which the charge was introduced in the usual manner at the beginning of the operation, the residue to be discharged as an unfused ash. There was, of course, a possibility of converting this from an intermittent to a continuous operation, but, as I have already stated, the slowness of the reduction under these conditions dispelled any such idea. When we changed to the scheme of starting the furnace with a bath of slag, continuously introducing the charge upon this bath, we found immediately that the reduction became relatively rapid. I am unable to offer an adequate explanation of the improvement in this respect. I can but state that a retort of small proportions smelts a surprisingly large quantity of charge by comparison with the retort of ordinary practice at an equivalent temperature. With a furnace of which the laboratory was a plumbago crucible 12 in. in diameter, we have been able to smelt 10 lb. of ore per hour. With a furnace 18x18 in. in horizontal section, we smelted 737 lb. in 23 hours. We have learned consequently that the claims of extraordinary capacity of electric zinc smelting furnaces of comparatively small size are well founded.

Bearing in mind the main difference between the conditions of ordinary and electric zinc smelting, we may pass on to a consideration of similarities. There is no reason to believe that the reduction of the metallic oxides, the reactions between metals, oxides, sulphides and sulphates, the scorification of oxides, and, in short, the multiplicity of complex reactions that we believe to take place in the externally heated retort, will be any different in the internally heated, the nature of the charge and the temperature remaining the same.

The Matter of Temperature

With respect to the matter of temperature, that of the electric furnace may be anything that it is pleased to make it, within the limitations of the material whereof the furnace may be constructed. In the ordinary practice of zinc smelting, the tendency in Europe during recent years has been to drive the furnace harder and harder. A furnace temperature of 1400 deg. C. was once thought to be high, but now 1500 deg. C. and upward is reported. Such high temperatures imply, of course, the necessity for much more substantial furnace construction and a high class of refractory material. Naturally the average life of the retorts is reduced. The actual smelting temperature, i.e., the temperature inside of the retorts, is about 100 to 200 deg. less than the furnace temperature. In this particular the electric furnace has the advantage that the full temperature of the furnace is realized in just the place where the smelting is to be done.

The amount of zinc remaining in the residuum, whether the latter be an ash (loose or clinkered) or a slag, depends primarily upon the temperature of the smelting and the fluxing of the ore. Conditions favorable to low zinc retention are high temperature and highly calcareous slag. It is possible to discharge from the electric furnace a slag containing less than 1% of zinc. We have made such slags at McGill University, and other experimenters also have done so. The ability to do that does not, however, imply either commercial feasibility or advisability. It may be impossible to maintain a furnace in continuous operation under the conditions necessitated by the production of such a slag. This matter has not yet been worked out. The slag made at Trollhättan, during Mr. Harbord's test, was high in zinc. We do not as yet know much respecting the shape that the smelting chamber of an electric furnace will naturally assume, the formation of refractory accretions on the walls, the deposition of sows of metallic iron (that doubtless will be produced in the same way as in the ordinary retort), and the difficulties that are likely to occur in continuous operation from these things.

SMELTING AT TROLLHATTAN

The operations at Trollhättan and at Sarpsborg were the subject of a report by F. W. Harbord, in 1911, which is the only recent source of technical information respecting them. Mr. Harbord's report was made privately for commercial purposes and did not go fully into the metallurgy of his subject. Mr. Harbord conducted a test at Trollhättan, during which 537 metric tons of ore were smelted, the test extending through 27½ days. This is the longest continuous run on a large scale that has been reported. The ore was essentially a zinc-lead ore, rather than a zinc ore, and was high in silver, containing 36% zinc, 24% lead and 30 oz. silver per ton. In making deductions from the experience in smelting this ore, we must hesitate in applying them too freely to the cases of what are more distinctly zinc ores. Mr. Harbord extracted 64% of zinc, 74% of lead and 46% of the silver as metals, which percentages would be slightly increased by further treatment of certain incidental products, but even so the metal recovery would still be relatively low.

A summary of Mr. Harbord's report is to be found in the ENGINEERING AND MINING JOURNAL of Feb. 10, 1912. Briefly, the furnaces were of the resistance type, having one large vertical electrode passing through the roof, the other electrode being a carbon block bedded in the bottom of the furnace. Each furnace smelted about 2800 kg. of ore per 24 hours. The product was partly metal and partly blue powder and oxide, containing about 54% of zinc and 20% of lead. This powder is mixed with fresh ore and recharged, when a larger percentage of the metal volatilized is recovered as metal. The first operation of smelting ore alone is to be regarded mainly as a concentrating process for the production of a rich oxide. The regular charge was 100 kg. of roasted ore, 200 kg. of powder, 25 kg. of coke dust and 5 kg. of lime. Thus for every ton of ore smelted, two tons of powder had to be resmelted; indeed rather more than that, there having been an accumulation of powder during the run.

RECOVERY OF LEAD

In the ordinary retort the lead content of the ore is reduced and is partly volatilized, condensing with the zinc, which it contaminates; and partly remains as metal in the residuum, from which it is recovered by smelting the latter, or by jigging and smelting the concentrate. The percentage of lead volatilized increases with the temperature. In the electric furnace lead behaves in the same way, but in fusing the residuum into a slag, the lead is given an opportunity to separate and thus may be tapped separately, which in so far is an advantage. On the other hand, the desirability or necessity of smelting at a high temperature leads to the collection of a leady spelter, which must undergo a subsequent refining, and the experience at Trollhättan has indicated difficulties in the furnace construction because of the lead.

I am not greatly attracted by the possibility of smelting for lead and zinc in a single operation, much less by aiming also to make a matte (although that may be inevitable), which adds to the difficulties, nor do I see any good reason to head in that direction. In most kinds of mixed sulphide ores the galena is easily separated to a fair degree by gravity concentration, and no loss need be experienced in such a separation, inasmuch as the galena and the blende-pyrites may be easily collected in filter bins. It should be the policy first to subject the ore to this cheap process, very likely cutting out a portion of the gangue sufficiently clean to be discarded, and pass the galena on to ordinary lead smelting, also a relatively cheap process, rather than to deliver all of the ore to the zinc-smelting process, which must inevitably be relatively dear, whether it be the ordinary one or the electrothermic.[2].

There will be, of course, from such a treatment a percentage of lead in the blende-pyrites, and being there it will be desirable to extract it, but it is troublesome both in the roasting and in the smelting, and I conceive that the electric smelter, like the ordinary smelter, will rather have a zinc ore without lead than with it, unless it can be obtained on terms that compensate for the disadvantages. It may be accepted, however, that the electric furnace will probably obtain a higher extraction of the lead and at less cost than is possible in the ordinary method of smelting, and there are some ores wherein the galena and blende are so intimately mixed that mechanical separation is impossible, which may be treated more advantageously in the electric furnace than in any other way. I do not by any means regard this as a step in metallurgy that has yet been accomplished, but it is a possibility. The work at Trollhättan has been in this direction.

CONDENSATION

It has been assumed by some investigators that the difficulty of condensing the vapor resulting from the reduction of zinc oxide, lies chiefly in the condensing apparatus. It may be taken for granted that the condenser connected with an electric zinc-smelting furnace, required to deal with a relatively large quantity of vapor and operating under some conditions different from those existing in connection with the ordinary furnace, must be of dimensions and design conforming to the new conditions.[3] It has been found possible to condense the zinc satisfactorily as spelter from the electric furnace treating zinc powder and galvanizers' dross. This has been done at Trollhättan, where, in the refining of crude zinc, but 9.8% of powder has been collected. In refining 111,794 kg. of leady spelter, Mr. Harbord obtained only 11,209 kg. of powder. Charles A. Weeks reported, in *Metallurgical and Chemical Engineering* of July, 1911, that in the refining of zinc dross in an electric arc furnace, during a run of 36 hours, no powder was made. In a private communication, Mr. Weeks informed me that this furnace was built and operated in the works of the General Electric Co., at Schenectady, N. Y. Accepting the foregoing evidence, which is confirmed by experience at McGill University, the reason for the production of blue powder is to be sought not in the condenser proper, but in the character of the gas and vapor delivered to the condenser; in other words, to the conditions that exist and the reactions that take place inside of the furnace itself. It has been found that when metallic zinc is simply distilled, there is no great difficulty in condensing the vapor in a liquid form, but when the vapor originates from the reduction of zinc oxide, there is difficulty.

Nearly all experimenters in ore smelting by the reduction of zinc oxide by carbon have been baffled in the attempt to condense a commercial proportion of the zinc as molten metal. We have encountered this difficulty in our experimental work at McGill University, and have not yet been able to master it. The reason why zinc vapor from the electric furnace should condense in this way has not yet been satisfactorily explained. It may pertain to the differences between the conditions of ordinary smelting and electric smelting that I have already mentioned; it may pertain also to other conditions. I shall not advance hypotheses respecting this; I shall limit myself to the mere statement of the fact.

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[2] The great progress in the treatment of mixed sulphide ores has been in the development of improved processes of mechanical concentration. See my paper on this subject in Proceedings of the Canadian Mining Institute, 1911.

[3] The condenser of the electric furnace receives no radiant heat from the front of the furnace nor from the glowing charge in the retort. On the other hand, the condensation of a large amount of zinc vapor liberates a relatively large amount of latent heat. The balance between these conditions has by no means been worked out. We find some experimenters having artifically to cool the condenser and others to heat it

BLUE POWDER

At the present time the matter of reducing and distilling the zinc and condensing the latter chiefly as spelter and blue powder is the crucial point of electric zinc-ore smelting. Until that has been accomplished, I can see no future for the process, except under special conditions of extraordinarily cheap power, peculiar kinds of ores, etc. On the basis of ore alone, the consumption of power at Trollhättan was 2078 kw.-hr. per 1000 kg. of ore, but for every ton of ore smelted about two tons of powder had to be resmelted. The smelting of 1000 kg. of ordinary zinc ore is reckoned to require from 900 to 1000 calories of heat, which is equivalent to 1047 to 1163 kw.-hr. of electric energy, these figures representing the cases of ordinary ores containing 25 to 50% zinc. In one run at McGill University, lasting 24 hours, with a resistance furnace, 18x18 in., Dr. Stansfield determined the power consumption per 2000 lb. of ore smelted as 1610 kw.-hr. (about 1771 per 1000 kg.). It has been claimed that it is possible to smelt 2000 lb. of zinc ore with 1000 kw.-hr. While it is doubtful whether such a result has yet been actually realized by anyone, the claim is plausible with respect to certain kinds of ore, although even then it is necessary to assume a high furnace efficiency. It would seem that 1200 kw.-hr. per 2000 lb. of ore would be a sufficiently brilliant realization.[4] Even such a one would put electric smelting upon a sound basis in so far as power consumption is concerned.

COST OF SMELTING

The art of electric zinc smelting is still too much in its infancy to permit of much more than speculation respecting the probable cost. The only data of operation on a large scale continued for a considerable period of time that are available are those of Trollhättan, where electric power, labor, etc., are obtained very cheaply. If the Trollhättan figures be applied to the conditions of power at $20 per horsepower per annum, labor at $3 per eight hours, and other elements in proportion, electric zinc smelting on the basis of the metallurgic results obtained there would be out of the question. If it becomes possible to smelt with 1200 kw.-hr. per ton of ore, to reduce materially the labor and electrode costs, and to extract 90% of the metals, there will be some chance.

As to the probable cost of plant we are still greatly in the dark. It is hardly to be expected that the electric plant will be of any less cost than the coal fired. Comparing operating costs, there will be the same expense for administration, general charges, yard labor and roasting in each case. Heating coal will stand against electric current, say 1 to 1.5 tons against 1200 kw.-hr. The relative consumption of reduction coal is uncertain. The retorts of ordinary practice will be dispensed with, but instead of them the electric smelter will have an electrode expense. The relative cost of repairs and renewals and miscellaneous supplies is uncertain; also the matter of labor. At first thought it seems that the labor on a furnace smelting 6200 lb. of ore per day ought to be less than in connection with 80 Rhenish retorts or 150 Belgians, but the experience at Trollhättan does not yet confirm that idea, though, no doubt, improvement will be realized in this particular.

LIMITATIONS

In the report of the Commission to Investigate the Zinc Resources of British Columbia, published in 1906, I made the following remarks:

> The successful smelting of zinc ore in the electric furnace is a matter which depends chiefly, indeed I may say solely, upon the cost of the process. De Laval has shown that it can be done. The doing of it profitably is quite another question. This is dependent chiefly upon the cost of power, the electrical efficiency of the furnace, and finally upon the purely metallurgical difficulties that pertain to the reduction of zinc oxide and the condensation of the metallic vapor.
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> . . . .
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> From the present development of electrothermic smelting of zinc ore, and the calculations respecting it, the following conclusions may be drawn:
>
> 1. Electric smelting will never displace ordinary smelting, if it be necessary to generate the power from coal.
> 2. Electric smelting may be, in the future, economically conducted at places where very cheap hydro-electric power is available.
> 3. Aside from the question of power, up to the present time certain peculiar and serious metallurgical difficulties in electric smelting have not been satisfactorily overcome.

During the six years that have elapsed since those words were written, much has been learned respecting their subject, but as generalizations they remain as true today as they were then.

The successful achievement of smelting zinc ore in an electric furnace will probably be the result of learning how to run the furnace; i.e., how to control the process, rather than of any distinct invention. I conceive that the electric zinc-ore smelting furnace will be an apparatus of general character, such as is the blast-smelting furnace for lead ore, etc. This is to say: Lead ore may be successfully smelted in many forms of furnaces of the same generic character, but with variations in their lines that are of important economic effect. Once it has been learned how to run an electric furnace for zinc smelting, I believe it will be found that the process can be conducted in many forms of furnaces conforming to the general type, wherein the principle will be the same although the economic results may differ widely.

Diamonds in German Southwest Africa

The production of diamonds in German Southwest Africa, according to the report of the German Diamond Regie, amounted in the year 1911-12 to 816,296 carats, which were sold by the company; the quantity was 798,865 carats in the preceding financial year. The average price realized was 25.602 marks (1 mark = 23.8 cents) per carat, as against 26.775 marks in 1910-11, the reduction being chiefly attributed to the further decline in the size of the stones, of which 6½ formed 1 carat, as contrasted with 5¾ stones per carat in the previous year, says the *African World.*

Of the total production, 94.55% was forwarded to Antwerp, 4.79% to Germany, and the balance, 0.66%, to London. A large portion of the diamonds forwarded to Germany was, however, sent abroad in an uncut condition, so that the German consumption scarcely amounted to 3%. The total production was raised by 14 Southwest African companies, of which 5 were responsible for 96.32% of the total. The net profits realized by the Regie amounted to $203,420, and it is proposed to pay a dividend of 10%, being the same rate as in 1910-11.

The output of the United Diamond Mines at Luderitzbucht amounted to 2480 carats in March, against 2075 carats in February. It is stated by the *Financial Times*, of London that it is officially announced that, owing to a new agreement between the Government and the Antwerp syndicate, German Southwest African diamonds will be sold at higher prices than hitherto.

Titanium Rails

There is at present much experimenting to produce a rail that will be more resistant to wear than those now in use. Over 150,000 tons nickel- and nickel-chromium-steel rails were rolled in 1910, beside about 80,000 tons of chromium, manganese, vanadium and other similar steels. However, most of the experimenting was done on titanium steels, of which 250,000 long tons were rolled says the U. S. Geological Survey. There need not be any titanium left in the steel, its value being in its absorptive power for nitrogen, oxygen, and other impurities.

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[4] It may be possible to economize electrical energy by the direct use of coal or gas for part of the process. Perhaps the carbon monoxide discharged from the condenser may be utilized. However, I do not consider knowledge of electric zinc-ore smelting to be far enough advanced yet to warrant any calculation of this kind.

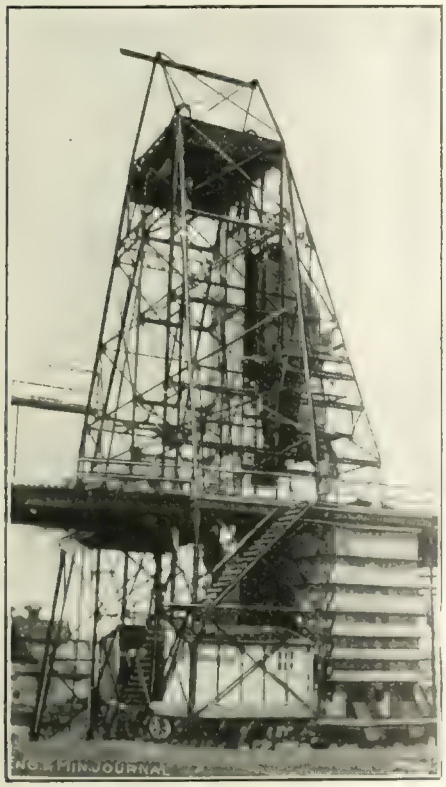
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Steel Headframe at Negaunee Mine

The new steel headframe, recently completed at No. 3 shaft of the Negaunee mine of the Cleveland-Cliffs Iron Co., is shown in one of the accompanying illustrations. The circular, concrete-lined shaft is 940 ft. deep and 17 ft. inside diameter. There are two skip compartments through which hoisting will be done in balance, and a cage compartment with a counterweight, consisting of a length of 11-in. steel shafting in a 12-in. pipe. The arrangement for handling sheaves is convenient. To take a sheave out, it is hoisted to the horizontal member at the apex of the headframe, moved to the side and lowered.

The steel stockpile trestle is also shown in an illustration, and is an innovation at the iron mines, where it is customary to build a wooden trestle every year. The total length of the trestle is 3000 ft. It extends an equal distance in either direction from the headframe. A single line of reinforced-concrete pillars about 5 ft. in diameter and over 100 ft. apart supports the two tracks. The cars are self-dumping, which is not the case at most mines, where from two to eight men are required to dump the cars.



Steel Headframe at Negaunee Mine and the Negaunee Stockpile Viaduct

Some Improvements in Drill Sharpeners

A number of changes have been made in the Word drill sharpener used at the Champion mine in the Lake Superior copper country, to make that machine meet more closely the requirements of that mine. A special fuller for drawing out the wings of the dull bits and a four-piece die for forming them are among these improvements. By their use the manner of working out the metal in hand sharpening is approximated.

In order to make the tail block against which the drill steel abuts during sharpening more rigid, it is carried on heavy I-beams, so that the tail-block guides are rigid and a screw feed can be used on it without danger of breakage. Instead of throwing the valves by a special controlling rod and thereby bringing the two die hammers into a retracted position, as is done in the ordinary Word sharpener, both the vertically and horizontally disposed hammers are thrown out of the way automatically by the air as soon as it is turned on. In the old method the lifting device was apt to wear and get out of order so that the vertical hammer would be thrown at the wrong time, often spoiling a finished drill. In the Champion method of accomplishing this withdrawal of the hammers into a retracted position, the throttle piston, whenever the treadle control is released, is carried back by the air and shuts the air off from the valve chests of the hammers, at the same time uncovering an auxiliary port allowing air to enter behind the piston so as to hold the hammer in a retracted position and out of the way. The valve and the hammer piston are specially designed to accomplish this, so that there is only one lever to operate, and that a foot lever, to control the running of the two hammers, and the only auxiliary lever is the hand lever that is used to run the tail block forward or backward.

In order to lessen the breakage on the pistons both of these operate through guide collars so that the side bound of the hammer on striking the die and the steel is limited. This has reduced the strain on the piston rods which is usually considerable. Another feature is that both the bedplate casting and the column supporting the vertically disposed hammer are hollowed out so as to serve as an air receiver for the sharpener.

In order to diminish the wear and tear as well as the trouble which comes from leakage from the wearing of a spool valve, a hollow double-ported spool valve with a small throw is used; this has been patented by Ernest Pemberthy of Painesdale. The details of this valve which has worked in these sharpeners so well that only one of the four used on the two machines has been replaced during 20 months of service, will be described in another article. It is only mentioned here so that the reader will understand why, in the enumeration of the repairs on the drill sharpeners, there is mention of only one valve being replaced on the four cylinders that are in constant use nine hours a day.

In order to diminish the danger of smashing down the drill wings too much in drawing them out before forming the finished edge, a fuller arrangement is so fastened as to swing in by a horizontally disposed lever under the vertical hammer. In this way the fulling blow is struck at short stroke so that the speed of the hammer is less and the blow is considerably lighter than when the fulling is done with the vertical hammer at full stroke. This fuller is made in two parts so that in case one wing needs more fulling than the other it gets the benefit of the blow. This fuller fastens by a pin to the fuller holder so as to let it rise up with the thickness of the wings that are to be drawn out. The fuller and its holder slide in on this pin as a guide until they strike a collar that stops the fuller in its proper position with respect to the openings of the die block on which it rests while being used. When to one side this fuller is carried on a resting block that also acts as the key block to hold in place the die for shaping the sides of the drill and the bottom sides of the wings while they are being spread with the fuller attachment.

In sharpening the drills a four-piece die is used. These four parts operate in a sleeve which, owing to the shoulders on each end of the die pieces, also keeps them from flying out. The advantage of the four-piece die is that the die faces can easily and cheaply be ground down on an emery wheel without drawing the temper. In the case of the solid dies it is necessary to draw the temper and machine down the faces in order to straighten out the bottom of the die grooves. Then the die has to be retempered. This means considerable trouble and expense and as a result the dies are neglected and the bits of the drills allowed to become rough on their cutting edges.

By the use of the fuller the speed of sharpening is greatly increased, especially in making up new drills. One new bit was formed in 45, another in 35, while a long bit took 70 seconds. Of course, the steel was already hot. By using the four-piece die the machine sharpener is made to similate hand sharpening in the way that the metal is drawn out and formed into the bit much more than is the case in machines using a solid die.

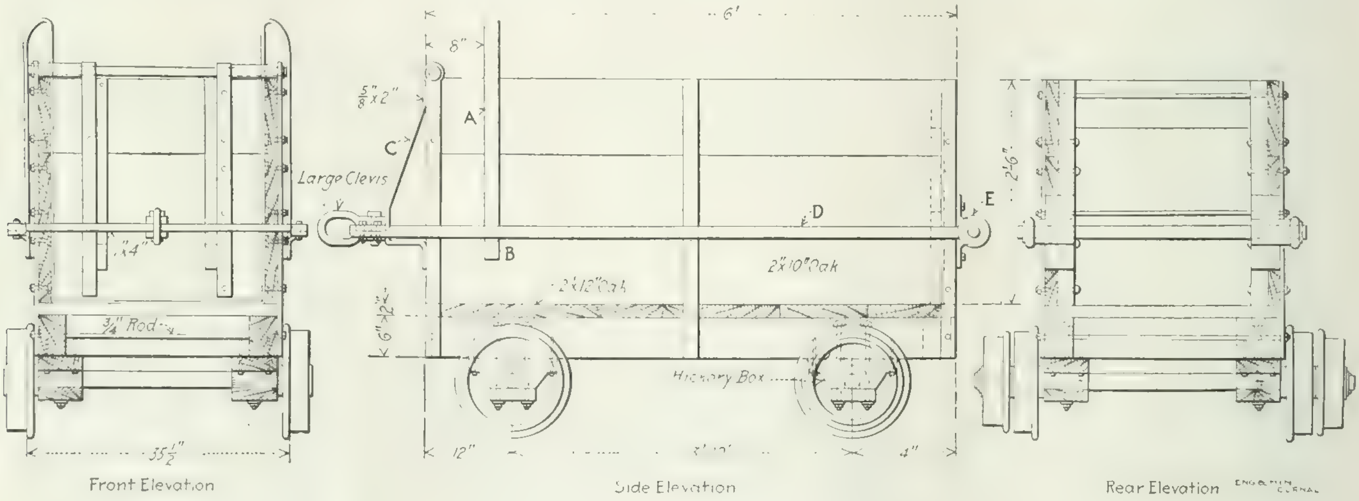
With the sharpener and the additional equipment above described, 620 cross bits varying in gage from 2¼ in. on the starters to 1½ in. on the 8-ft. finishers were sharpened on one machine in five hours. At present two machines are sharpening about 1100 drills per day as well as making up the new steel that is needed from time to time. These two machines, of course, are not crowded, nor were they when sharpening 1200 drills per day, which is the number when the mine is working at its normal output. Two have to be used as the work is too much for one sharpener.

The repairs on the drill sharpeners since they were first installed, Apr. 27, 1909, with the equipment that has been mentioned, two machines being in use and an average of about 1100 drills sharpened per day, have been: Dec. 19, 1910, one hollow spool-valve for hammer chest, one new set of dies, one tail-block nut, one back-head spring; Jan. 12, 1911, upright piston rod broken and replaced; Jan. 12, 1911, refaced fullers. Jan. 30, 1911, changed top and bottom dies; March 13, 1911, new set fullers; Aug. 24, 1911, horizontal piston rod broken and replaced; Sept. 30, 1911, new tail-block nut put in.

The cost of the sharpening, exclusive of power and upkeep of the machines, for the year 1910, during which time at the three mines, the Baltic, Trimountain and Champion, 638,593 cross bits and 2002 single bits were sharpened and 9500 new drills were made, was, for labor, 1.5c. and for fuel 0.16c., or a total of 1.66c. per drill, exclusive of repairs or cost of power. The labor consisted of seven drill sharpeners at $66.57, three men tempering at $68, and four boys at $35 per month. During this time 310,652 lb. of coke was used, or 0.457 lb. coke per drill sharpened and tempered. Credit for these different innovations belongs to James Treganza, blacksmith-shop foreman, P. P. Daume, machine-shop foreman, Ernest Pemberthy, the draftsman, and W. J. Richards, the master mechanic, as working in common they gradually thought out the changes that have been made.

Skip Car for Flat Grades

The details of construction of a skip car for flat grades is shown in the accompanying illustration. These cars are used in the Joplin district, chiefly for transferring the ore from a subsidiary shaft to the mill hopper or bin, but which are also used in some instances for hauling boulders up an incline to the dump, and in other instances for conveying dewatered tailings to the tailings pile. In all instances, these cars are used on a flat grade, so that a front door is required to hold the load in place.



Skip Car Used in the Joplin District

The body of the car is made of 2-in. oak, lined on the inside with No. 12 plate, and held together by iron straps at the end and middle. The wheels are keyed to the axles and the axles rotate in bearing pieces of hickory. The bridle is fastened to the skip by side straps to a cross piece of round iron at the rear end of the car. Guide pieces *A* are bolted to the sides near the front end, so as to guide the straps back down the sides of the car in case they move above the sides of the car when dumping. Brackets *B* are also provided for the bridle straps to rest on while the car is being filled and while the cable is slack.

As the car dumps by the raising of the rear wheels above the line of the track, the tread of the back wheels is made wider than that of the front wheels. This is effected by putting two separate wheels on the rear axle, the outside wheels on each side being loose. On this account, no special wide-faced wheels have to be cast for these skip cars. Because the grades are flat, the cars have to be fitted with a front door. This is latched by the bridle which, after the car dumps, drops down on to one or two bracket pieces *C*, that are bolted to the door of the car.

The dump consists of two timbers put up at such an angle that the rear end of the car is raised about 4 ft. in a distance of about 10 ft., and owing to the slow speed with which the car is hoisted into the dump, no attempt is made to ease the shock by curving the dump track. The raising of the rear end of the car raises the cable and lifts the bridle off the brackets, unlatching the doors. When the car is lowered back out of the dump, the bridle drops as the rear end of the car falls and the door is again locked in place. For self-dumping surface cars running up fairly steep inclines, but where the car must be in a horizontal position while being loaded, a rear-dumping car in which the door is unlatched by a trip may be preferable, but on flat inclines the front-dumping car seems to be better.

Automatic Mine Pump Control

Plans are now being made at the Homestake mine in South Dakota for installing electric-driven pumps for raising all the mine water to the tunnel at the 200-ft. level through a flume in which it will run out to daylight. Worthington pumps of 1000 gal. per min. capacity, driven by Westinghouse motors will be installed in pairs at the 500, 800, 1100, and 1400-ft. levels, and near the Old Abe shaft in which the pump columns will be placed.

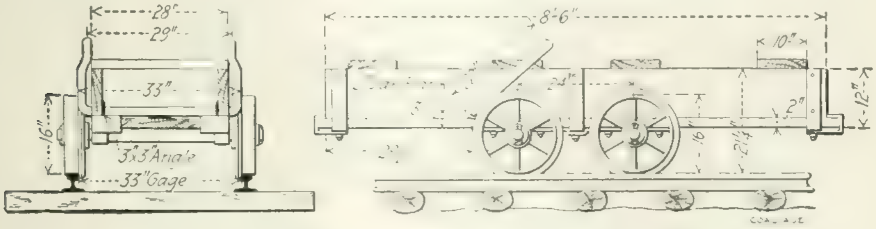
The pumps will be mounted upon a roof of I-beams and reinforced concrete over the sumps, all of which are 23 ft. square. The pumping will be controlled by floats in the sumps arranged so that when the floats rise a switch will be closed automatically and pumping will start. When the floats sink in the sumps to a certain level the switch will be opened and pumping stopped.

A Cornish pump that has been used satisfactorily in the Old Abe shaft for 30 years will be dispensed with. Sinking work has been going on in the shaft for nearly a year and it is the intention to maintain the bottom a little lower than that of the Ellison or main hoisting shaft. A pump will also be installed at the drainage tunnel which will be used for raising the water to the tanks in case it is required in the mills.

Safety Device for Cars on Inclines

Apropos of the remarks, recently published in the JOURNAL, regarding the use of safety appliances on cars and skips in inclines, the device described by A. W. Evans, in *Coal Age*, is of interest. The device is used on the man cars in the Rockwood slope of the Roan Iron Co., at Rockwood, Tenn. It may be used on the cars of any flat incline, but where the grade is steep the device would be useless.

As shown in the accompanying illustration, the appliance consists of two 1½-in. round iron bars, one attached to each side near the rear end of the car. While hoisting, the bars are thrown back, so that they trail upon the ground. Should the rope break and the car start to move backward, the ends of the bars would seize on the floor of the incline and act as props upon the car. The device is only effective for preventing accidents while hoisting. Nothing is said of a safety device to stop the car in case of breakage of the rope while lowering men down the incline.



SAFETY DEVICE FOR MAN CAR ON INCLINE

Strength of Manila Rope

Manila rope is measured by circumference instead of diameter, therefore, a 3-in. rope is nearly 1 in. in diameter. The strength, according to *The Foundry*, depends upon the quality of the fiber and the solidity with which the rope is twisted. A 3-in. rope, soft laid, has a maximum strength of about 7300 lb., while a hard laid rope will withstand up to 9000 lb. The breaking strength of ropes can be obtained approximately by multiplying the square of the circumference by 8 and the product by 100, which gives the strength in pounds. For blocks and falls, the rope should be figured at one-eighth its breaking strength, using two double blocks of suitable size. Thus, if 1000 lb. is to be raised regularly, two double 8-in. blocks, equipped with 3-in. manila rope, should be used. For direct pulls on single ropes, the latter should be operated at only one-twentieth of its breaking strength, to allow for wear and tear.

Sinking Placer Test Pits in Siberia

In the Amur district of Siberia, prospectors work in pairs and sink 30 pits to an average depth of 17½ ft. in the four winter months, November to March, states Leon Perrett.[1] Sinking to prospect gold- or platinum-bearing deposits is done by the thawing method, i.e., fires are built on the bottom of the pit, which thaw the gravel to a depth of about seven inches. The thawed gravel or clay is then excavated. The sinking is done at the rate of three feet per shift, and at a cost of 45c. per ft. including cost of overseeing, washing samples, and maintaining a few horses. From 0.9 to 1.3-cords of wood are burned to sink a pit to a depth of 18 to 20 feet.

The pits are dug to depths of 11 to 28 ft. or more and are about 5x6 ft. in section. The excavated material is thrown to the surface from the shallower pits, while a windlass is used for the deeper. If the pit is too deep for the shoveler to throw the clay or gravel to surface and it is not to be sunk deep enough for a windlass, a "shelf" is built, i.e., recesses are cut into the walls in which the ends of beams are placed, upon which a floor of boards or poles is laid so as to cover about half the section of the pit. The excavated material is thrown upon this platform, and then to the surface.

This method of prospecting may be used in regions where there is little snowfall, where heavy uninterrupted frosts prevail during a few months, and where sufficient wood for fuel is available. The alluvial deposit should not be over 30-ft. deep, as at greater depths the gravel freezes slowly or not at all. The natural freezing may be expedited by using stoves to accelerate the draft in the following ways:

1. By dividing the pit into two equal compartments with brattice cloth, and maintaining a good draft by a small iron stove on the pit bottom.

2. By dividing the pit into two unequal compartments with brattice cloth extending to within three feet of the bottom, the larger division then being covered at the surface with a closely fitting floor into which is inserted a tall wooden box made of tightly joined boards with inside dimensions 21x28 in. At a distance of 4½ ft. above the floor an iron grating is fixed in the box, which is accessible through an opening provided with a tight fitting door. Through this

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[1] Bull 92 I M M

opening a perforated drum of sheet iron is placed on the grating and in which a charcoal fire is built to induce the draft required to promote freezing.

3. By placing a bottomless iron box about 28-in. high on the bottom of the pit. This box is smaller than the pit so as to leave a 10 or 14-in. space all around between its sides and the walls of the pit. The box is forced into the gravel or clay as far as possible and then the joint is made air-tight by packing earth around it. From opposite ends of the top of the box two iron pipes, 3 or 4-in. in diameter lead to the surface; one opens to the air, the other is fitted to a stove at the collar in such a manner that the draft for the stove is drawn through this pipe. The doors of the stove are made air-tight with asbestos. If the stove is kept burning continuously the bottom of the pit can be frozen in this way in half the time required by either of the other methods. The sides of the pit freeze independently.

Heating Water

Water for a 50-gal. tank can be heated in an ordinary upright heating stove, such as is used for heating large rooms, by running pipes down through the grid in the top of the stove. This is done at the plant of the St. Louis Smelting & Refining Co., in the Flat River district of Missouri, where only a small quantity of hot water is desired, as at the change house for some outlying shaft, or for the machinists in a small wash room away from the main change houses.

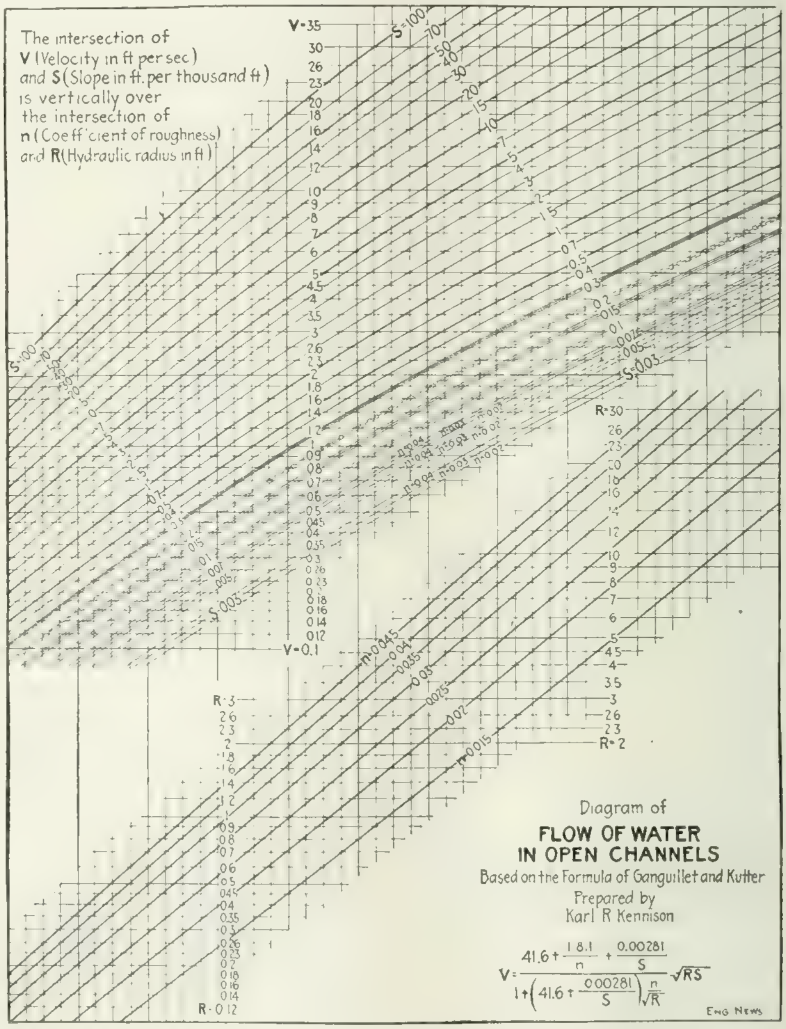
In case the water contains much scale-forming compounds, it will be better to put in a pipe of large diameter, say 8 in., the top cap of which is tapped to receive two 1¼-in. pipes for circulating the water back and forth from the hot-water reservoir tank. Any scale that may form can then be cleaned out easily from the large pipe. Using this large pipe which is carried down about 18 in. into the stove, the heating is not so efficient as a coil of 1¼-in. pipe, carried down through holes in the top grid, because when heated in that way the water circulates as fast as its temperature rises, while a proportionately greater heating surface is obtained by the use of the coil. Scale, though, gives more trouble.

To Anneal Cast Iron

A German authority says, according to the *Engineer and Fireman*, to anneal cast iron, heat the whole piece to a bright glow and gradually cool under a covering of fine coal dust or similar substances. Small objects are packed in quantities in a pot in a furnace. They should be heated gradually, kept at a bright heat for an hour and allowed to cool slowly. The substances used as a covering, in addition to fine coal dust or powdered charcoal, are cast-iron turnings, sodium carbonate or raw sugar.' If only raw sugar is used, the quantity should not be too small.

A New Kutter Formula Diagram

The accompanying diagram for the Kutter formula is the result of several months' study to put this much used formula into compact convenient graphical form. In many computations of flow in the Mississippi, Missouri, and other rivers, states K. R. Kennison in *Engineering News*, this diagram has saved about 75% of the time used in making such computations by the only other Kutter diagrams which, as far as I know, are available.



The Kutter diagram prepared by Messrs. Rudolph Hering and John C. Trautwine, Jr., is complicated, but from it, after carefully flattening it out, one can with a straight edge find, when the other three are known, any one of the four variables *R* (hydraulic radius), *S* (slope), *n* (co-efficient of roughness), or *C* (the constant in the equation $V=C\sqrt{RS}$). Prof. I. P. Church has to some extent improved upon this by preparing a set of several diagrams, each for a different constant value of *n*, which eliminate the necessity of dealing with *C* and enable one to find, when the other two are known, any one of the three variables *S*, *V* or *R*. It is impracticable, however, to find *n* from the other three variables.

Other authors have arranged graphical solutions of this Kutter formula, but I know of none which, like the one here presented, puts upon one small sheet all the information which can be desired and enables one to find almost at a glance any one of the four variables *V, S, R,* or *n* when the other three are known.

In its present form this diagram could not be used, except approximately by extrapolation, when very low values of *S* (slope) are involved; but I believe from considerable experience in its use that its scope is amply adequate, particularly in problems where the flow is in rivers and other natural channels.

In connection with a notable power project now in process of construction, I have used this diagram in estimating back-flowage conditions in flows varying from 20,000 to 300,000 cu.ft. per second and with many varying pond levels.

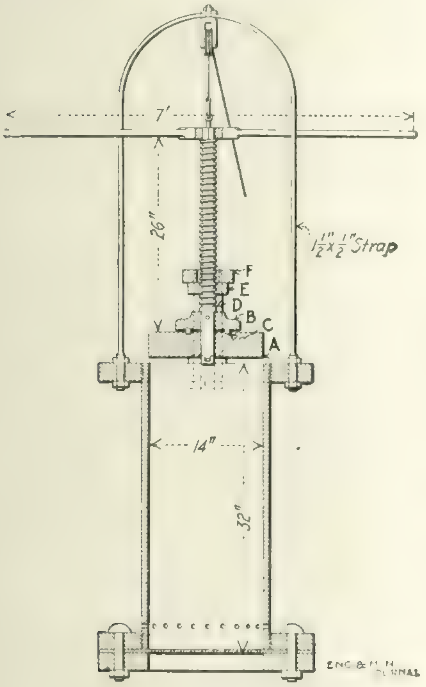
The Admiralty alloy, which is highly resistant to corrosion, is: Copper, 70; zinc, 29; and tin, 1 part.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Cleaning Oily Waste

At the Leadwood mill of the St. Joseph Lead Co. in the lead district of southeastern Missouri, Ross Blake, the superintendent, cleanses soiled engine waste with Oakite and obtains waste free from oil that he uses instead of colored waste which costs 6c. per lb. This waste, after it has been cleansed once and has again become soiled by oil, is cleansed a second time and a still dirtier product obtained which is used again, but only for the dirtiest work about the central station.



PRESS FOR CLEANED WASTE

The cost of cleansing, according to the results of treating the first batch of 1100 lb. of waste, is 2½c. per lb. Of this, 1.3c. is the cost of Oakite required per pound of waste cleansed, Oakite costing 11.3 per lb. There is therefore a considerable saving effected by this treatment of waste if the saving on waste alone be considered, but from 1100 lb. of waste 70 gal. of oil is obtained that is good enough to use for lubricating cars and other heavy machinery.

The apparatus required can be made cheaply. First it is necessary to provide iron receptacles for storing the waste. These are made by riveting a bottom and a cover of sheet iron to sections of old smoke-stack from 24 to 30 in. diameter. Two oil barrels are provided and one is fitted with a steam coil. In this barrel the waste is cleansed, and from it a pipe conveys the oil as it floats to the top of the Oakite solution over to the second barrel, where it is allowed to accumulate until a sufficient quantity has been recovered to make it worth while to cleanse it by rinsing with water. This can be done in another barrel. In cleansing the waste, Oakite and water are first put into the first barrel; then the oily waste is thrown in and steam is admitted to the coil. Gradually the oil is freed from the cotton fibers and rises to the surface of the solution. The oil is then floated over to the second barrel, the last of it being dipped out.

The cleansed waste is taken to a press, where as much water as possible is squeezed out before it is put on the shelves of the drying chambers heated by steam coils. These shelves are made of pieces of old screen tacked to a frame supported by the framework inside the drying box. In the accompanying drawing the construction of the press is shown. It can be made in any shop. A piece of 14-in. pipe about three feet long, is used. Flanges are screwed to the top and bottom. A few holes are bored in the sides of the pipe near the bottom to aid in draining the water as the waste is compressed. An iron plate ⅜ in. thick with a series of holes bored through it is put on as a bottom by bolting it between the bottom and another flange. The body of the press is bolted to a timber frame so that it will be held securely in place while the waste is being pressed. From the top flange of the pipe a strap-iron yoke is carried up to support a pulley, suspended from it by a stirrup attached to a swivel. This pulley is used to lift the head of the press out of the body after the waste has been pressed dry. The pressing device consists of the head-piece *A*, three inches thick, which makes a fairly tight fit with the body of the press; the foot-piece B, which together with the head, is recessed to take the balls *C* between the foot piece and the head plate; the screw *D* is 2 in. diameter and 26 in. long. To it the foot plate *B* is securely fastened, while the head piece is loosely secured to it swivel fashion. On the top end of the screw is a nut *E*, that fits under the yoke *F*. This yoke is fastened by U-bolts to the upper flange. The upper end of the screw is square so as to receive the double-hand wrench *G* by which the screw is turned and the waste compressed.

The Caldecott Sand Filter Table

The Caldecott sand filter table is one of the appliances used in connection with the Caldecott system of continuous sand collection. This table takes the place of the collecting vats that were formerly required in all cyanide plants on the Rand. The pulp issuing from the batteries undergoes a preliminary treatment in the Caldecott, diaphragm, cone classifier, in which a separation of sand from slime is made. The underflow, a thick sand containing from 26 to 30% moisture, is carried by a small additional stream of water through a launder and is discharged upon the sand filter table, where the water is removed prior to treatment by cyanide solution. One of the advantages of the table is that half an hour after the pulp leaves the battery, after having been crushed in water so as to enable flowing it over amalgamation plates, the excess water can be removed and the cyanidation of the pulp be started.

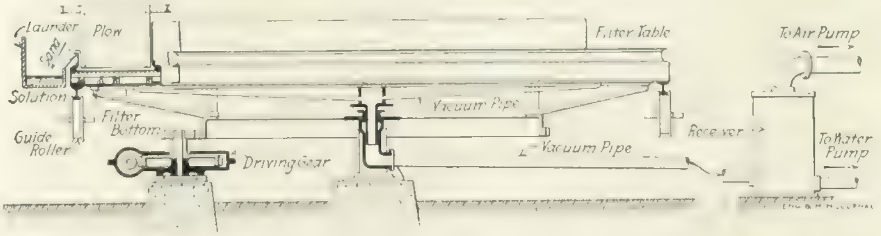


FIG. 1. CALDECOTT SAND FILTER TABLE

The underflow from the first diaphragm cone is led to a secondary cone or cones with the addition of sufficient water to enable the resultant pulp to flow readily through launders set at a grade of not less than 10%. The overflow of the secondary cones carries with it about 80% of the slime left in the underflow of the primary cone, so that a final product containing about 1 to 1½% slime remains for treatment at the filter plant. As the efficiency and durability of the filter depends largely upon the freedom of the sand from slime, it will be seen that efficient working of the classification plants has a great effect on the results obtained by the system of continuous collection of sand.

The sand filter table consists, as shown in the accompanying illustration, of a central supporting cylinder, around the periphery of which is a launder in which is fitted a grating carrying a heavy filter cloth. This launder is capable of being revolved at a speed of one revolution every three minutes, it being mounted upon rollers, as shown, for that purpose. The bottom and sides of the launder must be air-tight, and should be well coated with bitumen, applied hot, after the usual calking has been done. The grating is made of strong screening, about 9 mesh, with No. 12 or 14 wire, and is supported by pieces of wood set radially on edge and beveled so as to reduce the filtering area as little as possible. On the grating is laid cocoanut matting bound at the edges and calked well into the sides of the launder. As cocoanut matting shrinks on becoming wet it must be cut to fit the launder and placed in position while moist, otherwise it will be liable to pull the calking away from the sides of the launder. A strip of jute about six inches wide should be placed between the matting and the grating at the outer and inner edges to render the filter less porous at these places. This is necessary to obtain an even flow of air through the filter, as the layer of pulp from the classifiers is usually thicker at the middle than at the sides. To prevent slime reaching the matting and choking it, strips of unbleached calico are cut to fit the launder and laid on the matting without being fastened.

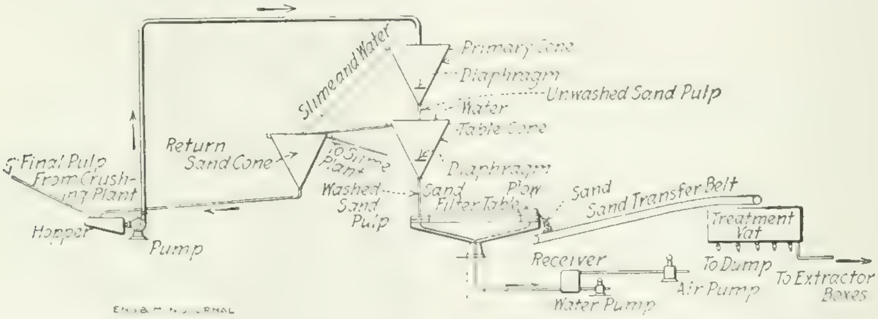


FIG. 2. FLOW SHEET, SHOWING POSITION OF SAND TABLE

The sand is removed from the revolving table by a stationary plow placed in a slanting direction across the launder, and made so that it may be raised or lowered a few inches when desired. Care must be taken, however, that it does not approach closer than ½ in. to the filter cloth, and that the variation in the distance between the filter cloth and the plow does not exceed ⅛ in. during a revolution of the table. The launder is attached to a center column on which it revolves, and is driven by gears actuated by a 5-hp. electric motor. The center column is hollow, and is connected to a receiver to which a vacuum pump is connected at its upper and a water pump to its lower portion. Pipes are placed to connect the bottom of the launder and the column so that the space between the bottom of the launder and the filter cloth may be partly exhausted as is shown in the accompanying illustration.

The pulp from the classifiers is distributed at a point about three feet behind the plow, so that the sand must make almost a complete revolution on the table before being removed. In actual working the plow is raised so as to leave a space of 1¼ in. between its lower edge and the filter cloths, and the table is put in motion. The pulp from the classifiers being directed on to the filter and the pumps started, the superfluous moisture is drawn through the filter to the receiver, from which the water pump returns it to the mill supply. The space between the plow and the filter cloths becomes filled with a bed of sand which forms the working bed and prevents slime being drawn into the matting. This bed, and the calico, must be renewed at least once every 24 hr. The operation is readily performed, and in actual practice takes less than an hour.

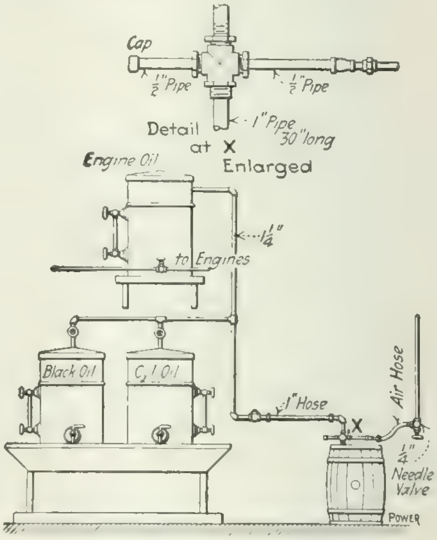
The vacuum, as shown by a reliable gage, must not be allowed to rise higher than about 10 in. of mercury. If this does occur, the working bed should be carefully raked, when the vacuum will drop once more to normal, provided the bed has not become choked with slime. A table of this type, 20 ft. in diameter with a 2½-ft. filtering bed, is capable of handling one ton per minute, and will regularly reduce the moisture in 800 tons of sand per 24 hr. from 30 to 12 or 14%.

The power required to drive a plant where two filters are used, handling about 1600 tons of sand per day, is about 69 hp., as follows: Two filter tables at 5 hp. each, 10 hp.; two water pumps at 2 hp. each, 6 hp.; one sand pump elevating 40 ft. 40 hp.; one pump supplying solution to gland of sand pumps, 3 hp.; a total of 69 hp. Separate receivers, vacuum, and water pumps, are required for each table installed, and should be arranged so that any receiver may be connected with any table, to permit repairs being made without stopping the plant. In the accompanying figure a diagrammatic scheme of how this filter table may be used in the treatment of sand is indicated by a section of a flow sheet.

These sand tables, each handling sand from over 2000 tons of ore per day or about 13% of the total Rand tonnage, are used at the Simmer Deep-Jupiter, Simmer & Jack; Cason (section of East Rand Proprietary Mines); Angelo (section of East Rand Proprietary Mines); and are to be installed at the Princess and at the City & Suburban mines.

Compressed Air Oil Lift

In a mill where compressed air is available and there is a considerable amount of oil or other liquids to be taken from barrels and transferred to tanks or other receptacles, the device shown in the accompanying illustration will make a useful adjunct to the engine room, states A. R. Munzer, in *Power*.



PIPING FOR AIR LIFT FOR OIL

It is simple in construction and can be made in a short time (with the exception of a special bushing, which requires lathe work) by anyone familiar with pipe tools. The sketch shows the construction plainly, also the method of using the device in a power plant.

Care should be taken not to open the air valve too suddenly, especially when pumping cylinder oil, which is generally heavy and hard to move. It is best to let the cylinder oil stand in a warm place for a day or two before attempting to pump it out. A ¾-in. needle-valve on the air line should be used, but an ordinary valve will do if the attendant is careful.

In 1911, 2650 ft. of churn drilling cost the Giroux Consolidated company $5628; this is an average cost of $2.12 per ft. A common contract price for similar work on the Cuyuna iron range in Minnesota is $3 per foot.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Esperanza Costs

At the Esperanza mine, El Oro, Mexico, the timber consumption, in 1911, amounted to 21.52 b.ft. per ton of ore (2240 lb.) compared with 35.49 b.ft. in 1910 and 43.33 b.ft. in 1909. The reduction in the use of timber in 1911 was the result of working narrower and harder orebodies as well as a more careful use of timber. These figures include all timber used in drifts, shafts, raises, winzes, squaresetting, lagging, bracing, wedging, stulls, and miscellaneous uses underground. All timber is handled on the surface by an electric yard locomotive.

The cost of operating per ton of ore, (2000 lb.) for 1911 was as follows: Development, 70c; ore breaking, $1.06; transporting from mine to mine bins, 30c; transporting from mine bins to mill bins, 5c; making a total cost of $2.11 per ton delivered at the mill. Milling cost was $1.52 per ton milled, making a total of $3.63 per ton for mining and milling. After the addition of indirect charges the total cost of production was $4.38 per ton of ore.

Costs on Gogebic Range

The Gogebic iron range is in the northern part of Michigan and Wisconsin, on the south shore of Lake Superior. The principal mines in Michigan, situated on this range, are near the towns of Ironwood, Bessemer and Wakefield. The deposits on the range reach depths of 1000 ft. or more and mining is carried on by underground methods. The ores occur in the Upper Huronian iron formation and are chiefly soft hematites though hard, slaty ores are abundant. According to various published reports there were 15,000,000 tons of ore shipped from the Gogebic range in Michigan in five years ended 1910, and practically the same amount mined.

The principal mines of this group were the Ashland, of the Cleveland-Cliffs company; the Norrie, Aurora, Tilden, Puritan and the Chicago, belonging to the Oliver Iron Mining Co., a part of the U. S. Steel Corporation; the Newport, Anvil and Palms, owned by the Newport Mining Co.; the Ironton and Colby, of Corrigan, McKinney & Co.; the Yale, of the Lake Superior Iron & Chemical Co.; the Eureka and Castile, owned by the Castile Mining Co.; the Brotherton, of the Brotherton Iron Mining Co.; and the Mikado, of the Verona Mining Company.

Basing the value of the ore at 100%, the cost of mining and delivering the ore from this district to the lower Lake ports is approximately as follows: Mining, 32.2% of the total value; exploration and development, 2.3%; construction, shafts, machinery, etc., not charged direct to mining, 3.92%; general expenses, including administration, 2.36%; royalties, 9.1%; taxes, 1.51%; rail freights, 9.15%; Lake freights, 16%, and commissions, 1.06%; making the total cost about 77.7% of the total value of the ore. Owing to a change in the method of taxation in Michigan, taxes will probaby be much higher in the future than shown by these figures.

Costs at the Bluebell Mine

The Bluebell mine is situated on the east side of Kootenay Lake, British Columbia. Wage rates are as follows: Foremen, $5 to $6 for 8 hr.; shift-bosses, $4 to $4.50 for 8 hr.; machine miners and helpers, $3.50; hand miners, $3.25; mill hands, $3 to $4; smiths and helpers, $3.50 to $4 for 9 hr.; compressor runners, $4 for 8 hr.; muckers, $3 for 8 hr.; outside laborers, $3 for 9 hr.; carpenters and machinists, 50c. per hr.; average wage for all classes, $0.433 per hour.

The ore is all mined by adit and stoping, so there are no pumping and hoisting charges. There is but little timbering, but a good deal of shoveling and wheeling. Power is furnished by a 700-ft. head of water. Ore is hauled in trains of five 16-ft. cars by horses, except rarely, when a car is taken out by hand at night. The normal crew consists of a foreman and shift boss, 2; timberman, 1; driver, 1; miners, 14; muckers, 15; total, 33.

The total costs, as shown in the accompanying table, are $0.984 per ton extracted (calculated on 43,069 tons mined and 200 ft. of dead work), and may be roughly divided as follows: Breaking, $0.647; mucking, $0.272; haulage, $0.033; timbering, $0.032.

COSTS AT BLUE BELL MINE

	Labor $ per Ton	Supplies $ per Ton	Total $ per Ton
Foremen and bosses	0.055		
Timbermen and topper	0.042		
Miners	0.299		
Muckers and loaders	0.235		
Driver	0.019		0.650
Dynamite, fuse, caps		0.147	
Candles		0.013	
Drill points and steel..		0.014	
Miscellaneous		0.019	0.193
Power and light, depreciation	0.067	0.011	0.078
Shopwork proportional part	0.055	0.008	0.063
	0.772	0.212	0.984

Note—Abstracted from a paper by S. S. Fowler in the "Quarterly Bulletin," of the Canadian Mining Institute, February, 1912, "Costs and Cost-Conditions at the Bluebell Mine."

U. S. Iron and Steel Works

The figures published in the 13th census of the United States, show that there were 446 iron and steel works and rolling-mill establishments in 1909, compared with 415 in 1904; in 1909, 95.1% of the total were operated by corporations, producing 99.5% of the products, against 98.9% of the total products by corporation-owned concerns in 1904, when their holdings represented 92.8% of the establishments. Of all concerns reporting, 41.7% had an output of products amounting to $1,000,000 and over in 1909, while in 1904 only 31.6% were so rated.

The total cost of iron and steel material was reported as $657,500,856, and the total value of the products at $985,722,534. Material produced and purchased amounted to 38,558,359 tons, of which 7,846,462 tons were produced in the works of the concern reporting; 19,270,763 tons transferred from other works of the companies; 11,441,134 tons purchased. This material consisted mainly of 18,712,304 tons of pig iron; 9,929,710 tons of scrap; 6,508,249 tons of ingots, blooms, billets, slabs, muck, scrap bar, etc., and the remainder of ferro-alloys, skelp and wire rods.

Products sold and consumed amounted to 98,937,886 tons; 81,480,801 tons were for consumption in the works of the companies; 4,995,281 tons transferred to other works; 12,461,804 tons were produced for sale. The total products were composed chiefly of 22,968,862 tons of steel ingots, of which only 30,444 tons were for sale; 22,826,117 tons were consumed in the works of the company, and 112,301 tons transferred to other works. Blooms, billets and slabs produced amounted to 16,263,418 tons; 1,841,819 tons were sold, 3,045,977 tons transferred to other works and the remainder consumed at the works of the reporting company. Openhearth, basic and bessemer steel were next in the list in the order named, the production being 13,725,783 tons, 12,952,840 tons and 9,145,542 tons, respectively. The production of scrap amounted to 6,364,647 tons. Of the products sold, bars and rods, 3,151,569 tons, represented the largest tonnage with plates and sheets next, 2,807,114 tons.

There were 260,762 persons engaged in the industry; 47 were proprietors or firm members, 779 salaried officials of corporations, 3460 superintendents and managers, 16,400 clerks and 240,076 wage earners. Proprietors, officials, superintendents and managers represented 1.6% of the persons engaged; clerks, 6.3%, and wage earners, 92.1%, of whom 99.1% were males, 0.4% females and 0.5% were under 16 years of age. The total power reported as used by all concerns was 2,100,978 hp. The expense of production was composed of 2.9% for salaries, 18.3% for wages, 73.9% for materials and 4.8% for miscellaneous expense.

Nundydroog Mines, India

In 1911 the Nundydroog mines, Oorgaum, South India, employed 4294 persons and mined 155,962 tons of ore which indicates an average of 36.2 tons of ore per year per employee, including those engaged in development, milling and miscellaneous work. Underground, 2544 men were employed, which shows that 61 tons of ore and 4.7 ft. of development work are secured per year per man employed underground. The total development work performed was 12,096 ft., consisting of 67% drifting and crosscutting, 22% raises and winzes, 5% for ore bins, and 6% shaft sinking. The development work performed is equal to 1 ft. for every 12.8 tons of ore produced. During the year an average of 35.51 machine drills were operated underground, 34.19 being used in development and 1.32 in stoping. No data are given in the annual report in regard to the percentage of the ore mined or the development work performed by machine drills.

Of the ore sent from the mine to the mill 11.3% was discarded by hand sorting. In the mill 82.7% extraction is made by amalgamation and the average mercury loss was 2.59 drachms per ton of ore. The cyanide plant makes a 53.12% extraction, consuming 0.561 lb. of cyanide, 0.072 lb. of zinc, and 0.143 lb. of caustic soda per ton of ore treated. The mill worked during the year with an average of 82 heads and crushed 3.59 tons per day per stamp, the falling weight of each head being 850 lb. and using Nos. 6 and 7 needle-punched copper screen.

The company erected 33 new coolie huts during 1911, bringing the total number owned by the company up to 1375 huts. The employees consisted of 143 Europeans and Eurasians; 2544 natives working underground: 1579 working as hand laborers and contractors, 472 as timbermen and assistants, and the remainder in general occupations; 1607 natives on surface, 232 of whom were employed as engineers, fitters and boilersmiths, 107 as engine drivers and firemen, 73 as blacksmiths, 109 as carpenters, and the remainder in handling sand and slime, mill work and general surface labor. Of the natives employed on surface, 390 were females, 111 tramming quartz and cleaning sand from slime pits, 40 charging and discharging cyanide vats, 207 as laborers, including building and excavating, and 32 as sweepers. The total cost of production, including all expenses, was $4.40 per ton of 2000 lb. of ore as mined or $6.66 per ton of sorted ore. The net yield was 15 dwt. 14 grains of fine gold per ton of ore.

Machine Drilling in Alaska

The 1911 records of drilling at the Alaska United and the Alaska Mexican, adjoining properties to the Alaska Treadwell, as shown in the annual reports, are given herewith for comparison with the 1911 record of the Alaska Treadwell. The latter figures were published in the JOURNAL, Apr. 13, 1912. Labor cost $3.50 for machine drillers and $3.25 for helpers.

	Alaska United			
	Ready Bullion Claim	700-ft. Claim	Alaska Mexican	Alaska Treadwell
Footage drilled during year...	266,172	249,622	367,712	920,545
Tonnage broken............	252,701	210,350	340,536	1,021,765
Footage drilled per ton broken..	0.95	0.82	0.93	0.90
Average machine shifts per day in ore...	10.24	10.49	14.65	39.28
Average machine shifts per day in waste..	1.05	0.06	2.20	4.59
Average machine shifts per day, total.....	11.29	10.55	16.85	43.87
Average tons broken per machine shift....	32.5	27.4	27.8	32.74
Average footage drilled per machine shift............	34.2	33.2	30.1	29.42
Cost per machine shift:				
Labor...............	$8.59	$7.36	$7.55	$6.86
Explosives	2.88	2.68	2.34	2.62
Supplies, power, repairs, etc..	5.38	5.85	4.62	4.02
Total cost per machine shift..	$16.85	$15.89	$14.51	$13.50
Rate of drilling per machine shift, feet:				
Stoping...............	32.71	28.58	28.58	31.05*
Cutting out..............	34.91	33.90	31.32	38.45*
Development.........................	35.57	41.26	34.78	32.92*
Average tons broken per machine shift				
Stoping.................	57.70	40.67	36.25	39.04*
Cutting out.....	16.94	15.94	13.95	16.30*
Development	8.64	7.04	8.01	8.90*
Tonnage broken per foot drilled:				
Stoping......	1.764	1.42	1.26	....
Cutting out...	0.485	0.47	0.45	...
Development	0.242	0.17	0.23	....
Average number of machines employed:				
Stoping	4.85	5.92	11.28	..
Cutting out..............	3.66	1.54	2.54	
Development...	2.78	3.09	3.03	..

*Approximately.

Zinc Mining Costs

An engineer's report of a certain zinc mine in southwest Missouri shows the following costs: 48,000 tons of ore, yielding 2.15% blende and 1.3% lead concentrates after culling, cost 9c. per ton of rock for pumping, 76c. for mining, 22c. for milling and 5c. for miscellaneous charges, making a total of $1.12 per ton of rock or $32.44 per ton of material. A record of 136,000 tons averaging 1.78% yield in blende and 1.04% in lead concentrates, after culling cost 97c. per ton of rock, consisting of 4c. for pumping, 67c. for mining, 22c. for milling and 4c. for general expenses or $31.70 per ton of mineral. A four-year record at one shaft shows that of 305,000 tons of rock mined 5% was discarded by culling, the waste ranging from 9% for the first year to 2½% for the last year. A three-year record at another shaft of the same company shows a regular average of 2½% of the rock hoisted as discarded by culling.

Ahmeek Production Costs

According to the 1911 annual report of the Ahmeek Mining Co. in the Lake Superior copper district, the cost of producing copper was 7.17c. per lb., a reduction of 3.88c. from 1910 costs. The apparent reason for the lower cost of 1911 compared with 1910 is the increase yield of ore in pounds of copper, and the small amount of construction work for 1911; as only $48,822 was expended against $219,405 in 1910, a difference of 1.53c. per lb. of copper. The cost of mining, transportation to the mill and taxes was the same, $1.42 per ton stamped, for the two years; but the yield in copper for 1911 was 25.41 lb. compared with 22.3 lb. in 1910; making a difference of 2.32c. per lb. of copper, although the cost per ton of rock was the same. The cost of interest was reduced 0.06c. per lb. and the cost of smelting, freight, commissions, etc., increased 0.03c. The cost per pound of refined copper for 1911 was as follows: Cost at the mine and mill, including 11,691 ft. of development, 5.61c.; construction 0.32c.; smelting, freight, commissions, etc., 1.19c.; and interest 0.05c. In 1910, 6.8% of the ore hoisted was discarded by sorting and in 1911, 3%. The increased yield of rock in copper was partly due to a closer saving by the mill.

Company Promotion in London

By William Hillman

> **The man from the West attempting to float a mine in London finds the promoter a necessary factor in all company promotions. Because of the consequences in case of failure the promoter demands and gets what seems to be an exorbitant fee. Irresponsible promoting syndicates nullify the protection of the British company law.**

In spite of the great and growing importance of New York as a money center and even admitting that the "Money Trust" is there developed to its greatest extent, London is still preëminent in finance and it is to her financiers that the eyes of all who desire capital are turned. Although many Americans are thoroughly familiar with London financial methods, I believe those who are contemplating financing their enterprises in London will find the following notes of interest.

It is my object in this article to give an account of the usual method of raising money in London for public companies of moderate capitalization, say up to £500,000, and to point out some of the difficulties that an American vendor is likely to encounter. I also wish to show that in spite of its high reputation English company law does not afford adequate protection to the investor, and to indicate how some of these defects might be remedied.

Where the Promoter is Essential

About the first fact that strikes an American who attempts to sell properties in London is that as a rule there is no chance to sell to a group of private investors and that he must depend upon having his property handled by means of a public company; i.e. a joint stock company formed in accordance with a special body of laws, and offering its shares to the general public, usually by medium of a prospectus that is published as an advertisement in the leading newspapers, and is also distributed to individual investors through the mails.

These public companies are formed and their initial expenses are borne by promoters, and hence the chief requisite for doing business is "first catch your promoter." This is an extremely difficult task, for strange as it may seem, the promoter is a shy bird, and his name does not often appear in connection with the companies that he promotes. Though there are directories of directors, and all sorts of classified lists of investors and shareholders, there is no list or directory of London promoters. This retiring disposition of prominent men is quite a feature of London life and is carried to such an extent that some prominent bankers and capitalists do not have their names appear in the directory or in the telephone book.

It is probable that any American visiting London will have letters of introduction to leading engineers and capitalists, and it is equally probable that he will be disappointed when he attempts to do business with any of these people. He will find them so occupied with their own affairs and his interviews so full of depressing interruptions that he will not have a fair chance of stating his own case; the most that he can hope for is to be allowed to leave his maps and reports and to accept a promise that they will be carefully examined. Sometimes the reports are opened and read, but not always.

The Glad Hand Is Not Extended

A typical interview might be somewhat as follows: A long delay in a gloomy cupboard is ended by an invitation into an inner sanctuary by a stolid commissionaire, whose breast shines with medals won in African or Oriental campaigns. Hardly do you state your business when your host tells you that he has already had your proposal placed before him, or at any rate a similar one. He regrets that he cannot entertain it at present. You scarcely get a chance to utter three consecutive sentences before he is interrupted by the telephone, and you soon learn that you are talking with a man whose mind is too full of absorbing business to contain any new ideas. He is sure to have a deal of some sort on in the part of the world which is financially fashionable, whether it be West Africa, the Malay States, or, as recently, Nigeria. To him all other parts of the earth are non-existent. "Now if you only had a tin concession in Nigeria I could handle it in a minute. It is so difficult to get anything good there. I am just promoting a property with a capital of £1,000,000 and I cannot handle anything else until this is out of the way." Brr! Brr! goes the 'phone. "Yes, you must get on to him at once, for if he gets away I don't believe we can handle the deal." Then follows a long 'phone conversation, probably touching on golf before it ends. Eventually he turns to you and says in a confidential manner: "You heard this deal I was just talking about on the 'phone. It is practically all settled, and the shares are certain to be oversubscribed. Possibly I could get some underwriting for you if you feel like taking some." And before you know where you are, you will find yourself listening to the details of the promoter's scheme, and all chances of discussing your own proposal vanish. This effective method of getting rid of a visitor who seems likely to prove unprofitable, by leading the conversation to the promoter's own affairs, is so common that I have sometimes thought that it must be laid down somewhere in a "Manual for Promoters."

An intimate acquaintance with busy promoters has convinced me that it is practically useless to try to sell a mine or other property through them, and it is the busy promoter that the American coming to London is likely to meet. It seems, therefore, that his best chance is to get in touch with promoters who are not so busy. These men are equally hard to find, and are usually only to be reached through intermediaries who expect a large slice of profits for their introductions.

Pitfalls for the Unwary

Here it seems appropriate to caution the American who is unfamiliar with London methods against giving commission notes or writing letters that can in any way be interpreted as giving anyone a claim on his property. The spirit of Dick Turpin is still stirring, and it is marvelous on what a slender basis of fact the commission hunter works. A stranger to London wiles should at once put himself in charge of an experienced solicitor as soon as he begins serious negotiations.

When a promoter is found who will undertake your business he is sure to want nearly all the rest of your profits—there are, of course, exceptions—and the more successful the promoter, the bigger the slice he takes. I know of one case where the promoter made about £60,000 on a deal and gave the unfortunate optionholder nothing except a call on some ordinary shares; a call which soon became worthless. In this particular deal a property for which about £1800 was paid in cash was sold to the public on a basis of £130,000. No set rule can be given as to the amount of profits that a promoter requires, but a common formula among them closely resembles the problem set for Alice by the White Queen: "What's one and one and one and one and one and one and one and one and one and one?" The promoter's formula is: "One and one and one." This expression translated is: one part for purchase price, one part for working capital and one part for promoter's profits. I do not know of any deal that has been put through exactly on this basis, but it is an ideal toward which a number of promoters work.

After the promoter has been found and an agreement reached with him the business of the American is ended, for he can be of little use in the turmoil of a promotion. However it seems worth while to give some details of the actual promotion for there is as far as I know but little written on the subject.

An Example of Company Promotion

As I have remarked before, the promoter raises the money needed for his schemes by selling shares to the general public; his methods can probably be best understood by a concrete example. I give here, with some modifications, the details of a promotion with which I am familiar. The property in question, call it the Marianne mine, was first offered for £100,000, but long negotiation convinced the owner that all cash was not to be had and he finally sold for £40,000 cash, and £60,000 in shares. As soon as negotiations were well under way the promoter formed the Maryan Syndicate, Ltd., capital £200 in 4000 one-shiling shares. This syndicate was formed to facilitate the handling of the promotion and also to protect the promoter from any claims that might in future be raised by irate shareholders in case the promises of the prospectus were not fulfilled. The promoter's name did not appear in connection with the formation of the syndicate, the original subscribers being three of his solicitor's clerks, whose average pay was £3 per week, and whose total belongings would not aggregate £100—yet the law considered these men of straw good enough to become responsible to the public for transactions involving about £200,000. Men who are anxious to find out who are the promoters in any particular case can best do so by investigating the original subscribers of the promotion syndicate, full details will be given by Somerset House, the record office for London companies.

All the contracts with the vendors, brokers and underwriters were made by the Maryan Syndicate, and the syndicate transferred the property to the Marianne Mining Co., Ltd., which had been formed with a capital of £200,000. Owing to the well drawn prospectus, based on the reports of a prominent expert, and to well chosen chairman and directors, backed by the efforts of strong underwriters, aided by a good press, and, most important of all, owing to the region where the mine was situated, being in fashion at the moment, the promotion went off swimmingly and the shares were oversubscribed. The final results of the promotion, omitting details, were £110,000 in cash received from sale of shares, which was distributed as follows: Cost of property, £40,000; working capital, £30,000; promotion expenses, £15,000; promoter's profits, £25,000; or a total of £110,000 cash received, and shares to owner of property, £60,000; shares in reserve, £30,000, so that the total capital of the Marianne Mining Co., Ltd., is £200,000. The promotion expenses in detail were: Legal fees and expenses of formation of company, £1000; printing and postage of 30,000 prospectuses, £500; advertising prospectus, £3200; expert's fee and cables, £1000; broker's fee for allowing use of name on front page, £500; underwriting £110,000 at 8%, £8800; or a total of £15,000 for promotion expenses.

Mailing Prospectuses a Business

The 30,000 prospectuses were mailed to possible investors by a firm that makes a specialty of this work and has a large staff of clerks and classified lists of shareholders covering all Great Britain. The advertising was the publishing of the prospectus in about fifty prominent newspapers, the price ranging from £125 for a single isue in the *Daily Mail* down to £10 for a provincial paper. At the foot of each advertisement was printed a form for application for shares, and it was on these forms that most of the applications were made; few subscriptions resulted from the prospectuses that were sent out by post.

The underwriting, 8% on the cash received or £8800, was a heavy expense, and in this case it was extremely profitable to the underwriters, for as they had, in accordance with their underwriting contracts, to pay in but 10% of the amount underwritten, and as they received this amount together with their underwriting commission within 10 days, they made a profit on the money employed at the rate of 8% per day or over 2500% per annum. It is almost needless to remark that underwriting is not always so profitable. The great utility of the underwriter is as an advertiser and boomer of shares. It is for this reason that nearly all companies have their shares underwritten, though in many cases the expense is probably unnecessary.

The Hazards of Being a Promoter

The promoter's profit, in this case £25,000, seems excessive to the outsider, but it is usually divided among a number of people and to one who is familiar with the proceedings of the London bankruptcy courts the profits do not seem so attractive, for the way of the promoter often leads to failure. While the promoter can cover himself for most of his risks, he is bound to advance several thousand pounds for legal costs, expert's fees, cables and printing, on every business that he takes up and if he goes so far as to advertise his outlay will not be less than £5000 on any company that he forms. In case the public does not subscribe for his shares much of his loss is paid by the underwriters, but after his underwriters have been "stuck" once he finds it most difficult to get any new company underwritten. As a result he takes more chances and does his own underwriting, and often lands in bankruptcy. I know of several cases where the promotion expenses have run into thousands of pounds and the amount of shares subscribed for has been merely nominal; in case of a Rhodesian mine the promotion expenses were £5000, and £23 the amount of the shares subscribed.

It will be seen from the foregoing that this cumbersome method of raising money inevitably overcapitalizes the enterprise. Take the case of the Marianne mine, above mentioned; the mine worth £100,000 needed £30,000 working capital and would pay a profit on this, but now being saddled with £200,000 capital and an expensive and incompetent organization, has but a poor chance of success.

Not all companies are failures, and it is to be remembered that the promoter does much useful work in gathering capital from thousands of persons and enabling profitable enterprises to be established. Under the present constitution of society there seems to be no way by which the promoter's services can be dispensed with, and accordingly he will be able to levy his heavy tax on industry for a long time to come. However, the promoter does not set out to serve the public; his chief aim is to make profits, and an almost equally prominent aim is to avoid getting entangled in the meshes of the law. This is at times an expensive proceeding and promoters and vendors have been obliged to refund large sums. One of the most recent cases is that of the Kern River Oil Co., where a large sum of money was repaid by the vendors, and I know of another case where a promoter had to pay £176,000 in damages.

Irresponsibility of the Flotation Syndicate

It was to avoid such consequences that the irresponsible Maryan Syndicate was formed. By working through these irresponsible syndicates the promoter is insured against any claims of shareholders from irregularities in the purchase and transfer of the property, and for any mis-statements in the prospectus the promoter protects himself by his expert's reports in the first instance, and then throws the onus of the prospectus on the directors of the public company, in this case the Marianne Mining Co., Ltd. The directors shelter themselves behind the expert's report under the advice of solicitors and counsel.

The Maryan Syndicate, Ltd., was a private company, for it did not ask the public to subscribe to its shares, and had a capital of only £200, and this was the maximum amount that could be recovered from its shareholders. But, as a matter of fact, this £200 was never paid into the treasury of the syndicate, and its shareholders were not worth even that small amount. Therefore, the loss that could come to the promoter through the operations of the syndicate would be nominal.

PROSPECTUS CAUTIOUSLY PREPARED

The greatest risk run by the promoter is in the preparation of the prospectus, for should any shareholder be able to prove that he had been misled by it he would have a good chance to recover his money from the directors, and they in turn would look to the promoter, so there is a possibility of heavy loss should any glaring mis-statements be found in the prospectus. Hence, the preparation of a prospectus is a delicate piece of work and only those on the "inside" have any conception of the vast amount of thought and consultation expended on a well written prospectus. It is first drawn up in a general way by an experienced prospectus writer, who well knows the safe path between glowing fancy and dull fact. His draft passes the scrutiny of the promoter's solicitor and finally a counsellor of note is called on to revise the finished work.

After all it is not the writing of the prospectus that gives the promoter the most trouble, but it is the selection of the men whose names are to adorn the "front page" in bold-face type. These important names are those of the chairman, directors, brokers, bankers, solicitors, auditors and secretaries; the names of the engineers are usually not considered of enough importance to mention.

NOTABLES AND NOBLES DESIRED AS DIRECTORS

It is in the selection of the chairman and the directors that the promoter shows his capabilities, and the task requires a wide acquaintance, tact, influence and liberality. These are the men to whom the investor looks for a "square deal"; their names are what he first sees, and they have more weight with him than all the rest of the prospectus. Accordingly they must be men in whom the public has confidence, and yet they must not pry too deeply into the mysteries of the promoter's profits and the origin of the reports on which the prospectus is based. The chairman should have a title, for in spite of the failure of many members of the nobility to protect the interests of their shareholders "Sirs" and "Lords" are still of value in the city of London. From the promoters standpoint, an ex-army officer, or a retired government official is an excellent chairman. Some of the directors should have a practical knowledge of the business that is being promoted.

The anxiety of the promoter to guard against consequences is easily accounted for by the well known high death rate among public companies. It does not seem worth while to prove this mortality, but the results of the West African boom are interesting. In 1901, 260 companies were formed and only 20 were alive in 1911, and of these only five or six have paid dividends and only one has done really well. The records of the West Australian boom are even worse.

In view of the great risk of a failure and of the subsequent attacks by angry shareholders, it is a mystery why so many men of high social position and large fortunes are induced to lend their names to support a business of which they know little or nothing and which is foredoomed to failure from the start. A startling instance was the acceptance by Earl Dufferin of chairmanship of Whitaker Wright's companies. A more modern instance is shown by the appearance of the names of Cornelius Vanderbilt and Robert Goelet as directors of the United Malaysian Rubber Co., floated in London in April, 1910. In the opinion of prominent rubber experts, as stated at the time, the company never had the slightest chance of success, and the fact that instead of an estimated profit of £160,000 a loss of over £40,000 was incurred up to May 31, 1911, seems to show that the experts were correct. This case seems even more mysterious than usual for it is admitted that neither of the above gentlemen made any money from the promotion.

Now it is unquestionably the case that when a man buys shares on the strength of a publicly advertised prospectus backed by well known men, he expects to have a fair run for his money, and it is equally unquestionable that in 90% of the companies promoted during a boom he never has a chance of seeing his money again. The companies are formed and the shares issued under the protection of the law, and I hold that if the law was properly drawn up and administered a large proportion of the failures could be avoided. There would still be large sums of money spent unprofitably, but the risks run would be incurred knowingly, and investors would not be hoodwinked as at present.

INVESTOR HAS NO CHANCE TO JUDGE EXPERT'S REPORT

It is not within the scope of this article to criticize the English company law in detail, but there are two points that seem important enough to discuss, and which should be of as much importance in America as in London. One of the great defects of the present methods of issuing prospectuses is that no chance is given to the investor to properly judge of the expert's report. A requirement that every prospectus should contain a description of the expert's qualifications, the amount of his fee and how it was paid and the name of the payer, the date and duration of his examination would materially aid an investor in judging of the value of the report. These requirements would certainly interfere with the present practice of having reports made by men who know nothing of the business on which they report, or who report on properties that they have not seen for years, or possibly have never visited.

IRRESPONSIBLE PROMOTION SYNDICATES

Another defect in the present methods is the lack of control over the promoting syndicates. The intent of the law is that the promotion of public stock companies should be carried on in such a way that the private investor should have full notice of all contracts made and of the prices paid for the property that he is buying, and also that these statements should be made by some responsible authority so that the shareholder should have redress in case of mis-statements. But the invention of the irresponsible syndicate has taken away all chance of recovery of damages suffered by the investor. It would seem as if the interests of the shareholders would be much better served if every promotion of a public company were required to be carried on by men of substance instead of men of straw, and if carried on by a syndicate the actual paid-in capital of the syndicate should bear some reasonable proportion to the capital of the company which is being promoted.

Australian Production in 1910

The statistics of the mineral production of the Commonwealth of Australia and Northern Territory for 1910 are as follows, the items being ranged in order of descending value: Gold, 2,720,005 oz.; coal, 9,759,004 tons; copper, 51,080 tons; silver-lead ore, 369,196 tons; zinc, 468.639 tons; tin ore, 14,427 tons; silver, 2,836,304 oz.; pig lead, 23,607 tons; coke, 282.337 tons; wolfram ore, 1189; pig iron, 40,487 tons; opal, £69,200 worth; limestone flux, 203,157 tons; iron flux, 38,796 tons; shale, 68,657 tons; salt, 54,000 tons (exclusive of Victoria); unspecified gems, £24,081; iron oxide, 47,551 tons; bismuth, 72 tons; molybdenite, 154 tons; scheelite, 154 tons; gypsum, 17,046 tons; and antimony, diatomaceous earth, manganese, platinum, alunite, and kaolin, all under £8000 each.

Western Australia furnishes 54% of the gold; New South Wales 84% of the coal, 63% of the silver, and all of the zinc.

After numerous attempts to find potash in Baden, says the *Daily Cons. and Trade Reports*, of May 13, 1912, a deposit 13 ft. thick, lying 2322 ft. deep, has been discovered near Mullheim.

Stock Companies and Townsites on the Iron Ranges

Special Correspondence

Incident to the successful development of the Cuyuna iron district and the revival of interest in exploration in the older iron districts of Minnesota, a number of companies have sought to secure the necessary money for their operations by public sale of stock. This is a feature which has been practically absent from the financial side of the important operations in the iron region, since the boom incident to the Mesabi in the early '90s. The large part of all operations has been carried on by strong corporations or close syndicates identified with the iron industry. Often personal acquaintances were asked to help provide the funds required for exploration and development, but ordinarily there was no open or systematic solicitation of the public's money, as in the case of mining undertakings in other metals and in other districts. The first stock companies operating in the Minnesota region in recent years were identified with the Vermilion Range. In fact, it must be recognized that these companies had something to do with the revival that has made them thrive.

These Vermilion stock companies have not all been failures, but there are several cases of poor and extravagant judgment in the conduct of the operations, and there is talk, locally, that some of the companies did not put all of the money received from the public into real development. Some buoyant prospectuses were issued and conditions were presented that the experienced operators say "never wuz." A little iron in the ground was made to do a large duty in the reports for public consumption. One promotion carelessly announced that "a vein of gold ore, assaying $90 to the ton and of large tonnage" had been encountered, and that after the iron had been developed, it was intended to operate this "gold" mine. The facts of this "gold" find were never made public, but it would appear to an outsider that the real "gold mine" in such a case was the public. The Cuyuna district, with its unexpected development, has now a number of stock-selling companies. It would be unfair to criticize them all, and inadvisable to decry any of them on grounds concerning the possibilities of finding ore in the large, unexplored area of the district. But the fact remains that exploration and misrepresentation are almost inevitable in these campaigns for the public's money and the actual developers and operators in the iron districts are not pleased to see such features intruded into the business which has heretofore been free from anything like fraud or jobbery, as far as the public is concerned.

Another feature incident to the rapid progress of the Cuyuna district has been the multiplication of townsite projects and the sale of lots at boom prices to prospective residents and to speculators. The example of the prosperous and permanent cities and towns which have sprung up in the Mesabi district is the strong argument in these promotions. But here again caution is necessary in the interests of the public and the good repute of the iron business. Out West the great question in connection with each new camp is that of permanency. Some of the towns will be permanent and some will not; others, too, may have to migrate bodily, as did some of the early Mesabi towns, when ore was found under them.

The stock companies and the town-site speculations are not in accord with the serious, substantial and sound nature of the iron-mining business in the Lake Superior region and those who are most closely identified with the business would like to see the practices discontinued, or at least confined to the straight and narrow path of financial rectitude and soundness.

Gold Mining in Formosa

Gold mining in Formosa is no new thing, says Consul S. C. Reat, of Tamsui, Formosa (*Daily Cons. and Trade Reports*, Apr. 29, 1912), as it dates back to the Chinese régime. In 1890, when Liu Ming Chuan was carrying forward the first railroad construction, Chinese coolies found gold while excavating for the foundation of a railroad bridge over the Keelung River at Shichito, and no subsequent prospecting has shown any mines outside of the Keelung River watershed.

Both placer and quartz mines were operated for several years, but placer mining has been virtually abandoned. There are three quartz mines being worked. These mines are situated in north Formosa, within 10 or 12 miles of Keelung, the chief port of Formosa. They are called Botan-ko Kozan, Kinkwaseki Kosan, and Zuiho Kozan, the address of each being Keelung, Formosa.

The Botan-ko consists of 600 acres, and has been operated since 1903. In its equipment are six Huntington mills; six gravity stamps, 1000 lb. each; 20 small stamps; and 13 motors. The system is amalgamation, concentration, and cyaniding by sand percolation, and slime treatment.

This mine smelts its own concentrates. This is a gold ore with a small amount of silver. It also contains about 0.6% of copper. There is a great deal of ore worth about $2.50 and some worth $5 per ton, and the company is planning to treat 200 to 400 tons per day. At present about 100 tons a day are being treated. The Botan-ko mine should run for several years. Hydro-electric power is used.

The Kinkwaseki mine comprises 2246 acres. The general equipment is not unlike the Botan-ko, except that there are 80 light stamps. The ore is not highly siliceous. There is here a cyaniding ore also, and about 100 tons are treated daily. The company intends to increase the capacity of its plant. The power is hydro-electric.

The Zuiho mine comprises 2046 acres. In its equipment are nine Huntington mills. The same process of cyaniding, sand and slime, is used here. This mine sells its concentrates to the Kinkwaseki. The ore consists of two classes—oxidized and sulphide. They are eventually treated together. The amount of ore treated daily is about 85 tons, with a value of $6 per ton. This mine is now a small producer and is on the decline. Power is derived from electricity generated by steam.

The accompanying table shows the production of the mines from 1906 to 1910, being the last statistics available.

FORMOSAN GOLD PRODUCTION

Year	Botan-ko	Kinkwa-sek	Zuiho	Total
1906	$318,324	$346,462	$243,369	$908,155
1907	275,785	301,796	220,542	798,123
1908	191,535	694,859	186,707	1,073,101
1909	176,202	709,890	166,964	1,053,056
1910	134,147	693,947	231,895	1,059,989
Total	$1,095,993	$2,746,954	$1,049,477	$4,892,424

Missouri Zinc Production in 1911

The total output of zinc concentrate in Missouri for 1911 was 217,812 tons of sphalerite and 20,119 of silicate and carbonate. The zinc content, allowing for smelting losses, is estimated at 122,515 tons, according to the U. S. Geological Survey. The total crude ore produced from soft-ground workings was 3,217,166 tons, which contained 2.3% of zinc and 0.3% of lead, corresponding to a percentage of 4.1% of zinc concentrate and 0.4% of lead concentrate in the original ore. The average lead content of all classes of soft-ground galena concentrates was 79.9%; of lead-carbonate concentrates was 54.7%. The average zinc content of all soft-ground sphalerite concentrates was 58.9%; and of silicates and carbonates was 40.4%.

The total crude ore from sheet-ground workings in 1911 was 4,944,910 tons as compared with 5,779,192 tons in 1910, carrying an average zinc content of 1.24%, and a lead content of 0.4%. The average galena concentrates produced carried 79.8% lead and the sphalerite concentrates carried 58.6% zinc.

Benoni Mine and Mill on the Rand

By H. S. Gieser *

Two of the three reefs encountered are being stoped. The ore, from which 18.5% of waste is sorted, is reduced by Blake-Marsden crushers, a 55-stamp battery and four tube mills, the crushing capacity being 20,000 tons per month. After plate amalgamation the pulp is classified and the sand cyanided in Way-Arbuckle tanks arranged for continuous agitation; the slime is stored for future treatment, the Arbuckle cones having proved unsatisfactory.

The Benoni Consolidated Gold Mines, Ltd., is an outcrop property on the Far East Rand, situated between the New Kleinfontein and the Apex. It is opened by three shafts of which two are being worked at present. The east shaft is inclined and is 2200 ft. deep. From it 11 levels are driven, connection being made with the Kleinfontein down to the seventh level. This section of the mine is the highest grade and here the most work has been done. The central shaft is vertical for about 600 ft., then inclined down 2000 ft. Eight levels have been driven and connection made with the east shaft down to the fifth. As the west shaft is partly under water no work is being done at present.

THREE REEFS IN MINE

Three reefs are encountered, the main reef, upper main reef and the main reef leader. The first two are being stoped at present as the last is poorer in grade. The ore reserves on the first of January, 1912, excluding all ore under 4.5 dwt., were as follows: 606,839 tons, width 43.12 in., value 6.56 dwt., percentage 62.50. But the average working cost for the whole Witwatersrand for January was 18s. 10d. on a tonnage of 2,067,161, and for new milling properties it is generally higher, so it would be better to take 5 dwt., as the minimum value. On this basis the reserves are: 322,671 tons, width 43.34 in., value 6.80 dwt., percentage 54. This decreases the profitable ore by 84,168 tons but increases the value from 6.56 to 6.80 pennyweights.

BENONI CONSOLIDATED MILL, ON THE FAR EAST RAND

Preliminary crushing tests were made in the middle of November, and continued through December, during which period 20,000 tons were crushed. Since then the battery has been brought up to a capacity of 20,000 tons per month. The reduction works was such an innovation and so much was predicted for it that a description might not be amiss.

LOCOMOTIVE HAULS ORE TO SORTING HOUSE

The ore is hauled by a locomotive in 40-ton hopper-bottom cars from the shafts and dumped into a receiving bin from which it is conveyed by a 30-in. belt to the top of the sorting house and dropped into a Lea trommel revolving on rollers. It is 5 ft. in diameter and 21 ft. long and divided into three sections. The first is 8 ft. 6 in. long, and has 2-in. holes. The undersize from this section falls into a 150-ton fines storage bin, from which it is conveyed by a 16-in. cross belt to the 24-in. main belt ascending to the battery bin.

The second section is 5 ft. 6 in. long and has ¼-in. holes. The ore is here sprayed with water to wash off the slime, enabling the waste to be recognized more readily. The undersize drops into a launder and runs to one of two filter-bottom settling tanks, 20-ft. diam. by 8 ft. deep. Each tank is provided with two doors placed over the main belt leading to the battery. The third section is 7 ft. long and is provided with 4-in. openings. The undersize goes to the first 36-in. picking belt and the oversize to a third belt 42 in. wide.

The three picking belts are provided with chutes 18x24 in. at 7 ft. centers, eight on a side; through which the waste rock is dropped into a storage bin holding 1200 tons. From here the waste is conveyed by a 30-in. cross belt to a long 30-in. belt and joins the sand residue from the Caldecott table to the dump. About 18.5% waste is sorted out. The coarse rock from the 42-in. picking belt is crushed by a 20x30-in. Blake-Marsden crusher and is returned by an 18-in. belt to the second 36-in. picking belt for further sorting. The first belt with its under-4-in. product discharges through a crusher (not running) into a crushed-ore bin below holding 300 tons. The product of the second belt is split and sent to two Blake-Marsden crushers, which discharge into the crushed-ore bin. From the latter the ore passes on to the main 24-in. belt leading to the battery. Pebbles for the tube mill are picked off the 42-in. belt and the 18-in. return belt and dropped into a small bin below, from which they are conveyed by the 16-in. dry-fines belt to the battery belt and dropped into a small bin at the end of the battery bin.

BATTERY OF 55 STAMPS

The main conveying belt at the top of the battery discharges on to a belt provided with a Blake-Denison automatic weigher. The ore then drops to a shuttle belt and is distributed in the battery bin, holding 2000 tons.

The distinctive features of the battery are steel king posts, long narrow bossheads and 5-stamp cam shafts. Provision is made at the back of the battery for more stamps for the Apex mine with which it is later proposed to amalgamate.

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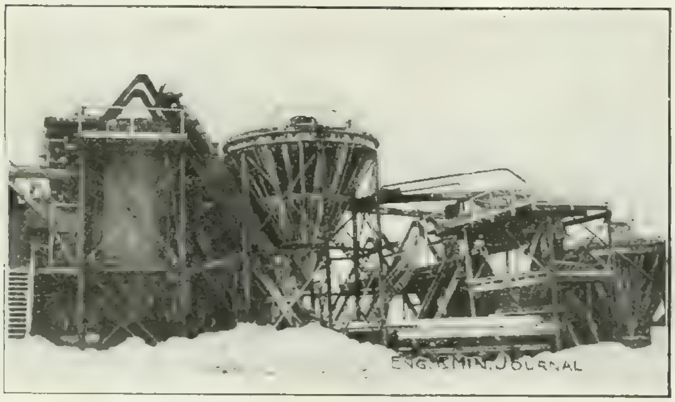
*Mining engineer, Box 1180, Johannesburg, South Africa

In fact the reduction works is situated on Apex ground. The battery consists of 55 stamps, 2200 lb. in weight, dropping into Bremner open-front mortar boxes. It is actuated by a 375-hp. motor from a lineshaft provided with clutches.

The concrete mortar block is of particularly massive construction. The shoes are 14 in. long by 9 in. diameter; bosshead 7 ft. 9 in. long by 9 in. diam. for 12 in. at each end, and the remainder 6 in. diam.; tappet 18 in. long by 9 in diam. and stems 10 ft. 3 in. long by 4 in. diam. There is one guide on the stem and another on the boss. The number of drops per minute is 99½ and the height of drop, 8½ in. Belt feeders are provided but are not satisfactory. The capacity of the battery is 14 tons through an 8-mesh screen, or 22 tons through a 3-mesh, without using excessive water, as the classifiers are heavily loaded.



Arbuckle Cones and Caldecott Table

Sand-tailing Dump, Benoni Consolidated

Plates Follow Tube Mills

The pulp passes direct to four Stadler classifiers, 2 ft. 6 in. diam. by 4 ft. deep with one molasses-spigot outlet, where a rough classification is made before entering four Ernest Newell & Co. tube mills, 5 ft. 6 in. diam. by 22 ft. long lined with bar iron set in concrete. Tube pebbles are fed by hand, an ammeter showing when there are enough present. A 110-hp. motor operates them.

The overflow from the classifiers joins the discharge from the tube mills and passes to one of two 8-in. Robeson-Davidson pumps run by a 40-hp. motor and is elevated to the amalgamating tables. There are 28 amalgamating plates 4 ft. 8 in. wide, originally shaking, but as experiment showed no advantage, they were stopped and the angle changed to about 12° or until the pulp flowed freely from the plate. The extraction by amalgamation is 55%. In the plate house are also the amalgam press, cleanup barrels, batea and plates for treating black sand, etc.

From Plates to Cyanide Mill

The pulp from the plates runs to one of two 8-in. Robeson-Davidson pumps operated by an 85-hp. motor and is raised to four Stadler classifiers, 3 ft. 6 in. diam. by 4 ft. deep provided with four tops, where a final classification is made, the underflow being returned to the tube-mill classifiers. The overflow goes to six Stadler classifiers, 5-ft. diam. by 4 ft. deep placed over a Caldecott table.

The Stadler classifier consists of a cylinder or tank with molasses-spigot outlets, 1¼ in. or more in diam., an interior overflow launder and a center impeller to throw the pulp horizontally. It was found that there was a tendency for the spigot to "breakaway" and let slime and water through, also the sand carried excessive moisture.

This was overcome by suspending a hollow cast-iron ball 9 in. in diam., a few inches above the bottom discharge, the theory being that when the pulp got thin on one side the greater specific gravity of the pulp on the other, forced the ball over until the pressure was equalized. The classifiers are operated with from 3 to 3½ ft. of sand in them. It was found that with a tap wide open a depression was formed on the side of the ball nearest the center of the classifier and the ball moved that way, which to a large extent, prevented slime and water from being discharged.

After the introduction of the balls the underflow carried 27% moisture, and there was from 3 to 5% plus-200-mesh in the overflow, which was so much better than formerly that the balls were installed in all the classifiers. The device is patented by J. M. Neill, the reduction officer.

Trouble with Arbuckle Cones

The overflow from the classifiers goes to three Arbuckle cones of 21-ft. diam., with sides at 60°, terminating in a casting and a long upwardly inclined casing inside of which is a spiral conveying screw 21½ in. in diam. and 9 in. between threads. It has three speeds and is actuated by a bevel gear and pinions. It is designed to deliver 2 ft. above the top of the cone into a mixing agitator.

Inside the cone and parallel to the sides of it, is a nest of frustums of cones, 5½ in. apart on the perpendicular. Eight of the cones are 6 ft. long, the four cones within these being 4 ft. long. The cones were later provided with a slow-moving agitator with iron arms of different lengths. For a time after starting a clean cone the pulp was discharged periodically, the moisture of the product varying greatly, then the discharge gradually ceased. The reason for this was found to be that the slime built up on the sides and arched over the outlet necessitating stopping the apparatus to prevent breaking the agitator.

Various devices were tried to prevent the arching without success, and after three months' experimentation the method was abandoned. Everything showed that if the slime reached the screw it would be delivered, but even then it is doubtful if the method would be successful as the pulp delivered was too thin.

The cones were then used as settlers and the slime pumped to the treatment agitators, but here again the pulp was too thin. The three cones are not large enough to settle 300 tons of slime per day so it was found more economical to store the slime in a dam temporarily and treat sand only. The clear overflow from the cones goes to a 24,000-gal. return-water tank and is pumped to two 55,000-gal. mill-water tanks.

Caldecott Sand Table

The Caldecott table is a rotating horizontal filter of 20-ft. external diam. with a 30-in. annular launder and a false bottom covered with cocoa matting and jute. It has 137.5 sq.ft. of filtering area and makes 3 r.p.m. The false bottom is connected by eight radial pipes to a hollow spindle and a vacuum pump. It uses 3.4 hp. and 5 hp. operates the vacuum and a triplex pump; the vacuum varies from 3 to 10 in. The triplex pump is connected to the bottom of the receiver and pumps the water to the return-water tank.

The sand from the classifiers containing 27% moisture, falls on the table, makes almost a complete circuit and is continuously taken off by an inclined plow 3 ft. from the point of overflow. It then has 12% moisture. The filtering medium proper consists of 8 in. of sand which is removed by lowering the plow when it gets hard and slimy.

The sand from the table drops into a launder is mixed with 0.15 cyanide solution and goes to the Way-Arbuckle continuous-treatment agitators, 32 in number, operated by compressed air. It originally went to two mixing agitators, 8 ft. diam. by 22 ft. deep, but there was not sufficient air, so they were bypassed.

The treatment agitators are 10-ft. diam. by 18 ft. 3 in. deep, fitted with a 12-in. air-lift column, terminating at the top of the tank and discharging on an annular plate 2 ft. wide to which are attached six launders, 18 in. wide, leading to 6-in. notches cut in top of the tank and connecting to adjacent tanks. The bottom of the launder is hinged for the last 12 in., so by raising the hinge the pulp can be thrown to each side. The air pressure is 13 lb., supplied by a Bellis & Morcon vertical compressor, direct connected to a 125-hp. motor, using 84 hp. to agitate 21 tanks.

Sand containing 6% on 60-mesh, 9% on 90-mesh and 85% through 90-mesh can be agitated up to 18% solid by volume. Above that amount sand accumulates in certain tanks and agitation ceases. To start again, high-pressure air pipes are shoved into the tank and the sand tapped from the bottom until agitation starts. By means of the six openings, the pulp can be sent in any direction, except from the outside tanks, and the tanks operated in parallel or in series.

No Provision for Stoppages

No provision is made for cutting out a tank and to take care of inequalities of agitation, a stopped tank gradually fills, due to sand in suspension from neighboring tanks. Therefore the whole plant must be kept moving. Also a sudden stoppage of power for five minutes is sufficient to pack the sand, especially the pyritic part of it, in the bottom of the tanks, so that it takes from two to 12 hr., depending on the thickness of the pulp, to get the whole plant going again; and many tons of sand and solution are tapped out on the cement floor beneath.

The capacity of the compressor is only sufficient to agitate 21 tanks, so the others were connected by a reducing valve to a high-pressure main, from a distant mine compressor. But the increased extraction, from 78 to 82%, did not pay for the air and it was stopped. Judging from the time it takes the sand to reach the last agitator when the plant is empty it must be agitated from 10 to 14 hr. The absence of slime works against the running of the plant as it helps greatly in agitation.

Zinc-Box Precipitation

From the agitators the pulp passes to two 5-in. Robeson-Davidson pumps then to four Stadler classifiers 5 ft. diam. by 4 ft. deep, the overflow going to three Arbuckle dewatering cones, 21 ft. diam., the underflow, of which there is but little, is tapped out periodically and joins the underflow from the classifiers. The clear overflow goes to four filter-bed classifiers, 20 ft. diam. by 8 ft. deep, then to eight 12-compartment zinc boxes, each box being divided into two sections, and then to two sump tanks 40 ft. diam. by 10 ft. deep.

The underflow from the classifiers is mixed with barren solution from the zinc boxes and goes to two mixing agitators (not now used) and thence to the last set of Stadler classifiers, three in number, 5 ft. diam. by 4 ft. deep, the overflow of which goes to a second set of three dewatering cones. The clear solution goes to two sump tanks, 40 ft. diam. by 10 ft. deep, to be used for mixing with sand at first table, and the thickened slime at bottom is pumped to the dam, the solution being returned to the sump tanks.

The underflow of the last set of classifiers falls on a second Caldecott table similar to the first, and the clear solution goes to the clarifiers. The sand, which is the final residue and contains 12% moisture, is plowed off the table and falls on an 18-in. cross belt, joins the waste rock from the sorting house and is conveyed to the dump. As the system is a continuous one trouble with the sand-conveying belts would disarrange the whole plant, so a parallel 18-in. belt is provided dumping on the ground, the sand later being sent to the dump.

Sand Conveying Costs Low

The system of sand conveying in use was developed at the New Kleinfontein reducing works and is characterized by low operating costs and inexpensive installation. It consists of a 60-ft. pivoted boom, capable of being swung 180°, carrying a 30-in. belt. It discharges on to a 30-in. belt running on a cantilever 110 ft. long, 13 ft. wide at the middle and 8 ft. 6 in. at the end, 60 ft. of which projects out. The cantilever rests on wheels, running on a track for horizontal swinging and there is a truck for pulling it ahead up the dump. When the limit of the boom is reached it is moved up the dump and the lower belt lengthened to it. The cantilever, boom, and lower belt are operated independently by motors.

Sorting House and Stamp Battery at Benoni Consolidated Milly Rand

In the extractor house are the zinc boxes, zinc lathe, Krupp ball mill for grinding slag, solution and return-water pumps and the melting furnace. The furnace consists of two drying compartments, 3 ft. 2 in. by 6 ft. 2 in., holding three trays each, a reverberatory furnace, 6 ft. 2 in. by 7 ft. 4 in., holding 14 No. 80 graphite crucibles, and a Cornish furnace holding two No. 60 crucibles all compact.

The precipitate and short zinc are acid treated in lead-lined tanks out in the air, with sodium bisulphate, a byproduct of the local dynamite factory. The bisulphate is dissolved in water in a tank 10 ft. diam. by 5 ft. 6 in. deep. The zinc is placed in four tanks 5 ft. diam. by 5 ft. deep, bisulphate run on and the zinc stirred until dissolved. The product is then dropped into a tank 10 ft. diam. by 5 ft. 6 in. deep and pumped through a 24-in. Johnson press. The precipitate is dried and melted, giving bullion 950 fine.

It is impossible with the present equipment to treat the slime, the agitator costs are excessive, 8d. per ton treated for air alone, and much of the conveying system runs continuously at a fraction of its capacity. Therefore, from the viewpoint of the directors the cyanide plant is a failure. The sorting house, battery, tube mills and plate house give complete satisfaction, so they are considering the erection of a plant, using as much of the present equipment as possible, to consist of sand-leaching vats and possibly a Butters filter.

Electrification of Butte, Anaconda & Pacific R. R.

The electrification of the Butte, Anaconda & Pacific R.R. is of exceptional interest because it represents one of the largest installations of electrical equipment for steam-railroad service and the first in this country where 2400-volt direct-current locomotives will be employed. Construction work necessary to effect the change from a steam to an electrically operated road is now progressing actively, and it is hoped that the entire electrification work will be completed and the electric operation commenced by the fore part of next year.

The section of the road to be equipped is that between Butte and Anaconda, Mont., comprising about 30 miles of main-line single track and a total single-track mileage including the sidings, smeltery tracks, etc., of approximately 114 miles. The remaining 24 miles of track, embracing the mine tracks on Butte Hill, minor sidings, etc., will continue to be operated by steam; although it is probable that the entire system will be electrified at an early date.

To use 2400-Volt Direct Current

The 2400-volt direct-current system was adopted by this road after a careful and exhaustive study of local conditions. The system adopted was deemed best for the heavy steam-road service handled over its tracks. The main-line trains of the Chicago, Milwaukee & Puget Sound R.R. run over the Butte, Anaconda & Pacific track for a distance of 16 miles, which calls for trunk-line freight and passenger service in addition to the heavy local-freight traffic. The haulage of freight consists principally of copper ore from the Butte mines to the smelters at Anaconda, and of mine supplies, lumber, etc., moving in both directions. The total amount of freight handled is approximately 5,000,000 tons per year. Complete trains, weighing 3400 tons and made up of 50 loaded steel ore cars, will be handled by two locomotives against a ruling grade of 0.3%. Single locomotives will be used for making up trains in the yards and for spotting cars.

The entire electrical equipment for this installation is being furnished by the General Electric Co. Seventeen 2400-volt direct-current locomotives of the articulated truck type, each weighing 75 tons, have been ordered. Each locomotive will be equipped with four No. 229, 1200-volt, commutating-pole, twin-geared railway motors insulated for operation two in series on 2400 volts. The motors are designed throughout to secure exceptionally good ventilation, and a forced circulation of air will be employed in addition to the ventilation secured by the fan incorporated in the armature. Control of the motors will be effected through special Sprague General Electric Type M control equipments, a dynamotor being used to furnish 600 volts for the operation of the contractors, lights and air compressor. The dynamotor will have two windings, 1800 volts and 600 volts, and will be direct connected to a blower for ventilating the motors. Heating of the locomotive cabs will be accomplished by means of special heaters using 2400-volt direct current from the trolley circuit.

Two of the locomotives are designed for passenger service. A schedule of eight passenger trains per day, four each way, is maintained for local traffic, and the average train is composed of a locomotive and three standard steam-road passenger cars. The passenger locomotives will be duplicates of the freight locomotives, except that they will be geared for higher speed. When hauling a train of three coaches, they will be capable of running 45 miles per hour on level track. Current for lighting the cars will be taken from the 600-volt circuit of the dynamotor, and for heating the coaches will be tapped from the 2400-volt trolley circuit on the locomotive.

Substations 26 Miles Apart

Two 2400-volt substations are being installed, one at Butte and the other at Anaconda, 26 miles apart. Duplicate equipments are to be installed in the two stations and will each consist of two 1000-kw. synchronous motor-generator sets, each composed of two 500-kw., 1200-volt compound-wound, compensated, commutating-pole generators insulated for operation in series at 2400 volts, direct connected to a 1450-kva., 2300-volt three-phase, 60-cycle synchronous motor; also two 50-kw. induction-motor exciter sets, and alternating-current and direct-current switchboards. Power for operating the motor-generator sets will be supplied from the 2300-volt, 60-cycle, three-phase buses in the substation of the Great Falls Power Co., to which power is transmitted at 50,000 volts from the hydraulic power stations of the company.

A regulator will be installed in each substation to maintain constant voltage automatically at the terminals of the synchronous motors. Through this method of operation the possibility of the sets dropping out of step on extreme overloads is said to be eliminated. The direct-current switchboard will follow standard practice for 1200-volts with remote-control circuit breakers and switches. The feeder circuits and generator circuits will be protected by 2400-volt direct-current aluminum-cell lightning arresters.

Current for operating the locomotives will be taken from overhead conductors. A special flexible catenary trolley suspension will be used over the larger part of the line, with direct suspension over some of the difficult sidings, smeltery tracks, etc. Side brackets and cross-span construction will be employed where local conditions demand. Numerous yards are to be electrified and at one point it will be necessary to span 12 tracks, which will be accomplished by cross-span construction using a pole between the eighth and ninth tracks.

The Butte, Anaconda & Pacific is a most important link in a transcontinental railroad system and its electrification is attracting widespread attention. The fact that the substations are situated 26 miles apart and but a moderate amount of feeder copper is required, notwithstanding the heavy traffic handled, strongly emphasizes the advantages of the high-voltage direct-current system.

Current Mineral Output of Ontario

The report of the Bureau of Mines of the province of Ontario shows the following outputs of metals for the first three months of 1912: Gold, 573 oz.; silver, 7,439,044 oz.; copper, 2537 tons; nickel, 4722 tons; pig iron, 116,824 tons; cobalt and nickel oxides, and crude cobalt material, 538,170 lb. Of the silver production, 7,006,842 oz. came from Cobalt, 285,942 oz. from South Lorrain, and Gowganda, 147,103 oz. Shipments were: Ore, 4346 tons; concentrates, 2528 tons; bullion, 1,445,834 oz. Of the 5,561,998 oz. of silver recovered from ore and concentrates, 4,197,161 oz. were recovered by Ontario plants. There was no gold recovered at Porcupine during the quarter owing to the destruction of the mills by fire.

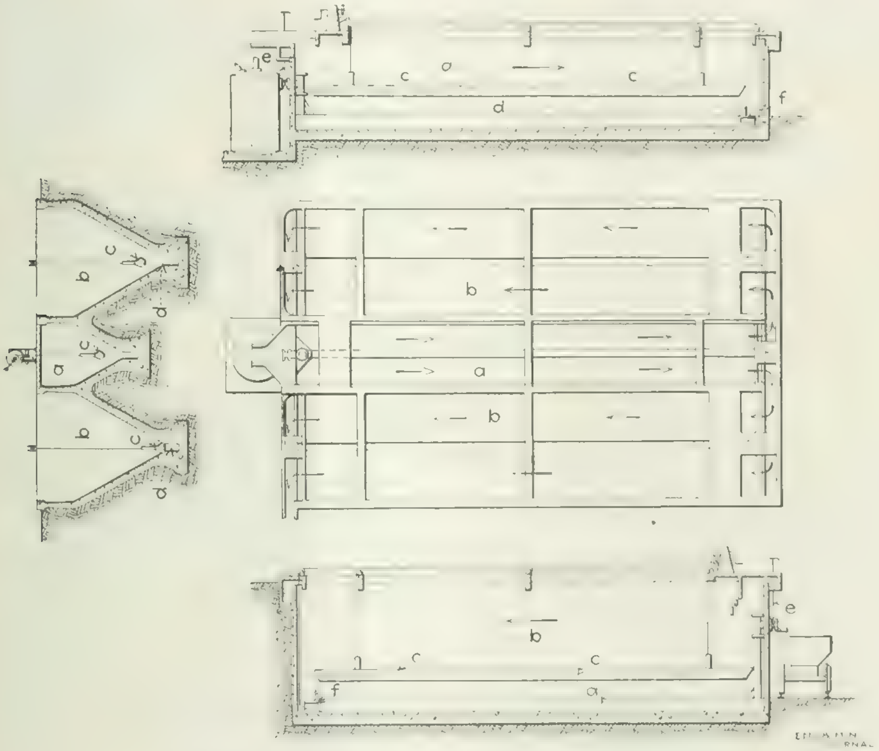
Venezuelan Plaster of Paris

A concession has been given Eusebio Chellini, of Caracas, for making plaster of paris (*Daily Consular and Trade Notes*, June 24, 1912). Señor Chellini is to have exclusive right to operate a factory in the Federal District for 5 years, with 3 years' extension; to import free of duty the ovens, triturating mill, grinding mill, wire-screen, bolter and iron for roof. Señor Chellini agrees to use only native rock and to sell plaster to the Government at 12% reduction. The contract is to be in force after approval by the national congress, and the factory should be in operation within a year thereafter.

Mud Disposal in Blast Furnace Gas Purification

By Alfred Gradenwitz*

The clarification of the water used in purifying blast-furnace gas, which is laden with large amounts of dust, imposes on the works a considerable additional duty, the more so as the available space and fresh water grow less. Attempts have therefore been made to render this unproductive operation as inexpensive as possible. Dr. I. Steuer has suggested for this result a new type of settling tank, which concentrates the mud to a bottom area as small as possible, and discharges the portion most thoroughly settled periodically during clarification, so as to separate it entirely from any supernatant water. The illustration represents the arrangement of these settling tanks as constructed by the Wasser- und Abwasserreinigung Ltd. of Neustaat a. Haardt.



Disposal of Mud from Gas Purification

The water having been used in gas purification, first traverses a lengthy tank, *a* (or several tanks in the case of larger volumes), with small cross-section, at a speed which is only overcome by the specific gravity of any heavy ore particles, while any lighter turbid matter is prevented from settling. Such matter is settled in the larger tanks *b*, arranged parallel to one another, at a hardly noticeable rate of water flow during 1½ to 2 hours. The process of clarification as well as the collection and discharging of the mud settled, however, is the same in both cases.

The side walls converging at the angle of 60° towards a longitudinal groove *d*, immediately direct any settling dust particles towards this groove, thus causing the lower part of the tank gradually to fill with mud. The latter thus concentrates at an increasing rate as it sinks towards the bottom, thus filling the groove with thick and relatively dry mud, after a given time of operation, whereas the upper layers are fresher and thinner as they lie nearer the surface.

A beam *c*, suspended above the mud groove *d* (at about the level of the lower edge of the clarified portion), is dropped from time to time on the groove, thus separating the lowermost mud, which is most concentrated, from the remaining contents of the tank with which it only communicates at one end of the groove. This mud groove *d* is continued by a riser, closed by a quick-acting slide *e*, which leads into the open below the water level. At the other end of the dust groove there is a piston disk *f*, moving horizontally in guides. As the slide *e* is opened, this disk receives the hydrostatic pressure working behind it, thus discharging the whole of the contents of the mud groove, while preventing its being diluted by water.

This simple arrangement with a relatively small difference between the water level and the height of the mud outlet allows the heavy pulpy mud to be discharged within a few seconds without any interruption in the settling operation. A hand-operated winch then allows the beam to be lifted, restoring at the same time the folding piston disk to its initial position, after which there begins a new settling period.

The means of conveyance used for receiving the thick mud discharged from the tank, are adapted to the conditions of the case, being, for instance, tank-wagons or vertical compressed-air cylinders. The latter scheme, on account of its simplicity, will be found preferable in nearly all cases, especially when the mud has only to be transported short distances. The mud obtained in the first tank, which contains 40 to 50% of iron oxide, should not of course be mixed with the less valuable mud from the main settling tank, being discharged through a special branch-pipe in order to be used in the briquetting of dust, for which purpose it will be found especially suitable.

The process above described has been carried out at several blast-furnace works of Lorraine and Luxemburg, in plants, each having an output of 700 to 1800 cu.m. of gas water per hour, while several other plants are in course of construction. These installations have so far given every satisfaction.

As seen from the accompanying figures, the space requirements of the new scheme are small, being about 75 to 100 sq.m. for the complete clarification of 100 cu.m. per hour. In many cases it will be found possible to convert existing clarification plants into the new type of settling tanks, thus allowing large areas which are so far covered with settling ponds, etc., to be used for other purposes while removing a number of other drawbacks. The same process has been advantageously applied to the disposal of sewage mud.

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First Recorded Use of Mineral Coal in America

By Charles R. Keyes*

Relying upon general history, the discovery of mineral coal in America dates back to the beginning of the eighteenth century. The earliest record in Pennsylvania is 1704, twenty years after the privilege of colonization was granted by Charles II. to Penn. Anthracite was first known in the Wyoming district of Pennsylvania in 1766; and its discovery in the Lehigh Valley took place 25 years later. Virginia coals appear to have been mined for the first time near Richmond in 1750; and at the close of the Revolutionary war they were shipped from this region to Philadelphia, New York and Boston.

There are however, authentic records of the earlier use of mineral coal in this country. Its discovery belongs to the interior of the continent rather than to the Atlantic seaboard, where the first permanent European settlement took place, where it is now so extensively mined, and where it is known to be so widely distributed. In the continental interior the discovery of coal precedes that of the East by at least 50 years; while in a limited way to be sure, its use by the Indians goes back to a still more remote period.

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*Consulting engineer, Des Moines, Iowa.

In the Upper Mississippi valley the earliest definite mention of the existence of mineral fuel in the form of coal appears to be that of the Jesuit missionaries in the Assiniboine land, in what is the State of Minnesota of today. As early as 1659, in describing the Poualak (Assiniboine tribes), record is made of mineral coal as follows: "As wood is scarce and very small with them nature has taught them to burn coal (*charbon de terre*) in its place, and to cover their wigwams with skins." It is quite possible that the Iowa Indians of the northern prairies also made use of the lignite deposits of the region such as are found, for example, in Brown County, Minnesota, near the headwaters of the Des Moines River.

When LaSalle established, in 1680, Fort Crève Coeur on the Illinois River near the present site of Peoria, large coal beds were found and used. Father Hennepin, who was assiciated with La Salle, states in the journal of his travels, that at the place mentioned mineral coal exists. In an English edition of his map of the Upper Mississippi region the location is clearly represented. That he was not in any way mistaken is amply shown by subsequent developments.

In his letters regarding the natural productions found along the Illinois River, written a few years later, LaSalle also mentions the fact of the occurrence of coal at Crève Coeur. These letters were recently reprinted in Paris by Margry. Still another very early reference to the occurrence of coal in the Upper Mississippi Valley is that of Le Gardeur de l'Isle, who writes in 1722 from Fort Chartres, near Kaskaskia, that he accompanied one Renault to the Illinois River to look after copper and coal mines.

The French early knew of the existence of coal which outcrops on the Missouri River near its mouth, at a point called La Charbonnière. Nearly a century later, in 1805, Pike, when he started on his famous trip to the sources of the Arkansas River, passed the place. He says: "Six miles below St. Charles, on the south side, in front of a village called Florissant, is a coal hill, or as it is termed by the French, La Charbonnière. This is one solid hill which probably affords sufficient fuel for all the population of Louisiana."

Measuring Air Consumption

By George H. Gilman*

The science known as efficiency-engineering is, in some of its aspects, merely the application of ordinary common sense to the problem at hand. When purchasing rock drills or hammer drills, for example, it is often desirable to conduct tests upon several makes or types, to determine their relative efficiency for the work in hand. One of the tests which it is important to make is that for air consumption, in order to arrive at the quantity of power used per foot of hole or per cubic yard of rock removed. This is a factor too often left to guesswork, or ascertained only roughly.

Extended experiments have shown that the displacement tank method is as accurate as, and probably more reliable than, the special mechanical air meters which have been devised at various times.

A satisfactory apparatus for this purpose is shown in the accompanying illus-

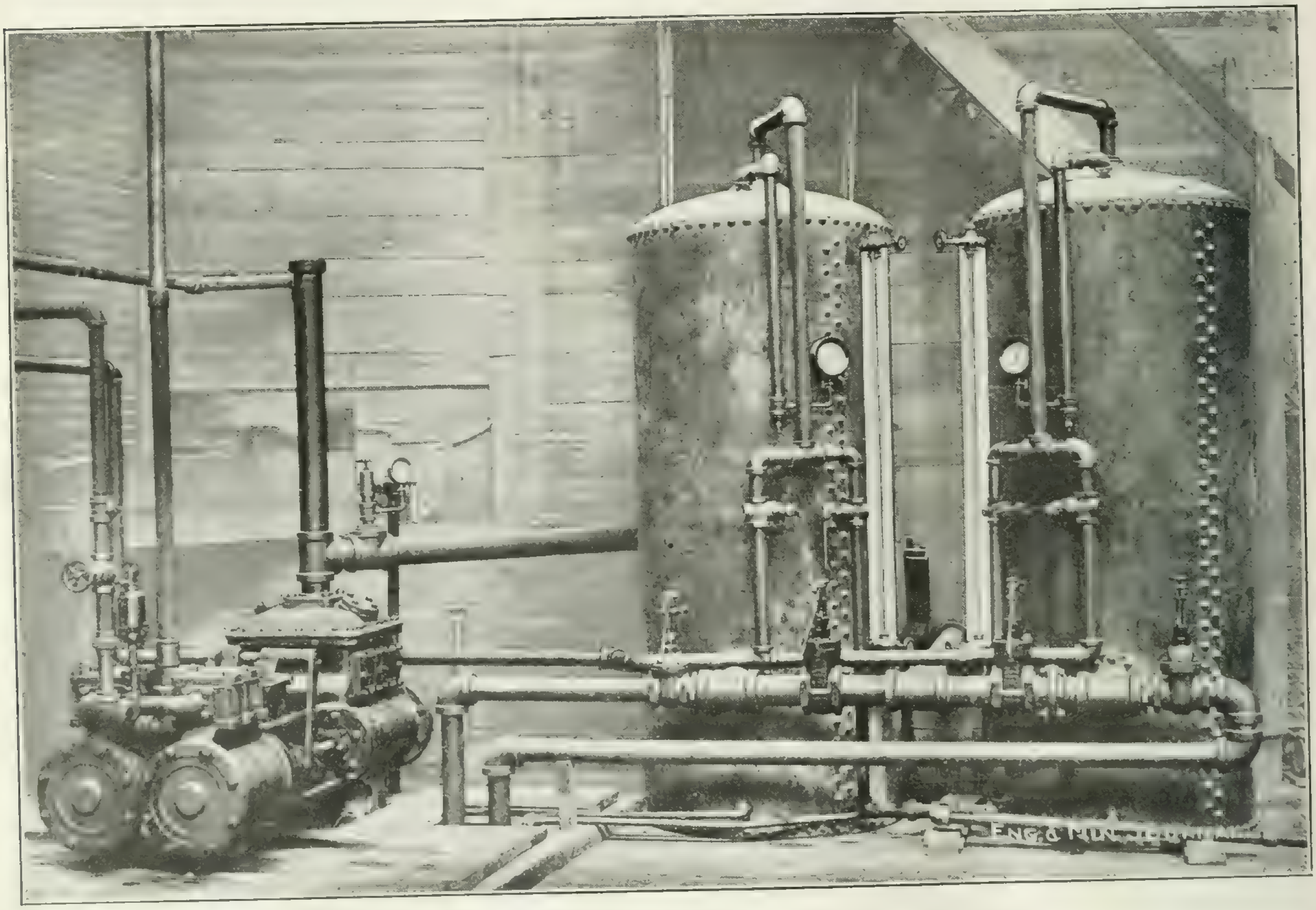

Fig. 1. Displacement Tanks for Measuring Air Used by Drills

trations. It consists of two large vertical tanks, so arranged that they may be filled with air at any desired pressure. The drill to be tested is connected to one of these tanks, the tanks are filled with air at the proper pressure, and the large steam pump, shown at the left of Fig. 1, is started. The height of water in the gage glass is noted, and the drill started working. The air pressure in the tank is kept constant by the admission of water from the pump. After a run of sufficient length to secure accuracy, the drill is stopped, and the height of the water in the gage glass is again noted.

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*Claremont, N. H.

The increase in volume of the water in the tank is the amount of air used by the drill during its run, and from this the cubic feet of free air used per minute may be figured.

Two tanks are supplied, so that one may be used while the other is being filled with air, thus allowing tests to be run over a considerable period of time.

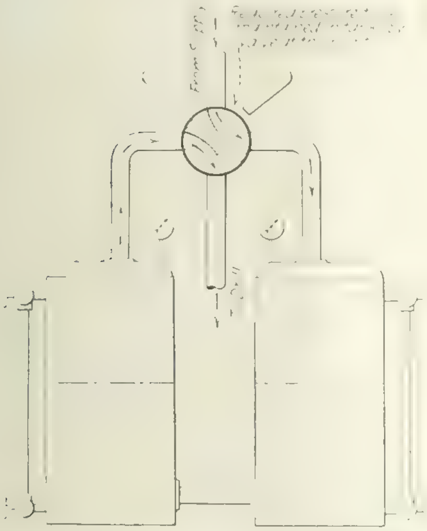

Fig. 2. Diagrammatic Sketch of Air Measuring Tanks

An apparatus of the kind above referred to, however, is rather expensive to install, as it involves the use of a steam pump and a reservoir for the water used.

The sketch, Fig. 2, shows a type of displacement apparatus, at present used successfully by various mining companies. This is much less expensive than the apparatus with pump and reservoir, and will meet the requirements of any mine or quarry to practically as good advantage, although possibly, it is not quite as accurate.

Two small tanks, say about two feet in diameter and four to five feet long, are connected together at the bottom by a pipe of good size, say three inches, and about half filled with water. Gage glasses for observing the water level are attached to each receiver. Out of the top of each receiver is brought a pipe and connected to a four-way valve. When the valve is set in the position shown by the full line, water in the right-hand tank will be forced into the left-hand tank by the air pressure, and the air in the latter tank will be driven out and passed through the four-way valve to the drill or other machine being tested. When the water arrives at a definite point on the upper end of the gage glass on the left-hand tank, the four-way valve is quickly thrown to the position shown by the dotted line, when the process will be reversed and the air in the right-hand tank will be driven out and passed to the machine under test. By counting the number of times each tank is filled or emptied during a given interval of time, it will be seen without further explanation that the amount of air consumed by the machine under test can be determined by reducing to cubic feet of free air the volume of air under pressure which has been displaced.

Yerington District, Nevada

LUDWIG CORRESPONDENCE

Shipments from the mines of the Yerington district to the Mason Valley smeltery at Thompson, continue to increase and at the smeltery the two furnaces 25 ft. long and 44 in. wide at the tuyeres are to be increased to 30 and 35 ft. respectively. At present the one furnace is smelting approximately 700 tons of ore each 24 hr. By increasing these furnaces to the length mentioned above, the capacity of one single furnace will be as great as was figured for the entire plant originally. These additions to the furnaces are to be installed from the shops on the ground and at present a number of the parts are ready. The Dwight-Lloyd sintering plant is doing excellent work and making considerable headway on the accumulated dust. One machine comprises the present installation but a second machine is to be added soon. The machine now in use is the largest size made. Its speed, of course, varies with the material to be sintered and on this account its capacity is variable. At present the machine is running through about 75 tons of flue dust per day, the three shifts of three men each being worked continuously. The amount of gasoline consumed by the machine is not obtainable now, but sometimes two burners are required, and for some of the flue dust little coke is needed; for other dust a considerable amount of coke is required. A triplex Gould pump with 2x4-in. pistons is being installed to pump water from the townsite well to the lower Mason Valley workings.

OTHER PRODUCERS

At Yerington station, the Northern Light Copper Co. is piling up ore. The property is 20 miles east of Yerington and the mine is employing about 10 men. Duncan McKenzie, of Yerington, is managing the mine at present. The Bradley mine, owned by Charles Holland, of Yerington, shipped one car of ore recently. The New Yerington Copper Co. also shipped one car. Mr. Browngrose, William Boyle and others who own the Mohawk mine east of Yerington, have several cars of ore ready for shipment to the smeltery. Several small properties in the hills to the east and south of Mason are shipping regularly to the smeltery. The Malachite Copper Co. is shipping one car of ore per day, and the McConnel mine is shipping two cars. It is the intention of the Malachite management to begin operations soon and to do considerable development work immediately adjacent to the south of the Mason Valley mines works. The Mason Valley company has developed its property to within a short distance of the lower end line of the Malachite and indications are good for the development of ore in the Malachite property, close to the end line. The Mason Valley company has encountered 72 ft. of commercial ore in the diamond-drill work in the bottom level of the mine. This work is being done by a Sullivan diamond drill, on contract.

The Bluestone mine, owned by Captain De Lamar, has four men remodeling the roasting plant and experimental mill and will have the work completed soon. Martin Heller, manager of the De Lamar properties paid a short visit to the property recently. No definite advice as to the plans of the management are obtainable. C. A. Weck is superintendent. The Nevada Douglas Copper Co. during a recent week shipped 2943 tons of ore, contained in 57 cars. This gives an average daily tonnage of 406 tons. A total of 700 tons of gypsum were shipped to the Western Gypsum Co.'s plant at Reno. A contract has been let for 300 ft. in the new Douglas Hill tunnel, which is 150 ft. below the upper Douglas Hill tunnel, from which all the ore is drawn on Douglas Hill. At a point 250 ft. north of the mine workings on Douglas Hill, "spot" ore has been encountered. This ore contains chalcocite and chalcopyrite, impregnating the garnet. A winze has been sunk about 15 ft. and still continues in this material.

Some lead ore is being shipped from what is called Bald Hill, about four miles south of the town of Wellington, in the Pine Nut Hills. Much development is being done in this section, as well as in the country adjacent to Red Cañon, where lead-copper ore containing gold and silver has been discovered. Some time this summer regular shipments are expected from these mines, the shipping point of which will be Hudson, Nevada.

The production of calamine in Upper Silesia in 1911 was 118,960 tons; of blende, 375,210 tons; of lead ore, 47,722 tons.

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19,356—HOISTING—The Ilgner System in Electric-Hoisting Operations. Geo. E. Edwards. (Min. and Eng. Wld., May 11, 1912; 4 pp., illus.) 20c.

19,357—HOISTING ROPES—Die Sicherheit der Förderseile. Speer. (Glückauf, May 11, 18 and 25, 22¼ pp., illus.) $1.

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19,359—MEXICO—Conditions in Mexico. T. Lane Carter. (Min. Mag., May, 1912; 3½ pp., illus.) 60c.

19,360—MINE VALUATION. J. R. Finlay. (Eng. and Min. Journ., June 22, 1912; 1 p.) Paper before Min. and Met. Soc'y of America, May 16, 1912. 20c.

19,361—MINERS' BATHS. H. F. Bulman and W. B. Wilson. (Trans. N. Eng. Inst. Min. and Mech. Eng., Mar. and May, 1912; 21 pp., illus.) Also discussion.

19,362—MINING METHOD—A Problem in Deep-Mine Exploration by Crosscut. Carl Henrich. (Min. and Eng. Wld., June 1, 1912; 2 pp., illus.) 20c.

19,363—MINING METHOD—Breaking Ground Without Powder. G. E. Wolcott. (Eng. and Min. Journ., May 25, 1912; 1⅓ pp., illus.) 20c.

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19,367 PROSPECTING — Ueber Erzsuchen mittels Elektrizität. O. Trüstedt. (Zeit. f. prakt. Geol., Apr. 12, 1912; 3⅝ pp., illus.) On prospecting for ore by means of electricity. 40c.

19,368 — PRUSSIA — Die Arbeitsverhältnisse auf den Bergwerks- und ähnlichen Betrieben in den preussischen Oberbergamtsbezirken. (Bergbau, May 7, 1912; 1¼ pp.) Labor conditions in mining and similar industries in the Prussian mining districts. 40c.

19,369—PUMPING—Unwatering a Mine with Electric Turbine Pumps. Percy E. Barbour. (Eng. and Min. Journ., May 25, 1912; ½ p.) 20c.

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19,371—SHAFT SINKING—Ueber das Abteufen des Tagbau-Bremsschachtes in Trifail. E. Pietsch. (Oest. Zeit. f. B. u. H., Apr. 13, 1912; 4 pp., illus.) 40c.

19,372 SHAFTS—Reinforced Concrete as Applied to Mine Shafts. E. R. Jones. (Min. and Eng. Wld., May 25, 1912; 1⅞ pp.) Abstract of paper before Mich. College of Mines Club, Feb. 25, 1912. 20c.

19,373—SPAIN—La Région Minière de Linarès-La Carolina. G. Braecke. (Rev. Univ. des Mines, Mar., 1912; 20 pp., illus.)

19,374—SOUTH AUSTRALIA—A Review of Mining Operations in the State of South Australia during the Half-year Ended Dec. 31, 1911. (Issued by F. C. Ward, Acting Secy. for Mines, Adelaide, South Aust.)

19,375 SURVEYING a Raise Connection with Transit. H. Y. Russell. (Eng. and Min. Journ., June 8, 1912; 1 p., illus.) 20c.

19,376 TIMBER—Konservierung von Grubenhölzern (Bergbau, Apr. 4, 1912; 1 p.) 20c.

19,377 TIMBER — Methods for the Preservation of Mine Timbers. G. B. McDonald (Min. and Eng. Wld., May 18, 1912; 2 pp.) 20c.

19,378—TIMBER—The Preservation of Mine Timbers. E. W. Peters. (U. S. Dept. of Agriculture, Forest Service, Bull. 107, 1912; 27 pp., illus.)

19,379—TIMBER—Wood Preservation. James D. MacLean. (Wisconsin Engr., Apr., 1912. 7 pp.)

19,380—TRANSPORTATION—The Operation of Electric Ore Roads in Sweden. O. Gjessing. (Min. and Eng. Wld., May 25, 1912; 2 pp., illus.) 20c.

19,381—TUNNEL—Arthurs' Pass Tunnel, New Zealand. W. H. Gavin. (Eng. News, May 9, 1912; 3½ pp., illus.) 20c.

19,382—TUNNEL—Lining a Tunnel in Swelling Rock. Guy R. McKay. (Eng. Rec., May 25, 1912; 2⅓ pp., illus.) Description of methods used on the Snake Creek tunnel in Utah. 20c.

19,383—TUNNEL—The Laramie-Poudre Tunnel. Discussion by W. C. Hammatt, W. L. Saunders, Lazarus White, O. J. Swensson and B. H. Wait. (Proc. A. S. C. E., May, 1912; 16 pp.)

19,384—WAGES—Die Bergarbeiterlöhne in Deutschland im Jahre 1911. (Glückauf, Apr. 27, 1912; 9 pp.) 40c.

ORE DRESSING—GENERAL

19,385—CRUSHERS—Types of Shaft Bearings for Gyratory Crushers. (Eng. and Contracting, May 29, 1912, 1¼ pp., illus.) 20c.

19,386 — CRUSHING — Heavy-Duty Crushing Rolls. S. W. Traylor. (Met and Chem. Eng., June, 1912; 2 pp., illus.) 40c.

19,387 — ELECTROSTATIC SEPARATION in the San Juan District. F. S. MacGregor. (Min. Sci., May 23, 1912; 1 p., illus.) The Huff process at the Sunnyside mine near Silverton. 20c.

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19,390—SCREEN—A Durable Shaking Screen. Roy Reddie. (Mines and Minerals, June, 1912; 1 p.m., illus.) 20c.

19,391—SEPARATION—Ore Separation by Decrepitation. Henry E. Wood. (Eng. and Min. Journ., June 15, 1912; ⅜ p.) 20c.

19,392 — TAILINGS—Converting Tailings to Commercial Products. A. H. Martin. (Mines and Methods, May, 1912; 2⅜ pp., illus.) Describes rock-crushing plant of Natomas Consolidated in California. 20c.

19,393 — WILFLEY TABLE KINKS Used in Joplin District. Claude T. Rice (Eng. and Min. Journ., June 8, 1912; 1 p. illus.) 20c.

METALLURGY—GENERAL

19,394—ALLOYS—Untersuchungen über das System Kobalt-Kohlenstoff. G. Boecker. (Metallurgie, May 8, 1912; 7 pp., illus.) Researches on the system cobalt-carbon. 40c.

19,395—ELECTRICITY AND CHEMICAL ACTION. Harry C. Jones. (Eng and Min. Journ., May 18, 1912; 4½ pp.) 20c.

19,396 — ELECTROLYSIS — Electricity Applied to Chemistry. Harry C. Jones. (Eng. and Min. Journ., May 25, 1912; 3 pp.) A discussion of the electrolysis and of electrolytic separations. 20c.

19,397—FURNACE CHARGES — Calculation of Furnace Charges—V. Regis Chauvenet. (Met. and Chem. Eng., June 1912 1½ pp.) 40c.

19,398—PYROMETRY — Radiation Pyrometry. G. A. Shook. (Met and Chem. Eng., June, 1912; 1 p., illus.) Second paper on theory of radiation pyrometers. 40c.

19,399—ROASTING—Mechanischer kontinuierlich arbeitender, als Trommel ausgebildeter muffelröstofen. Paul Schmieder. (Metallurgie, May 22, 1912; 1 p., illus.) Mechanical continuous working cylinder furnace arranged as muffle furnace. (U. S. pat. No. 1,004,916.) 40c.

19,400—ROASTING—Ofen zur sulfatisierenden Röstung kupferhaltiger Kiese. Richard. (Chem. Ztg., May 21, 1912; 1 p.) 40c.

19,401—SURFACE COMBUSTION. (Engineering, May 10, 1912; 2⅓ pp., illus.) Lecture by W. A. Bone before the Cavendish Soc'y of Leeds University. 40c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

H. D. McCaskey has been visiting quicksilver prospects in Nevada.

Frank J. Probert passed through New York this week on his way to Europe.

P. G. Lidner, of New York, has gone to Venezuela on professional business. He will be absent about two months.

M. L. Robb, of the Cerro de Pasco Mining Co., has been appointed U. S. consular agent at Cerro de Pasco, Peru.

Harold Kingsmill, formerly manager of the Rea mines, recently visited Porcupine, Ont., and has now returned to Peru.

Claude T. Rice, of the editorial staff of the JOURNAL, and Mrs. Emma R. Wood, were married in Chicago, June 22 last.

Professor Robert H. Richards, of Boston, was married on June 8 to Miss Lilian Jameson, of Jamaica Plain, Massachusetts.

Stephen Birch has been elected a director of the Braden Copper Co. in place of Edgar J. Meyer, who was lost on the "Titanic."

George I. Adams has been appointed professor of geology in the Pei Yang University, Tientsin, China, and will start for the East in July.

Charles Fergie is on a visit of inspection to the Pacific Pass, Western Coal, and Lethbridge collieries, of which he is consulting engineer.

V. F. Marsters left New York, June 28, to take a position with the New York & Honduras Rosario Mining Co., at San Juancito, Honduras.

C. E. Powers and C. W. Pocock have left the Cerro de Pasco Mining Co., and have gone to the Backus & Johnston Mining Co., at Casapalca, Peru.

William Davidson, well known as a successful prospector in the early days of the Porcupine camp, is now engaged in zinc mining in western Missouri.

H. A. Bakewell, of Goldthorpe, England, is making an inspection of properties in the Manitou gold area, Ontario, in the interest of English capitalists.

H. W. Kitson, formerly with the Ray Consolidated, is now superintendent of the Kornkob Mining & Developing Co., at Redington, Pima County, Arizona.

W. W. Mein has become the general manager and chief consulting engineer of the Canadian Exploration & Mining Co., and will make his headquarters in New York.

R. K. Stockwell has resigned his position with the Robins Conveying Belt Co., and is now chief engineer of the Braden Copper Co., at Rancagua, Chile, succeeding C. E. Rock.

H. P. Gordon, an experienced California hydraulic engineer, has been appointed superintendent of the Champs d'Or mines in the Seigniory Rigaud Vaudreuil, Beauce County, Quebec.

V. P. Walling, for 11 years chief engineer of the narrow-gage railroad of the Cananea Consolidated Copper Co., at Cananea, Mexico, has been appointed assistant engineer of the Chicago & Great Western R.R., Chicago.

C. K. Studley, of the California State Normal School, will engage this summer in geological research in Big Chico cañon in Butte County. Professor Studley will probably be assisted by members of the State University geological department.

George D. James, of Salt Lake City, has returned from an extensive investigation in Beaver County, Utah, in the interest of Eastern investors; the examination included mining and hydraulic possibilities for development of that county.

S. W. Traylor, president of the Traylor Engineering & Manufacturing Co., of New York, recently visited the Bishop Creek mine, Inyo County, Calif., for consultation with A. Del Mar, superintendent, regarding the mill construction and additional equipment.

Charles R. Miller, of Wilmington, Del., recently visited the Penn Copper mine at Campo Seco, Calif., for the purpose of inspecting the thiogen plant. Mr. Miller is president of the Thiogen Co. which has installed the Young process of neutralizing the fumes in the smelter smoke.

Louis Fenn Vogt, Pittsburgh metallurgist retained for the past year by the Vanadium Mines Co., of Cutter, N. M., and Pittsburgh, to develop new processes on the vanadium and other rare metal ores, returns to Pittsburgh about Aug. 1, upon successful completion of his work.

Dr. Ernest H. Angermann, whose death was reported by a correspondent in our issue of Mar. 2 last, writes to us from Clausthal, Harz, Germany, that he is still alive, and has been engaged all winter in France, on professional work. He expects to return to Mexico next fall to take up again his work as a mining geologist.

George J. Rockwell, for some time past, head of the Rockwell Engineering Co., of Denver, has been appointed general manager of El Tajo Mining Co. the San Sebastian district of Jalisco, Mexico. He succeeds Ferdinand McCann, of Mexico City, who recently resigned. Mr. Rockwell is widely known as a mining engineer and metallurgist, and as a successful manager, in the United States and in Northern Mexico.

Prof. J. Volney Lewis, of Rutgers College, expects to spend the greater part of the summer in the study of mining regions in the West. For the present he is busy with the publication of his new "Determinative Mineralogy," which is to appear in August. In general plan the book follows the well known Brush-Penfield treatise, but it is intended to meet the requirements for a less encyclopedic and therefore simpler and less expensive work. By the elimination of exceedingly rare minerals, the number in the tables has been reduced from 380 and the procedure has been greatly simplified.

OBITUARY

A cable from St. Petersburg, Russia, reports the death of F. Osmond, the distinguished authority on the metallurgy of steel and on alloys. He was an honorary member of the Iron & Steel Institute and a frequent contributor to its *Transactions.*

J. W. Mullin died at Sumpter, Oregon, June 21, aged 74 years. He was one of the best known mining men in the Baker City district. He went to Oregon in 1862 and was one of the first to work the mines of the Auburn district, not far from Baker City.

Richard Bryan died at Sumpter, Oregon, June 21, aged 55 years. He had lived in Oregon about 30 years, and operated several mines in the Alamo and Red Boy districts. His death was caused by miner's consumption. He was a widower and leaves a married daughter in Virginia.

Societies and Technical Schools

Canadian Electrical Association—The twenty-second annual convention was held at Ottawa, June 19-21 about 300 members being in attendance. The secretary-treasurer's report showed a total membership of 586. Among those who presented papers were J. G. Hennenger, of the National Electric Lamp Association. Prof. H. T. Barnes, of McGill University, and S. Bingham Hood, Toronto. The following officers were elected: President, R. F. Pack; vice-presidents, W. L. Adams and W. L. Bird; honorary secretary, T. S. Young.

National Fertilizer Association—A meeting of the Executive Committee was held June 7 and 8, at Cleveland, O., to perfect arrangements for the nineteenth annual convention of the association, which will be held at Atlantic City, N. J., the week beginning July 15. The Southern Fertilizer Association convention will also be held that week. Tentative plans were adopted for a most interesting and instructive program. Men widely known in national, state and commercial life will be invited to make addresses on subjects of interest to the fertilizer trade. The entertainment committee has arranged a program for the entertainment of guests, which was presented to the Executive Committee and unanimously ratified.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

June 26—A number of California miners have gone to and returned from Bolivia. Many of the California adventurers are reported to be stranded. They who have returned have only ill words to say of the promoters who induced them to go to Bolivia. It is admitted there are placer mines, which the natives work, and expect to earn not more than 50c. per day. One of the California men writes that the natives cannot be beaten at placer mining, but they will not work for others, nor will they give any information as to the situation of the placer mines. The fact is that the California adventurers were looking for big returns on small investments, and the promoters expected a larger crop of investors than has been harvested. Bolivia, like other fields, probably has gold, but it is not a poor man's country.

A regular meeting of the executive committee of the Anti-Débris Association, held at Sacramento, received reports from watchmen who made an inspection of the hydraulic mining territory. It was announced that an injunction had been served upon the companies operating mines in the vicinity of Camptonville. The Brandy City company, which operates two giants and works about 25 men, has erected dams which are declared insufficient to restrain the débris and tailings and this company has been enjoined. Considerable complaint is made that Yuba River shows the effects of the mining operations in the vicinity of its head waters and an extra effort will be made in this vicinity by the association. W. L. Irwin, superintendent of the Neocene Placer Mining Co., has filed an affidavit that after the present cleanup the operations by this company will cease.

Denver

June 27—Among the many more or less idle, but historic mines, which are being revived under the new era in Colorado, is the Bassick at Querida, Custer County, which for many years produced regularly. Now it is reported that lessees have found in the 200 level a body of ore assaying unusually high in gold and silver. A 20-ton carload has been taken out for shipment. The early success and development of the Bassick was largely due to Judge Hugh Butler, of Denver, who has been for many years a third owner in the mine; the pathetic side of this reported extraordinarily rich discovery is the fact that Judge Butler passed away today at St. Joseph's Hospital.

Dr. Victor C. Alderson, president of the State School of Mines, will issue a monthly pamphlet containing information as to the treatment of complex ores, and also a record of the work accomplished by the experimental plant just opened. These pamphlets will be distributed for the benefit of the mining interests of the state.

The mining revival has extended to Craig, in Moffat County, where the sands of the prairie and hills west of the Elkhead Mountains and north of the Yampa River, as far west as the Snake River, are known to carry gold in what would be paying quantities if water were only availiable; the latter not being the case in a large portion of the territory, the dry separating machines are receiving attention, and three different types of machines are being operated there by their inventors. The gold-bearing gravel and sands are not in the gulches, as is usual, but form the mesa or upland, and cover the entire country; although it would not be correct to state that the gold is uniformly distributed, it is certain that in order to recover the gold, the whole of the material will have to be handled, as it has been demonstrated that gold has been found at grass roots as rich as deeper down.

Butte

June 26—The Helena land office has received notice that several thousand acres of public land in Granite, Deer Lodge, Silver Bow and Beaverhead Counties were withdrawn from entry, June 10, on account of the presence of phosphates. This land extends from Township 12 North, Range 14 West, south to Township 1 South, Ranges 9 and 10 West; also from Range 9 West, west to Range 14 West, and is designated as Phosphate Reserve No. 12, Montana No. 3.

At the Badger State mine of the Anaconda company, an average of 700 tons of ore per day is being hoisted, and ore reserves at present are such that this amount could easily be doubled. Preparations are being made to install a new hoisting engine and skips to replace mine cars and double-deck cages now being used. Also a new steel headframe will be erected, as the present wood frame will not bear the additional strain of 4½-ton skips. In preparation for the equipment of the 1800-ft. level with electric motors for ore hauling, the wiring has been completed and heavy steel tracks, necessary for the running of motors, laid on the entire level. The Stromberg-Carlson mine-telephone system has been installed on all of the levels and at the surface buildings. On the 200-ft. level a diamond drill has been started, to tap the water in the workings of the old Moose mine adjoining the Badger State, which has been closed for years. The hole is being run to strike the end of an east drift on the 400-ft. level.

In the case of the British Butte Mining Co. *vs.* Shirley Jenks, of London, in which Jenks brought suit against the company for money loaned it which was never returned, judgment was rendered, by default, in favor of the plaintiff. By order of the court the gold dredge, constructed by the company at a cost of $100,000 some years ago, was sold at a sheriff's sale on June 24 for $1000 to Jenks. The large acreage of placer ground, owned by the company, and situated at Rocker, four miles west of Butte, was not included in the sale.

Salt Lake City

June 27—Producers of lead ore in Utah are benefited by the increase in the price of lead from $4.20 to $4.50 per 100 lb., which has occurred recently. The latter price was that prevailing prior to the agitation for the reduction of the lead tariff, and the passage in the lower house of the Underwood hill. Utah's production for 1911 was approximately 110,396,000 lbs. The 1912 output so far has been practically the same as that for the corresponding period of 1911, and the recent rise will mean an increase of about $200,000 to Utah producers for the second half of the year. The camps most benefited are Park City, Bingham, Alta, Tintic, Beaver County, etc. Lead producers are being urged to begin immediately on the compilation of statistics to be used in demonstrating the need of the existing tariff, to the next Congress, which it is thought may undertake a revision of the metal tariff schedules. With the recent rise in the price of copper, lead, and silver, increased activity in the local mining field is apparent, and Salt Lake mining machinery houses report a marked increase in business during the last two weeks. Much of the machinery is going into producing mines and some of it is being applied to new development work. A large amount of lumber and mining timber has also been sold to Utah buyers.

There are fewer idle miners in Utah and Nevada camps than at any time during the last two years. Copper producers are increasing their forces, and owners of zinc producing mines have the best market in several years, the price of the metal being high and facilities for the disposal of the ores good.

Negaunee, Mich.

June 29—Exploration continues active in the region from Lake Michigamme, on the western Marquette Range, southwest to the Amasa-Crystal Falls district of the Menominee Range, and from there through the Iron River district west into Wisconsin, south of the Gogebic Range This territory, on which little systematic geological or diamond-drill work was done until recently, gives promise of developing some surprises in the line of ore finds. South and west of Lake Michigamme the Oliver Iron Mining Co., and the Jones & Laughlin Co. have been exploring for some time, their operations reaching as far south as Witbeck on the Chicago, Milwaukee & St. Paul R.R. and as far west as Fence Lake in T. 47 N.-R 31 W. From this region the Amasa-Crystal Falls district is not far distant, where the following companies are drilling: Oliver Iron Mining Co. in Sec. 9 T. 44 N.-R. 33 W., near the company's Michigan mine, and also two miles southwest of Crystal Falls near the Dunn mine; Pickands, Mather & Co. are likewise drilling in the same section near Amasa; the Iron Development Co., of Iron River, has been drilling for a year in Sec. 26, the same township; the Ladenberg-Thallman interests have two drills at work on Sec. 36 in that township, and have an immense area of land under option throughout the region; Corrigan, McKinney & Co. are drilling in Sec. 21 T. 43 N.-R. 32 W., one mile northeast of Crystal Falls.

Kingman, Ariz

June 18.—The bill recently passed by the Arizona legislature, making mining claims subject to liens for work done on them by leasers or parties holding them under bond, is being viewed with considerable disfavor. There is some agitation regarding petitions for invoking the referendum. It is feared by those opposed to the bill, that under its provisions development work in the county will be greatly curtailed.

Last week three bars of bullion weighing 420 lb. avoirdupois and worth $90,000, were brought into Kingman by S. S. Jones, general manager of the Tom Reed mines. This was the production of 10 stamps during May. Active mining operations have been suspended there pending the installation of an electric hoist to replace the steam hoist now in use. At the same time improvements will be made in the shaft to facilitate hoisting.

This company has purchased the Neglected group of mining claims, from which will be obtained an additional water supply sufficient to enable the operation of the 30-stamp mill at full capacity, after the other improvements are completed. The Gold Berg company was recently organized in Utah with James Rooney, president; J. T. Williams, secretary and Edward Wilkins, treasurer, and has taken over the group comprising the Gold Berg and other claims in the Squaw Peak section, northwest of White Hills. There is a 400-ft. tunnel on the property and it is reported that it has tapped a body of good ore. Further development work will be commenced soon.

Toronto

June 29—Prof. A. P. Coleman, of Toronto, has made an investigation of the Whiskey Lake area on the north shore of Lake Huron, where gold claims were recently staked. He reports that only one of all the locations, the Peyton claim, gives any promise of being valuable It has a large showing of quartz carrying free gold, but no well-defined veins have been discovered. There are a number of low-grade copper deposits in the district.

An expedition to search for and work placer-gold deposits on Baffin's Island, in the Arctic Circle, is being organized by A. W. (Lucky) Scott, of Toronto, a former partner of F. Augustus Heinze. A ship of 300 tons' burden has been chartered, which will sail from St. John, Newfoundland, about July 10. Among the members of the party are S. Osgood Pell, of New York, Thomas Morrisey, of Nevada, Alexander Gillies and E. Holland, who have been engaged in mining in Porcupine, and Frank Vasser, a South American miner. The entire party, including the crew, will number 22. Capt. Robert Janes, who has made gold discoveries on Baffin's Island during the explorations made by the Canadian government SS. "Arctic," will accompany the expedition as guide and interpreter. The immediate destination of the expedition will be Pond's Inlet on the northern coast of Baffin's Island, across from Greenland. The vessel will carry provisions sufficient for two years, the party expecting to return in the summer of 1913.

Cobalt

June 28—The silver mines of northern Ontario have been receiving a great deal of attention lately, more real interest having been evinced in them than in any other mining district of the province. An interesting feature of this has been the development of the Casey-Cobalt and the Townsite mines which are the only two properties in the camp controlled entirely by English capital. They both sprang into prominence within a few weeks, the Casey having recently shipped the richest car of ore that ever left Cobalt. These two companies, the flotation of which was directly responsible for keeping a large amount of English capital away from Cobalt, are now both on a sound basis. There is a healthy activity throughout the whole district, and a number of mines which have been idle for some time are being worked as leases.

The report for the first three months of the present year gives some interesting figures as to production and values. The total output for the quarter was 7,439,044 oz., worth $4,092,405, compared with 7,530,487, oz. and $3,708,544 for the corresponding period of 1911. This shows a decrease of 91,433 oz. in production but an increase of $383,861 in value. Of the total production for the quarter, Gowganda produced 147,103 oz., an increase of 14,200 and South Lorrain produced 285,042, oz., an increase of 218,257 over last year. The total decrease from Cobalt alone was therefore 323,890 oz. The shipments for the quarter were: Ore, 4346 tons; concentrates, 2528 tons; bullion, 1,445,834 oz. Of the total quantity of silver 4,197,161 oz. were produced in Ontario smelteries, and adding the bullion produced at the mines, over 75% of the total yield of silver was treated in Ontario. For the first time in the history of silver mining in this province the total value of the shipments has exceeded $4,000,000 for three months.

Chihuahua

June 23—A slight betterment of mining conditions is apparent throughout northern Chihuahua since June 1, due to the regular supply of fuel and dynamite, and to the abundance of better-class Mexican miners. As a result, such companies as the American Smelting & Refining Co. and the Chihuahua Mining Co., in the Santa Eulalia camp, have increased working forces by more than 200 men, and consequently the production. There is also less unrest among the peons, the majority of them appearing anxious for a termination of the revolutionary disturbances, so that they may continue work undisturbed. Six furnaces are now in commission at the Chihuahua smeltery of the A. S. & R. Co., while a seventh is being made ready. The plant is now handling about 1400 tons per day. There is an abundance of ore coming in regularly.

According to late reports the larger mines and mills in the Parral camp have secured ample supplies from the south, since the government forces have opened the railroad from Mexico City to Jiminez, the main-line terminal of the Parral branch of the National Railways of Mexico. The Rio Plata Mining Co. is preparing to restart its mill at Guazapares, which has been out of commission over six months, pending the development work in the mine. Early in July the Yoquivo Development Co.'s cyanide plant will be in commission again after a 30-day shut-down, to permit of needed repairs and annual overhauling.

The Mining News

The Current History of Mining

Alaska

Fairbanks dispatches state that a new gold find has been made in Fox Gulch in the Innoko district.

Alaska-Treadwell—During May 84,280 tons of ore were crushed, yielding $191,590 gross and net $71,602. Operating expenses were $89,276, construction, $30,711; yield per ton, $2.30. Development work totaled 929 feet.

Alaska-Juneau—This company is driving a tunnel over a mile long to connect with the mine near the head of Silverbow Basin.

Alaska-Gastineaux—This company is about to drive a tunnel to the Perseverance mine, from a point near Sheep Creek, about three miles south of Juneau. This tunnel will be nearly two miles long and by laterals will tap the Sheep Creek mines belonging to the same company.

Bewick, Moreing & Co.—This company, of London, England, is exploring property at Auk, about 15 miles from Juneau.

Juallin—This mine, about 50 miles from Juneau, was recently reopened and about 90 men are at work.

Kensington—This mine is situated at Berners Bay, about 60 miles from Juneau, and, although a separate company, is under the same management as the Alaska-Gastineaux.

Mineral Creek Mining Co.—The company has taken over the Ramsey-Rutherford gold property, near the Valdez glacier. This property was under bond to Col. B. F. Millard and associates. It has at least $100,000 worth of ore blocked out.

Arizona

GILA COUNTY.

Needles—The Guggenheim interests have relinquished their option on this group of 27 claims, and the so-called independent group of 13 claims, situated three miles west of Miami and adjoining the claims of the Southwestern Miami and the South Live Oak companies. The option called for a total payment of $625,000. The ground was examined by five engineers at various times and orders had been placed for machinery and supplies for churn-drilling.

Copper Reef—At this mine, 12 miles south of San Carlos, good progress is being made in driving the California tunnel. The drift on the California vein is reported to be breasted in good vein matter. The pump installed at the new well is furnishing sufficient water for the mine and camp. M. J. Kennedy, of Pittsburgh, president, is visiting the mine.

Gold Needle—W. Sparks and Frank Thompson have acquired title to this old mine about one mile northeast of the Black Warrior, and will start work soon. The mine produced gold ore about 30 years ago and is opened by a shaft and 900-ft. tunnel, from which two winzes have been sunk. It is reported that a quantity of ore was mined from the oxidized zone and that the mine was abandoned when base ore was reached. The workings are badly caved and the new owners intend to clean out the tunnel and explore the property.

Inspiration Consolidated—The company is sinking three development shafts and one working shaft and is opening the Inspiration orebody by drifts and raises. The development of the Live Oak orebody will begin after the sinking of development shafts Nos. 1 and 2 is finished. The working shaft is being temporarily timbered with 8-in. timbers. After it reaches the desired depth it will be lined with concrete beginning at the bottom and working upward, removing the timbering as the concrete is poured in. There will be three compartments, each 5 ft. 11 in. x 5 ft. 6 in. and the concrete walls will be 10 in. thick. It is being sunk on contract, there being three shifts with six men on a shift. A 25 hp. gasoline hoist is being used for sinking. About 480 men are employed.

Miami—At the concentrator, additional rolls are to be installed in the crushing plant so that all ore will be reduced to ½-in. size before going to the bins. The new rolls are expected soon. They will be 15x42-in. spring rolls of unusually heavy construction, specially built by the Traylor Engineering Co. and will gradually replace all the rigid rolls now in use. The chilean mills will be replaced by Hardinge conical pebble mills. While the cost of steel and pebbles consumed by the latter is said to be about the same as that of steel for the former, the repair cost of the chilean mills far exceeds that of the Hardinge mills.

Iron Cap—F. A. Woodward, of Boston, vice-president and general manager, is inspecting the Iron Cap mine at Copper Hill, preparatory to resuming development work. The mine adjoins the Copper Hill mine of the Arizona Commercial and has been considerably developed but was closed down in 1910 owing to exhaustion of funds of the National Mining Exploration Co. The Iron Cap Copper Co. is virtually a reorganization of that company and is capitalized for 200,000 shares, par $10, of which 85,000 shares are outstanding, the rest being treasury stock. There is also outstanding a $50,000 bond issue. Mr. Woodward states that there is sufficient money in the treasury to carry on development during the coming year.

MOHAVE COUNTY

Several leasers are working on the Banner property in the Stockton Hill district and it is the intention of others to commence work soon on some of the adjacent properties in this section. Stockton Hill has been a productive district and the deposits of high-grade ore frequently found at comparatively shallow depths, make it an attractive field for leasing.

The San Pedro, Los Angeles & Salt Lake R.R. Co.'s recently completed branch to St. Thomas will open up a rich mining and agricultural section in that portion of Mohave County north of the Colorado River. Considerable copper ore is found in that region, but heretofore it has been impracticable to ship ore carrying under 40% copper. With better transportation facilities and the present price of copper, ore carrying 20% copper would probably show a profit.

Tennessee—It is reported that this mine, one of the United States Smelting, Refining & Mining Company's properties, will suspend active mining until the Santa Fe R. R. extends the tracks of the Chloride branch to the mine. It is expected that this will be done in about five weeks.

I. X. L.—This company is about to sink the main shaft another 200 ft. The property is in charge of Superintendent Atlee.

Frisco—A 24-mile telephone line has been completed by the Arizona, California & Nevada Telephone Co., from Kingman to these mines, by way of Union Pass.

PINAL COUNTY

Magma—At the old Queen mine at Superior, a shoot of high-grade copper ore has been opened on the 650- and 800-ft. levels. On the 650-level it was 150 ft. long and 5 ft. wide. On the 800-level it is from 5 to 20 ft. wide, and has been opened for nearly 300 ft. The ore from development work is being shipped and averages from 20 to 25% copper and some silver. The copper occurs as chalcocite and bornite. The mine was taken over on the advice of Henry Krumb about two years ago by the Gunn-Thompson Co. which organized the Magma Copper Co. and started development work. Results have exceeded expectations.

SANTA CRUZ COUNTY

Austerlitz—W. R. Layne and Todd C. Woodworth are reopening this mine. A pump and hoist have been placed at the shaft and the latter has been unwatered. The shaft will be sunk deeper; four crosscuts are being driven from the tunnel and ore has been disclosed. The mill and mine, situated ¼ mile apart, have been connected by pipe line and tram. The mill is crushing ore. The ore is a copper sulphide, carrying gold and silver.

California

AMADOR COUNTY

Kennedy—The suit of H. D. Emerson for possessory right to the Bright claim, purchased by the Kennedy company for $20,000, has been dismissed on demurrer.

Bunker Hill—This is the only active producing mine on the Mother Lode in Amador County that employs the cyanide process for the treatment of tailings. It is also the first mine to employ auto trucks in this county.

Keystone—The main inclined shaft has been deepened to 1700 ft.; vertical depth, 1300 ft. From May 14 to June 23 the shaft was deepened 118 ft. A new 300-hp. electric hoist will be installed. C. R. Downs, Sutter Creek, is manager.

ELDORADO COUNTY

Beebe—This quartz mine, near Georgetown, has been taken over on bond by Bewick, Moreing & Co.

INYO COUNTY

Black Warrior—Shipments of ore are being made by pack animals from this mine on Big Pine Creek.

Gibson—The first shipment of ore in the Buena Vista district is being sent out from this property. Cass Gibson is leaser.

Skidoo—During May, 1209 tons of ore were milled yielding total receipts of $17,719 for the month. Development work cost $1504; operation, $7202; and net profits were $9013.

MONO COUNTY

Crystal Lake will be raised about 20 ft. by the construction of a concrete dam which will cost about $90,000.

MONTEREY COUNTY

King—A new Scott furnace will be installed at this quicksilver mine in the Parkfield district. Oil fuel will be used. G. W. Warner and W. Gray, of the Dominion Oil Co., Coalinga, are owners of the mine.

NEVADA COUNTY

Republic—This mine west of Graniteville has sufficient ore blocked out with which to operate the 10-stamp mill on full time.

Bald Mountain Gold Mining Co.—This company has been incorporated to acquire and operate the Hippert gravel claims above Graniteville.

Erie—This mine, four miles south of Graniteville, will drive a lower tunnel to intersect five veins and to prepare for mining and milling on a larger scale.

Gaston—This mine, south of the Erie, has completed its drainage tunnel and has sufficient ore blocked out to operate the 40-stamp mill night and day. Fred Moore is superintendent.

Blue Rock—A vein 4 ft. wide is reported to have been disclosed in this prospect at Cherokee. Charles Salmon is superintendent.

PLACER COUNTY

Red Bird—It is reported that telluride ore has been disclosed at this mine near Colfax. George Tubb is owner.

PLUMAS COUNTY

The old town of Prattville has been destroyed, the remains of the dead removed, and the site prepared for the storage reservoir of the Great Western Power Co., which is building the great dam near Nevis.

Snow fell at Portula on June 21. The precipitation was light, but covered the ground.

California and Utah men are said to be interested in developing some old properties near Doyle, on the Western Pacific Railroad.

SIERRA COUNTY

City-of-Six—This property has been bonded to J. W. Henderson, of Fresno, and work has been resumed.

Bellevue—Pay gravel is being taken out by a large force of men at this mine.

Sierra Standard—A wagon road is being built to this mine in Sailor Ravine by the recently incorporated company that is operating there.

Hewitt—At this property, near Gibsonville, the recently erected mill has begun crushing good ore from the vein 21 ft. wide.

Cleveland—Nevada men have bonded this mine and are putting the mill in condition for early operation.

SISKIYOU COUNTY

Jilson—The adjoining claim has been leased by J. E. Leary and A. B. Boseman, of Montana. A 5-stamp mill will be installed.

TRINITY COUNTY

An effort is being made to erect a modern custom mill in this district. There are a number of small mines and prospects in the vicinity that can furnish such a plant with considerable ore of good grade, but the ore will not bear the expense of shipment to outside points.

Trinity—At this group of mines a shipment of high-grade ore is being prepared for the smeltery.

Bonanza—Rich telluride ore was recently found, assaying 27 oz. gold per ton.

Golden Chest—The principal work is being done from the Mountain View claim. The mill is to be remodeled.

TUOLUMNE COUNTY

Confidence—The last cleanup at this old mine was made recently, and the surface equipment will be dismantled. All the accumulated ore was run through the mill and the sulphurets shipped. The extraction of ore has extended to the limit of exploration and development. This mine was located in 1853, and is reputed to have produced about $4,000,000 in gold. In the early working of the mine, the sulphurets were shipped to Wales, and returned a large profit. The mine is being abandoned through the indisposition of the present owners to expend money in further exploration.

Colorado

ASPEN COUNTY

Silver Cream—A discovery of 10-oz. gold ore is announced as having been made by H. Dickinson in the old mine on Castle Creek, above Ashcroft. The mine has not been worked for years. Excitement prevails and claims are being staked.

CHAFFEE COUNTY

Black Hawk—In this mine, about 2½ miles from St. Elmo, 14 in. of ore, carrying gold, silver, copper and lead, have been encountered. The mine is operated by the Atlas Leasing Co., of Denver.

CLEAR CREEK COUNTY

Alice Gold Mines Co.—It is reported that this property has been purchased by the Tonopah Mining Co., and that considerable money will be spent in development and a 500-ton mill built. This is said to be a $4 per ton, steam-shovel mine.

Humboldt—Two tables and a slimer have been added to the mill equipment.

Mineral Chief—Operations will be resumed soon at the mill and both company and custom ore will be treated.

Hudson—The remodeling of this custom mill is nearly completed. The process includes amalgamation, concentration and continuous cyaniding.

Golden Glory—Development will be resumed soon. A contract has been let to drive the main tunnel 500 ft. beyond its present length of 1000 feet.

Lake County—Leadville

Anderson—W. B. Anderson has returned from the East, and states that money is available to drive the tunnel ahead. The breast is now 550 ft. from the portal and in 300 or 400 ft. more will probably begin to intersect a series of veins which have been mined from the surface down.

Ponsardin—The lessees have opened several streaks of carbonate-of-zinc and lead ore at the 300-ft. level and expect soon to reach the main orebody.

Result—Lessees are shipping a car per day of good iron ore, carrying silver and lead.

Denver City—The lessees are repairing the drift to the north from the 300ft. level and will drive in the direction of the old Blaine shaft, hoping to open a body of zinc ore. Meantime the lessees are hoisting good-grade excess iron ore, carrying 20 oz. of silver per ton.

Helena—At this mine in Iowa Gulch, milling experiments are being made with the installation of Hartz jigs and a 16x28-in. Davis roll. Ore from the third, fifth and seventh levels is keeping the plant running steadily.

Ouray County

Wanakah—It is reported that 8 ft. of high-grade smelting ore have been opened north of the porphyry dike. Hitherto the orebodies have all been found south of this dike. The ores are chiefly magnetite and pyrite, with occasional chalcopyrite.

San Juan County

Taylor and Elston have found tungsten ore in an abandoned property which they located in Prospect Basin.

Clevenger—The strike made on this property at the head of South Mineral Creek last autumn, has been developing steadily and some rich ore carrying copper and silver has been encountered. Extraction and sorting of ore has begun but shipments have been held up by the poor condition of the roads.

Esmeralda—A rich strike of gold and silver ore is reported to have been made at this mine in Minnie Gulch. The mine is owned by the Edward Ruth Mining Co. The excitement is great.

Hamilton—The mine, near Midelton, will be operated from the lower tunnel, which will develop the copper and lead-ore vein 1300 ft. below the surface, under the superintendence of Isaac Hughes, and Etienne Ritter, consulting engineer.

San Miguel County

Black Bear—The tramway between the mill in Ingram Basin and the loading station at Pandora will be rebuilt. Timbers for the new tramway towers are framed and ready for erection. A new 125-gal. boiler has been installed to unwater the main shaft.

Suffolk—The mill at Ophir is being overhauled and remodeled. Cyanide treatment is being added.

Jim Crow—The company will soon commence the construction of a boarding house to accommodate 35 men and will install additional mining equipment. T. E. Thomas is manager.

Blue Flag—The concentrator at this mine, in Upper Illinois Gulch, is running steadily on ore from the mine, and regular shipments of high-grade silver-lead concentrates will be maintained.

Teller County—Cripple Creek

American Eagles—The mine is producing about 12 cars of ore per month from the 11th level.

Wonder Gold Mining Co.—Operations are to be resumed at once on the Irish Mollie, on Gold Hill, by W. R. Foley, general manager. The 1000-ft. shaft will be sunk to the new water level.

Moon Anchor—Operations have been resumed on this old producer, on Gold Hill, and ore is being shipped.

Jolly Tar—This mine is reported sold to Charles Walden, of Victor, who represented outside men.

Resurrection—The output from No. 1 mine is from 15 to 18 tons per day, carrying about 1 oz. gold per ton, with some silver.

Portland—No. 2 shaft is being sunk to the 1600-ft. level, where laterals will be driven to open the orebody now being mined on the 1500. Between 125 and 150 tons of ore per day are being received at the mill at Colorado Springs, and about 300 tons per day are being treated at the mill at the mine at Victor.

Idaho

Blaine County

Sam Allen Mining Co.—This company is operating the Parker group. A compressor has been installed and power is received from the Idaho Consolidated Mines Co. hydro-electric plant. About 15 men are employed under I. E. Rockwell, manager.

Hidden Treasure—The mine has installed a compressor and is searching for a vein below the exhausted orebodies. A. B. Menken is superintendent.

J. P. P. Co.—Work is being done on a new tunnel, to open the orebody at a depth of 150 ft. below the present workings. G. U. Lee is superintendent.

Boise County

Boston-Idaho—Both dredges are working to capacity.

Golden Age—This mine at Grimmes Pass has sufficient ore blocked out to run the 15 stamps for the summer season.

Gold Hill—This mine at Quartzburg continues to run its 20-stamp mill and has recently found good ore on the 500 level. E. E. Carter is manager.

National Mining & Development Co.—Work has been commenced on the Mountain Chief Mine; the road is about completed and a small mill will be installed this summer.

Coeur d'Alene District

Hunter—The Ryan stope at this mine has been cut by the crosscut from the 400-ft. level and some good ore has been found. The vein contains from 4 to 6 ft. of galena, running from 40 to 45% lead and 45 to 50 oz. silver, besides a good width of milling ore, assaying 7 to 8% lead and 10 oz. silver. During May, about a car of concentrates per day has been shipped. A picking belt has been installed and has proved successful; several cars of crude ore have been shipped to the smeltery.

Michigan

Copper

Osceola—Production at the old mine is confined to No. 6 shaft, where there are eight drills in operation and a rock tonnage of about 250 tons per day is being handled. No. 5 shaft will start operations soon.

Mayflower—No. 18 drill hole has been discontinued at a depth of about 1910 ft., without revealing the copper formation that was cut in the No. 16 hole. The drilling outfit has been moved to a new site about 150 ft. distant.

Ahmeek—Preparations are being made at shafts Nos. 3 and 4 for the erection of the new steel shaft house. A portion of the temporary wooden building has been removed, but the erection of this new steel structure will not interfere with the hoisting of the rock coming from sinking, so that development work can be carried on without interruption. A new boiler house and engine house are under construction. The stock pile accumulated during the early operations on the conglomerate lode, is being removed and the rock sent to the mill. No. 1 shaft is down to the 18th level and No. 2 is sinking below that depth.

Allouez—The steel shaft house at No. 2 shaft is about completed and it is expected that the large skip will go into commission in the south compartment about July 1. There remains the skip road to be put in from the collar to the dump in the north compartment to accommodate the large skip. This shaft house is equipped with one dump, each skip dumping on a common movable apron which will feed the rock to one 24x48-in. crusher. Sinking is to be resumed at No. 1 shaft below the 18th level, where it has been bottomed for some time.

Tamarack—The adjourned meeting of this company was held recently and it was voted to sell the two-head mill on the shores of Torch Lake to the Lake Milling, Smelting & Refining Co. This is a portion of the milling arrangement that was proposed some months ago by the Calumet & Hecla management, which controls this property.

Mohawk—No. 6 shaft tributary to the Ahmeek northern boundary is down about 1000 ft. and is developing a grade of rock that will eventually increase the production of the mine, as the ground tributary to this shaft has been practically proven by the developments in the northern portion of the Ahmeek mine.

IRON

The Board of Review, in Ishpeming, has approved the assessment of mines within the city limits for the payment of 1912 taxes. The mines have been given a reduction in valuation of 10% from the figures of 1911. The reasons for the reduction are the shipment of ore from the mines and the consequent loss in ore blocked out.

Wickwire—The Chicago & Northwestern Ry. has let a contract to A. D. MacRae, of Palatka, to build 1½ miles of track to this mine at Iron River.

Lake Superior Iron & Chemical Co.—This company, operating six charcoal pig-iron furnaces in upper Michigan and Wisconsin, is purchasing iron ore from independent companies, as its Yale mine at Bessemer does not supply sufficient ore. A purchase of low-grade ore was recently made from the Breitung companies, which will be shipped by rail to the furnaces. The furnace and chemical plant at Manistique has been placed in commission.

American—The foundation for the concentrator is finished; the low-grade ore to be treated will constitute only a portion of the mine's output and will be mined with the better-grade ore; it is estimated that 40% ore, situated conveniently for mining, can be handled cheaply without much increase of overhead expenses.

Montana

BUTTE DISTRICT

Anaconda—The water in the Moose mine stands about 12 ft. above the 300-ft. level, and after it has flowed out through the drill hole now being drilled, to the height of its mouth, it will be pumped out the additional 20 ft., after which an inspection will be made of the Moose shaft for the purpose of repairing it for operations. To care for the increasing supply of timber an addition to the timber yard has been graded. The building containing the mine offices and miners' change rooms, has been found to contain inadequate space for the increase of business, and it has been decided to double the size of the building. The foundation is being laid and the work will be rushed.

Butte-Alex Scott—For the year ended May 31 the company showed a net profit of $19,584. A total of 25,756 tons of ore. worth $15.14 per ton, were mined. The cost of extraction, including mining, development, construction, and supplies, etc., amounted to $131,546 or $5.17 per ton. Total receipts from sale of ore were $151,131 leaving a profit on the year's operations, of $19,584.

East Butte—An average of about 1,400,000 lb. of copper per month is being mined and smelted at present, and net earnings are about $100,000 per month. During the year ended June 1, 1912, 94,532 tons of ore were mined, yielding $16.51 per ton, the gross yield being $1,560,660. The total mining cost amounted to $407,451, or $4.31 per ton. Smeltery costs came to $463,857 at a treatment charge of $4.91 per ton. Costs for freighting, selling, etc., amounted to $225,288; surface and mine equipment worth $11,795 was installed, making total expenses $891,226 and $250,187 net earnings.

La France—The Lincoln Trust Co., of New York, according to reports, has instituted suit against this company, to foreclose a $2,000,000 mortgage on which interest has been defaulted. The mortgage covers all property of the company, including the Lexington mine, and Basin Reduction Works.

DEER LODGE COUNTY

Hidden Lake—At a meeting of the company in Anaconda June 20 the following officers were elected: Patrick Cuddahy, president; W. A. Law, vice-president; R. R. Robinson, treasurer; T. L. Cullen, secretary; directors, W. C. Ahern, L. D. Robinson and P. J. Dooley. The north crosscut on the 50-ft. level has penetrated a 33-ft. vein, of which 16 ft. is good gold ore. The property is producing steadily, and the last three cars shipped, averaged $27 per ton. A cyanide mill and chilean crushers will be erected this autumn.

GRANITE COUNTY

Royal Basin—Active operations are being carried on at the property near Flint. The mill is being operated steadily. Plans are being laid to install electrically driven machinery in the mill, the power to be obtained from a contemplated extension of the Great Falls Power Co.'s line from Phillipsburg.

Copper—Supt. John D. Fields, of this mine in the Princeton district, has miners at work and is hoisting ore regularly. Plans are being made to construct a road direct from the mine over the hills to Phillipsburg.

JEFFERSON COUNTY

Assets Gold Mining Co.—The 5x7-ft. tunnel, in granite, is progressing at the rate of 11 ft. per day. Electric power has been installed. The property is being operated by Colin McIntosh.

LINCOLN COUNTY

J. J. Hibbard, who owns an interest in gold-quartz claims in the West Fisher district, has purchased a two-stamp mill, which will be erected on the property.

Vermilion Silver & Lead—The company expects to ship ore July 1 from the mine near Silver Butte, 40 miles south of Libby. The company has a vein about 7 ft. wide, in which is a vein of shipping ore about 20 in. wide, containing gold, silver and lead. There is no mill.

Nevada

COMSTOCK LODE

Crown Point—Shipments to the Yellow Jacket mill last week included 680 tons of ore and about 400 tons were stoped on the 1400-ft. level. The ore from No. 2 stope averaged about $13 per ton. East crosscut No. 1 on the 1400, is 294 ft. in porphyry and quartz stringers.

Ward—A Starret pump has been ordered to reclaim the shaft from the 2100 to the 2475 station, which was flooded three weeks ago. It is expected to accomplish this within two weeks. The pump is air driven.

Consolidated Virginia—The three-compartment raise from the 2400-ft. level has been connected with the 2300 workings, and the third compartment is being carried up to the point of connection. This connection will facilitate ventilation. The company has closed a five-year contract with a California smelting company to treat all concentrate and shipping-grade ore at a rate said to be less then formerly.

ESMERALDA COUNTY

Lone Star Consolidated—Sinking is being done with two shifts of miners and the shaft is 200 ft. deep. The bottom is in dacite and developments are expected after 300 ft. depth. Crosscutting and drifting will be done from the 250-ft. point.

Goldfield Treasure—T. E. Joseph has secured a two years' lease and bond on this property, three miles northeast of Goldfield. Miners are at work.

Goldfield Consolidated—The large body of quartz recently encountered on the 1300-ft. level of the Grizzly Bear shaft, carries low-grade gold and silver ore, and some copper. The concrete foundation is practically completed for a double-drum electric hoist that will be installed soon.

Jumbo Extension—It is reported that the company will soon commence the repair of the Bonnie Claire 20-stamp mill 38 miles south of Goldfield, upon which it has obtained a year's lease.

Silver Pick Consolidated—Drifting east is in progress from the 262-ft. level. Development is also underway at the Webbfoot claims in the Gold Mountain district, where a shaft in the foot wall of the smaller vein is 150 ft. deep.

Florence-Goldfield—Superintendent Dewey has ceased raising on the rich ore recently encountered on the 250-ft. level, and an attempt is being made to find this orebody on the 350-ft. level. The main shaft is about 1130 ft. deep.

HUMBOLDT COUNTY

Hunter—Gold and silver ore is reported to have been found recently in a 3-ft. vein, assays from which gave $300 per ton.

Mines Development Co.—The company is doing extensive development work at the properties on Juniper Mountain. The veins which carry copper, gold and silver, are found in a large batholith of coarse-grained granite. It is said that a hoist will soon be installed, good for a depth of 1000 feet.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended June 20, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,450	82,919
Tonopah Belmont	1,800	50,726
Montana-Tonopah	1,054	25,483
Tonopah Extension	1,004	24,181
West End	690	17,654
Midway	...	180
MacNamara	472	9,132
North Star	......	80
Totals	8,470	210,355
Estimated value	$211,750	

Pioneer Consolidated—This company, of Pioneer, of which W. J. Tobin is general manager, will erect a 10-stamp mill plans for which are being drawn.

Halifax-Tonopah—This Tonopah company, of which S. H. Brady is manager, is preparing to install new equipment, comprising a 150-hp. electric hoist, a 120-ft. steel gallows-frame, a 10-drill compressor plant and pumping plant.

MacNamara—The clean-up at the mill for a 15-day run, resulted in the shipment of 900 lb. of bullion, worth $10,800 from 1010 tons of ore.

West End Consolidated—The company has added to its mill four Callow cones and 12 Deister concentrators to treat the higher-grade ore being mined, increasing the capacity to 120 tons. The mill comprises 20 stamps, two tube mills and Trent agitators and now treats 100 tons per day.

Tonopah Extension—The main oreshoot on the 400- and 500-ft. levels of the South vein, has been shown to be 240 ft. long and from 14 to 36 ft. wide.

Tonopah Merger—This company recently made a discovery, said to be the most important in two years. The Golden Anchor shaft at a depth of 935 ft. struck a new and unknown vein, 30 ft. between walls, 14 ft. of which is solid ore averaging over $30 per ton. The position of the discovery is 900 ft. northwest of the extreme western workings in the district. John Kirchen is manager.

Tonopah-Belmont—In a south crosscut on the 900-ft. level the company has opened a foot-wall branch of the Belmont vein, 5 ft. wide of good ore. The drifts on the vein on the 13th level continue to open good ore. During the quarter ended May 31, total receipts were $855,848; mining, milling and administration, $450,825; net income $414,141. Available resources were $1,111,856 on May 31.

Mizpah Extension—The raise in ore on the 1000-ft. level shows a width of 3 ft., averaging about $80 per ton.

New Mexico

SOCORRO COUNTY

Ernestine—The bullion product for the first 10 days of June amounted to 11,300 oz. of gold and silver; concentrates for same period, 5½ tons. The daily ore treatment continues at more than 100 tons. A new triplex, electrically driven pump has been installed in the mill to handle the battery solution, replacing the old steam pump.

Deadwood—The mill is handling an average of 60 tons of ore per day; 4375 oz. of gold and silver bullion were produced for first 10-day cleanup in June, with approximately 2½ tons of concentrates.

Oaks—Pacific mine development is yielding about 40 tons of mill ore per week. The tunnel is in 510 ft., where the vein shows 8 ft. wide of good-grade ore.

Deep Down—The leasers are constantly increasing the tonnage taken from south stope. The grade thus far has been above the average of the mill ore in the camp; it is sent to the Deadwood mill for treatment.

Oregon

JOSEPHINE COUNTY

Greenback—H. L. Willson, of Grants Pass and Glendale, with Dr. J. F. Reddy, of Medford, have purchased this mine, a producer. The new owners will install a mill.

Wade—C. E. Wade, owner of this mine on Williams Creek, has sold his three claims for $10,000. They are well developed and are good prospects.

Afterthought—J. R. Baily, owner of this mine on Thompson Creek, has sold out to R. E. Doan, of Los Angeles, Calif., and H. Silver, of Medford. The ore is free milling.

Golden Drift—A. J. McCorkle, manager, has returned from the East, where he ordered a complete milling plant for this mine, 12 miles north of Grants Pass

Almeda Consolidated Mines Co.—Judge Bean has appointed Robert Tucker as receiver, on application made by Mr. Williamson and Mr. Montague, of Dayton, Ohio, on behalf of clients. The company was incorporated in 1905 to engage in the general mining business. Dr. L. A. Kent, 770 East Yamhill Street, Portland, an old stockholder, says that the management has done development work, including about 7000 ft. of tunnels, crosscuts and shafts besides installing a 100-ton smeltery.

Utah

BEAVER COUNTY

Moscow—Ore running $1500 per car is being shipped.

Red Warrior—Shipments are being made, and the property is reported to be in good condition.

Majestic—Two cars of ore were marketed recently, the net returns from which were $8.64 per ton.

Indian Queen—A renewal of the lease, which expired June 23 has not been granted. As yet plans for future development have not been given out.

Rob Roy—Good gold ore has been opened in a drift under old workings.

Cave—A bond and lease has recently been taken by E. P. Kesler and other Beaver County men, on this property a few miles southeast of Milford.

JUAB COUNTY

Eagle & Blue Bell—The output for the week ended June 21 amounted to seven cars. Two cars of ore have been marketed from the new find on the 700-ft. level, each of which brought between $5000 and $6000.

Chief Consolidated—Thirteen cars were shipped the week ended June 21. There is a good surplus in the treasury, and monthly earnings of several thousand dollars are being made. The April receipts amounted to $8000, those for May being somewhat less.

Scranton—Work was delayed the beginning of the last week, on account of a slight accident to the 50-hp. gasoline engine. Considerable development is being done. An incline drift is being driven from the main tunnel level. Shipments for the week ended June 21 were two cars.

Eureka-Swansea Extension—The operation of the new electric hoist has begun, and work has been started in the east drift on the 400-ft. level.

Utah—The average monthly output from this mine at Fish Springs is given as 40 tons of ore, bringing $80 to $100 per ton. Three teams are hauling ore along the 75-mile wagon road to Oasis at a cost of from $12 to $15 per ton. During the 21 years the mine has been in operation $281,000 have been paid in dividends. The last dividend was paid a year and a half ago. The company has lately acquired the Last Chance claims.

Emma—There is a car of ore sacked at this property south of the Utah, awaiting shipment as soon as teams can be procured.

Gemini—About $8000 have been distributed among the leasers for ore marketed during May.

Lower Mammoth—Ore is being followed on the 1000-ft. level. A recent assessment will probably bring in about $10,000, to be used for further development.

Tintic-Delmar—Work has been resumed at this property in North Tintic.

PIUTE COUNTY

Bully Boy & Webster—The building for the new mill has been completed and the machinery is being installed. It is expected to begin operations Aug. 1. About 100 tons per day will be treated. The management estimates the amount of ore at present broken down and blocked out above the lower level to be sufficient for maintaining operations two or three years. Drifting is being done on the lower level, and the work is in ore.

SALT LAKE COUNTY

Utah Consolidated—Average daily shipments of 600 tons of copper and lead ores are being made.

Bingham Copper—The debts of this company are being met, and plans for reorganization considered. A large percentage of the stockholders have deposited their stock, as requested, together with the assessment of 5c. per share, recently levied.

Bingham Mines—About 100 tons of lead ore per day are being shipped. The old Yosemite No. 1 mine is being reopened, and the shaft has been sunk to the 800-ft. level. Raising is being done from the Mascotte tunnel to connect with the old workings.

TOOELE COUNTY

Consolidated Mercur—The company is treating 400 tons of ore per day. About 45% of this tonnage is base, and two roasters are being operated. There are employed in mine and mill about 215 men. The company recently announced that its mines would probably be worked out before the end of the year, and that they would be shut down. Underground developments have been disappointing. A lessee is working in the silver vein, which underlies the gold veins, and on June 14 shipped a car of silver ore.

Franklin Leasing—This company has a lease on the old Geyser-Marion mine, and is building a new cyanide plant. The ore is low grade, but it is expected that both mining and milling can be done cheaply. The ore will be dry-crushed in a rock-breaker and rolls, and classified in solution, with Consolidated Mercur mixer-classifiers and Dorr classifiers. The sand will be leached, and the slime settled in plain tanks, and filtered by an Oliver filter. Zinc-dust precipitation will be used. The plant will be ready to start about Aug. 1. T. H. Franklin, mill superintendent of the Consolidated Mercur Gold Mines Co., is at the head of the company.

Wyoming

Reports are being circulated of several rich gold discoveries on the east side of Medicine Bow Range, in the vicinity of the Victoria mine. At the New Rambler, ore is being stoped from a 7-ft. vein, carrying platinum, copper and gold.

Philippine Islands

Guamas—The New York Engineering Co. is installing a dredge on this placer property in the Paracale district, and expects to have it at work in August.

Surigao Gold Mining Co.—This company has acquired title to 30 gold placer claims, comprising 1664 hectares of land, in the Causuran district, Surigao Province, Mindanao Island. The property is 16 km. from the town of Surigao, and covers an old river channel which has been worked by native methods for some years. The company is prospecting the ground by ditching.

Umeari Gold, Ltd.—This company, organized in Sydney, N. S. W., has bought the property of the Umeari Syndicate, which includes 1600 acres of gold placer ground on the Umeari River in Tayabas Province, on the East coast of Luzon. The ground has been prospected by boring, and the new owners purpose installing two dredges as soon as possible.

Canada

BRITISH COLUMBIA

Granby—During May the mine shipped a total of 103,974 tons of ore, an average of 4159 tons per day. Development included: Raising, 264 ft.; drifting, 528; sinking, 25; and diamond drill holes, 1247 ft. At the smeltery ore was received from the following mines: Surprise, 1062 tons; North San Poil, 224; Republic, 32; Snowstorm, 602; Sunday, 19; total 1939 tons. During the month 106,313 tons of ore were treated, of which 103,174 tons came from the Granby mines, and the balance from outside sources.

ONTARIO-COBALT

Jackson—This property near North Cobalt is being examined.

Buffalo—Ground has been broken for the erection of a refinery capable of handling the entire output of the mine. The process employed at the Nipissing will be adopted, with some modifications.

Ophir—Active work has been carried on since May 1, on a new shaft at the south end of the property, in which three large veins have been encountered, showing milling ore. Development in No. 1 shaft will be resumed.

Wettlaufer—The new mill is completed and in successful operation, the tailings being reground in Huntington mills and treated on slime tables, which produce from 1½ to 3 tons of concentrates per week, assaying from 600 to 2000 oz. of silver per ton. This process has not been adopted by any of the other Cobalt mills.

Temiskaming—The shareholders of this company have voted by a large majority to retain the controlling interest in the North Dome property at Porcupine.

ONTARIO-PORCUPINE.

Crown Chartered—The main vein has been cut in the crosscut from the 200-ft. level.

Preston-East Dome—This company is driving a long crosscut to explore the contact between the quartz porphyry and Keewatin.

Plenaurum—Another rich discovery has been made on this property.

Scottish Ontario—This property is being examined by prospective purchasers.

Hollinger—This company's mill is now running at full capacity.

Porcupine Gold—The new mill has been started and is giving excellent satisfaction.

Porcupine Lake—This company will start sinking in order to develop the veins under the lake.

McIntyre—Work on the construction of the new mill has been suspended.

Dome Extension—The annual meeting was held on June 28. The financial statement for the year ended May 31 showed cash in hand, $19,050; unpaid payroll, $3712; treasury stock, 199,993 shares. Capt. H. C. Anchor, superintendent, reported development work amounting to 2277 ft. to June 21, and stated that 30,000 tons of ore could be safely figured on from the 100-ft. level, while if the ore continues to the 200-ft. level the mine would have 40,000 tons more, running according to sampling, $5 per ton. In addition there are 3000 to 4000 tons partially developed in the west drift on the 200-ft. level in No. 1 shaft, which assayed $7 per ton. He recommended sinking to 500 ft. where the best ore was found by the diamond drill.

Mexico

According to press dispatches, orders to forfeit all property which has been abandoned by its owners, now refugees in the United States, or on which the taxes have not been paid to the rebel government, were issued by Gen. Pascual Orozco, Mexican rebel chief on June 27. The property, including mines, is to be worked by the rebel government for the benefit of the revolution.

South America

CHILE

According to a cable dispatch to the *Sun* a huge new deposit of iron ore has been discovered in the province of Coquimbo.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, July 2—The coal trade in the West begins to show a little improvement. Consumers are more inclined to put in stocks and operators are hopeful of better trade after the holidays. In the East the bituminous trade continues very dull and sales are not heavy. The anthracite trade is improving. Dealers are putting in stocks more largely in the domestic sizes, while the demand for steam coals continues good. The collieries are improving in output and after next week will probably be running up to full capacity.

A report comes from Pittsburgh that five large independent companies operating in that district will soon be consolidated into one company with a capital issue of $30,000,000. The companies named are the United Coal, the Pittsburgh & Westmoreland, the Pittsburgh-Buffalo, the Youghiogheny & Ohio and the Carnegie Coal Co. Several smaller companies and the Carnegie Dock Co. will also be included.

United States Foreign Trade—Imports of coal and coke into the United States five months ended May 31, long tons:

	1911	1912	Changes	
Anthracite	... .	29	I	29
Bituminous	617,110	621,550	I.	4,440
Coke	40,341	32,519	D.	7,822
Total	657,451	654,098	D	3,353

Canada furnished this year 550,208 tons of coal and nearly all the coke; Australia, 63,029 tons of coal.

Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, five months ended May 31, long tons:

	1911	1912	Changes	
Anthracite	1,365,470	829,484	D.	535,986
Bituminous	4,266,575	5,045,030	I.	778,455
Coke	416,919	344,884	D.	72,035
Bunker coal	2,710,434	3,151,318	I.	440,884
Total	8,759,398	9,370,716	I.	611,318

The bunker or steamship coal is practically all bituminous. Canada took this year 3,741,405 tons of coal; Cuba and the West Indies, 824,406; Mexico, 152,193; Panama, 199,139 tons.

German Coal Trade—Exports and imports of fuel in the German Empire, four months ended May 31, metric tons:

	Exports	Imports	Excess	
Coal	10,542,325	2,114,911	Exp.	8,427,414
Brown coal	18,952	2,430,487	Imp.	2,411,535
Coke	1,696,776	171,935	Exp.	1,524,841
Briquettes	865,789	64,610	Exp.	801,175
Total	13,123,842	4,781,943	Exp.	8,341,899
Total, 1911	10,513,273	5,779,810	Exp.	4,763,463

The exports this year included 6900 tons of coke to the United States.

IRON TRADE REVIEW

New York, July 2—The second half of the year opens with conditions almost unprecedented for midsummer. The mills are all busy and not only that, but most of them have work enough on hand to carry them well over into the fall. New business has not been large for the last week and that is the only sign of summer conditions. Many people, however, think that there will be quite a rush of now orders after the holiday. The usual stoppages for repairs at the mills will be postponed as long as possible.

Specifications for finished-steel products were heavy throughout June and particularly in the closing week, partly by reason of many low-priced contracts expiring, the mills being committed to a policy of canceling any unspecified tonnages at the close of the contract. Specifications will doubtless be light this month, but of actual business the mills are believed to have a larger tonnage on books than ever before, so that a quiet period is faced with equanimity.

The advance of $1 a ton in bars, plates and shapes announced by a majority of mills as effective June 26 has become universal, the market being squarely on the basis of 1.25c. for bars and 1.30c. for plates and shapes, Pittsburgh. Hoops and spikes have similarly moved up $1 a ton.

Pig iron orders continue to come in. The demand in the Central West is mainly for basic, and prices of that description of iron are firmer. Foundry iron is being taken quite actively in the East and some large orders are noted.

Railroad buying has been good. The tonnage of rails taken in June is estimated at about 200,000. Equipment orders have also come in during the last few days, a number of steel cars having been placed and also a number of locomotives, including 40 for export to Japan.

The weak spot in the trade is the uneasiness of labor. There is a demand for more men and those who are at work are evidently inclined to be discontented. It looks very much as if small concessions would be made to avoid strikes. The Steel Corporation has published a statement showing how much it has done for its labor, and this is evidently timed to meet the prevailing discontent.

Bar Iron Scales—The scale signed by the Western Bar Iron Association with the Amalgamated Association, in effect in the iron mills as far west as Newport, Ky.; East Chicago, and East St. Louis, gives the puddlers, under the present sliding-scale basis, $5.70 a ton instead of 5.37½, the rate paid during June, the scale being raised from $5 to $5.25, with 15c. instead of 10c. graduations, as heretofore. In the settlement by the Pittsburgh and Valley district manufacturers with the Sons of Vulcan, the insurgent puddlers' union, the men obtained the concession of a flat rate of $6 for puddling, with the abrogation of the sliding scale, under which the wage rose and fell with the price of bar iron. The sliding scale has been an institution in the bar-iron trade for over 25 years.

Baltimroe

July 1—Exports for the week included 1,233,800 lb. steel rails and 106,408 lb. track fastenings to Havana. Imports included 6,200 tons iron ore from Cuba.

Birmingham

July 1—A buying movement is looked for in the near future in the Southern pig-iron market. Quotations are firm at $11.25 per ton, No. 2 foundry, immediate delivery, with $11.50 asked for last quarter; some asking $12. Sales have been made on the $11.50 basis and inquiries in hand indicate there is going to be a steady demand. The production in Southern territory is disturbed right now by the blowing out of furnaces of the Alabama Consolidated Coal & Iron Co., now in the hands of receivers, but announcement is made that within the first 10 days in July the Woodward Iron Co. will be able to put two stacks in operation. Two of the iron companies in the South are out of the market so far as immediate-delivery iron goes.

The home consumption of pig iron is steady, with promise of improvement in two or three directions. There will be a larger melt in the near future for cast-iron pipe. Machine shops and foundries, too, report a little improvement in the trade.

There is no change in the steel situation. The Southern Iron & Steel Co. has a blast furnace at Gadsden in operation with several departments of the steel plant at that place going. There is a fairly good demand for the products and no loss of time is anticipated this month.

The plant of the Tennessee company at Ensley will hardly shut down this month. Orders for more than 13,200 tons of rails have been received during the past week.

The scrap-iron market shows strength. Charcoal iron sells at $22@22.50 per ton.

Chicago

July 1—General conditions in the iron and steel market are but little changed; pig iron is in light and manufactured products in heavy demand. The pig-iron market indeed has flattened out, orders being for very small lots, with here and there an inquiry that stimulates interest in selling agents. Yet prices are firm and everybody seems to be content to await developments. It is evident that the melters are running on as small a basis of raw material as possible. This, of course, is not surprising at this season, when foundry production ordinarily is at a minimum.

In carload lots chiefly, for delivery within one to three months, Northern No. 2 pig iron brings $14.50 and Southern No. 2 brings $11.50 Birmingham, or $15.85 Chicago, Lake Superior charcoal iron sells for $15.50@16. Sales for last half requirements are rare. Almost all orders are for delivery one to three months hence.

In the finished goods market, there is large buying. Structural material has a considerable sale for use over a wide range of territory. Railroad materials continue in very good demand. Bars are strong with local mills taxed to their limit of production to meet the demand; iron bars sell for 1.25c. and soft-steel bars for 1.38c. Plates, sheets and wire products are firm. Conditions of the market cause general expectations of heavy buying.

Cleveland

July 1—Ore transactions are small. A few furnaces have been trying to fill out their stock.

Pig Iron—The market has been quiet so far as new business goes. Quotations, Cleveland delivery, are $15.15 for bessemer, $13.75 for No. 2 foundry, $13.25 for fray forge and $15.75 for Lake Superior charcoal.

Finished Material—Local mills are firm. Iron bars are in heavy demand and there is no cutting below 1.35c. Small orders for plates and shapes are numerous.

Philadelphia

July 3—The general hardening of prices in pig iron seems to be expected. Recent quotations have been withdrawn for foundry and forge though the withdrawal has not aroused the market to action. There is more activity in material for cast pipe than any other and both northern and southern makers have secured a liberal volume of business. There are prospects of some idle furnaces being blown in. Transactions in No. 2 foundry are small considering the small supplies in users hands. Low phosphorus is selling well and malleable is under good inquiry. Many consumers, however, are supplied for some time to some. No. 2 X foundry sells at $15.25 @ $15.50, gray forge $15., basic $15.50 per ton.

Steel Billets—Prices have been marked up to $24.40 and several good sized lots have been taken at figure; stocks among consumers are low.

Bar Iron—Bars are active at higher prices.

Sheets—Prices have been advanced for early delivery but the orders are mostly for small quantities to piece out new requirements.

Pipes and Tubes—Prices are being maintained and there is enough business in sight to satisfy the mill interests.

Plates—All plate mills in the district are booking an abundance of business. The car building interests and all other buyers have not covered their urgent requirements and this points to a stronger situation in the sheet market.

Structural Material—Much new early fall delivery business is being ordered. The rumor that new and larger car orders are coming is making a stronger foundation for both shapes and plates.

Scrap—The market is again active in small lots, mostly from small buyers picking out material to fill out current orders.

Pittsburgh

July 1—Iron and steel exports made a new record in May, totaling 307,656 gross tons, a gain of 15 per cent. over April. Exports during April and May averaged a rate of 3,450,000 tons a year, 58 per cent. in excess of the 1911 total and more than double the rate in 1910. Rail exports in May were the heaviest for any month on record, 60,306 tons, but gains were well distributed among other items.

The local iron and steel market presents a quiet aspect this week, following last week's advances in certain finished-steel products and this is true of pig iron as well as of finished steel. The Connellsville coke operators have not succeeded yet in inducing furnaces not covered for second half to enter into contracts at the price of $2.50, but they have adopted fresh tactics, by blowing out a proportion of ovens, in order to force the spot market above the asking price on contracts. In this they seem to have been successful, sales being reported of 50 to 60 cars of prompt coke at $2.50 at ovens.

At last week's advances, bars 1.25c. and plates and shapes 1.30c., these commodities are $4 a ton above their low point last November, when the low point of April, 1909, was touched but not passed. Hoops are quotable at 1.30c. on very desirable contracts and at 1.35c. ordinary business. Standard railroad spikes are firm at 1.50c. and small spikes at 1.60c., all these products having lately advanced $1 a ton.

Mills are closing a minimum amount for repairs, but several are off this week. In the case of sheet and tin mills the labor supply is so scant that plants are to be kept running, only a few mills being taken off at a time for repairs.

Pig Iron—The market is quiet but strong. On account of the uncertainty as to coke prices some furnaces are pursuing a conservative policy. Buyers are not keen, as they are covered for third quarter and it is too early, in the present temper of the market, to consider fourth quarter. The Andrews & Hitchcock Iron Co. will blow in its second stack at Hubbard at the close of this week. We continue to quote: Bessemer, $14.25; basic, $13.25; No. 2 foundry, $13.25@13.50; forge, $13; malleable, $13@13.25, all f.o.b. valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese — The market is quieter as consumers are getting fair deliveries on contract. It is now only on the most prompt delivery that a premium must be paid over the regular price, which can be done for shipment over a couple of months as well as over the balance of the year. We quote small prompt lots at $50@52 and contracts at $48.50, f.o.b. Baltimore.

Steel—The market continues very firm, and steel is particularly scarce now, as one or two of the mills are down for repairs for a week or ten days. Prices quoted are largely nominal: Billets, $21.50; sheet bars, $22, f.o.b. maker's mill, Pittsburgh; Billets, $21@21.50; sheet bars, $22, f.o.b. maker's mill, Youngstown.

Sheets—Specifications on sheet contracts were very heavy last week, as a number of low-priced contracts were to expire with the month. The sheet market has been gaining in strength steadily for some time, and rapidly in the past fortnight. The American Sheet & Tin Plate Company on April 11 advanced its minimum prices to 1.95c. on black and $3 on galvanized, but ever since then until the past few days there has been shading by several independents, particularly on early deliveries. Such shading has now practically disappeared and the market is firm at the prices mentioned. The mills have several weeks, and in the case of a few interests several months of actual business on books, and they are thus fortified for a dull summer. The independent sheet and tin mills which operate under union auspices, about half the total independents, on Saturday afternoon arranged with the Amalgamated Association to continue the old wage scale for another twelve months. The men had asked advances on certain jobs which were equivalent to an average advance on the entire scale of about 2% in the case of sheets and about 7% in the case of tinplates. We quote: Black sheets, 28 gage, 1.95c.; galvanized, 28 gage, 3c.; blue annealed, 10 gage, 1.40c.; painted corrugated 28 gage, 2.15c. per lb. and $1.35 per square; galvanized corrugated 28 gage, 3.05c. per lb. and $2.55 per square.

Pipe (By telegraph)—Effective July 1 the National Tube Co. advanced merchant steel pipe and oil-country goods 7-in. and larger one point, or approximately $2 per ton, and independents have followed this advance. June 1 there was an advance of one point on 6-in. and under, so that all sizes have now advanced one point. Specifications were very heavy in June and all pipe mills are well filled.

St. Louis

July 1—The summer lull has set in and the demand for pig iron is rather light, though considering the season entirely satisfactory. The price of $11.25 Birmingham or $15 St. Louis for immediate delivery holds for No. 2 foundry. A premium of 25c. per ton is asked for last-quarter delivery. The demand is mostly for small lots for present delivery. Finished products and railway supplies are in very good demand. Northern Iron is in light demand at $14.50 per ton.

Iron Ore Trade

Exports and imports of iron and manganese ore in the United States five months ended May 31, long tons:

	1911	1912	Changes
Iron ore, imp.	683,572	814,364	I.* 130,792
Iron ore, exp.	52,104	103,368	I. 51,262
Manganese, imp.	64,623	95,836	I. 31,213

Iron ore imports this year included 48,695 tons from Spain, 25,040 from Newfoundland, 177,741 from Sweden and 549,070 from Cuba.

Sault Ste. Marie Canal Traffic

The freight passing through the Sault Ste. Marie Canal in May was 8,936,693 tons, the largest ever reported in May. For the season to June 1 the total freight was, in short tons:

	1911	1912	Changes
East-bound	4,531,433	7,128,152	I. 2,596,719
West-bound	2,386,172	1,975,459	D. 410,713
Total	6,917,605	9,103,611	I. 2,186,006

The number of vessel passages this year was 3379, showing an average cargo of 2694 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal	2,059,146	1,670,870	D. 388,276
Iron ore	3,589,120	5,546,715	I. 1,957,595
Pig and mfd. iron.	84,605	113,807	I. 29,202
Copper	21,405	19,785	D. 1,620
Building stone	612	2,282	I. 1,670
Salt, bbl.	175,815	219,022	I. 43,207

Iron ore was 60.9% of the total freight, and coal 18.4% this year.

METAL MARKETS

New York, July 2—The metal markets have been less active, and price changes small.

Our market report this week covers the period from Thursday, June 27 to Tuesday July 2. Next week the usual weekly period will be resumed.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
May 1912..	$ 4,450,899	$ 3,346,491	Exp. $1,404,408
" 1911..	6,817,149	5,014,741	Exp. 1,802,409
Year 1912..	26,225,801	19,653,285	Exp. 6,572,516
" 1911..	10,176,807	29,005,312	Imp. 18,828,505
Silver			
May 1912..	6,725,781	4,345,032	Exp. 2,380,749
" 1911..	5,054,304	3,555,842	Exp. 1,498,462
Year 1912..	28,623,028	20,384,764	Exp. 8,238,264
" 1911..	28,665,500	18,454,155	Exp. 10,211,345

Exports from the port of New York, week ended June 29: Gold, $4,977,131, chiefly to France and Mexico; silver, $1,369,603, principally to London and Paris. Imports: Gold, $1,475,352, largely from France and Mexico; silver, $55,907, from South America and Japan.

Gold—The price of gold on the open market in London remains at the bank level 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Supplies were distributed, parcels being taken for Germany, Turkey, India and Java. In New York an additional $2,000,000 was taken for export to Paris.

Platinum—The jewelers are beginning to take a little for the fall trade. Prices are firm and unchanged. Dealers ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal. The foreign market seems to be a little unsettled.

Iridium—The price of this metal is easier at $63 per oz. New York.

Silver—The market has ruled quiet and dull with lower tendency, and closes at 28⅛d. in London, ¼d. fall for the week. The market is quoted weak at the close on speculative selling based on an increase in the Indian Currency reserve of 1¾ crores of rupees.

SILVER AND STERLING EXCHANGE

June-July	27	28	29	1	2	3
New York....	61¾	61⅜	61¼	61¼	61⅛	
London....	28⅜	28¼	28 3/16	28 3/16	28⅛	
Sterling Ex..	4.8725	4.8710	4.8715	4.8715	4.8725	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to June 20, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£4,008,700	£3,270,300	D. £ 738,400
China	822,800	873,500	I. 50,700
Total	£4,831,500	£4,143,800	D. £ 687,700

India Council bills in London averaged 16.05d. per rupee for the week.

It is reported from Ottawa that the Canadian mint will turn out this year about $8,000,000 in $5 and $10 gold pieces. The plan to coin Canadian silver dollars has been abandoned. All the silver minted will be in subsidiary coins. The first of the gold pieces have been sent to British Columbia.

Copper, Tin, Lead and Zinc

NEW YORK

June-July	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
27	17⅜ @17⅝	17.25 @17.35	45¼	4.50	4.40 @4.42½	6.95 @7.05	6.80 @6.90
28	17⅜ @17⅝	17.25 @17.35	45⅝	4.50	4.40 @4.42½	6.95 @7.05	6.80 @6.90
29	17⅜ @17⅝	17.25 @17.35	45⅝	4.50	4.40 @4.42½	6.95 @7.05	6.80 @6.90
1	17⅜ @17⅝	17.25 @17.35	45½	4.50	4.42½ @4.45	6.90 @7.00	6.75 @6.85
2	17⅜ @17⅝	17.25 @17.35	45¼	4.50	4.42½ @4.45	6.90 @7.00	6.75 @6.85
3	......	....	...	....	......	......	......

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

June-July	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
27	78 5/16	79⅛	83¾	209	201	18	25¾
28	77½	78⅜	83	209	203¾	18 1/16	25¾
29			...	......		..	......
1	77⅝	78¼	83½	209	203¾	18⅝	26
2	76¾	77⅝	82½	207½	203	18⅝	26
3	....	....	....	....	....	...	...

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper—The week of June 27-July 2 has been very quiet, almost stagnant. The large consumers are pretty well supplied for the present and some of them seem to have been frightened by the sudden drop of standard in London last week. At any rate they have been out of the market. The leading agencies have maintained their price of 17¾, usual terms, but have done practically no business. The small demand has been satisfied from second hands, who have supplied it generally at 17½, delivered 30 days. The coming holiday has also had some effect on the market and there will be little business until it is over.

Lake copper has been almost entirely nominal, sales being few and far between. On the other hand, producers are not pressing sales. In consequence, the market is in second hands and quite nominal at the last prices: 17⅜@17⅝c. for Lake copper and 17.25@17.35c. for electrolytic in cakes, wirebars or ingots. Casting copper is quoted nominally at 17@17⅛c. as an average for the week.

The London market for standard copper has been quiet and weakish. On June 27, spot copper was quoted £78 6s. 3d.; on June 28 it was about 15s. lower, and on July 2, spot closes at £76 15s., and three months at £77 12s. 6d. per ton.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 7586 long tons. Our special correspondent reports the exports from Baltimore at 1401 tons.

Visible stock of copper in Europe June 30 are reported as follows: Great Britain, 28,640; France, 5490; Rotterdam, 1350; Hamburg, 5190; afloat from Chile, 1480; afloat from Australia, 6,000; total, 48,150 long tons, or 108,186,000 lb.; a decrease of 1930 tons from the June 13 report.

Tin—The market has been firm, and the feature of the past few days has been the advance in three months' tin, which, on June 27, was £201, or £2 above the previous day, spot ruling at £209. On June 28, three months' advanced further £2 15s., and held its advance during first, closing on July 2 at 15s. lower, or £203 per ton.

There was no squeeze on this side the end of June, as had been expected in some quarters. It appears that consumers have helped themselves through by making inroads on their stocks, and while tin for the first half of July is still comparatively short, after that the shipments that have been made from the Continent will relieve the situation. The premium on spot tin, as compared with shipment tin, has become considerably lower, being about 1¾c. The spot market has ruled around 47¼@47½c. July tin has been about 46⅛c., while tin for shipment has been 45¼@45⅝c., closing at 45¼ cents.

Visible stocks of tin on June 30 are reported as follows: London, 7750; Holland, 578; United States, excluding Pacific ports, 4177; total, 12,445 long tons; a decrease of 1900 tons from the May 31 report.

Lead—The market is firmer. Consumption of white lead is excellent and other branches are also doing well. St. Louis is quoted 4.42½@4.45c. and New York 4.50 cents.

The London market is again higher and there is a great scarcity of lead for early delivery. Spanish lead is quoted £18 12s. 6d. and English lead 2s. 6d. higher.

The National Lead Co. has acquired control of the Matheson Lead Co., a large manufacturer of white lead, by purchase of stock. This appears to have been a fair business transaction. Both companies were in need of enlarged plants and the Matheson Co. owns property which was well situated and adapted for a larger plant. The National Lead Co. owned no such property, but was considering the purchase of land for that purpose, which is now rendered unnecessary. White lead has been exceedingly active recently and the demand has been larger than for some time.

Spelter—A good business is being done from day to day at about last prices, and the market is quoted 6.75@6.85c., St. Louis; 6.90@7c., New York.

The European market is firmer, good ordinaries being quoted £26 and specials £26 5s. per ton.

Base price of zinc sheets is $8.65 per 100 lb., f.o.b. La Salle, Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—New business is good. The consumption appears to be large and it is reported that the chief producer is rather behind on its contract deliveries. The price is firm at 23c. per lb. for No. 1 ingots, New York. The foreign market is steady.

Antimony—Business is better and there have been fair sales, but no great activity. An improvement is expected as this is the antimony season. Prices are a little firmer. Cookson's is held at 8@8.25c. per lb. and Hallett's at 7.75@8c.; while 7.15@7.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—There is a little more activity in this metal and an advance of 5s. in London has been followed by a small advance here. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London rice is now £8 10s. per flask, with £8 7s. 6d. asked from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Platteville, Wis., June 29—The base paid this week for 60% zinc ore was $55. The base price for 80% lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED JUNE 29

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Shullsburg	874,040	....	....
Mineral Point	842,740	....	....
Dodgeville	624,000	....	....
Benton	568,300	390,000	599,100
Platteville	567,100	....	246,800
Harker	444,050	....	....
Hazel Green	357,600	....	....
Galena	340,100	....	....
Rewey	131,000	....	....
Highland	95,600	....	....
Cuba City	82,680	83,000	....
Montfort	66,000	....	....
Total	4,993,210	473,000	845,900
Year to date	104,115,470	4,496,470	14,833,370

Shipped during week to separating plants, 2,407,870 lb. zinc ore.

Joplin, Mo., June 29—The high price of zinc sulphide ore this week was $61, the base per ton of 60% zinc is $52@58. Zinc silicate sold at $29@31 per ton of 40% zinc. The average price, all grades, was $53.90 per ton.

SHIPMENTS, WEEK ENDED JUNE 29

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,490,390	......	963,400	$153,186
Joplin	1,932,570	......	172,310	59,901
Galena	644,560	......	99,960	20,745
Duenweg	696,980	......	25,260	20,222
Alba-Neck	454,910	......	78,490	15,488
Miami	246,710	......	292,680	13,821
Oronogo	508,370	......	......	13,098
Granby	157,150	505,210	13,740	12,100
Spurgeon	117,850	269,700	23,040	8,101
Jackson	261,720	......	8,300	7,290
Carl Junction	240,600	......	......	7,097
Springfield	170,500	......	......	5,100
Cave Springs	62,730	......	......	1,693
Sarcoxie	58,640	......	......	1,583
Carthage	48,110	......	......	1,298
Lawton	38,300	......	......	1,072
Aurora	......	66,400	......	996
Totals	10,130,090	841,310	1,677,180	$342,791
6 mos.	263,214,860	16,082,740	44,684,190	$8,083,248

Blende val., the week, $282,219; 6 mos., $6,626,595
Calamine, the week, 13,495; 6 mos., 238,287
Lead value, the week, 47,077; 6 mos., 1,218,366

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41 85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40 21	45 75	39 16	43 31	54 46	52.39
March	39 85	51.56	38.45	49.25	54.57	54.64
April	38 88	52.00	37 47	50 36	56 37	54 18
May	38 25	55.30	36 79	53.27	55.21	52.45
June	40 50	55 88	38.18	54 38	56 49	55.01
July	40 75	. . .	38 36	......	58 81	..
August	42 50	.	41 28	.....	60 74	......
September	42 63	......	41 29	......	59 33	......
October	42.38	......	40.89	......	54.72	......
November	45.40	......	43.25	......	57 19	......
December	44.13	.....	40.76	......	62 03	......
Year	$41.45	......	$39.90	......	$56.76	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold

The ore market this week shows the same prices as were paid last week, but the second- or middle-grade ores were more in demand. The production was much improved this week, as most of the mines have recovered from the flooded condition of two weeks ago.

The lead market was strong at $58; average, all grades, $56.12 per ton.

Chemicals

New York, July 2—This is a holiday week and there is very little doing in the general market.

Arsenic—Supplies are a little better. Canadian makers are catching up to their contracts and a shipment of 25 tons was received from Mexico July 1. Trade is still fair and prices unchanged. Spot arsenic is $3.75 per 100 lb. while $3.62½ is asked for futures.

Copper Sulphate—The market is quiet but steady. Quotations are unchanged at $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is fair and prices firm, 2.45c. per lb. being asked for both spot and futures.

CURRENT WHOLESALE PRICES

Ammonium sulphate	cwt.	3.25@3.28
Arsenic, white	lb.	0.03½@0.03⅞
Barytes, ground	sh. ton	12.50@14.00
" floated	sh. ton	16.00@17 00
Calcium acetate, gray	cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls	sh. ton	70.00
Carbons, good drill quality	carat	75.00@85.00
Cement, Port., Am.	400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburg	M.	175.00.
ore, 50%, ex-ship, N. Y.,	lg. ton	14.00@16 00
Copperas, bulk	cwt.	0.55
bbl.	cwt.	0.70@0.85
Copper sulphate	cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg	ton	8.00@9.00
Magnesite, crude, 95%	lg. ton	9.00@11.00
calcined, powdered		30 00@35 00
brick, dom., f.o.b. Pittsburg	M.	160@180
Paints, litharge, Am. powd	lb.	0.05¾@0.06¼
red lead, American	lb.	0.06¾@0.07¼
white lead, Am., dry	lb.	0.05½@0 06
zinc white, Am., dry	lb.	0.05⅛@0.06¼
Phosphates, acid:		
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3 70@3 80
†Tenn., 78@80%		5 00@5 50
75%		4 75@5 00
68@72%		4 25@4 50
†So. Car. land rock 60%		3.50@3.75
Potassium cyanide, 98@99%	lb.	0. 19
Pyrite:		
Domestic, non-arsenical, furnace size, f.o.b. R R per unit		0 12@0 12½
Domestic, non-arsenical, fines, per unit, f o b mines		0 11¾@0 12
Imported, non-arsenical, furnace size, ex-ship, per unit		0.13½
Imported, arsenical, furnace size, size, ex-ship, per unit		0.12¾@0 13
Imported, fines, arsenical, ex-ship.		0.11@0 12
Imported, fines non-arsenical, ex-ship, per unit		0.12½

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

Sodium cyanide, 120 to 130% KCN (per 100%)	lb.	0 18
nitrate 95% spot	cwt.	2 15
95% future	cwt.	2 45
Sulphur, Louisiana prime, N. Y,	lg. ton	22 00@22 50
roll	cwt.	1 85@2 15
flour	cwt	2 00@2 40
flowers, sublimed	cwt.	2.20@2.60
pow com, bags	cwt	1 50
Sicilian, crude brimstone	lg. ton	22 50
Zinc chloride, granular	lb	0 04¼@0 04½

*F o b Florida or Georgia ports †F o b Mt Pleasant †On vessel Ashley River, S C

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

Oil production in California in May was 7,333,180 bbl.; deliveries, 6,703,087 bbl. Stocks reported were 44,017,775 bbl. at the close of the month.

New Caledonia Ores

Shipments of ore from New Caledonia twelve months ended March 31, as reported by the *Bulletin du Commerce*, of Noumea, included 7558 tons nickel ore and 10,032 tons chrome ore.

MINING STOCKS

New York, July 2—On June 27 the Exchange was more inclined to discuss the Baltimore convention than stocks and business was very slow. On the Curb there was quite a demand for mining stocks and small advances were recorded all around. Yukon Gold is showing some life again.

June 28—The Exchange was still dull but firm. Trading on the Curb was only moderate. Copper stocks were nearly all off a fraction, losing the gains of the preceding day; and Cobalts were also weaker. El Paso and Yukon Gold each gained a little.

June 29—Trading on the Exchange was very moderate but prices were steady. Dealings in mining stocks on the Curb were rather narrow but with some gains except in the coppers which were stationary.

July 1—The Exchange was again dull and without special features. Trading on the Curb was narrow, but prices were firm, and some mining stocks advanced. On July 2 there was little change in conditions.

Boston, July 1—Copper shares have had a reactionary week and along with this the market has been quiet except in the cases of some specialties. Mohawk took a sharp $4.50 advance to $73, on an announcement that a $3 dividend had been declared. This was unfounded, for the following day the directors declared a $2.50 semi-annual dividend. In the meantime the price of Mohawk drifted back to $70.75. This dividend compares with $1 six months ago and 75c. a year ago.

The increasing of the Mohawk dividend adds another copper-mining company to the list that have increased their dividends payments the current year to date. There is some disappointment that the Anaconda Co. did not increase from the 50c. quarterly rate, but it is felt that this may come with the next declaration.

Butte & Superior suffered a $6 decline to $42.50 on liquidation and belief that the apex question will again be brought into the courts by Senator Clark, who owns adjoining property. From this

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	March	April	May
Alaska shipments	4,987,916	1,243,911	1,720,391
Anaconda	25,900,000	25,480,000	25,800,000
Arizona, Ltd.	3,150,000	3,400,000	3,500,000
Copper Queen	7,197,121	6,806,425	7,024,087
Calumet & Ariz.	4,652,000	4,104,000	4,424,000
Chino	1,108,381	1,150,000	1,275,850
Detroit	2,246,238	2,506,718	2,092,478
East Butte	1,480,000	1,400,000	....
Mammoth	1,939,310	1,718,450	....
Mason Valley	1,140,000	1,503,056	1,520,000
Nevada Con	6,380,000	6,115,095	6,063,462
Ohio	599,156	675,000	....
Old Dominion	2,432,000	2,167,000	....
Ray	2,300,000	2,611,920	2,924,913
Shannon	1,388,000	1,544,000	1,464,000
South Utah	299,000	284,215	236,884
United Verde*	2,250,000	2,250,000	2,500,000
Utah Copper Co	8,160,000	8,615,775	9,564,919
Lake Superior*	19,750,000	18,250,000	21,250,000
Non-rep. mines*	6,792,463	7,625,000	8,400,000
Total production	104,051,585	97,400,495	....
Imports, bars, etc.	23,519,215	26,842,014	....
Total blister	127,570,800	124,242,509	....
Imp. in ore & matte	8,736,874	9,350,972	....
Total American	136,307,674	133,593,481	....
Miami†	2,755,000	2,554,352	2,565,000
Brit. Col. Cos.:			
British Col. Copper	....	1,043,173	875,000
Granby	1,882,073	1,941,797	1,914,460
Mexican Cos.:			
Boleo†	2,424,800	2,149,280	2,260,160
Cananea	2,834,000	4,654,000	4,600,000
Moctezuma	2,446,731	2,797,718	2,892,521
Other Foreign:			
Cape Cop., S. Africa	725,760	954,240	754,880
Kyshtim, Russia	....	1,545,000	....
Spassky, Russia	638,400	649,600	694,400
Famatina, Argen.	....	....	....
Tilt Cove, Newf'd.	104,992	119,869	123,087
Exports from:			
Chile	3,584,000	6,496,000	3,696,000
Australia	8,064,000	9,408,000	7,840,000
Arrivals in Europe‡	12,559,680	12,064,640	9,976,860

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VI, 1911	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	....	....	....

VISIBLE STOCKS

	United States	Europe	Total
VII, 1911	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,388
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	....	108,186,000	....

level a recovery to $47.37½ ensued. The stock sold at $51.75 early last month.

Curb trading has shown a little more animation and strength in spots. Houghton Copper rose to $9.75, but reacted over $1. Ohio Copper has been very active, breaking to 50c. per share.

Assessments

Company	Delinq	Sale	Amt
Best & Belcher, Nev	June 3	June 27	$0.10
Buffalo, Mont	June 4	July 2	0.002
Challange, Nev	June 8	July 2	0.10
Chollar, Nev	July 7	Aug. 5	0 10
Confidence, Nev	July 15	Aug. 9	0.20½
Crown Point, Nev	June 24	July 17	0.10
Exchequer, Nev	May 23	June 13	0.05
Glen Dale, Utah	May 25	June 25	0.00
Gould & Curry, Nev	July 19	Aug. 12	0.05
Great Falls, Utah	June 26	July 27	0.002½
Hale & Norcross, Nev	July 2	July 29	0.05
Houghton Copper, Mich	May 17	....	1.00
Julia, Nev	May 15	June 5	0.05
Mineral Farm, Ida	July 15	Aug. 15	0 002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida	July 18	Aug. 19	0.001
Overman, Nev	June 29	July 23	0 10
Savage, Nev	June 4	June 26	0.10
Seven Troughs, Nev	June 15	July 2	0.002½
Sierra Nevada, Nev	July 4	July 30	0.10
Silver Mt., Ida	July 15	Aug. 15	0.002
Tintic Central, Utah	June 14	July 6	0.005
Union Consolidated, Nev	July 12	Aug. 7	0 15
Utah Antimony, Utah	June 1	....	0 03
Utah, Nev	July 12	Aug. 6	0.05
Yankee Con., Utah	....	....	0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56 260	24.154	24.865	25 887
February	51.534	52.222	59 043	23 794	24 081	27.190
March	51.454	52.745	58.375	23 690	24 324	26.875
April	53 221	53.325	59 207	24 483	24.595	27.284
May	53.870	53 308	60 880	24 797	24.583	28 038
June	53 462	53 043	61.290	24 651	24 486	28 215
July	54 150	52 630	....	25 034	24 286	....
August	52.912	52.171	.....	24 428	24 082	..
September	53 295	52 440	......	24 567	24.209	
October	55 490	53 340	....	25.596	24.594	
November	55.635	55.719	..	25.680	25.649	
December	54.428	54.905	....	25.160	25.349	
Year	53 486	53.304	..	24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12 680	14 337	55 600	62.760
February	12.256	14.084	12 611	14 329	54 974	62 893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15 741	12.275	15.930	54.034	70.294
May	11.989	16.031	12 214	16 245	54 313	72 352
June	12.385	17 234	12.611	17 443	56.365	78.259
July	12 463	..	12.720	....	56.673	....
August	12 405	. .	12.634	.....	56.266	. .
September	12.201	.	12.508	....	55.253	.
October	12.189	. .	12.370	.....	55.170	. . .
November	12 616	.	12.769	. ...	57.253	....
December	13.552		13.768	....	62.068	
Year	12.376		12.634		55.973	

New York cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	
February	[illegible]	42 962	August	43 319	
March	[illegible]	42.577	September	39 755	
April	42 185	43.923	October	41 185	..
May	43.115	46.053	November	43.125	. .
June	44 606	45 815	December	44 655	
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4.435	4 334	4.327	13.009	15.619
February	4 440	4.026	4 266	3 946	13 043	15 738
March	4.394	4.073	4 238	4.046	13 122	15.997
April	4.412	4 200	4 262	4 118	12.889	16 331
May	4.373	4 194	4.223	4 072	12 984	16 509
June	4 435	4.392	4 292	4.321	13.260	17 588
July	4.499	......	4.397	......	13 530	.....
August	4 500	......	4 406	......	14.260	......
September	4 485	.....	4 356	......	14 744	......
October	4.265	......	4.139	......	15.332	......
November	4.298	......	4.181	......	15.821	.....
December	4.450	......	4.332	......	15.648	. ...
Year	4.420	......	4 286	......	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23.887	26.642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5.563	6.626	5.413	6.476	23 016	26.048
April	5 399	6.633	5.249	6 483	23 743	25 644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5 520	6.877	5 370	6 727	24.612	25.763
July	5 695	......	5 545	......	25.006	......
August	5 953	......	5 803	......	26 801	. ....
September	5 869	......	5 719	.....	27 750	.... ..
October	6.102	.....	5.951	......	27.256	......
November	6.380	.. ..	6.223	......	26.795	......
December	6.301	... ..	6.151	......	26.849	......
Year	5.758	......	5.608	......	25.281	... ..

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15 90	15.03	14 50	13.28	14 81	14.01
March	15.90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13.90	15 00	14 15
May	15.90	15.14	14 30	13.90	14.72	14.12
June	15 90	15 15	14 06	14.11	14.56	14.22
July	15 90	..	14 03	. ...	14 53	. ..
August	15 90	..	14 00	. . .	14 47	.
September	15 90		13 57	.....	14 40	.
October	15.43	......	13.44	.	14.34	
November	14.92	..	13.30	....	14 25	
December	15.15		13.10	. . ..	13.90	
Year	$15 72	. ....	$13 94	.....	$14.49	...

STOCK QUOTATIONS

COLO. SPRINGS July 1	
Name of Comp.	Bid.
Acacia	.05⅝
Cripple Cr'k Con.	.01⅝
C. K. & N.	.17
Doctor Jack Pot	.06¼
Elkton Con	.64½
El Paso	.98¼
Findlay	.05
Gold Dollar	.17⅜
Gold Sovereign	.02
Isabella	.12
Jack Pot	.04½
Jennie Sample	.04¼
Lexington	‡.02
Moon Anchor	01
Old Gold	03¼
Mary McKinney	.70
Pharmacist	.01⅜
Portland	92
Vindicator	82
Work	.01½

SALT LAKE July 1	
Name of Comp.	Bid.
Beck Tunnel	‡ 09
Black Jack	‡ 14½
Cedar Talisman	‡ 02
Colorado Mining	.16
Columbus Con	‡ 28
Crown Point	‡ 02
Daly-Judge	‡5 60
Grand Central	‡ 65
Iron Blossom	1 30
Little Bell	‡ 41
Lower Mammoth	‡ 02½
Mason Valley	‡11 50
May Day	‡ 10
Nevada Hills	‡1.95
New York	‡ 04½
Prince Con	‡1 62½
Silver King Coal'n	‡2.50
Sioux Con	.06
Uncle Sam	.21
Yankee	‡.10

TORONTO July 1

Name of Comp.	Bid.	Name of Comp.	Bid
Coniagas	‡7 10	Hollinger	13 90
Hudson Bay	‡70 00	Imperial	† 02
Temiskaming	‡ 41	Pearl Lake	26
Wettlaufer-Lor.	‡ 66	Porcu. Gold.	‡ 36
Apex	03½	Porcu. Tisdale	02
Central	‡5 56	Preston E. D.	04½
Crown Chartered	13½	Rea	35
Doble	‡ 25	Standard	01½
Dome Exten	26½	Swastika	12
Foley O'Brien	.18	West Dome	.15

SAN FRANCISCO July 1

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.90
Belcher	.57	Jim Butler	.61
Best & Belcher	.11	MacNamara	.22
Caledonia	.88	Midway	.50
Challenge Con	.12	Mont.-Tonopah	2.55
Chollar	.02	North Star	.17
Confidence	.39	West End Con	1.70
Con. Virginia	50	Atlanta	.23
Crown Point	.45	Booth	.08
Gould & Curry	02	C.O.D. Con	.10
Hale & Norcross	15	Comb. Frac	.15
Mexican	2 75	Jumbo Extension	.27
Occidental	50	Pitts.-Silver Peak	1.05
Ophir	1.05	Silver Pick	.12
Overman	.68	St. Ives	.33
Potosi	.02	Tramp Con	‡.01
Savage	13	Argonaut	‡2.00
Sierra Nevada	.11	Bunker Hill	‡4.50
Union Con	54	Cent. Eureka	.53
Yellow Jacket	.35	So. Eureka	2.90

N. Y. EXCH. July 1	
Name of Comp.	Clg.
Amalgamated	85⅝
Am. Agri. Chem	61¼
Am.Sm.&Ref.,com	86
Am. Sm. & Ref., pf.	107⅞
Am. Sm. Sec., pf. B	87¾
Anaconda	43⅝
Batopilas Min	1½
BethlehemSteelpf	71½
Chino	33¾
Comstock Tunnel	.12
Federal M. & S., pf.	42
Goldfield Con	4
GreatNor.,ore.,ctf.	42½
Guggen. Exp	60½
Homestake	94
Inspiration Con	19½
Miami Copper	28¾
Nat'nalLead,com.	58¼
National Lead, pf.	107½
Nev. Consol	22
Pittsburg Coal, pf.	91½
Ray Con	22¾
RepublicI&S,com.	27½
Republic I & S. pf.	86
SlossSheffi'd,com.	57
Sloss Sheffield, pf.	100
Tennessee Copper	44
Utah Copper	63½
U. S. Steel, com	71⅜
U. S. Steel, pf.	112
Va. Car. Chem	48¾

N. Y. CURB July 1	
Name of Comp.	Clg.
Barnes King	‡ 30
Beaver Con	.46
Braden Copper	7⅜
B. C. Copper	5⅞
Buffalo Mines	‡1 40
Caledonia	.40
Con. Ariz. Sm	⅝
Davis-Daly	2⅜
Diam'field-Daisy	9
Ely Con	7/16
Florence	.90
Giroux	5
Gold Hill Con	⅜
Greene Cananea	10½
Greenwater	.05
Internat. S. & R.	124
Kerr Lake	2⅞
Keystone	2⅝
La Rose	3 5/16
McKinley-Dar-Sa.	1¼
Min. Co. of A. new	3
Motherlode Gold.	1⅛
Nev. Utah M. & S.	03½
Nipissing Mines	7½
Ohio Copper	½
Pacific Sm. & M.	7/16
South Live Oak	3⅜
South Utah M. & S.	¾
Standard Oil (Old)	865
Stand'd Oil of N.J.	380
Stand'd Oil Subs.	525
Stewart	1¼
Tonopah	7⅛
Tonopah Ex	1 13/16
Tri-Bullion	½
Tularosa	‡ 1/4
Union Mines	3/16
United Cop., pfd.	10
Yukon Gold	3⅞

LONDON July 2	
Name of Com.	Clg.
Camp Bird	£1 8s 9d
Dolores	1 10 0
El Oro	0 16 0
Esperanza	1 10 0
Mexico Mines	7 0 0
Oroville	0 4 9
Stratton'sInd.	0 3 1½
Tomboy	1 5 0

BOSTON EXCH. July 1	
Name of Comp.	Clg.
Adventure	9½
Ahmeek	350
Algomah	‡6½
Allouez	48
Am. Zinc	31¾
Ariz. Com., ctfs.	‡5½
Bonanza	.45
Boston & Corbin	8⅛
Butte & Balak	‡3½
Calumet & Ariz	75½
Calumet & Hecla.	530
Centennial	25
Con. Mercur	‡.05
Copper Range	59½
Daly West	5¾
East Butte	13⅝
Franklin	12¼
Granby	55
Hancock	34¼
Hedley Gold	‡17
Helvetia	‡1⅜
Indiana	19
Island Cr'k, com.	62¾
Island Cr'k, pfd.	89¾
Isle Royale	34⅞
Keweenaw	‡1¾
Lake	38¾
La Salle	7⅛
Mass	‡7
Michigan	‡3
Mohawk	71
New Arcadian	4
New Idria Quick.	‡6⅞
North Butte	30¾
North Lake	6½
Ojibway	5¼
Old Dominion	58
Osceola	122
Quincy	92½
Shannon	16⅛
Shattuck-Ariz	22¼
Superior	46½
Superior & Bost.	2¼
Tamarack	45
Trinity	6¾
Tuolumne	3¼
U. S. Smelting	45
U. S. Smelt'g. pf.	50
Utah Apex	2½
Utah Con	11½
Victoria	4
Winona	6¼
Wolverine	110
Wyandot	2⅛

BOSTON CURB July 1	
Name of Comp.	Last
Bingham Mines	4¼
Boston Ely	1¼
Boswyocolo	02½
Butte Central	6¼
Cactus	09
Calaveras	2¼
Chief Cons	1¼
Corbin	1¼
Cortez	1⅛
Crown Reserve	3
First Nat. Cop.	2¼
Majestic	52
Mazatan	‡½
Moneta Porc	‡ 07
Nevada-Douglas.	3¼
New Baltic	2¼
Oneco	2¼
Raven Copper	.29
Rhode IslandCoal	26
San Antonio	‡3
S. W. Miami	‡7½
South Lake	10½
Trethewey	.40
United Verde Ext.	.30
Vulture	‡5.00

‡Last quotation.

The Engineering and Mining Journal

Vol. 94. JULY 13, 1912. No. 2

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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*Illustrated.

American Institute of Mining Engineers

The report of the committee that has been looking into the affairs of the American Institute of Mining Engineers is too lengthy for us to reproduce it in full, but the summary that we give elsewhere will be sufficient. It will be useful to review the circumstances under which this committee was appointed. About the beginning of the year the administration of the Institute proposed an increase of dues from $10 to $15 and some other innovations to be acted upon by the membership at the annual meeting in February. This was opposed by 20 prominent members of the Institute, who inaugurated a movement against the plan of the administration, especially against the proposed increase of dues until an investigation of the affairs of the Institute be made and the determination that there be no other alternative. By virtue of proxies received, the "insurgents" came into control of the annual meeting and carried out their program, holding up the proposed amendments to the constitution and appointing a committee of investigation. All of this was done in a conservative and temperate manner, and the committee appointed, consisting of C. R. Corning, chairman, A. R. Ledoux, Wm. H. Nichols, Jr., J. F. Kemp, and Geo. C. Stone, was unanimously approved.

The committee finds that the Institute has been running behind about $2000 a year in ordinary income, and $7884 more if its share of the land occupied be paid for in equal annual instalments plus interest. The management of the Institute has been imperfect, from a business standpoint, although probably no more so than in the cases of similar organizations, and certainly there was great improvement under Mr. Kirchhoff. The committee is of the opinion that material savings in publishing, in office work, in excursion expenses and in salaries can be effected, and recommends a negative vote upon the amendment authorizing an increase in dues, thus sustaining the position of the "insurgents" last February.

The tone of the committee's report is judicial and its phraseology is temperate. It is a report that is constructive, not destructive, and it is distinguished by the absence of captious criticism. We find in it but one suggestion to which we take any serious exception, viz., "that the appropriation for the retired secretary be, if possible, entirely eliminated or at least very greatly reduced in order to avoid further continuance of the annual deficit." We consider that Dr. Raymond devoted the major portion of his life to the building of the Institute. He more than anybody else established its prestige. Such service would be recognized in any commercial business of ordinary high tone by a retiring allowance adequate to make things easy during the declining years. If the membership of the Institute refuse to recognize such an obligation we shall regard their action as preposterous and indecent. We do not advocate an extravagant honorarium, but to dispense with it entirely is an economy a body of gentlemen cannot consider.

During the investigations by the committee frequent conferences have been held with the board of directors, and the latter, informally advised respecting the findings, have already put into effect some of the economies that are now recommended. Whether these and others remaining to be done will put the Institute in a comfortable financial position remains to be seen. The great difficulty pertains to the indebtedness of about $74,000 still owed on the land upon which the engineering building stands. It goes without saying that this must and will be settled, but the sooner it is done the better it will be. Any further attempt to raise the money needed through a begging committee, appealing to corporations and capitalists, will in our opinion be objectionable. The membership of the Institute incurred the indebtedness by a deliberate vote, and the membership ought to face the music and pay it. If this cannot be done in any other way the recommendation of the committee that the dues be raised by $5 per year for a sufficient time to liquidate the debt, then automatically dropping back to the old figure, ought to be adopted. We do not think that the insurgents will object to that.

The committee has not dwelled, we think, upon some of the fundamental features of the Institute, probably for the reason that it did not consider itself to be commissioned to do that. We believe, however, that at the forthcoming meeting of the members the problem should be considered in its broadest aspects, and in the meanwhile the council and directors should cast their thoughts that way. The opposition to the proposed increase in dues was based, we think, upon the feeling that the Institute failed to give a proper return even for the present dues. The organization possesses a valuable name, history and prestige, but membership in it has become so promiscuous that no value is attached to that, and about all the benefit to the majority of members has been the receipt of an annual volume of transactions, the need for which is now very much less than it was in the days when the technical press was young and inefficient. The object of the Institute should be to make itself a live and useful thing to its members, to shed some of its prestige among them, to be a means of reflecting their opinions and to be a medium of exchange of experience. A part of this has no doubt been recognized in the reforms instituted during 1911, by the organization of local sections among other things, but however progressive these may have been the inspiration of an important movement does not yet seem to have come.

We have no doubt that the old abuses of junketing excursions and local meetings, the latter throwing improper burdens upon a few members who have to provide entertainment for an indiscriminate assembly of visitors, are going to be summarily abolished. We believe that the dual control of the Institute by a council and a board of directors ought also to be abolished, in favor of one or the other, no matter which. And we think that the Institute has got to make of itself something more than a mere purveyor of miscellaneous technical literature. This is what really ought to be considered during the period remaining before the next meeting of the members.

The Break in Copper

The exponents of the copper boom are beginning to draw the distinction between "real" copper and "unreal" copper that engages their fancy when the tide turns against their wishes. The copper which certain producers are willing to sell at 17¾c., delivered to buyers' warehouses, with the usual allowances, etc., but don't sell because there are not any buyers at that price, is "real" copper. The copper that other producers, and also "second hands," are willing to sell at the market in order to convert it into money, and do sell, is "unreal" copper. "Second hands" comprise professional speculators, casual speculators, and persons who have bought copper for their own uses but for one reason or another may see fit to resell it.

The series of sensational breaks in the London market during the last fortnight indicate that some important persons have made up their minds that the increase in the smelters' production that so mysteriously disappeared—lost, strayed or stolen—is soon going to be found. The optimistic interviews with which the daily and financial press is now so profusely favored, do not necessarily reflect real opinions.

The statistics of the American refiners for June, published on July 9, do not throw much light on the situation, owing to the interference of strikes, etc. What they show chiefly is that the increase in production, already long overdue, has been still further delayed.

Mine Accounting

The art of mine accounting seems to be peculiarly like the old verses

> 'Tis with our judgments as our
> watches, none
> Go just alike, yet each believes
> his own.

From descriptions received, and mines visited it appears that each mine has its own system, and that each system is the sovereign panacea for every other miner's accounting ills. The last may be somewhat open to question. Accounting in its ultimate analysis is a system of seeing that one doesn't get stuck by the other fellow, and of knowing whether one is coming or going on one's own operations. Consequently while the underlying safeguards must be the same, it seems that each plant should work out a system with some reasonable divergences to suit its own necessities.

This is not always practical by large corporations running many properties, where uniform accounting often develops into a managerial obsession, but as is occasionally pointed out, it is doubtless also often owing to the topheaviness of the big corporation, that the smaller has any chance. Consequently it is possible that uniform accounting for dissimilar conditions in the big corporation doesn't indicate anything in particular except its undesirability. Hence, we advise to make sure of the underlying soundness of a system, and then adapt it to your own needs.

Preparing Furnace Charges

In most metallurgical operations improvement is experienced when the material to be treated is of uniform character, and this is particularly true of charges for smelting. The zinc smelter, who has to conduct a singularly delicate operation, learned this by experience long ago, but lately the copper and lead smelters have been learning it also.

In the early days, indeed, some care had to be taken in the preparation of charges, because otherwise the small furnaces of that time would freeze up, and do so almost before anyone became aware that anything was going wrong; but with the large furnaces of a later era, there would always be an active smelting chimney affording an opportunity to work out the accretions that had been building up. These large furnaces are veritable firepots into which almost anything can be dumped and smelted down; and so we have come more or less to expecting them to do just that, forgetting perhaps the metallurgical reactions that are to be effected in them.

There are several modern works, however, whereat careful compounding of the charge and insuring of a uniform admixture of the components, together with preparation in the proper physical condition, have resulted in such great increase in furnace efficiency, i.e., the quantity of charge smelted per square foot of hearth area, that there can be no longer any doubt that the tendency of modern smelting practice will be in this direction.

By the Way

A dispatch announces that Page and Pickens won the drilling contest at Tonopah, on July 5, by drilling 45$\frac{7}{16}$ in. into a granite block in 15 min., this being 4 in. farther than their nearest competitors, Lundquist and Dahlen, of Victor, Colo.

The daily press has booked a large order for Alaskan volcanos in the following dispatch: "Permanent alteration in the climate of the Alaskan coast, through the shifting of warm ocean currents by lifting of the sea bottom, the opening of new fishing banks, of unestimated value and the eventual closing of Bering Straits, owing also to a rise in the floor of the sea, are among the scientific problems now being investigated as the result of the eruption of Mount Katmai a month ago. So far as the earth's surface is concerned, the eruption was beneficial, the volcanic ash having already stimulated plant growth."

But for the distractions of politics, the obstetrical observations of Daniel Guggenheim, on sailing for Europe, would doubtless have received the attention they deserve, remarks the *Evening Post*. "We have now, as I see it, prenatal prosperity," he said, in his annual interview, "which, if allowed to be born, will, I believe, grow into the greatest this country has ever experienced." Alas! he fears it will not get born (mark the consequences), and that, if born, it will never grow to regular size, owing to the manner in which capital, which is the sire of prosperity, is continually antagonized. However, there are now four shares of Guggenheim Exploration Co. stock where there was but one before, and the four shares of $25 each are selling in the aggregate for more than the one of $100 par value ever was believed to be worth. That is doubtless the strongest possible tribute to the importance of pre-natal influences upon even such things as securities.

Sherman-law dissolutions do not seem to have had serious results to stockholders in the dissolved companies. Standard Oil shareholders are receiving larger dividends than before the dissolution. In the case of the E. I. duPont de Nemours Powder Co., it is announced that the owners of common shares are to receive a stock and bond dividend of $15,000,000, equivalent to 50.9%, when the "trust" splits itself into three parts and distributes the various plants to the three companies. The decree stated that the securities of the new companies were to be distributed to "stockholders" but Pres. Pierre S. du Pont says that the owners of common stock will be the beneficiaries of the dissolution, as the charter of the company specifically states that the preferred stock is entitled to no additional dividend beyond the regular 5%. It is not known whether all preferred shareholders will concur in this interpretation of the provision, under the present extraordinary circumstances.

Though the unexpected and sharp break in the price of copper metal abroad last week was convincingly ascribed to a bear crowd, and though everybody was temporarily reassured, the market has not recovered from the shock of the discovery that there were two sides to the metal market, said the *Evening Post* last week. The price, even if by accident, could go down a little. The tendency of metal prices since has been to sag, and today both Amalgamated Copper and Rio Tinto shares sold lower than on the day the bear party attacked the metal market in London and broke the price ½c. per pound. So much has been staked upon the scheme of copper-metal valorization, that if anything should happen to it, the consequences might not be limited to copper, the metal, and shares. Thus, it is with a feeling of uneasiness that Wall Street reads of metal sales having abated, the prices being for the present nominal, and of the big sellers' unabated expectations. A bullish commentator in Boston has made the mistake of comparing the situation with what it was at the beginning of 1907, when there was not enough copper metal to go around, and copper shares were scheduled to have a great rise, presumably on the theory that if consumers could not procure the metal they would buy the shares.

The glad tidings will, no doubt, reach many hayseeds that their clay banks are going to become valuable as sources of aluminum, when they read the prospectus of the Alumina Oxide Manufacturing & Mining Co., of Los Angeles, Cal. This cheerful concern, which is offering some of its 200,000 shares of stock at $1 per share (it was 50c. before May 1), presents some chemical remarks that make us dizzy, so for stability of thought we seize upon the promise that the first unit of the milling and extraction plant, to cost from $50,000 to $75,000, to handle 100 tons per day and extract 200 lb. of aluminum per ton of ore, is going to produce the aforesaid aluminum at "under 7c. per lb." Ten tons of aluminum per day is 3500 tons per annum. Figure out the profit for yourself. We have never heard that aluminum can be produced even in Europe at under 12c. per lb., and the Southern Aluminum Co., which is about to erect a plant at Whitney, N. C., is contemplating putting $8,000,000 into the business. It seems to us that it will be a shameful waste of money to spend all that for what may be done for a few paltry thousands, according to the Alumina Oxide Manufacturing & Mining Co. We hope that this information will come to the attention of L'Aluminium Française and Dr. Heroult.

The "Corozal," the largest ladder dredge in the world, operating on the Panama Canal, broke the main driving-wheel gear on the port side on June 4, putting the dredge out of commission until a new gear can be installed. The accident occurred while the dredge was excavating in a 25-ft. bank, the upper part of which consisted of stratified clay, and the lower part of argillaceous sandstone, and resulted in breaking off every one of the spokes of the port-gear wheel, leaving the hub entirely free. The gears are 14½ ft. in diameter, 2 ft. wide, and made in two sections, an outer wheel or cog rim, and an inner wheel, consisting of rim, spokes and hub, each section weighing approximately 10 tons. Considerable difficulty was experienced in handling the broken parts, owing to their great weights. A new casting was made at the Gorgona shops, machined at Empire, and was ready for shipment on June 17. Another casting has also been ordered from the Scotch builders, William Simon & Co., of Renfrew. This dredge, it will be remembered, is provided with two sets of buckets, one with buckets of 52 cu.ft. capacity, and the other set with buckets of 34 cu.ft. each. The dredge discharges into barges alongside and was built to dig to a depth of 55 ft. and to have a capacity of 1200 cu.yd. per hour.

Brokers who buy stock on margin for customers must keep the stock constantly in their possession in order that it may be delivered immediately upon the payment by the customer of the amount due, according to a ruling by the Apellate Division of the Supreme Court of New York, on June 27. The court reversed a judgment in favor of the firm of Charles A. Stoneham & Co., curb brokers, in a suit by Pierre A. Shiel to recover $410 as the value of certain curb stock purchased for him which the brokers couldn't deliver when Shiel offered to pay the amount due. The brokers offered testimony to show that the stock had really been purchased for Shiel on the date named, but that when he demanded the stock the brokers had to wait until it could be sent here from Salt Lake City or Toronto. Justice Lehman, who wrote the opinion, said:

> A broker is merely employed to buy stock for his client, and moneys paid to him on account of the purchase price are paid merely as the agent. If he fails to purchase the stock when ordered, hoping to buy the stock at a lower price and pocket the difference, he has concededly converted his client's money; if he does purchase the stock when ordered, but treats the stock as his own, parting with the stock so he cannot deliver it on demand, it seems to me that he has also failed to obey the directions to buy the stock for the client and has also converted the client's money.

Shiel contended that there was no proof that the brokers ever bought the stock at all.

American Institute of Mining Engineers

The report of the committee of five appointed to examine into the affairs of the American Institute of Mining Engineers will be mailed to members the last of this week. The report is too voluminous to reprint in full, but a summary of the conclusions of the committee has been communicated to us and is reprinted below:

SUMMARY

(1) The Institute has been running behind $2000 a year in ordinary net income, and $7884 more if the land should be paid for in equal annual installments plus interest.

(2) Prior to this year, the technical, social, and business affairs have been practically under a one-man management. This is generally undesirable and has become impossible in a society of our present size and diversified activities and should be changed.

(3) The publications have been admirable and of high standing and we would deprecate any change in type, printing, paper, or other literary characteristics, and we suggest that each year in the year book or other prominent part of the publications all three fundamental documents underlying the Institute be published—not only, as heretofore, the constitution and the by-laws, but the certificate of incorporation as well: but we believe that the cost can be materially reduced by reductions and adjustments, even in addition to those which the directors and council have inaugurated in 1912, so that a saving of over $5000 can be effected in this line.

(4) We have indicated in the body of the report other savings in expense through greater efficiency, prompt adherence to office hours, and otherwise.

(5) On page 11 of the report, the committee has given in detail its views and its reasons for recommending the legalizing the office of secretary emeritus and will later, as part of the proposed changes in the constitution and by-laws, point out the steps necessary to that end.

(6) The putting into effect of recommendations as to a reduction of salaries of secretary and the retired secretary, if continued, and of editorial expense with other economies elsewhere suggested, we believe would bring down the deficit very largely, or entirely eliminate it. We believe, in brief, in cutting all expenses and all operations likely to involve such to the absolutely necessary minimum to make the budget of the Institute, all financial obligations of whatever nature included, balance.

(7) We advise that the annual meeting, which has now been adjourned until October, shall take up and carefully consider suggested alterations in constitution, that such of them as meet the approval of the membership may be put into effect at the annual meeting of 1913.

(8) We urge the board of directors likewise to inaugurate as soon as possible amendments in the by-laws so that responsibility shall be distributed and not placed upon one individual, and to put into effect still further improvements in addition to those already inaugurated by the directors.

(9) We recommend the copyrighting of all papers accepted and printed.

(10) We advise that delinquent members be dropped after 12 months' delinquency.

(11) We recommend that the election of life members be limited to 5% of the actual membership, and that the receipts from life memberships be set apart toward the accumulation of a fund for the liquidation of the mortgage and interest thereon, and not turned into the general fund of the Institute to meet ordinary expenses, and that after the indebtedness be lifted they be invested in trust funds and the interest thereon used to meet the Institute's obligations to its life memberships.

(12) We suggest for serious consideration the postponement of the publication of the "Emmons Volume" unless the directors and council are satisfied that there will be such a demand for it as immediately to meet the first expense of, say, $2100, which we understand will be payable next fall.

Finally, we wish to express our absolute confidence in the continued value of the Institute to all of its membership; our conviction of the possibility of its greater future efficiency until its publications become indispensable to the profession, and membership a coveted honor. We urge the present membership to increased interest and coöperation so that as soon as possible proposed constitutional changes may be intelligently discussed and properly authorized, and we record our fullest confidence in the board of directors and council as at present existing, which have already initiated many important changes in methods, and have continued to great advantage their efforts since the last annual meeting. Due credit should be given to those of our members who have consented and who shall consent to accept offices whose duties are and will be no sinecure, if our recommendations are adopted.

The membership should keep itself informed as to the affairs of their society, and by attendance and discussion at meetings and otherwise, inquire and criticize and be assured to their satisfaction that the business, both technical and financial, is conducted by modern methods and in a manner to insure prosperity.

Summing up, therefore, concerning the *specific* questions entrusted to us for our consideration, we recommend:

(*a*) That the vote on the constitutional amendment to change the name of the Institute be kept open for careful consideration and decision in 1913.

(*b*) We recommend a negative vote upon the amendment proposed last February, authorizing an increase in dues, believing that the economies proposed, some of which are already in effect, will not only do away with the deficit, but provide an adequate income, possibly even providing sufficient funds to liquidate the mortgage.

(*c*) We recommend a negative vote on the proposal to reclassify retroactively the present membership, leaving any reclassification of membership for a more careful consideration later on.

New Wage Scale at Butte

A committee of the Butte Miners' Union has been conferring with the managers of the Butte mining companies for several weeks with regard to introducing a new scale of wages. The old contract calling for the payment of $3.50 per day to miners, and $3 to surface men, expired May 1, but by previous agreement was to continue in force until a new contract was drawn up, or until either party to the contract gave 30 days' notice of desire to end it. On June 25, the Anaconda company made a provisional agreement guaranteeing that the present wage scale would be the minimum amount paid, irrespective of the price of copper, during the term of any contract entered into. The agreement further stipulates that the wages of all employees would be increased 25c. per day when copper is 15c. and above and under 17c. per lb. With copper at 17c. and over, all men employed underground should have an additional 25c. per day added to their wages. Also 25c. per day additional should be paid surface employees during the time that copper is 18c. per lb. or over.

In order to make this scale effective, the company attached a condition requiring that a three-year contract be entered into, and that the average price of copper during the calendar month should govern in settlement. In case any employee should for any reason terminate his employment before the end of the month, settlement should be based as follows: Settlement made during the first half of the month shall be made according to the average price of electrolytic copper for the month preceding. Settlement made during the last half of the month shall be made according to the average price of electrolytic copper during the first 15 days of the month. The company also gave notice that if the provisions of this contract were accepted before July 1, the scale would apply to the June payroll. On June 28, the men approved the new scale.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Mining on Forest Reserves

In the JOURNAL of June 22, 1912, there appears an article under this head by Merritt Booth, a mining expert in the employ of the U. S. Forest Service. The article is the usual mess of clap-trap in defense of the stupid and illegal interference of the Forest Service with legitimate prospecting on public lands. It says, that "the Service does not antagonize the locating of valid mining claims" but "such may be located only upon the discovery of valuable deposits."

I call this clap-trap and a perversion of the intent and object of Congress when the laws of 1872 were passed. The intent of Congress was to open to exploration all the lands containing deposits of valuable minerals. The Forest Service interprets this to mean that a prospector cannot locate until he makes a discovery of a valuable mineral deposit. The law requires the discovery of a vein or lode in place, but it does not require proof that the lode discovered is commercially valuable or anything like it. If the prospector thinks well enough of it to do $500 worth of work on it, Congress intended to sell the ground to him at $5 per acre.

If a prospector locate on heavily timbered ground, it will be easy to determine his good faith by the showing he has and by the diligence with which he keeps up the work. On heavily timbered land the Service should be careful to investigate fully and refuse patent, if there is a lack of good faith. On ground barren of timber or with scattering trees the prospector should have full swing as long as he has discovered a vein, no matter whether it is thin and of low assay value. That is the true interpretation of the law and there is no reason whatever why the claim should be protested, because he can show no deposit of actual value. It is enough that he is willing to spend $500 on development. On ground devoid of valuable timber the prospector acts in good faith, because his intent cannot be to profit by the timber which may grow up on it later, as he knows that it takes a century to grow a tree one foot in diameter in the Rocky Mountains.

But the Forest Service, like most other Government departments, knows no discretion and treats all alike according to its stupid interpretation of the law. It lacks common sense and the prospector, not knowing whether he can hold what he finds, does not go out at all. The Forest Service does interfere materially with the prospecting for mineral deposits and, I am afraid, it will take years to remedy the evil and inject the necessary common sense into the bureaucrats. The mining papers should hammer away, until relief is found.

MAX BOEHMER.

Denver, Colo., June 25, 1912.

Vicissitudes of Graphite Mining

I was much interested in the article on p. 1279 of the JOURNAL of June 29, 1910, on "The Vicissitudes of Graphite Mining," particularly in the statements of the U. S. Geological Survey "that there are no well established systems of treating the materials" and "certain rocks that carry graphite contain other minerals which preclude any possibility of successful concentration," these statements being directly contradicted by work being done every day on Sutton, Steele & Steele machines.

The treatment of crystalline graphite on S. S. & S. machines is an exceedingly simple one, and the separation of flake graphite from mica not at all difficult. The S. S. & S. dry-concentrating table, standard type, or the S. S. & S. jig-table, readily separates crystalline graphite from the gangue rock such as limestone, silica, etc., as well as the iron sulphides sometimes found with the flake, and produces a concentrate composed of flake and mica which concentrate is readily separated on the S. S. & S. dielectric separator.

As stated above, the treatment of crystalline graphite is a simple matter for S. S. & S. machines, the machines readily producing a flake product assaying from 93% to 95% carbon from 3% or 4% ore.

E. GOODWIN STEELE,
Secretary, Sutton, Steele & Steele, Inc.

Dallas, Tex., July 2, 1912.

The Sublevel Stoping Method

In the JOURNAL of June 15, 1912, the summary of the article, "The Sublevel Stoping Method," gives among the important features "the employment of the caving principle." Please allow me to say that the caving principle is not employed in this method of mining.

Modern mining methods may be said to employ three different principles: The open-stope; the back-filling, with or without timbers; and the caving principle. The sublevel-stoping method employs the open-stope principle; and perhaps its most important feature is the large number of small sublevels for means of attack and for the safety of the miners.

F. W. SPERR.

Houghton, Mich, July 6, 1912.

The A. I. M. E. Bulletin

Now that a well organized effort is being made to stimulate greater interest in the American Institute of Mining Engineers and make it of more benefit to the profession, it seems an opportune moment to call attention to a neglected subject, namely, discussion of the articles published in the monthly bulletins of the Institute.

The articles published in the bulletins of the English, Institution of Mining and Metallurgy, or of the Chemical, Metallurgical and Mining Society of South Africa are usually discussed at length by several members and these discussions form no small part of the bulletins. They are of great interest themselves and often enhance the value of the original article. The articles published by the American Institute are of the same general nature as those of the British and South African societies, but, so far, seem to fail to produce much contributed comment or discussion.

It is the hope of many members of the American Institute that the formation of local branches will result in a greater number of articles being contributed to the *Transactions*. The bulletins of the Institute should then be of greater interest than heretofore and that greater interest should find expression in more liberal discussion of the original articles.

Discussion or comment is complimentary to an author for it shows that his work is of interest. It brings out all sides of a question, and puts life into what is too often considered "high-brow stuff." The publication of articles that call forth no comment is too much like one person doing all the talking at a social meeting.

Perhaps American mining engineers are too reticent about expressing their views to give such discussion the value it should have. Most of the technical journals devote a page or more of every issue to discussion, but rarely are these columns used by the men whose writings would be of most benefit to their confreres. These columns seem to be regarded only as a means to repudiate some misquoted statement. Perhaps this reticence arises from a feeling that the author knows more about the subject than the man who would like to comment upon the article or ask pointed questions. This is especially apt to be the case of the practical man, and he is the very one whose questions or comments would be the most interesting.

The Institute should be regarded as a technical rather than scientific society, for the former term implies a more intimate relation of its members and greater freedom in the interchange of thoughts and ideas. More discussion would promote this "get-togetherness" and there would be fewer unopened bulletins lying about office tables.

An intelligent question may arouse discussion that will teach us all a little more about a subject on which we have thought we knew all there was to be known. We have all heard that a fool can ask more questions than a wise man can answer, but even some "fool questions" may suggest something of value. Let us have more discussion so we may know more about what the other fellow thinks.

ENGINEER.

Philadelphia, Penn., June 25, 1912.

Assay

After noting the articles which have recently appeared in the JOURNAL in regard to the iodide method for the determination of copper (Feb. 12, May 25, June 15 and 22, 1912), it seems to me entirely too much stress is being given to the separation of the copper with sodium thiosulphate. The discussion is interesting but we must not lose sight of the fact that the old reliable method of separating the copper with aluminum has never been improved upon, and probably has never been equaled, for economy of time, ease of manipulation and extreme accuracy of results. Of course this method, like any other, must be correctly handled but when all the proper precautions are taken it will be found to be all that is claimed for it.

The separation with aluminum seems far quicker and more accurate than that with sodium thiosulphate as it eliminates the trouble of using a muffle, which may or may not be convenient to the laboratory, and also the dangers of a muffle ignition, including that of not being able to remove all the copper from the dish in which the ignition is performed. Furthermore the work is done entirely in the laboratory and is completely under the supervision and control of the chemist at all times. The point mentioned of the danger of oxidation of some of the metallic copper is entirely overcome by using dilute hydrogen sulphide water for washing, which is one of the essential points of the method.

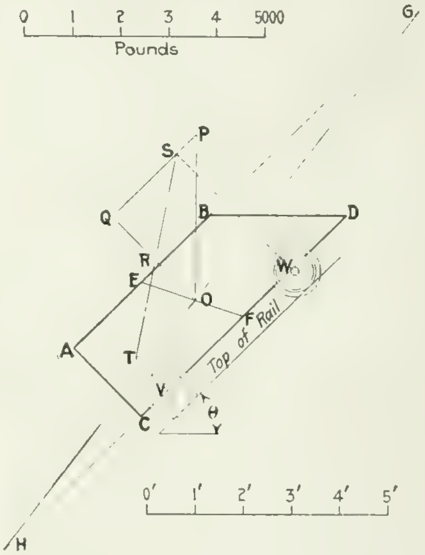
The use of sodium hypochlorite and phenol to oxidize the nitrous fumes seems entirely unnecessary, and only increases the time of operation, as bromine does it perfectly and is quickly boiled off. If care is taken to use only a slight excess of the different reagents the method will be found to be quick and accurate and with a few slight modifications is applicable to practically every copper determination the analytical chemist will ever desire to make, with perhaps the exception of copper bullion, where the much longer electrolytic method is a little more accurate, as it enables the chemist to obtain exact results in the second or third decimal place, which is a little beyond any volumetric method.

R. L. HALLETT.

Brooklyn, N. Y., July 3, 1912.

Graphic Solution of Skip Loads

I notice an article on "Graphic Solution of Skip Loads" that is very interesting. As the method I use is different from the one given by Mr. Collins, I herewith inclose the method in use by me. In the figure, the skip is supposed to be 2 ft. high, 4 ft. long on top and 6 ft. long on the bottom. The total weight of the skip and load is 3500 lb., and the angle of inclination of the shaft is 45 degrees.



GRAPHIC SOLUTION OF SKIP LOADS

The skip *ABCD* is drawn to scale as shown, and the center of gravity *O* is found as follows: From a point *E* in the middle of the line *AB*, to a point *F* in the middle of the line *CD*, draw the line *EF*. Extend *AB* to *G* and *DC* to *H*, making *BG* equal to *DC* and *HC* equal to *AB*. Join *H* and *G*, with the line *GH* and the point formed by the intersection of *GH* with *EF* will be the center of gravity *O*. Then from *O* draw *OP* vertical and to scale, making *OP* equal to the total weight of the skip and load. Draw *PQ* parallel and *OQ* perpendicular to the rail. Then *PQ* represents the pull on the bail and *QO* the total pressure on the rail.

Two alternatives now present themselves, owing to whether it is a question of design, or whether it is a question of analyzing a skip already constructed. If the former, *OR* is made equal to the load we wish on the front wheels and *QR* to that on the rear wheels. The rear wheel is then placed at *V*, making *CV* equal to the distance we wish the rear wheel from the back end of the skip. *TV* is then erected perpendicular to the rail, intersecting *TO* at *T*, *TO* being parallel to the rail.

A line is then drawn through *T* and *R*, which intersects *QP* (or *QP* extended) at *S*. *SW* is then drawn perpendicular to the rail, and *W* will be the position of the front wheel. If the skip is already made and we wish to find the load on the wheels, the above procedure would be reversed. *WS* and *TP* are erected perpendicular to the rail, intersecting *PQ* or *PQ* produced and *OT* at *S* and *T*. *T* and *S* are then joined by the line *ST*, which intersects *QO* at *R*. Then *RO* is the weight on the front and *QR* is the weight on the rear wheels.

E. R. RICE.

Miami, Ariz., June 8, 1912.

Eruption of Mt. Katmai

It may be of interest to know that the recent volcanic activity on June 6, 1912, of Mt. Katmai, which is about 400 or 500 miles to the westward, was noticeable in Prince Williams Sound. On the same day as the eruption we heard noises which we thought were ice breaking off from Columbia Glacier, 10 miles to the northwest, but which we now think were the first explosions of Mt. Katmai. For several days after the disturbance a fine, white, powder-like ashes, fell here. It was not heavy but about as thick as the dust which settles on furniture after a dirty carpet has been well swept. On June 10 the falling rain would sting hand and face and corrode everything metallic. The moisture-ladened atmosphere even rusted the tops of the polished parts of the hoist and centrifugal pumps here at the mine. Of course these machines are under roof. Brass and copper on launches and steamers turned a decided green. Vegetation was much affected the first few days, holes were eaten through leaves and their edges turned yellow.

L. L. MIDDELKAMP.

Ellamar, Alaska, June 21, 1912.

Rolling Mill No. 2 Shaft,

In the article that appeared under this caption in the issue of the JOURNAL for June 22, the JOURNAL draftsman inadvertently showed a tripod under the rock drill in the section of the shaft. This, of course, is incorrect, as one of the features of the method of shaft sinking described in the article, is the use of stoper drills with which tripod or bars are unnecessary.

P. B. MCDONALD.

Negaunee, Mich., June 29, 1912.

Electric Mine Locomotive Operation

By A. F. Elliott*

Suggestions are given concerning the operation and care of electric mine locomotives. Some of the common troubles encountered in practice with their causes and remedies are presented. The tables and formulas are useful in determining the haulage capacity and efficiency.

Before an electric locomotive is put into service, the operator should see that it is in proper condition. The journal box should be packed with wool waste and oil and compression grease cups run down and refilled. The sand box should contain plenty of dry sand and the sand levers should be tried to see that the sand runs freely on both ends before starting. The brakes should be tried to see that they are in order, and that there is plenty of travel for the brake screw and rod to allow for tightening the brakes. The controller levers should be in the "off" position before the trolley pole is put on. In starting, gradually bring the lever around, stopping on each point long enough to allow an increase in speed, but do not stop between contacts.

SLACK COUPLINGS BEST IN STARTING

It is always best to have the first two or three couplings in the trip slack, in order to avoid having to start all the trip at once. If the trips are standing on a side track with all the couplings slack, as they usually are, it is usually better to start with the motors in series. This prevents jerking the rear cars on the trip, which may cause them to leave the track or break loose. To prevent the wheels from slipping, shut off the controller and start again, using a little sand. Too much sand may do more harm than good by preventing a good return for the current.

Always turn the controller quickly to the "off" position; that is, do not drop back point by point. Under no circumstances should the brake be used to prevent the wheels from slipping. That is the most harmful thing than can be done, causing burned-out armatures, field coils and controllers.

The locomotive should be run with the motor in series as much as possible with light loads or empty loads, and when switching empty cars. This results in saving power and prevents heating the resistance unnecessarily. No hard-and-fast rule can be made as to the proper quantity of oil or grease to be used, but one quart of lubricating oil or two pounds of compression grease is usually ample for a day's run. An excessive amount of oil or grease is detrimental, as it may get into the motors and cause the insulation to become rotten, causing grounds and burnouts. It frequently happens that if motors are lightly loaded or have considerable switching to do, the motors do not get hot enough to melt the grease in the grease box and it does not get into the bearing unless forced down. In such motors it is usually best to use oil for lubrication, having the bearings packed with wool waste. Reversing motors when running at full speed is apt to break the gears and spring the armature shaft. Insulated wire or other conductors should never be used for trolley cords. Where arc headlights are used, the light should always be cut out when the locomotive is standing idle; otherwise, the arc may increase until the globe is broken or the coils overheated.

EXTRA CARE WITH NEW WHEELS

When making the first trip after new wheels have been put on the locomotive, it should be run slowly past all switches, as a misplaced guard rail or loose switch point may cause derailment. A groove worn in the old wheel acts as a guide and tends to prevent the motor from taking frogs or splitting switches.

Contacts and contact fingers should be examined to prevent their working loose. If they are found dry and cutting, a little grease should be applied. It is not good for this purpose unless used very sparingly.

It is important to prevent the armature bearings from wearing down and allowing the armature to strike the pole pieces. It sometimes happens on a double-motor locomotive that the top of the armature bearing on the forward end becomes worn out, and the armature appears to have proper clearance when at rest, but will strike the pole when pulling a load. A good way to discover this condition is to put a piece of sandpaper on the top of the armature between it and the pole; then set up the brakes tightly and open the controller to the first or second point and off again quickly. If the armature does not mark the paper, it has at least some clearance. Another way is to chalk the armature and examine it after pulling a trip to see whether it is touching any of the poles. A good way to find the clearance between the armature and the bottom pole, which cannot be readily inspected, is to insert a piece of tin or fine sandpaper between the armature and one of the side poles. If it does not go through easily, it is time to renew the armature bearings. Brush holders should be inspected to see that the brushes work freely in them, as, if they do not, excessive sparking will occur, especially if the bearings or armature shaft are worn.

Care should be taken on all locomotives which have the motors held in place by collars on the axle to see that they are kept tight; otherwise, the side lash of the motor will be taken by the gear case, which will soon work them loose, breaking bolts, stripping threads, etc. Motors having rigid suspensions should be securely fastened to the suspension bar in such a way as to prevent hammering or chattering, as this will soon crystallize the metal, causing it to break.

Locomotives should not have new wheels in one end and worn wheels in the other, or wheels of different diameter on the same axle. Locomotives should be connected up in such a way that they will all run in the same direction with relation to the position of the reverse lever. If a locomotive persists in jumping the track, it may be due to a sprung axle, a loose wheel on axle, journal box stuck, or spring buffer or distance piece out of place.

LOCOMOTIVE TROUBLES AND CAUSES

Some of the more common troubles with locomotives are as follows: The locomotive will not start. This is usually due to failure of current to get through the motors, caused by an open circuit somewhere in the connection or contact. It may be due to the motors "bucking" each other, due to a wrong connection. In this event, a heavy current will flow and blow the fuse if continued. To remedy this condition, the brush leads on one motor should be reversed. A grounded resistance will prevent the locomotive from starting. It may also be caused by the brakes being set up tight, a stuck or seized bearing, or broken gears. It may also be due to a break in the track return. In this event, it is usually found that there is a sufficiently good return for a small amount of current, so that the locomotive headlights will burn and the circuit will test all right, but when the controller is opened the lights, of course, will not burn.

If the locomotive jumps or does not increase in speed uniformly, it is caused by a short-circuit in the resistance, a wrong connection of the resistance lead, contact fingers or contacts not in proper condition, or an "open" on some section of the resistance, in which case the locomotive does not start until the controller has passed that point. If it jumps on the first point, it indicates a shorted resistance or wrong connection. The wrong connection may put one or more sections of the resistance in circuit with the motor

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after the controller is wide open. This will cause the locomotive to run slowly and that section of the resistance will heat when pulling a load.

HEATING DUE TO HEAVY CURRENT

Heating is caused by anything which causes a heavy current to flow through the motor. This may be due to an overload on the motors when hauling heavy trips, rough and dirty tracks and similar causes, or it may be due to weak or shorted field coils or granulated field; charred and weak insulation on the armatures.

The heating of the resistance may be caused by running too much with the controllers on points with empty trips, switching, etc., or it may be that the resistance is connected to the controller in the wrong order; that is, the coarse resistance may be cut out first, leaving the fine sections on the last point where they have heavy current to carry. Wrong resistance panels may have been put in; or it may be due to poor ventilation.

Flashing or arcing on the controller may be caused by heavy current due to the reasons mentioned in connection with the heating of motors. It may also be caused by the fingers or contacts not being in proper condition, by the operating cylinder not moving freely and quickly. In adjusting the controller fingers care should be taken to see that the contact fingers making the final break of the arc are set to break simultaneously. This is usually the two top and two bottom fingers, and all four should make and break at the same time, the object being to split up the arc into different sections and not allow it to be broken entirely on one finger.

Well designed motors, as a rule, do not give any trouble from sparking at the commutator under normal conditions. There is, however, a certain load at which any motor will spark at the brushes. This is not particularly injurious unless it occurs a great deal of the time. It is to be expected when the locomotive is pulling a heavy load. Continued sparking at the commutator usually indicates some defect, and is frequently the first warning of some trouble that will later appear. Therefore, it should be given attention immediately.

The peculiar long blue sparks are always caused by poor connection or an open circuit in the armature winding. A shorted or burned-out armature coil causes a violent flash as the commutator bar to which it is connected passes under a brush. A common cause of sparking is high mica in the commutator. This is usually caused by the copper bars wearing down faster than the harder mica. Also, there is nearly always minute arcing between the carbon brush and the copper bars that cannot be seen and which does not affect the mica.

This can be remedied temporarily by sandpapering, but the better plan is to remove the cause entirely. This can be done by cutting down the mica below the surface of the commutator, say $\frac{1}{8}$ in. If the brushes are taken out for any cause, it is always essential to replace them exactly as they came out; carbon brushes should be set at an angle of 10° from the diameter of the commutator, and if the brushes are turned over, they do not make good contact, causing sparking.

DETERMINATION OF LOCOMOTIVE HAULAGE CAPACITY

In the accompanying tables are given the loads that different locomotives can haul under average mine conditions, also the size of fuse wire to use. The rule for calculating the horsepower of electric motors is as follows:

$$\text{Horsepower} = \frac{\text{Miles per hour} \times \text{drawbar pull}}{375}$$

HAULAGE CAPACITY OF ELECTRIC MINE LOCOMOTIVES

Weight of Locomotive, Tons	Drawbar, Pull, Lb.	Speed, Miles per Hour	Load in Tons				
			Level	1% Grade	2% Grade	3% Grade	4% Grade
4	1600	6	50	30	20	15	11
6	2400	6	80	45	31	23	17
8	3200	6	106	61	41	30	23
10	4000	6	133	76	51	38	29
13	5200	6	173	99	67	49	38
15	6000	6	200	144	77	57	43

SIZE OF FUSE WIRE TO USE IN ELECTRIC MINE LOCOMOTIVES

Weight of Locomotive, Tons	Hp.	Amperes		B. S. Copper Wire	
		500 Volt	250 Volt	500 Volt	250 Volt
4	40	60	120	No. 17	No. 14
6	60	90	180	No. 16	No. 13
8	80	120	240	No. 14	No. 12
10	100	150	300	No. 13	No. 11
13	130	190	380	No. 12	No. 10
15	150	225	450	No. 11	No. 9

Note.—The horsepower and amperes shown above are not those calculated from the standard rating of 75 degrees temperature rise during one hour, but are based on overloads and conditions usually found in practice.

To calculate the drawbar pull a certain coefficient of friction must be assumed. This is usually taken as $\frac{1}{5}$ to $\frac{1}{7}$ of the weight on the drivers but depends on whether steel-tired or chilled cast-iron wheels are used, and also on the condition of the wheels and tracks. Worn wheels will pull more than new ones and they will pull more on a large rail than on a small one.

The weight of trips a locomotive will haul depends on the grade and frictional resistance. This latter is variable and depends on the condition of tires and track. It may be as low as 20 lb. per ton on the level or it may go much higher, 60 or 75 lb. per ton. Under average conditions around well equipped mines it is usually 30 or 35 lb. per ton on level track. For each 1% grade add 20 lb. per ton.

Therefore, to calculate the weight of trip divide the rated drawbar pull of the locomotive by the frictional resistance per ton, the quotient indicating the gross weight of the trip it will haul. It should be remembered, however, that the locomotive will not have as great a drawbar pull on a grade as it has on the level, as it has its own weight to haul up the grade. The drawbar pull developed on a grade may be calculated as follows: Multiply the weight of the locomotive in pounds by the per cent. of grade used as a decimal and subtract the amount from the rated drawbar pull.

The actual horsepower developed can be calculated from the electrical input. Take frequent readings of the volts and amperes while hauling a trip and get the average of each.

$$\text{Horsepower} = \frac{\text{Volts} \times \text{amperes} \times \text{efficiency (say 90 per cent.)}}{746}$$

In all the foregoing it is assumed that the locomotive has motors in it large enough to do the work without overheating. This is not always the case.

Mineral Production of Tunis

Tunis in 1911 exported minerals as follows: 34,395 metric tons of zinc ore; 36,109 tons of lead ore; 362,783 of iron ore; and 1,539,000 of phosphate rock. In addition there was an internal consumption of lead ore by the Société Metallurgique de Mégrine, in about six months of operation, says *Echo des Mines*, Apr. 29, 1912. Of the above ores, France took 10,000 tons of zinc ore; 5779 of lead, and 591,098 tons of phosphate. Belgium took 13,966 of zinc and 17,764 of lead ore. England received 237,805 tons of iron ores; Germany the remainder. The iron ore was all produced by two concessions, Slata and Djérissa.

The Dome Theory of the Coastal Plain

In a recent number of *Science*, A. F. Lucas comments on the claims of G. D. Harris for credit for the discovery and promulgation of the "dome theory" of the accumulation of oil in the gulf coastal plain and cites instances that indicate that the credit is due to him and not to Harris. Lucas says:

> As early as 1894 I bored with diamond drills on Jefferson Island, Belle Isle, Weeks Island and Anse La Butte, La., discovering in each place a huge mass of rock salt of limited area but of great depth. At Jefferson Island pure rock salt was penetrated to a depth of 2100 ft. without finding bottom, and at Belle Isle rock salt, having a depth of 2740 ft. pierced in 1907, was disovered with paraffine oil and large lenses of pure sulphur.
>
> The successful results attained by my explorations in Louisiana led me to extend the study of a nascent "dome theory" into Texas and to apply it to the various phenomena occurring on Spindle Top; a low elevation of only 10 to 12 ft. above the surrounding prairie, and to drill finally on this dome against the advice of my friends, with the well known result that the largest well ever discovered in the United States and variously estimated at from 75,000 to 100,000 bbl. per day had its birth Jan. 10, 1901.
>
> The success of this well demonstrated the possibility of attaining economic results by drilling for oil and sulphur on the domes of the coastal plain. This theory held good throughout the hundreds of wells drilled around Spindle Top in the effort to extend the area laterally without results, however, for it was subsequently proved that if the original well had been located only 65 ft. further to the northwest there would not have been a discovery well.
>
> It must be noted that this well was not located on the axis of "the central dome," hence the great risk incurred in its drilling, and whoever may claim that this theory does not apply, and "fools" around the rim of the dome, stands a good chance to lose himself in the quagmires of gumbos and the unconsolidated sands with which the domes are surrounded. This was proved by hundreds of wells drilled around the Spindle Top dome, not in an effort to prove a theory, but rather in the strenuous effort to extend laterally the area of the productive territory. The dome theory as advanced by me in the early days of the Spindle Top field to Dr. C. Willard Hayes and Prof. R. T. Hill, of the U. S. Geological Survey, to Lee Hager, consulting geologist, Houston, Texas, Dr. William B. Phillips, now director of the Mineral Survey, Austin, Texas, and to Eugene Coste, of the Canadian Mining Institute, has been generally accepted.

A letter to Mr. Lucas from Lee Hager and an article by Prof. R. T. Hill, published in the *Journal* of the Franklin Institute and an article by Marius R. Campbell published in *Economic Geology* are quoted to show that acknowledgment of Mr. Lucas as the originator and first exponent of the theory was made.

In conclusion, Mr. Lucas states:

"It appears that the claim made by Mr. Harris in locating wells at Pine Prairie, as noted in his article in *Science*, was quite premature, as *The Oil and Gas Journal*, of May 23, states:"

> Pine Prairie, that had promise of developing another Gulf coast field, has so far failed to produce other than disappointments. Of the five tests now drilling three are at depths considerably past that at which the Myles Mineral Co. found pay in is No. 8, the discovery well, and have failed to drill into anything encouraging to test. The Producers Oil Co. set screens in No. 1 Le Danois-Hudspeth at about 2000 ft. and made a try for a well, but the effort failed to be productive, and as a result the pipe has been pulled out, broken down and the hole abandoned.

The Zimmerman Mine, Iron River District, Michigan*

An important section of the Menominee iron range, in northern Michigan, is that known as the Iron River district, just north of the Wisconsin line, and centering about Iron River and Stambaugh, along the line of the Northwestern railway. Among the companies operating in this district are the Buffalo & Susquehanna Mining Co., the Brule Mining Co., Davidson Ore Co., Florence Iron Co., Verona Mining Co., Huron Iron Mining Co., Mineral Mining Co., Jones & Laughlin Ore Co., Oliver Iron Mining Co., Wickwire Mining Co. and the Spring Valley Iron Co.

ORE IS SOFT HEMATITE

The ore found in this district is chiefly a soft red hematite, although in some places it is hydrated and classed as brown hematite. A full description of the ore beds, and of the geology of this district, is given in monographs of the geology of the Lake Superior region, U. S. Geological Survey, Vol. 52. The average analysis of the ore produced in this district in 1909, showed 54.35% of iron, and 0.404% of phosphorus, with a range of 49.87% to 56.67% of iron, and 0.709 to 0.313 of phosphorus. The ore shipped from this district is made into pig iron, as the high content of phosphorus makes it particularly adaptable for casting purposes.

Mining operations in this district began in 1882, when the Riverton mine was opened, and continued until about 1893. There was a break from 1893 until about 1898, owing to the fact that the ore was of low grade, and the financial condition of the country during these years was unfavorable. Nearly all of the orebodies being worked at present, have been discovered since 1905, largely by the extensive use of diamond drills.

Mines in the Iron River district have not yet attained any great depth. The average is about 675 ft. Such large quantities of ore have been developed on the upper levels, that the necessity for shaft sinking after two or three levels have been opened, has not yet arisen. The ore is mined for the most part on the sublevel-and-topslicing system, which has been frequently described in mining journals. As a rule, the mines are dry and require little pumping, but several situated in the valley of the Iron River, have considerable water to handle, although not enough to make pumping a serious or expensive undertaking.

TWO SHAFTS AT ZIMMERMAN MINE

A promising member of the Iron River group is the Zimmerman mine, owned by the Spring Valley Iron Co. and situated between Palatka and Stambaugh, at the southeastern extremity of the district. The No. 1 shaft, was started on this property in 1906 and is at present 275 ft. deep. In July, 1911, the second, or Clutts shaft, was begun. This shaft is much larger than the first one. There are two skip compartments 5x5½ ft., a cage compartment 6x9 ft. and a compartment for pipes and ladder 6x2 feet.

The permanent surface equipment was installed at shaft No. 1 in 1910, and includes a two-stage air compressor, having a capacity of 1380 cu.ft. of free air per min., a dynamo driven by belt, a suitable battery of boilers, and a Sullivan automatic slide-valve hoisting engine with two engines 14 in. in diameter by 18-in. stroke, and a 6x6-ft. drum, grooved for steel cable and driven by gear and pinions. The engine has a range of 150 to 180 r.p.m. and the drum of 38 to 46 r.p.m. giving a hoisting speed of from 720 to 860 ft. per minute.

In this hoist, the admission of steam to the cylinders is controlled automatically. As the throttle is opened, steam is admitted for the full length of the stroke for the first four or five revolutions to start the loaded skip from the bottom of the shaft. As the throttle is opened wide, however, the admission of steam is automatically cut off at the most economical point by means of an auxiliary cylinder. When the throttle is closed at the top of the trip, steam is again admitted for the full length of the stroke. The application of the automatic cutoff to hoisting engines of the slide-valve, geared pattern, is a patented invention of the Sullivan Machinery Company.

MODERN EQUIPMENT AT CLUTTS SHAFT

Surface buildings and equipment of the most modern pattern have been installed at the Clutts shaft. The mine buildings include a dry house 100x24 ft., equipped with modern shower baths and steel lockers for 200 men. The new machine shop is 33x90 ft. and equipped to handle nearly every sort of a repair job that may be encountered. The engine house is 55x50 ft., built on a concrete foundation. There is ample space under the reinforced-concrete floor for all the pipes. This gives the engine room, a clear and roomy appearance and at the same time the piping is easily reached.

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*Abstract from an article, "Mining Iron on the Menominee Range," by J. F. Berteling in Mine and Quarry, June, 1912.

A Sullivan automatic slide-valve hoist of the same size as that at No. 1 shaft is installed here, and will run in balance, hoisting skips of three tons capacity. The No. 1 hoist has not yet been run at anything like its capacity, either in depth or speed. At present, the production from No. 1 shaft runs from 600 to 700 tons per day of two shifts, hoisting with a single skip. No. 2 shaft is not yet operating. A smaller cage hoist is also used for hoisting men and materials, and there is a 1700-cu.ft. air compressor, a high-speed engine direct connected to a dynamo, to run the electric haulage motors underground, and the necessary high-pressure boilers.

Prior to January, 1912, the Zimmerman was distinctly a hammer-drill mine. The room- and- pillar method of mining was employed and nearly all holes drilled in the stopes, raises and drifts were upper holes. In this work, Sullivan DA-21 air-feed stoping drills were used almost exclusively, about 15 of these machines being employed. From a record, kept over a period of several months, the average footage drilled with these machines in the stope was 60 ft. per shift. Usually drilling was not started until several hours had been spent in picking down the loose material from the back of the stope. When the back was solid and drilling started early in the shift, the average footage was about 140 ft. Sullivan DB-15 hand-feed hammer drills were employed for blockholing the larger chunks or fragments of ore in the stopes.

Block-Caving System Now Used

In January, for various reasons it was decided to change the method of mining to the block-caving system. The use of hammer drills in the new system is restricted to short raises, and piston drills are used almost entirely for the main work of mining. A winze was sunk 40 ft. from the original main working level and a main haulage drift was begun along the hanging wall to connect shaft No. 1 and the Clutts shaft. Crosscuts have been run from this main drift across a block of ore, which is being caved, and raises were put up to the old main working level. These raises were widened out at the top so that when the pillars supporting the block of ground to be caved were shot, the broken ore would work into them.

The old main working level was cut by drifts and crosscuts, the pillars remaining being drilled as the work advanced, and most of the timber removed to be used over again. The new style "Lightweight" drills which are being used in this mine, have a cylinder diameter of 2⅝-in. and weigh 155 lb. These drills require about 100 cu.ft. of free air per minute at 90 lb. pressure.

This drill is of new design and contains many interesting features, one of which is the automatic oiling device. This consists of a chamber cast in the drill cylinder and holding about half a pint of lubricant. Oil from the chamber is sent into the chest by the pulsations of the air in it. The speed is controlled by two small ball check valves screwed into the top face of the cylinder and connected by ports with the oil chamber so that oil is conducted to the inlet opening in the chest. It is then carried through the machine in the form of a spray and insures positive and sufficient lubrication of every working part. These machines are doing excellent work in the Zimmerman mine.

Production

In 1909, 11,000 tons of ore were shipped from the Zimmerman mine; in the following year, 25,000 and last year 112,000 tons. Much of this ore was shipped to furnaces in Ohio and a large portion of it went to Detroit. This ore was produced entirely from development work on account of the room-and-pillar method of mining, which was then in use. I am indebted to O. P. Doty, superintendent and Thomas Clutts for the information contained in this article.

Floris Osmond

The death of Floris Osmond, the noted metallurgist, at St. Petersburg, Russia, was briefly announced last week by a cablegram, received through the courtesy of Dr. Henry M. Howe. M. Osmond was born in Paris, in 1849, and graduated from the Ecole Centrale des Arts et Manufactures, where he studied metallurgy under the late Professor Jordan. After a short time spent in the machine shops of the Fives Lille Co., he entered the employ of the Societé des Forges de Denain-Anzin, where he remained several years, leaving in 1880 to join the metallurgical staff of Schneider & Co., at their great works, at Creusot. In 1884 he gave up his position there to devote himself exclusively to the study of scientific metallurgy. It was in his private laboratory in Paris that he conducted the brilliant researches which have made his name famous on two continents. In 1888, the French Société pour l'Encouragement de l'Industrie Nationale awarded to M. Osmond a prize of 3000 fr., and in 1895 a second prize of 2000 fr. In 1887 he received the Lavoisier medal in recognition of his masterly presentation and successful defense of the allotropic theory of iron. In 1906, the Iron & Steel Institute awarded him the Bessemer medal for his work in metallurgy.

M. Osmond's written contributions to the advancement of metallurgy are numerous, many of them being exhaustive papers presented to the leading engineering societies. For the Iron & Steel Institute his more noteworthy papers were on "Critical Points of Iron and Steel," 1890; "Micro-Structure of Steel," 1891; and "Howe's Researches on the Hardening of Steel," 1896. For the joint meeting of the American Institute of Mining Engineers and the Iron & Steel Institute at London, in 1906, he and G. Cartaud prepared a joint paper on the "Crystallography of Iron." His contributions to the discussions of papers before the Iron & Steel Institute were voluminous and took a wide range. The subjects include alloys of iron and nickel, changes in iron produced by thermal treatment, cooling curves, electrical resistance of iron and steel, micro-structure of steel, current theories of hardening, aluminum steel, thermal treatment of iron and steel and influence of temperature on steel.

Some of M. Osmond's most admirable researches were those dealing with carbon conditions in steel and critical points in heating and cooling. In recognition of his important contributions to the literature of micro-structure, it has been proposed to use the name Osmondite for the structures in steel representing the intermediate stages between martensite and pearlite and for those found in hardened steels which have been tempered, and to omit the names sorbite and troostite, previously used for these transition products.

No more profound and careful student of his chosen subjects lived in our day, and his research led to many improvements. He was recognized everywhere as one of the highest authorities in the refinements of the metallurgy of iron and steel.

Cleveland-Cliffs Iron Co.

A special dispatch to *Financial America* gives the following results of operation of the Cleveland-Cliffs Iron Co. on the Lake Superior iron ranges for the fiscal year ended Dec. 31, 1911: Operations show a deficit of $233,946. During the year the company paid 17½% in dividends compared with 20% in 1910. The net profits for the year were $1,378,558, against $3,432,513 in 1910. Depreciation charges were $753,255, against $937,401, while dividends amounted to $857,250, contrasted with $982,000. The deficit of $233,946 compares with a surplus of $1,513,112 in 1910. The accumulated surplus now stands at $18,038,067 and is equal to about $370 per share on the $4,910,000 capital stock outstanding.

The restricted profits for 1911 were forecasted in the previous annual report by President Mather, although in the current report Mr. Mather states that conditions for 1912 are greatly improved.

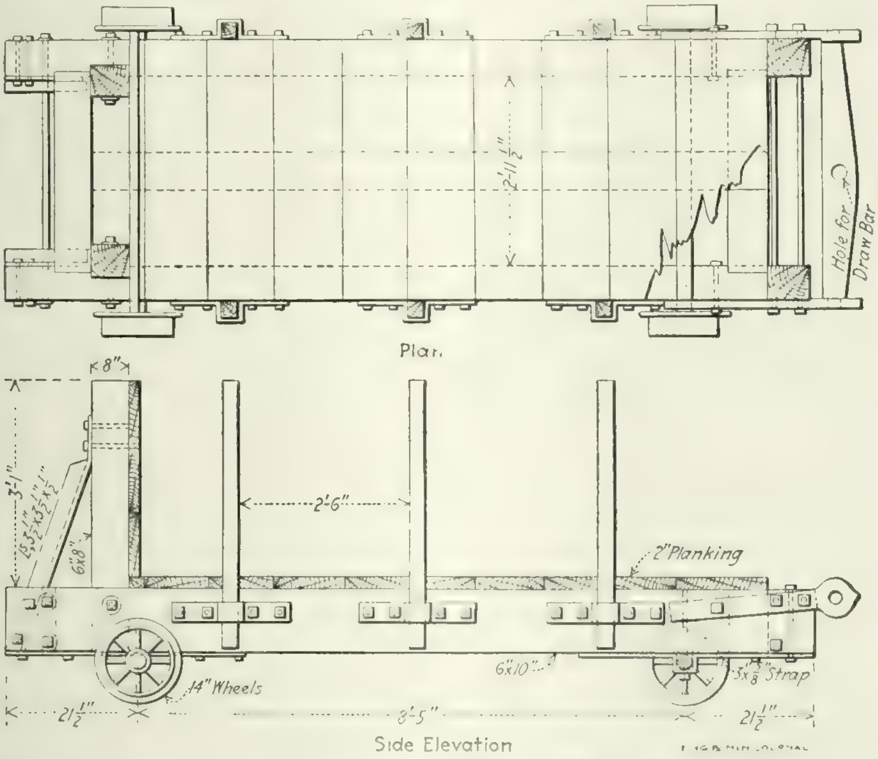
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Truck for Lowering Timber

The truck shown in the accompanying illustration is designed for lowering timber into a mine through an inclined shaft; in this particular instance the shaft for which the truck was designed had an inclination of 40° from the horizontal. The truck can be readily made by the mine carpenter and blacksmith. Bail, bridle, wheels and axles, similar to those of an ore skip, are used.

The truck consists of a platform mounted upon wheels and axres. To the back part of the truck upright timbers, against which the ends of the timbers being lowered rest, are attached as shown in the accompanying illustration. The timbers on the platform are held in place by the side uprights of which there are three at each side. In other respects the truck is operated the same as the ordinary ore skip much used in the inclined shafts of the Lake Superior copper country.



A Truck for Lowering Timbers

The position of holes and order of firing, both in shaft sinking and drifting, depend to a large extent on the nature and stratification of the rock, these also affecting the quantity of explosives used per foot of advance.

Reinforced Concrete in Mine Shafts*

By E. R. Jones†

When it was first proposed to use reinforced concrete in the shafts of the Ahmeek Mining Co. and of the Mohawk Mining Co., two distinct kinds of material were tested; a good grade of gravel and natural sand from a local pit; and the trap rock, through which the shafts were being sunk, together with clean conglomerate sands from the Calumet & Hecla mills. Sets were molded from these two classes of material and installed with equal partiality and subsequent service has proved both to be equal to the demands made of them. Pieces set aside for the purpose were allowed to season sufficiently in order that a fair competitive test could be made, and it was found, that the sand and cement filling in spaces between the rounded pebbles broke away from them, while the fracture in the trap-conglomerate, with the same proportions of sand and cement, continued through the larger elements of the mixture.

The materials finally selected were No. 1 portland cement, conglomerate sand, and trap rock trommeled over ¾-in. screens. The proportions used were 1-3-5 in wall plates, end plates and dividings, and 1-2-4 in studdles. The reinforcement in wall and end plates consisted of three ¾-in. monolith steel bars with ¼-in. webs crimped on, together with two straight ¾-in. monolith bars. The dividings were reinforced by four ½-in. monolith steel bars wound spirally with ¼-in. steel wire, the whole presenting a column of square cross-section. Studdles were reinforced with two pieces of old wire rope 1¼-in. diameter. Reinforced concrete slabs were molded for the shaft lining, the materials used being fine trap rock under ¾-in., conglomerate sand and Kahn expanded metal as reinforcement. The mixture used for slabs was 1-2-4. By way of experiment, I selected a piece of No. 1 hemlock plank of the same length, width and thickness as a concrete slab, which had been seasoned for one year. I supported them at either end and placed them side by side, and then applied an equal pressure across the center of each. Three failure cracks appeared in the concrete slab just previous to the breaking of the hemlock plank, although total collapse of the slab did not occur until the pressure was considerably increased. While the method of test employed was crude, it proved to my satisfaction that the concrete was much superior to the wooden slab in strength. Considering the rapid decay of timber used as shaft lining, no further comparison of the two is necessary.

In molding the concrete sets, 2-in., No. 1 white pine was used in the construction of the forms. The forms were soaked in Delaney's wood preservative and repainted with preservative on the interior each time before setting up, thus insuring them against warping and prolonging their lives indefinitely, as well as securing a smooth and easy parting of the concrete when removed. A Smith barrel-type mixer was used in preparing the charge for the forms. The amount of water used in the mix was such that when the batch was piled, it settled rapidly without agitation. A drier mix was attempted by way of experiment, but on account of the amount of reinforcement employed, it was found impossible to ram the drier mix into place.

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*Excerpt from a paper entitled "Reinforced Concrete as Applied to Mine Shafts," read before the Michigan College of Mines Club, Houghton, Mich., Feb. 25, 1912.

†Mining engineer, Ahmeek Mining Co., Kearsarge, Mich.

The labor involved in making the forms consisted of two carpenters setting up forms and keeping them in repair; one man wheeling forms on to skipways ready for filling, returning used forms to the shop and cleaning them; one man feeding mixer from stock piles of rock, sand and cement; one man delivering mix to forms and shoveling material into place; and one mason ramming charge into final positions. With this combination of men as many as four complete sets, consisting of 64 separate pieces, have been molded in one day of nine hours. In ordinary weather, the sides of the forms were allowed to remain in position over night and then removed, while the bottoms were left in place another 24 hours. The bottoms were removed by turning the pieces on their sides where they were left to harden one day longer before removal to the stock pile. All through the process of removal, the sets were handled with the greatest care in order to preserve the appearance of the set and prevent cracking, which might not develop so as to be visible to the eye until weathered. All skidways used in making and storing were brought to a level to prevent warping and bending while the sets were green, to insure a perfect set under ground, for unlike timber, concrete sets cannot be brought to place unless perfectly true. Sets should not have been used under 60 days after removing forms, although we, through the reduction of the stock piles, have been forced to install pieces of 14-day sets, but the greatest care was observed in handling and putting them in place under ground. Concrete sets one year old, which had been subjected to all kinds of weather, can be abused somewhat and handled almost as carelessly as timber.

These sets were made for the No. 3 and No. 4 shafts of the Ahmeek Mining Co. The shafts are sunk at an angle of 80°, and are 3-compartment shafts, two skipways and one manway. The outside dimensions of the compartments are; skipways, 7 ft. 6 in. high, by 6 ft. 10 in. wide; manway, 7 ft. 6 in. high, 3 ft. wide, with the end plate and dividings, making the greatest span of 7 ft. 6 in. Offsets were molded in all plates five inches from the inside face to accommodate lining slabs. Also, holes were cored for hanging and bracket bolts. The wall plates, end plates and studdles are of a cross-section of 80 sq.in., dividings 81 sq.in. The percentages of reinforcement are approximately as follows:—Wall and end plates, 5%; dividings, 5%; studdles, 3%.

It was found advisable from the beginning, because of the great weight of the wall plates, to mold them in two sections, one section spanning the ladderway and one skipway, and the other section spanning the remaining skip compartment. These two sections were connected when in place by two bolts passing through holes cored for the purpose and two straps of iron spanning the splice. Studdles were made for 4-, 5- and 6-ft. sets, to accommodate the ground passed through.

The weights of the different pieces comprising the sets are as follows: Long section of wall plate, 1035 lb.; short section of wall plate, 700 lb.; end plate, 600 lb.; divider, 645 lb.; and 3x3-in. studdles, 268 lb.; a total weight for a complete set of 16 pieces of 8104 pounds.

Taking the weight of No. 1 western fir, which has been exposed to the weather in stock piles, as 33 lb. per cu.ft., the concrete set weighs almost three times as much as a 12x12-in. timber set which the concrete set is intended to replace. Because of this additional weight of the concrete set, it was found necessary to increase the usual five or six men on the timber gang to seven. In a vertical shaft, to which the concrete sets are especially adapted, the number of men per gang might be reduced. The sets are hung or built as the ordinary timber sets, only requiring an additional rope and block with which to swing the pieces into place. After the sets are wedged to line, bottoms are put in between the plates and the surrounding shaft wall, and the set is then tied to the shaft by means of concrete in the proportion of 1-3-5. The concrete slabs are then put in place, and loose rock thrown behind them, filling up what space still remains between the set and the wall of the shaft.

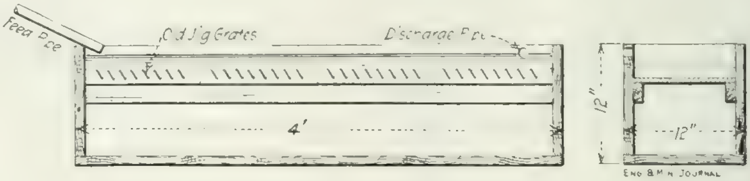
After the set is in place, it is extremely important that it be well protected from the blasting, for unlike the timber set, concrete will not stand blasting. For this purpose I used flat timber and steel plates chained to the under side of the plate and dividings, and even this precaution was at times inadequate. Where the ground was breaking easily, the sets have been as near as 12 ft. to the miners, and again, where the ground was especially hard and tough, sets 40 ft. from the blast have been cut out. It is obvious that it is well to keep as far behind the mining as the ground will permit. In dangerous ground, which requires timbering close up to the sinking, timber sets were used, but had not time played an important part in the sinking, no ground was met in which concrete sets could not have been installed. With a gang of seven men, complete sets can be installed in a nine-hour shift. This permits a sinking rate of more than 100 ft. per month, which was accomplished at the No. 3 and No. 4 shafts.

The comparative costs of the concrete and timber sets, delivered at the shaft collar is striking. The concrete set was delivered for $22.50, the timber set for $37.60. These figures are based on western fir at $28 per 1000 ft., f.o.b. car; crushed rock at 35c. per cu.yd., f.o.b. shaft; conglomerate sand at 60c. per cu. yd., f.o.b. shaft; No. 1 portland cement at $1.15 per bbl., f.o.b. works; reinforcement at $12 per set f.o.b. factory.

Joplin Method of Tempering Drill Bits

In the Joplin district a unique method of tempering the drill steel is used. It is a modification of the plunging method that retains all the advantages of plunging while there seems to be little trouble from temper checking and few drill bits break off at the shank.

The method consists of using old worn-out jig grates to form a shelf to support the drill steel in the tempering tank, which is a rectangular box about 12 in. wide, 4 ft. long and 12 in. deep. This shelf is arranged so that there is from ¾ to 1¼ in. of water on top of the grates. In a few instances more than this depth of water is used over the grates, but that is not good practice as it is apt to result in breaking off of the steel at the water line. The shelf must be made of iron, for if wood were used, the hot drills would burn into the wood enough so that the bit would not be properly cooled, and a soft drill would result. A greater depth of water is used over the grates with machine tempering than with hand work owing to the fact that it is difficult to keep the water as cool with the faster sharpening done with the machines, as when the work is done by hand.



TEMPERING TROUGH FOR DRILL BITS

There is a continuous feed of water going to the tank, and the amount is regulated so that by the time a drill has been put into the tank the temperature of the water is approximately at the temperature of the inflowing water. Of course the depth of the water on the grates is regulated by the overflow, which is generally a 1-in. pipe that takes the water clear out of the blacksmith shop before it discharges it.

By this method the tempering can be done in one heat just as in barrel plunging and there is no necessity of bathing the steel up and down in the water to prevent the sudden cooling of the steel at the water line and the breaking of the drills that would result from that. The reason for this is that the drill bit is covered with such a shallow depth of water that the steam generated by the hot steel causes the water line to play up and down on the metal and does the bathing automatically. An accompanying drawing shows the trough used in this method of tempering steel. All the tool sharpener does is to hold his steel for the right temperature, which is approximately that at which he finishes the sharpening operation, and to stand the drill on the grate in the tempering box. Once he has the water regulated properly, he has to pay no more attention to it.

Bull bits are used, with a blunt angle. In some of the mines cross bits are used, and these are also tempered by this modified plunging method. Some blacksmiths in the district say that they have been able to get as good results by this method as by draw tempering. Draw tempering is generally used on the hand steel, although some hand steel is also tempered by this plunging method. The machine steel chiefly used in the Joplin district is of the lower carbon grades not containing more than 0.60% carbon. The brands principally used are Howe-Brown, Harbord, Red Star, Black Diamond, Midvale hammered and unhammered, and Sisco Acorn.

Simple Method of Cutting Gage Glass

The following is according to the *Engineer and Fireman*, a simple yet accurate method of cutting a gage glass. Cut off and thoroughly wet the head of a match. Then, after measuring the glass, put the wet match head inside the glass at the point where it is to be cut and turn the glass several times until a distinct ring is formed on the inside. By holding a lighted match under this mark the glass may be easily separated at the desired point. By this method the glass may be cut more accurately than by the old way of marking and breaking with a file.

An Electric Pump Device

At the Franklin mine of the New Jersey Zinc Co., the electric motors driving the centrifugal pumps in the lowest station are water-cooled and hermetically sealed, compressed air from the mine system being introduced through a suitable arrangement of pipes. The purpose of this arrangement, which is the idea of R. M. Catlin, manager of the mine, and is carried out in a simple way, is to insure the operation of the pumps in the event of their being drowned.

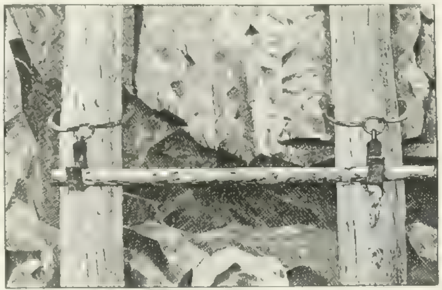
Temporary Staging Suspensions

By L. D. Davenport*

The hangers or suspensions illustrated in the accompanying sketch are used for supporting temporary staging in the Chisholm mine on the Mesabi range in Minnesota. The hangers are used in pairs to support a pole or beam, across two of which planks are laid to make the staging.

Clamps or large staples or boards spiked to the timbers in the drifts were formerly used for this purpose, but are open to the objection that they cannot be used on frozen timber.

The first hangers of the type illustrated were made with a pin or bar connecting the two hooks instead of a ring as shown. The hooks act in the manner of cant hooks, the greater the weight, the more firmly do they take hold of the timber. A spur on the heel of the hook prevents swinging.



Clamps and Pole Ready for Flooring

These hangers are now used in the "slice" rooms at the Chisholm mine. They can be used on timbers ranging from 6 to 24 in. diameter. One of the hangers in each set is made with detachable tongs in order that they may be used with a yoke or handle as timber carriers. They may be also caught into a cap or post and used to hold a snatch block for lifting heavy timber.

Storing Dynamite Caps

Dynamite caps should not be stored with dynamite in the magazine; neither should they be stored in the open in the supply house, as is usually done, for in case of fire everybody will feel reluctant to fight fire around the supply house if he knows that there is a quantity of fulminate caps somewhere around on the shelves. At the mines of the St. Louis Smelting & Refining Co., in the Flat River district of Missouri, the dynamite caps are kept in a safe in the supply house, where there would be little danger of their exploding in case of fire.

Taking Samples from Drill Holes

It is no uncommon thing to drill holes 10 to 12 ft. deep in the walls of a vein to prospect for parallel streaks of ore in mines where the fissuring is of a sheeted type with minor breaks parallel to the main line of fissuring. This is done often where the ore makes off into small irregular pockets in shattered areas of the walls, for often along the vein walls there is little indication of this shattering.

Where the holes are flat or slightly inclined upward, it is not difficult to get the drillings for a sample, but where vertical holes are drilled in the bottom, as, for instance, to test the ore immediately underlying a blanket deposit like the sheet ground of the southwestern Missouri zinc and lead district, or for cheaply getting an idea of what is below the water level when the water in the orebody is heavy and it would be quite expensive to sink winzes, or when for some reason in making an examination of a mine some such information is desired in a hurry, the following in an ingenious way of getting the sample.

The hole is started in a depression in the floor of the working, so that the most of the sludge that comes from the hole will be caught. To prevent the scattering of the mud in drilling the hole when it is shallow, an old gunny sack or some other piece of cloth can be wrapped around the drill or a protecting collar of heavy belting be laced on the piston just above the chuck. Of course, the drillings that are thrown away by the machine with proper mudding of the hole would not greatly vitiate the results, but it is just as well to catch them, as that can easily be done. Running back of the sludge into the hole will interfere to a slight degree with the building of the hole. That can be prevented by building a clay dam around the collar of the hole.

When the hole is not deeper than 6 ft. the sample can be removed with an ordinary 1-in. pipe with the hand over the top to form a vacuum above the sludge when pulling it out of the hole. At greater depths another form of sludge bailer will have to be used. An excellent device for this purpose is a piece of 1-in. pipe with a reducer on the bottom slightly turned down to form a better seat, if a lathe be handy, although this is not absolutely necessary. The valve is a marble with a pin put across the pipe about one inch above its top so that when the sludge is poured out the marble can not fall out of the pipe. If desired a pin can be rigged in the sample can, on which the pipe is rested, so as to lift the marble to discharge the sample without pouring it out through the upper end. But pouring is the more practical way of discharging the sludge from the sampler pipe. About 6 ft. is a convenient length for this pipe pump and when the hole is deeper it can be lowered into the hole by a wire, jumped up and down several times and pulled out. This is far more convenient than using a longer pipe as handling the pipe becomes awkward around the drill when it is made much longer.

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*Night foreman, Leonard Mine, Chisholm, Minn.

This method of sampling the bottom and pumping the drillings is used in the Providence mine near Webb City, Mo., where the grade of the lower run of ore under some headings driven in mining the upper run is being tested with holes drilled from a tripod to a depth of over 20 ft. Drills with specially large bits have to be used as it is impossible when getting the drillings for a sample to resort to blasting for gage as is often done in drilling deep holes.

Some Diamond Drilling Troubles

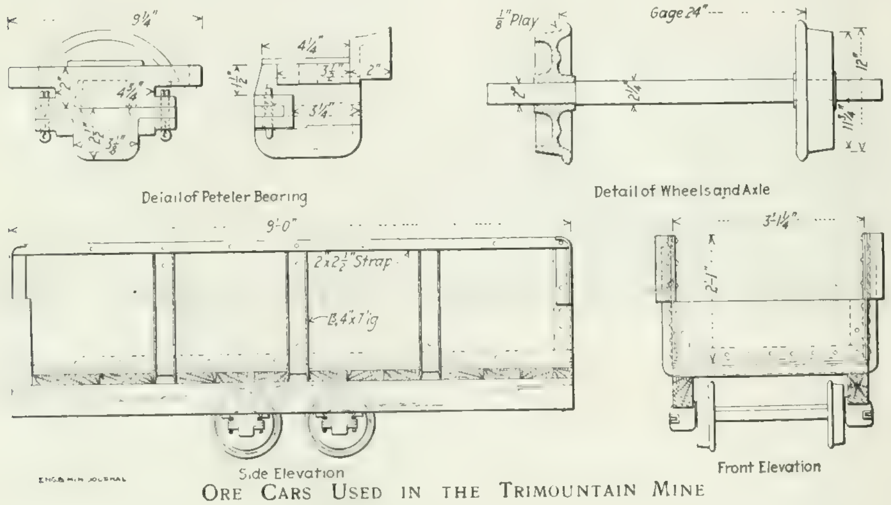
In a recent discussion before the Institute of Mining and Metallurgy (*Bull.* 95) W. H. Trewartha James told of some troubles he had recently experienced in diamond drilling. The boring was being done in Cretaceous sand-stones, shales and conglomerates, lying at an angle of from 15° to 30° from the horizontal. In boring through the small pebbly conglomerates, a hard quartz pebble sometimes came loose from its cement setting, and from its continual movement, wedged or jammed the boring crown, and broke the stones. The shales presented even greater difficulties, although comparatively soft and uniform in structure. They contained cavities and soft parts, and when the boring tool was withdrawn the roof or side of the hole collapsed, and continued to collapse until it became difficult and dangerous to withdraw the rods. Sometimes a chopping bit could be used, and the strata chopped through, keeping the pump going at the highest pressure. Cement was tried, but in this particular case, the fine silt carried by the salt water prevented the cement from setting. In one case the only thing which worked was to ream a hole from the surface down, drive a casing through the cave, and begin boring with a smaller bit.

Especially in boring through shales is lubrication of the rods of prime importance. If the rods are first greased with melted tallow, or other suitable lubricant, and then coated with Stockholm tar, it will be found that the tar makes a smooth, useful lining in the hole, as it tends to prevent caving. In some cases the casing thus formed becomes almost as hard as cement.

Copper Range Ore Car

By Claude T. Rice

The ore car used at the Baltic, Trimountain and Champion mines, in the Lake Superior copper district, is in many respects the best mine car in the copper country. The body of the car is long and low so that shoveling into it is easy, and as the front end is open and the back end somewhat lower than the sides, it is much easier to fill it than some of the better known types of cars. The capacity of the cars is 2½ tons of the Lake Superior ore, which when broken measures 20 cu.ft. per ton. In spite of the length of the car the wheel base is short. The track gage is only 24 in. These dimensions are unique in the practice of the Lake Superior copper region. The wheels are rigidly attached to the truck and the weight is evenly distributed upon the wheels so that the car runs easily. Bearings of the Peteler type, a modification of the regulation railroad bearings in which the journal rotates in brasses, are used without waste in the oil well. The oil receptacle may be drawn out of the solid bearing casting for filling. To prevent trouble from breakage of the bearing castings, they are made of malleable iron.



Detail of Peteler Bearing — Detail of Wheels and Axle — Side Elevation — Front Elevation

ORE CARS USED IN THE TRIMOUNTAIN MINE

The bearings are carried on overhanging extensions of the axle. Because of this the axles must be made strong in order to stand the strain. Stiffening plates that also serve as wings by which the car is grasped when being turned on the turntables are used on the corners of the body. As turntables are provided at all the shaft stations the cars can always be run to the breast front end forward so that the men can shovel into them easily. Leaving the front end open requires the building of a rough wall of boulders across the front, called by the Cornish miners, a "stilling." This must be built up at the front end to hold back the fine ore, but making it does not take much time. Doors were tried on the cars, but it was found that the maintenance was heavy. Owing to the open end, it is possible to up-end the cars, put a brace under the bodies and roll any boulders into the front end of the car.

The truck was formerly made of hardwood, but as that material rots quickly underground, the truck is now made of fir, giving a much longer life. Practically the only maintenance on these cars is the replacing of the trucks. Owing to the rigid axles attached to the trucks, the gage of the track and the wheel base being only 24 in., and the even distribution of the weight of the load on the wheels, as well as the excellence of the lubrication, the tracks on the levels may be laid at a grade of three inches per 100 ft. One man can push one of these 2½-ton cars along a level track without trouble, but such a heavy car is too heavy for one man to tram, so that the tramming is generally done by men in pairs. Because of the length of the car it is not adapted to crooked drifts, although owing to the short wheel base and the rigidity of the axles, the car goes around curves without much binding.

There are many features in its construction that can well be copied elsewhere. The fact that the wheels are fastened tightly to the axle would seem at first glance to be a drawback, owing to the friction in going around curves but becauses of the short wheel base and length of the car, the men obtain such a leverage that they "slough" the car around the curve so fast that the outer wheels jump rather than slide ahead, and no appreciable increase in resistance is noted.

At the Grace Zinc Mining Co. in the Joplin District during 1910, the average tons produced, per machine drill were, 22.52 tons; per shoveler, 15.5 tons; per underground man, 6.17 tons and per man employed, 3.17 tons. The tons per machine drill ranged from 18.30 to 26.38; per shoveler, 12.7 to 18.7; per underground man, 5.17 to 7.84 and per man employed, from 2.71 to 3.67 tons.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

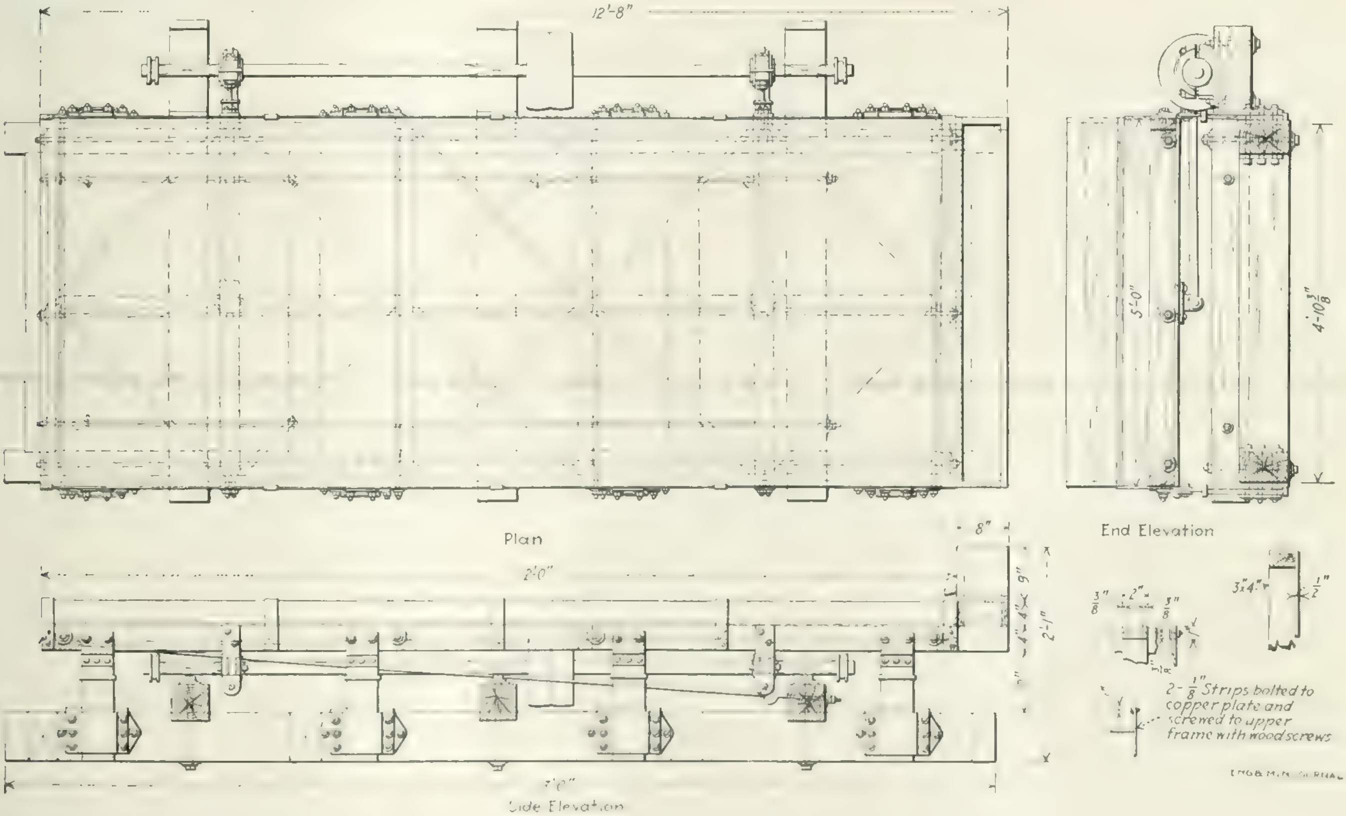
Shaking Amalgamation Tables for Tube Mill Circuit

It is a common practice on the Rand to pass the product from tube mills over amalgamation tables to recover the free gold before the pulp passes to the collecting vats of the cyanide department. As the sand is introduced into the tube mill with the minimum quantity of water in order to secure efficient crushing, the issuing pulp will not flow without dilution in a launder of any practicable grade. Therefore all or a portion of the dewatering cone overflow is added to the tube mill product, making a pulp that contains 2½ parts water to one part sand. In many mills this pulp is caused to flow over shaking amalgamation tables, the table shown in the accompanying illustration being made by the Allis-Chalmers Co.; in some mills stationary plates are used.

The shaking tables are usually housed in a separate building from the tube mills. The floor is of concrete and three concrete piers are made for each table. These are built at right angles to the length of the table, and are as long as the table is wide. The piers are made high enough to permit access to the under side of the table for repairs, and are graded to the same fall as the plate, usually 10%.

The stationary frame of the table, consisting of two longitudinal beams 4½ in. wide by 7½ in. deep and cross beams bolted together, is set on the piers. Attached by bolts and large square washers to each side of the stationary frame are four wooden springs at suitable intervals to carry the shaking table. These springs are made of ash, and each consists of three leaves, the inner leaf being 17 in. long, 5 in. wide and ¼ in. thick supported on either side by a leaf 9 in. long, 5 in. wide and ½ in. thick. The upper end of each center leaf is capped with iron to support a cast-iron recess on the side of the shaking frame. In the accompanying illustration these springs are shown at right angles to the frame. In the City Deep plant the springs are fixed in a vertical position, which is a great improvement, and reduces the tendency of the table to slide down hill.

The shaking frame is made of timbers 2 in. wide by 4 in. deep bolted together. Planks, 9x¾ in., and as long as the table and about three inches apart, are secured to the frame by bolts with recessed heads, the nuts of which are accessible from below for tightening when required. The distance between the upper and lower frames is about 10 in. The springs take the weight of the shaking table, but as the whole structure has a 10% incline it is necessary to insure that slipping does not occur. This is prevented by securing each side of the shaking table to the middle of the stationary frame by two ¾-in. iron bolts about four feet long which are attached to hook bolts.



SHAKING AMALGAMATION TABLE FOR TREATING TUBE-MILL PULP

A copper plate 12 ft. long, 5 ft. 3 in. wide and 3/16 in. thick is a suitable size to use on a shaking table. The size of plates selected determines the size of frame used to support it. The plate is turned up four inches on each side, thus preventing overflow and reducing the amalgamating width to 4 ft. 7 in. The turned edges of the plates are attached to the longitudinal sides of the frame by clamps capable of being tightened when necessary. The shaking frame and copper plate should be so firmly fastened together that they move as one.

Upon the upper end of the shaking amalgamation table, is attached a distributing box which receives pulp from a branch pipe leading from the distributing launder. This box is made of 1-in. wood and is 7 in. wide and 8 in. deep, closed at each end and extending across the copper plate. The side facing down the plate is perforated near the bottom with $\frac{3}{4}$-in. holes. The shake of the table insures an even distribution of the pulp over the plate. The drop of the pulp stream from the distributing box upon the plate is liable to cause scouring of amalgam but this may be prevented by allowing it to fall upon a piece of insertion or thin board upon the plate, below the $\frac{3}{4}$-in. holes.

The required movement is obtained by attaching to the lower side of the shaking table a flat bar connected with an eccentric upon a shaft upon a stationary frame. A short 2-in. shaft 4 ft. 6 in. long, supported by three bearings carried on timbers projecting from the sides of the stationary frame, and provided with fast and loose pulleys, imparts the shaking motion by an eccentric strap attached to the connecting rod. The shaft is driven by a vertical 2-in. belt from a light countershaft overhead. The number of shakes ranges from 160 to 200 per min. according to conditions; the stroke is one inch. All parts of the shaking table should be readily accessible, as owing to the continual vibration, nuts become loose and have to be frequently tightened. The ash springs permit of the side movement of the table, and in starting up a new plant they should be adjusted to suit the length of stroke of eccentric.

A common arrangement on the Rand is to use five of the tables to treat the discharge from each tube mill, although a recent arrangement shows seven shaking tables in front of each mill.

Making up Solutions

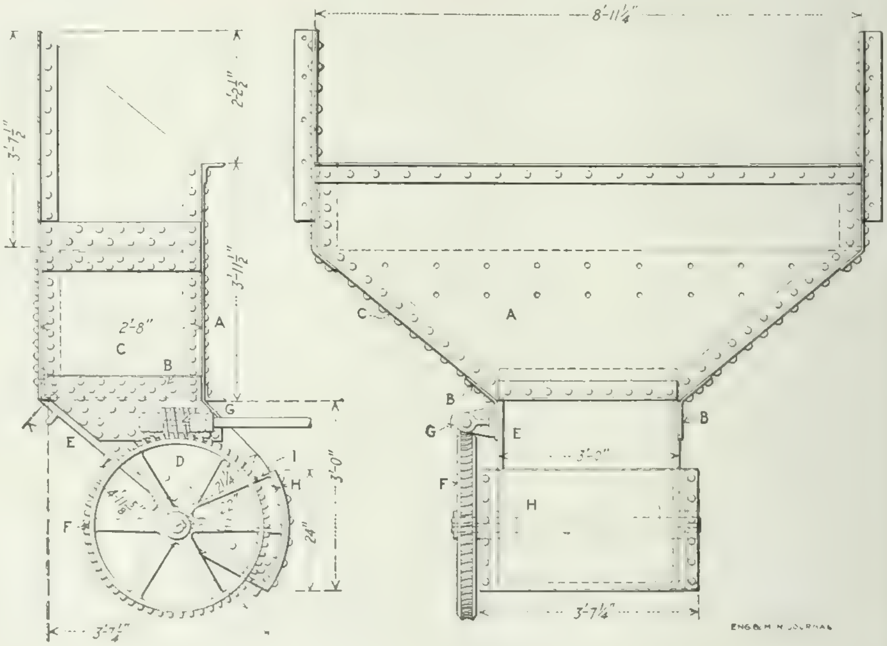
By H. T. Durant*

In making up cyanide and other solutions to any required strength, various tables are sometimes used. For ordinary mill and works purposes, the necessary calculations can be done mentally by the shiftmen. One ton is 2000 lb., and, therefore, one pound of anything to one ton represents 0.05% (one-twentieth of 1 per cent.). For example, a tank contains 300 lb. of solution, testing 0.04% cyanide, and it is required to raise the strength by the addition of solid cyanide to, say, 0.10%. Remembering that one pound added to one ton gives 0.05%, then it is obvious, the required increment being 0.06%, that $1\frac{1}{5}$ lb. of solid cyanide must be added to each ton, and that, therefore, 360 lb. ($300 \times 1\frac{1}{5} = 360$) of solid cyanide will be required to raise the above mentioned 300 tons from 0.04% to 0.10%.

An alteration of the above rule would be required in the event of the ton not consisting of 2000 lb., or in event of high-grade sodium cyanide being used while still adhering to the older method of reporting it in terms of potassium cyanide, or again if the cyanide were merely reported in terms of cyanogen regardless of the base with which it is combined.

Feed Gate for Coarse Ore

In the accompanying drawings are shown the details of the gates used on the hoppers that feed coarse ore to No. 6 Gates gyratory crushers at the mill of the St. Louis Smelting & Refining Co., in the southeastern Missouri lead district. The ore going to this bin is run-of-mine ore that has not passed over a grizzly. Consequently there are many boulders in the ore which no doubt would give considerable trouble from runs in case a gate closing from above was used on the hoppers.



Geared Roller Feeder for Coarse Ore

The gate is of the bottom-closing arc type. It is attached to the bottom of the feed chute coming from the hopper that is built up of front and back plates tied to side plates *C*, by angles. To this hopper the feed chute is tied by $\frac{7}{8}$-in. plates *B*. The bottom of the chute is a ribbed casting *E*, bosses on the back of which serving as bearings for the gate shaft. To this shaft are keyed two gate straps *I*, to which the gate plate *H*, is bolted. On the overhanging end of the gate shaft is keyed the toothed wheel *F*, which is operated by wormwheel *G*, carried in bearings bolted to the sides of the feed chute and through the splice plates *E*. On the end of the wormwheel shaft is a handwheel by which the attendant raises or lowers the gate. Owing to the leverage he can turn the wheel easily, but the gate moves slowly. An air piston could be arranged to operate the gate if desired.

The most interesting feature is that the gate closes from below so that the ore is stopped by damming it back at the angle of repose. Owing to the angle at which the feed chute is set, the gate does not have to be lowered all the way down and the ore feeds down to the crusher on a bed that is dammed back on the cast-iron bottom plate. In this way wear is greatly reduced. An angle iron is riveted to the front lip of the hopper in order to reinforce it. This keeps it from being bent out of shape by the boulders which often roll down with a considerable momentum. This feed gate works well. Its only drawback is that it cannot rapidly be closed in its present form, but that is easily changed if desired. Its great advantage is that it can be closed at all times without any possibility of becoming blocked by boulders.

Chemical Consumption at Montana-Tonopah Mill

At the Montana-Tonopah mill, at Tonopah, Nev., for the year ended Aug. 31, 1910, the cyanide and chemical consumption per ton of ore was as follows: Cyanide (125-130%), 2.126 lb.; lime, 7.68 lb.; zinc dust, 1.04 lb.; lead acetate, 0.345 lb.; and acid, 0.38 pounds.

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Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Cathode and Wire Bar Conductivity

Some dirty cathodes were deposited from impure leady anodes in an electrolyte analyzing as follows, in grams per liter: Acid, 113; $CuSO_4.5H_2O$, 131; As, 16.6; Sb, 0.50; Cl, 0.022; Ni, 17.9; Fe, 2.2 (*Bull.* A. I. M. E., June, 1912). Analyses of the anodes and the refined products were:

	Au, Oz. P.T.	Ag, Oz. P.T.	Cu, %	Pb, %	As, %	Sb, %	Ni, %
Anodes	0.83	213.9	96.59	0.65	1.00	0.32	0.2044
Cathodes		0.9			0.0016	0.0019	0.0028
Ingots		3.8	99.933		0.0010	0.0018	0.0046
Slimes	25.8	5434.2	8.6	22.5	6.8	11.8	5.8

Calculating that all the silver in the cathode comes from floating slime, and that this slime is of the same composition as the regular slimes, the contamination of the cathodes due to slime would have been: Ag, 0.9; As, 0.00113; Sb, 0.00195; Ni, 0.00096, and the difference between these figures and those in the table (practically negligible), would be due to electrolytically deposited impurities. Wires were drawn direct from the cathode, which tested 99.3 hard-drawn, while wires from the ingots gave 94.6 hard-drawn.

Boiler Corrosion

An interesting case of boiler corrosion stopped by a knowledge of physical chemistry, is instanced in *Engineering*, June 14, 1912. The corrosion was due to chemical action by sulphur, and not by electrolysis, as that term is ordinarily used. Serious pitting had started in a stand-by boiler at the generating station of the London Electricity Supply Corporation, which caustic soda was found powerless to stop. On examining the boilers numerous blisters were seen, varying in size up to 30 mm. in diameter, the bulk of them being just below the water-level. On pricking the blisters each was found to contain a liquid with a fine black powder in suspension, and a pit was seen to be forming in the center of each blister. Analysis showed that the liquid was a solution of ferrous sulphate, containing free sulphuric acid, although the water in the boiler was alkaline and contained much less sulphur than the liquid in the blisters. The pitting was traced to the sulphide of manganese in the steel, which by oxidation gave rise to free sulphuric acid, which attacked the iron, forming ferrous sulphate. This being oxidized to ferric sulphate by the oxygen in the water would attack more iron, and in the quiescent water of the stand-by boiler the oxides precipitated by the alkali in the water would not be washed away, but would seal in the corrosive liquid with a semipermeable membrane, through which the oxygen of the water could pass, but not the caustic soda. The use of sodium arsenite instead of caustic soda completely stopped the trouble, the arsenite presumably using up the oxygen in the water.

Ferroxyl

A reagent to which the name ferroxyl has been given by its inventors, Drs. Cushman and Walker, is being used to show the electrolytic corrosion of iron and steel (*Engineering*, June 14, 1912). Ferroxyl is a jelly containing in solution phenolphthalein and potassium ferricyanide. The phenolphthalein gives a pink color in the presence of hydroxyl ions, and the ferricyanide gives a deep blue precipitate in the presence of soluble ferrous iron. The jelly merely serves to localize these effects and prevent them from running into one another. If a piece of iron or steel is placed in the melted jelly and the jelly allowed to set, there are developed on the surface of the metal pink areas and blue areas indicating the positions of nodes of opposite polarity. The blue color shows the anodic areas where iron is going into solution, the pink color shows the cathodic areas where no iron is being dissolved.

Lackawanna Cement Tests

The new tests prescribed by the Delaware, Lackawanna & Hudson R.R. for cement, of which it is a large user, are given in *Engineering News*, June 13, 1912. Neat briquettes are made up as usual, and after being kept in a moist closet for 24 hr., are placed in an autoclave, and well covered with water. Steam pressure is then raised to 285 lb. per sq.in., the time required for this being about 45 min. The pressure is then maintained about 1½ hr., making a total of 2 hr., and the autoclave blown off. Those briquettes remaining intact are then broken in a standard cement-testing machine. If the briquettes stand this test they are ordinarily of first-class quality.

It has been found that properly seasoned cement usually passes a better test than fresh, and that quality is improved by fine grinding, consequently the Lackawanna is requiring that 78% of the material furnished it shall pass a 200-mesh screen.

The engineers of this road believe the failures noted by them come under the following heads, which can be used as a guide board by other users: (1) Use of inferior grades of sand and stone, and badly mixed concrete, or insufficient water to permit the concrete to attain its full strength. (2) Failure due to freezing of concrete placed in winter before the final set was attained, due to calcium chloride, or due to placing concrete in very hot weather when the temperature of the water is around 90 or 100°, the cement also being improperly seasoned. It takes an initial set in the mixer, and is broken when placed in the work. (3) Failures due to green cement, or improperly manufactured material.

Reduction of Carbon Dioxide by Carbon

The velocity of the reaction $CO_2 + C \longrightarrow 2CO$ has been determined by Rhead and Wheeler for various temperatures (Chem. Soc. *Proc.*, p. 104, 1912; abstr. in *Journ.* Soc. Chem. Ind., May 31, 1912). The velocity of reaction increases with increase of temperature, the mean velocity ratios for a temperature interval of 10° diminishing fairly regularly as the temperature scale is ascended.

Thus, in a series of experiments in which a mixture containing 20 per cent. of carbon dioxide and 80 per cent. of nitrogen was employed, the following mean values of *k* at different temperatures were obtained

$$\left(k = \frac{1}{t} \log \frac{C}{C - x}\right)$$

Temperature	k (t = 1 minute)
900	0.00060
950	0.00374
1000	0.01764
1050	0.05760
1100	0.10570

The mean velocity ratios for an interval of 10°, obtained from the expression

$$\frac{k_{t+10}}{k_t} = 10^{10b}$$

are given in the following table, together with the values of *b* obtained from the experimental numbers:

Temperature Range	b	$\frac{k_{t+10}}{k_t}$
900 - 950	0.01589	1.44
950 - 1000	0.01346	1.36
1000 - 1050	0.01028	1.27
1050 - 1100	0.00527	1.13

Proposed French Nickel Coinage

M. Klotz, Minister of Finance, submitted at the last meeting of the Cabinet a proposal to substitute smaller perforated nickel coins for the present copper pieces of 5 and 10 centimes (100 centimes, 19.3 cents) which resemble the British halfpenny and penny pieces, says the London *Times* of June 10, 1912. The proposal contemplates the issue of 80,000,000 francs of the new perforated coinage in pieces of 5, 10 and 25 centimes. Nickel pieces of 25 centimes are already in circulation, but they are not perforated. The object of perforation is to make the new nickel coins distinguishable by the feel from coins of similar size in silver. If Parliament adopts the Government proposals the value of the copper coin which will be withdrawn from circulation is estimated at 59,000,000 francs. The copper would be used for the future coinage of centimes, for colonial coinage, and for the execution of various orders for coins received from abroad.

Thermal Balance of the Electric Furnace

The thermal input of the electric furnace for pig-iron making was worked out by the Trollhättan engineers for the period Sept. 3 to Oct. 1, 1911, as follows (*Met. and Chem. Eng.*, July, 1912): Combustion of CO_2, 567 Cal.; combustion of C to CO, 381 Cal.; electric energy, 1504 Cal. The output was as follows:

Use	Cal
Consumed in reduction	1620
Decomposing limestone	35
Evaporating water	24
Carried off by gases	26
Carried off by slag	75
Carried off in iron	300
Cooling water	195
Transformer losses	43
Conductor losses	44
Radiation and conduction	90
Total	2452

Bauxite in Cement

The addition of bauxite to cements is stated to allow regulation of the time of setting and of the resistance (Fr. pat. 437,860). The bauxite is also stated to stabilize the lime in them, and to produce a quick setting, highly resistant product. The bauxite cements, as well as addition products with lime and plaster, are covered by the patent, as well as the processes of manufacture.

Alumina for Drying Gases

The use of alumina as a dehydrating agent for gases which act upon phosphorus pentoxide is suggested by F. M. G. Johnson (*Journ.* Am. Chem. Soc., July, 1912). The alumina is prepared by the gentle ignition of aluminum hydroxide, and is effective until it gains about 18 % of its weight (a hydration corresponding to $Al_2O_3.1H_2O$). The alumina is regenerated by heating the tube in a smoky flame, while passing air previously led through sulphuric acid, through it.

Melting Points of the Elements

The accompanying table has been taken from an article by G. K. Burgess in the *Journal* of the Washington Academy of Sciences, July, 1911, except for a recent value for the melting point of tantalum, which is lower than that given by him.

MELTING POINTS (C°) OF THE ELEMENTS

Element	Melting Pt.	Authority
Helium	<-269?	B.P.He =—268.5 Kamerlingh–Onnes
Hydrogen	-259	Travers-Jaquerod
Neon	-253?	
Oxygen	-230?	Range —227 to —235
Fluorine	-223	Moissan-Dewar
Nitrogen	-210.5	Fischer-Alt
Argon	-188	Ramsay-Travers
Krypton	-169	Ramsay-Travers
Xenon	-140	Ramsay-Travers
Chlorine	-101.5	Johnson-McIntosh
Mercury	-38.7 ± 0.5	
Bromine	-7.3	Range—7.5 to —7.0
Caesium	26	Range 25.3 to 26.5
Gallium	30.1	Lecoq-Boisbaudran
Rubidium	38	Range 37.8 to 38.5
Phosphorus	44.1	Hulett
Potassium	62.3 ±0.2	
Sodium	97.5 ±1.0	
Iodine	114 ±1	
Sulphur	113.5 to 119.5	Various forms
Indium	154.5 ±0.5	
Lithium	186	Kahlbaum
Selenium	217 to 220	Various forms.Saunders
Tin	231.9 ±0.2	
Bismuth	270	Range 267.5 to 271.5
Thallium	302 ±1	
Cadmium	321.0 ±0.2	Range 320.0 to 321.7
Lead	327.4 ±0.4	
Zinc	419.3 ±0.3	Range 418.2 to 419.4
Tellurium	451 ±1	
Arsenic	500	Guntz-Broniewski
Antimony	630 ±1	"Kahlbaum" purity
Cerium	645?	
Magnesium	650 ±2	
Aluminum	658 ±1	
Calcium	805 ±5	
Lanthanum	810?	Muthmann-Weiss
Strontium	>Ca,<Ba?	
Neodymium	840?	Muthmann-Weiss
Barium	850	Guntz
Germanium	<Ag	Winkler
Praesodym	940?	Muthmann-Weiss
Silver	961 ±2	
Radium	600 to 1200?	Unknown
Gold	1063 ±3	
Copper	1083 ±3	
Manganese	1225 ±15	
Yttrium	1000 to 1400?	Unknown
Samarium	1300 to 1400	Muthmann-Weiss
Scandium	1000 to 1400?	Unknown
Silicon	1420 ±15	
Nickel	1450 ±10	Day-Sosman = 1452
Cobalt	1490	Day-Sosman
Chromium	1505 ±15	
Iron	1520 ±15	
Palladium	1550 ±15	Day-Sosman = 1549
Zirconium	[illegible]	Troost
Thorium	[illegible]	[illegible]berg
Vanadium	1730 ±30	
Platinum	1755 ±20	Waidner-Burgess = 1753
Beryllium	<1800	Parsons
Ytterbium	1600 to 2000?	Unknown
Titanium	2200 to 2400?	Weiss-Kaiser
	1800 to 1850	Hunter
Rhodium	1920	Range 1907 to 1970
Ruthenium	1950	Joly
Niobium	2200?	v. Bolton = 1950
Boron	2200 to 2500	Weintraub
Iridium	2300?	Range 2100 to 2350
Uranium	near Mo	Moissan
Molybdenum	2500?	Range 2110 to > 2500
Osmium	2700?	Waidner-Burgess
Tantalum	2850	Deutsche Phys. Gesell.
Tungsten	3000 ± 100	Range 2575 to 3250 Waidner-Burgess ± 3080
Carbon	?	Unknown

Power Used in Cement Industry

The distribution of power in a cement plant using soft limestone and shale is given by R. K. Meade in the *Journal* of the Engineer's Club of Baltimore, July, 1912. The clinker is burned hard and is difficult to pulverize.

POWER DISTRIBUTION

	Per Cent.
Air drills in quarry	2.0
Stone to crushers	0.4
Limestone crusher	1.8
Shale crushers	0.1
Dryers	1.8
Raw ball mills	5.2
Raw fuller mill	21.8
Kilns	5.9
Coal mill	4.2
Clinker ball mills	2.0
Clinker fuller mills	43.2
Shipping and packing	1.4
Loss and lights	10.2
	100.0

In the accompanying table the power required in each step to deliver the material to the next, is included.

Roughly speaking, material should be prepared for the kilns at an expenditure of between 15 and 20 kilowatt-hours per ton, or 5 to 7 kilowatt-hours per bbl. of cement produced. For the operation of the kilns and driers, including pulverizing the coal for the former, about 2 kilowatt-hours should be sufficient, while for the reduction of the clinker to cement, a final 7 to 10 kilowatt-hours will be required, or in all, from 14 to 19 kilowatt-hours, or 0.7 to 1.06 horsepower-days, per bbl. If a kilowatt-hour is rated at about three pounds of ordinary coal, a barrel of cement represents from 42 to 57 lb. of coal for power and 80 to 100 lb. for burning, or 122 to 157 lb. in all.

Oldest American Iron Furnace Razed

Rapid work has attended the razing of the Port Henry, N. Y., stack of the Northern Iron Co., said to be the oldest furnace in the United States, which is being removed to clear the site for the erection of a new stack, says *Iron Trade Review*, June 27, 1912. The shell, which is double, and its appurtenances, were torn down in about two weeks and workmen began the building of the foundation for the new furnace. The use of an oxy-acetylene torch greatly facilitated the removal of the double shell and structural iron and steel work. The Northern stack was erected in 1872 and 1873 and the first iron was made in August, 1875. Its blowing engines are also said to have been the oldest in use in this country.

Reduction of ZnO by H

Zinc oxide is completely reduced to zinc by heating in a slow current of dry hydrogen (*Bull.* Soc. Chim. Belg., p. 106, 1912). This reaction is reversible in the case of nascent or any other hydrogen that is not absolutely dry.

Recovering Burned Dredge Machinery

By Lewis H. Eddy

The work of recovering the machinery from a 15-cu. ft. Natomas dredge, burned in October, 1911, occupied 104 days. After pumping out the pond and removing burnt timber, much the same methods were used in recovering the machinery as are employed in dismantling a dredge at the end of its commercial usefulness. The digging ladder was removed in two sections and required especially strong tackle.

The machinery of Natoma No. 8 dredge of the Natomas Consolidated, destroyed by fire on Oct. 20, 1911, in the American River district, Calif., has been recovered from the flotation pond and the work of overhauling the wrecked material completed. The pond is entirely clear with the exception of the two steel spuds standing upright as they were when the boat went to pieces. The spuds will remain in their present position until the new dredge is launched when they can be handled with advantage and economy. Besides the spuds the only parts of the burned dredge not brought ashore are four buckets that are sunk 20 ft. in the mud in the bottom of the pond, and some smaller pieces of material, all of which can be raised with the digging ladder of the new dredge.

Of the 72 buckets recovered 69 are intact, two have broken eyes and one has a battered lip. Some of the parts of the machinery withstood the fire and the shock of the breaking up of the boat without apparent costly damage; other parts are unfit for further use in dredge construction. The hull was only partly destroyed by the fire, but it was necessary to wreck the entire structure in order to take out the machinery.

Fired by the Transformers

The fire, which was caused by a disturbance of the electric transformers, started about 9 p.m., Oct. 29, 1911, and by 11 p.m. the boat sunk stern down. The housing burned during the following day and was extinguished by pumps operated from the shore. The wooden parts of the stern gantry were burned and the steel parts fell into the water. The bow gantry remained intact, though listed to port. No injury was done to any of the workmen. The work of recovering the machinery was started on Nov. 2, 1911, and completed on Feb. 14, 1912, a total of 104 days. The water was turned into the pond on Feb. 28. The work of recovery and overhauling was done by the Yuba Construction Company.

The initial work of recovery of the wrecked machinery was to pump the water from the flotation pond, begun immediately after the fire had been extinguished. This was done with two 30-hp. pumps. The removal of all the burned timbers and other remaining wooden parts followed. The position of the boat, the stern burned away and sunk and the bow standing firm though listed to port, saved the bow gantry from damage, while the stern gantry went down of its own weight when the wooden parts had burned away. The revolving screen and some other parts of the machinery remained practically in place. The first direct work of recovery consisted of taking down the main drive and the screen and disconnecting the bucket line. The buckets in the upper part of the line were first taken off to facilitate the removal of the upper tumbler and the hopper. The destruction of the superstructure and the breaking out of the burned portions exposed the machinery to advantage, so that a considerable proportion of the machinery was removed with the same precision as would be employed in the dismantling of a dredge that had gone out of commission at the expiration of its term of commercial usefulness.

There were conditions to be met that are not common to the ordinary dismantling of a dredge, the most serious of which was the removal of the bucket ladder which had fallen across the port pontoon and rested at an angle of 30°. But before attempting the removal of the ladder the two winches and the smaller machine pumps and other material were taken out, followed by lifting the tailing stacker which had broken into two parts. All of the lifting and hoisting had so far been done with a shore derrick with a 25-hp. electric motor.

Digging Ladder Removed in Sections

The bucket-ladder frame or digging ladder, as it is commonly termed, was constructed in four sections. The upper section weighed 27 tons, the second section 23 tons, third section 22 tons and the lower section 30 tons, a total of 102 tons. Added to this weight, in the position the ladder occupied on the dredge were: The lower tumbler, 11 tons; the suspension hanger, 12 tons; and blocks, 6 tons; total weight to be lifted, 131 tons. Tackles were rigged on the bank of the pond and the ladder first straightened. Then the upper and the adjoining section were hoisted separately. The two lower sections were then righted. These two sections of the ladder and the attachments were hoisted with an "A" frame constructed on the bank of the pond.

Hoisting the upper of the two sections was not so difficult as it was to hoist the lower section to which was attached the suspension parts, the lower blocks and the lower tumbler. The tumbler rested on bedrock and was imbedded in 23 ft. of precipitated mud that had hardened and cemented. The ground in which the dredge had been digging is locally known as Rebel Hill; the cemented character of the gravel has required the employment of monitors for initial breaking of about 25 ft. depth and the operation of specially constructed dredges for the digging. It was found to be impossible to move the lower section of the ladder and the attached tumbler without first loosening the cemented mud by the use of powder. Even when this was done the lifting of the 59 tons of machinery and several tons of mud required an especially strong rigging.

Strong Tackle Required

The "A" frame by which the hoisting was done was built on a piece of timber as a base 22x24 in. by 24 ft. long. The legs of the frame were 18x18 in. by 34 ft. high; the cap was 18x24 in. laid on edge; the legs stood on a batter 3 to 1; the two upper ends were 2 ft. 6 in. apart inside. Steel gusset plates fastened the cap to the legs. The top corners were protected from crushing by two angle plates 8 in. wide, 1 in. thick and 4 ft. long. The tackle was carried by clamps on the stern gantry of the dredge. The upper block of the tackle was composed of five sheaves with 1-in. rope; the lower block of four sheaves. Another tackle was suspended from the top of the "A" frame carrying the same size rope. Besides these there were two tackles of three blocks each placed on the ground and over the base of the "A" frame leading down to the lower section of the ladder. The two tackles on the ground were fastened from the inner end to a deadman. One-inch cable was used for this rigging, and all the gear used was made up from material taken from the wrecked dredge. The rigging was operated with a 30-hp. electric motor.

Bow Gantry Not Damaged

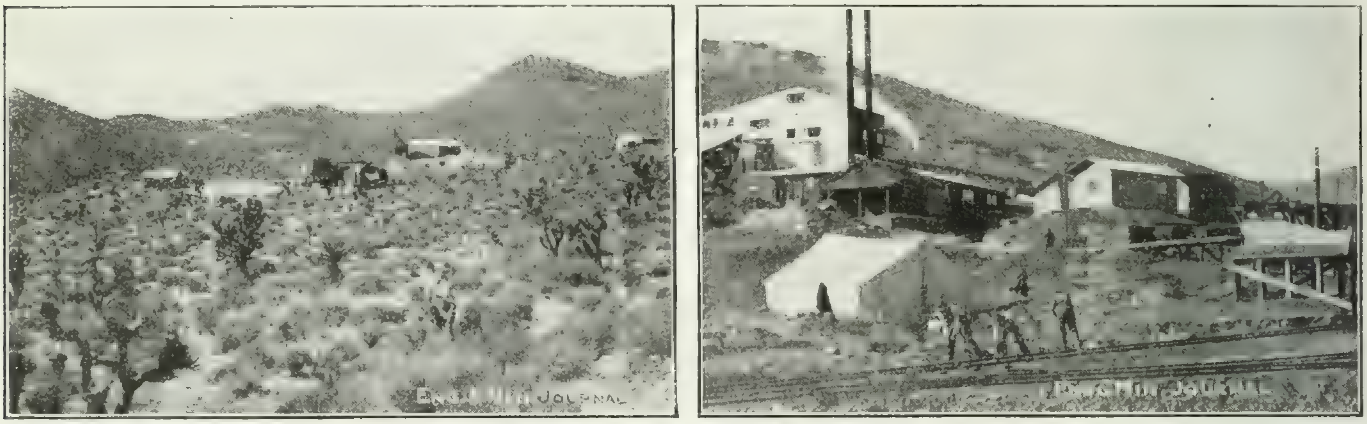
The bow gantry, which was not damaged by the fire, stood in place until removed in pieces, showing the result of the excellent workmanship employed in its construction. All the blocks were still hanging, and the gantry rested on its footing in the hull of the boat as it had been placed in construction. The hull of the boat though not wholly destroyed, was badly racked. The stern gantry was wholly destroyed; it was apparent that the posts had burned, and let the structure fall; the steel material of it was all taken out of the wreck.

The derrick employed in handling the wreckage was of 20-ton capacity, but in this work was required to lift loads greatly in excess of the rating. It is one of the six derricks employed by the Natomas Consolidated in the construction of dredges in the Natoma field. The mast is 105 ft. high, the boom 95 ft. long, each made in four sections.

The entire work of wrecking, recovery and overhauling the machinery was done as systematically and with almost the same precision and expedition as the dismantling of a dredge in ordinary condition or the construction of a new dredge. The machinery and material are laid out on shore in such order as to make their further use or removal convenient and economical. Whether or not any of these parts will be used in other dredge construction by the Natomas Consolidated has not been decided; but a new dredge with steel hull is to be built to take the place of No. 8 and the design and making of the machinery is in progress. This will be the second California gold dredge to be provided with a steel hull.

THE FIRST 15-CU.FT. DREDGE IN AMERICA

Natoma No. 8 dredge was the first 15-cu.ft. gold dredge built in North America. It was designed and constructed in 1910, the machinery tried out in December of that year, and the boat put into commission on Jan. 8, 1911. At the time of the fire it was digging 55 ft. below the water line and averaging 275,000 cu.yd. of gravel per month. The constructional details of this dredge were given in the JOURNAL of July 8, 1911. The dredge was built for the Natomas Consolidated of California by the Yuba Construction Co. of Marysville, California.



YELLOW PINE MINE AND MILL AT GOLDSPRINGS, NEV.

Yellow Pine Mill, Goodsprings, Nev.

By FRED A. HALE, JR.[*]

The treatment of the ores of the Yellow Pine mining district, Clark County, Nevada, has presented numerous difficulties, owing to the complex nature of the ore, and to the closeness of the specific gravities of the valuable minerals contained, rendering the ore hardly amenable to ordinary methods of concentration. Numerous methods have been attempted, the most notable being the leaching plant erected in 1900 by the Mineral Union Co., Ltd., but all proved unsuccessful, until the present plant, operated by the Yellow Pine Mining Co., was completed last fall.

METASOMATIC REPLACEMENT IN LIMESTONE

The orebody of the Yellow Pine Mining Co. consists of a metasomatic replacement in the carboniferous siliceous limestone. The limestone in the ore zone has been completely replaced by lead and zinc carbonates, although there are occasional ribs of coarse limestone within the orebody. The ore, when free from lime, assays about 30% zinc, 16% lead and 12 oz. silver, the zinc being in the form of mixed smithsonite, calamine and hydrozincite. About 75% of the lead content is cerussite, the remainder being anglesite and secondary galena, and the silver is apparently contained within the lead in an oxidized form.

This ore is readily marketable in the crude state on a so called "mixed ore" schedule, but the nearest market being the zinc smelters in the Mississippi Valley, excessive freight rates and high treatment charges absorb most of the profit, so that the producer obtains only about one-fifth of the actual value of the ore. For several years, the Yellow Pine Mining Co. has been working on a method to separate the valuable constituents in the ore, and, while the results from tests by ordinary concentration methods were far from satisfactory, the company was sufficiently encouraged to decide that a specialized method could be worked out which would give good results on the ore. Consequently, the old leaching plant of the Mineral Union Co. was purchased and remodeled to its present condition.

In order to facilitate sorting, the ore is screened at the mine, the skip dumping directly on to a shaking grizzly, having 3/4-in. openings. The screenings, amounting to about 50% of the ore, are kept separate from the coarse and the two are transferred to the mill at Goodsprings, four miles distant, by a narrow-gage railroad, owned and operated by the company. Here the two are dumped into separate bins at the head of the mill, having a total capacity of 300 tons.

From the bin, the fine ore is elevated directly to the fine-ore bin, and the coarse is fed on to an 18-in. conveyor belt, which, at an inclination of 30°, elevates the material to the rock breaker. Four ore sorters are employed, and only clean limestone is picked from the belt. The conveyor belt discharges into an 8x12 Blake crusher, where the ore is crushed to 1-in. size, and dropped into the fine-ore bin. The ore from the fine-ore bin is fed automatically into a set of 16x30-in. Gates rolls, which reduces it to 7 millimeters.

From the rolls, the ore is elevated in a 10-in. vertical elevator to a set of two 3x3-ft. Colorado impact screens, the coarsest having 4-mm. openings, and the fine screen being about 20 mesh. The oversize from the coarse screen passes to a two-compartment Harz jig, which removes practically all the galena in the ore and some lead carbonate, the jig tailing going to another set of 16x30-in. rolls for regrinding, the product from which is again elevated and passed through the screen system. The oversize from the fine screen passes to a second 2-compartment jig, the middling from this jig being sent to the regrinding rolls. A lead concentrate is drawn from the hutch of the second jig and also from the first compartment, while the tail is sufficiently low in lead to go directly to the tailing bins.

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[*] Mining engineer, Goodsprings, Nev.

SPECIAL OVERSTROM CLASSIFIER

The undersize from the fine screen, a 20-mesh product, flows to a classifier, designed especially for this ore by G. A. Overstrom, consulting engineer for the company. This classifier is worthy of special mention, as the successful treatment of this ore is largely due to the close classification and table work. The classifier is of the inverted type, i.e., the slime is removed in the first compartment instead of in the last, as is usual with most hydraulic classifiers. The hydraulic water is introduced in the bottom of the classifier through a 6-in. main, drawing from a special tank kept at a constant head by means of a float valve. The classifier has six compartments, formed by vertical partitions, and the velocities in the different compartments are varied by their different area of cross-section.

The classified products flow from the top of these compartments and a plug is inserted in the bottom of the final compartment to enable the withdrawal of any oversize too large to be elevated by the upward current. This classifier makes a cleanly divided product, 90% of the slime being removed in the first compartment, and requires little or no attention, there being but the one valve to adjust. The discharge from each compartment of the classifier goes to a special table of the Overstrom straight-line type, but especially designed for this ore. Grooved linoleum is used instead of wooden riffles, and a feature of the table work is the varying size of the tables.

The table taking the coarsest feed is 16 ft. by 4 ft. 6 in., and the slime table is 10x7 ft., the tables taking the intermediate sizes being of a proportionate length and breadth between these two limits. This has been found to effect a closer concentration, with an increase in the capacity of the table, owing to the minimum of waste space on the table.

A middling product is drawn from the first two tables, and returned for regrinding, but the remaining tables make but two products, concentrate and tailing. The concentrate is wheeled to the storage bin and loaded into cars for shipment. The tailing passes to dewatering bins, and is drawn from them into cars and thence to a platform, where it is dried for shipment. Water is not plentiful and all that is possible is returned for re-use. About 10% of the tailing is a slime product, which, after being thickened in cone-settling tanks, is run into slime ponds to dry for shipment.

ALL SEPARATED PRODUCTS SHIPPED

It can be seen that the mill is essentially a separating plant, rather than a concentrator, and all products are shipped, except the waste limestone picked from the belt. From a mill head, averaging 28% zinc, 17% lead and 10 oz. silver, a lead concentrate is produced averaging 62% lead and 45 oz. silver, while the tailing contains 33 to 35% zinc, making both profitable shipping products. The capacity of the mill is 75 tons per 24 hours, and from a continuous operation for the last six months, it has been determined that the increased value due to milling exceeds $5 per ton, above the cost of milling.

The company owns and operates a narrow-gage railroad 12 miles long from Jean, the shipping point on the San Pedro, Los Angeles & Salt Lake R.R., to the mine, via Goodsprings, where the mill is situated. Crude oil is used for fuel both on the railroad and for the mill, and costs $1.24 per bbl., f.o.b. Jean. The freight rate from Jean to Utah smelters on this class of concentrate is $6 per ton, and to the zinc smelters in the Mississippi Valley, $8 per ton.

Electrolytic Treatment of Water

BY G. D. VAN ARSDALE*

While ordinarily the purifying of boiler feed water must be a cheap operation, there are isolated points at which purification at high expense is still economy. Such was the case at a station on the Eastern division of the El Paso & Southwestern R.R., where a cost of even 50c. per 1000 gal. treated would have given a net saving. Ordinary chemical treatment was out of the question because the water was so hard that if enough lime and soda ash were added for complete softening, enough soluble salts were introduced to give prohibitive priming.

A plant was finally erected to treat 120,000 gal. of water per day by electrolysis of the water between iron plates. The plant ran from October, 1907, to January, 1910. The plant was finally abandoned, as not all waters were amenable to the treatment, and with others the cost was excessive, but it is thought the experience may be of value in other places, even though not a permanent commercial success where it was first tried.

On passing a current between either iron or aluminum electrodes, both the anode and cathode are attacked (the first to a much greater extent), with the formation of a large amount of hydrates of the metal, which detach from the plates and become suspended in the water. On continuing the action for a sufficient length of time, under the proper conditions of voltage, etc., which must be carefully determined for each water, a softening of the water and removal of certain of the dissolved salts takes place, proceeding to a minimum softness, which is different for each case. The action is not entirely understood, but the results show that some waters can be readily softened in this way at an expense which in some places is not prohibitive. The action is probably to be explained partly by occlusion by the hydrates formed, and partly by the fact that lime and magnesia and other constituents are separated by the electrolysis at the electrodes in an insoluble form, being removed with the precipitates which are formed there. A complete removal of the organic constituents also was observed in all cases tested, together with an appreciable reduction in the Cl, and SO_3 ions. In smaller-scale work a complete removal of emulsified oil, and also of bacterial impurities was observed.

These occlusion effects can, of course, be produced equally well by the formation of hydrate precipitates by chemical means, but the method under consideration has the considerable advantage of not introducing anything into the water as a result of the treatment. This is especially important for use for drinking, and as a matter of fact, drinking-water from this plant became popular in the little town soon after its installation, and I know of at least one much smaller plant which has been in operation for a number of years, producing water for sale for drinking and the making of soft drinks, which have a favorable local reputation. The cost of treatment necessary for removing organic constituents and suspended matter is comparatively small, so that in many cases, the method could be used for furnishing an absolutely safe drinking-water supply from doubtful water. After the electrolysis has proceeded far enough, the sludge is removed by filtration or settling, and the water is ready for use.

Most of the following data are adapted from a report made by H. W. Cutshall of the E. P. & S. R.R.: The plant consisted of three wooden tanks, 79 ft. long, 5 ft. wide and about 3 ft. deep. Each was divided into 25 vats of equal size. The tanks were of clear yellow pine, dressed down to 1½ in. The sides were provided with vertical strips, leaving a slot between to allow insertion of the plates, of which 60 were used for each vat. The plates were connected electrically so as to form two multiples of 30 plates each, to each vat, and in wiring four sets of plates in consecutive vats were connected in multiple and these were connected in series with the two tanks on each side. The switches were arranged so that any two of the tanks might be used while the third was being cleaned or filled. The capacity of each tank is 7200 gal., which allowed a treatment to be given to double this amount at one time.

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In treating water which showed a hardness of 40 soap test, and with plates spaced 1 in. apart, there was required at the beginning 250 amp. This gradually decreased during the treatment until at the end of four hours it registered 195 amp., the water then showing a hardness of eight. During the treatment bubbles (hydrogen and oxygen) were formed which rose to the surface in the form of foam, and sludge accumulated, partly on the negative plates and partly at the bottom of the tanks. This sludge made it necessary to provide some method of filtration, and a pressure filter was installed which did not prove satisfactory, and was discarded in favor of settling and decantation, although the latter method wasted considerable water. During the treatment it was observed that the corrosion of the plates was rapid where sludge accumulated at the bottom and formed a partial short circuit between the plates, but this could be avoided by altering the design.

ELECTROLYTIC TREATMENT OF WATER

	Treated	Untreated	Per cent removed
	Grains per U. S. gal		
SiO_2.....	0.175	0.58	70
$FeAlO_3$...	0.175	0.35	50
CaO.....	1.137	6.85	83
MgO	0.420	1.84	77
Na_2O....	0.928	1.19	22
SO_3	2.100	6.75	68
Cl.......	0.641	0.82	21
CO_2......	0.462	4.01	86
Total	6.038	22.39	73

Analyses by Seamon Assay Co.

The original installation with the plates spaced one inch apart was operated for 10 months, when it was found that fully one-third of the plates were so consumed and buckled that it became necessary either to replace or to re-arrange them in order to continue work. During August and September the plates were re-arranged in two tanks, using enough whole plates to space them two inches apart instead of the original one inch, leaving the third tank with the plates spaced one inch. This had the effect of reducing the current consumption in amperes almost half, with results almost as good as with the original installation.

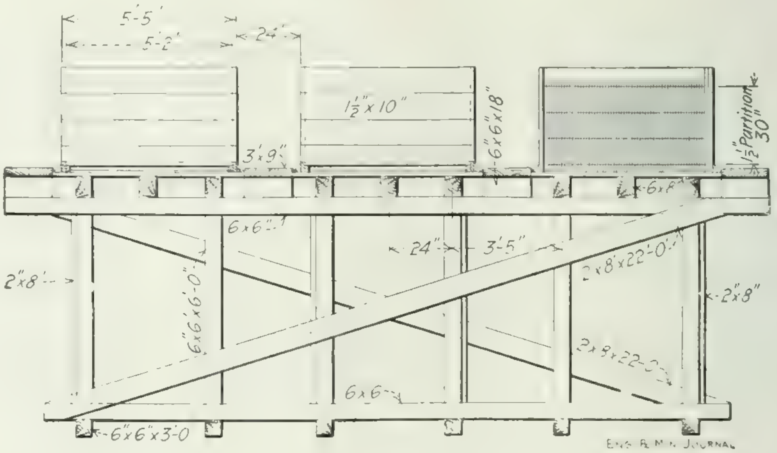
The most serious difficulty in the operation of the plant was the disposition of the sludge, which accumulated in great quantities in the treating and settling tanks. The weight of the plates and their number made it impossible to remove them for cleaning, but after the bottom of them had become eaten away so that the sludge did not form a short circuit, better results were obtained, and the former difficulties from this cause removed, and up to the time the plates were almost entirely consumed little change occurred either in time or conditions of treatment.

Another trouble was the corrosion of the nails used for fastening the side strips, which allowed short circuits between the plate.

The power for this plant was furnished in the beginning at a cost of ¾c. per horsepower-hour, which price was afterward doubled by the power company.

Analysis of the treated water showed that the treatment rendered it a good boiler water, and with modification a plant built on similar lines could be operated much more cheaply by avoiding some of the troubles experienced.

Some data from the operation are given: Total gallons water treated, 42,494,400; cost of electricity, $361,298; cost of coal for pump, $998.97; labor, $5117.50; iron consumed per thousand gallons of water treated, 2.561 lb.; cost of plant not including plates or expense of experiment, $3580; cost of plates per pound delivered, $0.04; weight per plate, 27.6 lb. Analyses of the raw and treated water are as shown in the accompanying table.



ELECTROLYTIC TANKS FOR WATER TREATMENT

Ohio 1911 Coal Output

There were 30,759,986 tons of coal mined in Ohio in 1911 as contrasted with 34,209,668 tons in 1910. That was a high-water figure, caused by Ohio's coal supplying part of the market ordinarily controlled by Indiana and Illinois coal. There were 9530 men on strike in 1911, losing an average of 3¼ days. The coal mined by machine was 86.5% of the total, while less than 2.8% was shot from the solid.

Iron Mining in New Jersey

A bulletin by Henry B. Kummel, State Geologist of New Jersey, gives the results of iron-ore mining in the state for two years past. The production and values were as follows:

	1910	1911	Changes
Tons mined	521,832	359,721 D.	162,111
Value at mines.	$1,582,313	$1,158,271 D.	$424,042
Average per ton	$3.03	$3.22 I.	$0.19

In addition to the decrease in tonnage mined the stocks at mines increased during the year from 17,567 to 115,581 tons, making a total decrease of 260,125 tons in shipments. The production was less than in any year since 1900, when it was 342,390 tons. Some notes on individual mines follow:

"Of the Hibernia group of mines only the Wharton mine was a producer, all of the other openings on this property being idle. At Wharton the Hurd mine was operated, but the Irondale and Orchard were shut down. The Richard mine [Thomas Iron Co.] was actively worked, and its production far exceeded that of any other; indeed, its production was approximately equal to that of its most successful year. Some of the Mount Hope [Empire Steel & Iron Co.] openings were worked and at Oxford the Washington and Ahles mines were producers".

"The Peters mine at Ringwood increased its output, and so did the Hoff mine, near Dover. The Shoemaker mine, near Belvidere, was worked a portion of the year, but was shut down in October, and the High Ledge mine was a small producer for a portion of the year.

The bulletin says: "There are in northern New Jersey vast deposits of magnetic iron ores that are too low in iron for use at the present time, but which can be economically concentrated into very rich material. In many cases the fineness of crushing necessary to secure proper concentration has prevented their use except in a very limited degree."

The Flotation of Minerals

Some further research work is described by Kenneth A. Mickle. Sulphides carrying 0.5 to 5% of adsorbed oil tend to attach gas bubbles, this tendency being greater at the lower limit; oil aids but does not cause gas attachment; acid tends to prevent gas attachment but its action is stronger on gangue particles than on sulphides. Analyses of gases from flotation products show that carbon dioxide is more persistently attached to sulphides than is air. Ferric chloride found to assist in separation of zinc and lead sulphides.

Note—Abstract of a paper by Kenneth A. Mickle, in the Proceedings of the Royal Society of Victoria, Vol. 24 (N. S.), Part II, 1911. Continuation of a previous paper which was abstracted in the Engineering and Mining Journal of Aug. 12, 1911.

Pure water, on being vigorously agitated with air, shows very little tendency to produce a froth. This tendency is much increased by the addition of small proportions of certain substances, not only those which are soluble in water, such as saponine and acetic acid, but some which are insoluble, such as various oils and certain finely divided solid substances.

FROTHING CHARACTERISTICS

Without doubt the phenomena of liquid cohesion are important factors in producing froth, but it seems apparent that gas attachment is the chief factor, and a comparison of the proportions of froth produced would, therefore, afford an approximate measurement of the attachment of air to water and to various aqueous solutions and mixtures.

In the first experiment, one drop of the contaminant was mixed with 60 c.c. of pure water and agitated vigorously with air, the froth produced being noted on the substances rated as follows, in descending order: (1) Saponine; (2) turpentine; residual oil (from rectification of eucalyptol); (3) refined petrol (0.754); acetic acid; (4) eucalyptol; crude shale oil (0.900); cottonseed oil; (5) oleic acid; combustion-engine oil (0.831); (6) shale residue oil; (7) kerosene; (8) alcohol; oil of wintergreen; naphtha; gasoline; ether; petroleum; sulphuric ether; the froth produced by the last members of the series was practically the same as with pure water.

Agitated with air, 60 c.c. of water and 10 c.c. of each substance produced froth in the following order: Saponine; naphtha; kerosene; machine oil; oleic acid; turpentine; eucalyptol; gasoline; alcohol; acetic acid; glycerine (practically no froth).

Each of the various contaminants alone agitated with air, afforded froth in practically the same order as when one drop of the contaminant to 60 c.c. of water was used. The froth produced was, however, less than when water was present. It is difficult to reconcile these three series of results.

It being apparent that the capacity of various mixtures of oil and water after agitation would indicate a measure of the attachment of one to the other, the following observations were made. In each case one drop of the contaminant was added to 60 c.c. of water and agitated with air; after standing, the opacity of the solution was observed: Oil of wintergreen (greatest opacity); turpentine; cottonseed oil; residual oil from rectification of eucalyptol; machine oil; kerosene; naphtha. In the case of the other substances a clear solution resulted. In some cases solutions still showed opacity standing for a week.

When 10 c.c. of the substance was added to 60 c.c. of water and agitated with air, after standing for some time, a layer of white emulsion was noticed between the layer of oil and the surface of the water. This was greatest in the case of machine oil and oleic acid, followed by oil of wintergreen, naphtha, kerosene, eucalyptol and turpentine. The other substances showed no emulsion.

In conducting these tests with oils and water, it was noticed that the following oils spread out as a thin film when one drop was added to the water: Turpentine, gasoline, naphtha, eucalyptol and kerosene. Oleic acid formed a film with one drop, but on adding another drop, the second remained as a globule. The following oils remained as globules on the surface of the water: Cottonseed oil, machine oil and engine oil. This property depends apparently to a large extent on the viscosity of the oil, for, as a rule, with the thin oils a film was formed, while with the thicker oils the drop remained as a globule. Viscosity is not, however, the only determining factor, as some of the more viscous oils were found to form films.

ADSORPTION OF OIL BY MINERALS

Oils protect minerals from being wetted by water, owing to their affinity for metals and many metallic substances. As no accurate method of measuring this affinity has been suggested, and as minerals may occur in many different forms with varying physical characters, no attempt is made here to make a definite classification on this basis. Tests were, however, carried out to show the amount of oil absorbed by minerals, and to indicate the character of the resultant product. Mixtures of mineral, water and oil (with and without a small quantity of acid) in definite quantities were agitated thoroughly until the character of the resultant product reached a definite standard.

The results of these tests showed that while there are differences in the degree of attraction between a given sulphide and various oils, and between various sulphides and a given oil, the general behavior between various sulphides and various oils in the presence of water is practically the same in character, i.e., all sulphides will become attached to all oils in preference to water. With the silicates and other rock minerals usually found in gangue material of ores, the character of the product varies with different minerals.

In the case of sulphides, bottles were taken containing 200 c.c. water, 5 grams of oil, and 0.5 gram sulphuric acid. Increasing amounts of the sulphides were added to each bottle, which was then well agitated to bring the mineral into intimate contact with the oil.

TESTS WITH BLENDE

In the first test, blende crushed to pass a 40-mesh sieve was used with a heavy engine oil. With 1 gram blende, on agitating, some of the mineral floated on the solution, being buoyed up by the oil and entangled air bubbles. On standing, all the mineral sank to the bottom of the bottle, carrying large blobs of oil with it The product formed by the oil and blende was oily and nonmiscible with the solution. An excess of oil floated on the surface of the solution and adhered to the surface of the glass above the level of the solution. With 5 grams of blende, much oil was carried down with the blende, but on standing some of it broke away and came to the surface, leaving an oily mass, nonmiscible with the solution. An excess of oil showed on the surface and adhered to the glass above the level of the solution.

With 10 grams a heavy, freely flowing, oily magma was formed below the solution. Excess of oil still showed on the surface. With 20 grams of the blende, the oily product became more putty-like in appearance, and moved less freely than with 10 grams. An excess of oil still showed on the surface of the solution and on the bottle. With 30 grams a putty-like, plastic mass was formed by the blende and oil, which was difficult to break up on agitation. A slight excess of oil still showed on the surface of the solution. With 40 grams the product broke up into large rounded lumps on agitation. No excess of oil showed on the surface of the solution or on the bottle. On violent agitation a few bubbles of air became attached to the mass. With 80 gm., the product of the oil and blende consisted of a mass of small coherent aggregations, which on violent agitation attached many air bubbles, but would not float. With 120 gm., the aggregates of blende and oil were smaller and less coherent. The blende at this stage seemed more prone to attach air bubbles, and showed a tendency to float. The appearance of the product was quite different from a similar quantity of unoiled blende in water.

Galena and Oleic Acid Tests

Another series using galena and oleic acid in similar proportions, showed that the general character of the products was similar to those produced with blende and engine oil. The oily magmas formed on the bottom of the bottles by the galena and oleic acid were less viscous and flowed more freely. A little free oil still remained on the surface of the water when 40 gm. of galena had been added; no free oil appeared with 80 gm. The products with 80 and 120 gm. of galena were more coherent and less prone to attach bubbles of air than was the case with blende. The stage at which small granules formed was less marked with galena than with blende.

In another series with heavy lubricating oil and blende, most of the oil was carried to the bottom with the blende in the form of a putty-like ball when 30 gm. of the blende had been added. This plastic mass would not break up on shaking violently, and was not miscible with solution. With 20 gm. of blende, the product was a thin, plastic mass on the bottom of the bottle, and nonmiscible with water. A large excess of oil remained on the surface of the water. With 40 gm. of blende, the mass showed a tendency to break into small lumps, but had no tendency to attach air bubbles. The lumps were rounded and were about the size of broad beans. No free oil showed on the surface of the water.

In another series, using copper pyrites and 5 gm. of heavy engine oil, all the oil was carried down with 30 gm. of copper pyrites, to form the putty-like magma which would not break upon agitation. When 40 gm. had been added, the magma showed a tendency to break into smaller lumps, but no tendency to attach air bubbles. With 80 gm. of copper pyrites the product was a mass of coherent aggregates under the solution, each aggregate being about the size of fishes' roe. With 120 gm. many air bubbles became attached, producing a marked tendency to float. The aggregates were smaller than when 80 gm. of copper pyrites had been added.

Galena and Other Oils

With galena and kerosene, all the oil was not carried down until 80 gm. had been added. The products were less coherent and less viscous than with the thicker oils.

Using machine oil with galena, little excess of oil showed on the surface when 30 gm. galena had been added, and no excess showed with 40 gm. With 60 gm. of galena the magma showed a tendency to break up, on shaking, and to attach air bubbles.

Using 5 gm. of cotton-seed oil with galena, a small excess of free oil appeared on the surface of the water when 30 gm. galena had been added; no excess with 40 gm. galena. The putty-like magma formed, but was not so viscous as with the thicker oils. No distinct stage occurred at which the oily magma broke up into smaller rounded lumps, as in the case with some of the oils. With 60 gm. a tendency to attach air bubbles was shown and when 80 gm. of galena had been added some of the galena would float, on agitation.

Using a eucalyptus oil containing 80% phellandrene, it was not until 80 gm. of the galena had been added that all the oil was carried down. No distinct "putty" stage occurred, all the oily products being more or less a freely moving pulp.

Tests with Sized Minerals

A series on the same lines as the above tests, but using minerals that had been sized, was then tried. Galena crushed to pass a 30-mesh sieve, but retained on a 40-mesh, was mixed with water and 5 gm. of oleic acid, as in the other tests. With 80 gm. of galena a slight excess of oleic acid still showed on the surface of the water. All the oily products under the surface of the water were feebly coherent, but no distinct putty stage occurred. With 200 gm. a few air bubbles became attached.

Using galena crushed to pass an 80-mesh, and retained on a 120-mesh sieve, with 5 gm. oleic acid, all the oil was carried down with 60 gm. of the mineral to form the characteristic putty-like magma. A small excess of oil showed on the surface of the water with 40 gm. of galena.

With galena crushed to pass 120-mesh sieve, all the oil was carried down by 40 gm. of the mineral. When 30 gm. had been added, the plastic putty-like mass was formed. With 120 gm. of this sized galena to 5 gm. of oleic acid, the product was much less coherent than with 120 gm. of galena crushed to pass an 80- and remaining on a 120-mesh sieve.

Experiments in Unacidulated Water

The foregoing tests were carried out with water acidulated with 0.5 gm. of sulphuric acid. The following is a short summary of the results of tests on the same lines, but using water which had not been acidulated.

Using galena crushed to pass 120-mesh sieve and 5 gm. of waste engine oil (fairly thick), the same general results were obtained as when acid was present. All the oil was carried down with 30 gm. of galena. The putty-like magma occurred when 40 gm. had been added, this product being firmer than that formed with 30 gm. When 60 gm. of galena had been added, the magma broke into granules. With 80 gm. of galena, air bubbles showed a tendency to become attached, and with 120 gm. a marked tendency to float was observed.

Other tests on the same lines, without acid, showed that with smaller proportions of oil to mineral the product was more prone to attach air bubbles and had a more flocculent appearance than when acid was present.

Two bottles containing 50 gm. of galena and 0.8 gm. oleic acid with 200 c.c. water were taken, and to one of them 0.5 gm. of sulphuric acid was added. The appearance and character of the products formed, after agitating vigorously, differed from one another. The aggregations formed in the acidulated solution were less flocculent and showed less tendency to float, on agitation.

Silicates and Other Gangue Minerals

The various silicates and other gangue constituents of sulphide ores, when agitated with various proportions of oil and an excess of pure water, exhibit less tendency to attach the oil than the various metallic sulphides. This tendency to attach oil in preference to water is very feeble in the case of the more acidic minerals, but is so great in the case of the more basic minerals that their behavior approaches that of some of the metallic sulphides. For instance, with 40 gm. of quartz or orthoclase, 5 gm. of oleic acid and 200 gm. of water, nearly the whole of the oil will separate and float on the surface of the water, while the mineral particles sink in the water without any sign of aggregation, a few scattered blobs of oil only being carried down with the mineral. On the other hand, with similar proportions of rhodonite and garnet, oil and water, the minerals unite with the oil to form coherent aggregations, and no oil separates as in the case of quartz and feldspar. Calcite also produces coherent aggregations with oil in nonacidulated water which on agitation readily attach air bubbles.

The addition of small proportions of acid (0.5 gm. sulphuric) to the water in all cases lessens the oil attachment. For example, on agitating the above proportions of quartz and oleic acid with acidulated water, the quartz behaves as if no oil were present; this is also the case with orthoclase.

With rhodonite and oleic acid, in acidulated water in the same proportions as before, free oil separates and floats on the surface of the solution. The product is a sandy pulp which is freely miscible with solution. This pulp has an appearance very different from the product formed by nonacidulated water, oil and rhodonite in the same proportions. With mixtures of galena and rhodonite, the oil collects the galena to form granules, while the rhodonite remains as a sandy pulp which could be washed out if desired. In cases of a mixture of a sulphide which will attach oil and a gangue mineral which, in an acidulated solution, will not attach oil, some of the gangue mineral is held mechanically by the sulphide aggregates, and thus may be caused to float, although having no natural tendency to do so. In such a case, what may be termed coadsorption may take place. For example, quartz sand by itself will not float with oil in a nonacidulated solution, but the particles of quartz sand in a gangue with other minerals, as in the case of Broken Hill tailings, are readily floated with oil in nonacidulated water. This coadsorption will take place in feebly acid solutions, and thus particles of rhodonite and other gangue may be caused to float.

ADSORPTION OF OIL IN WATER

From the above tests the following may be deduced:

(1) Finely divided sulphides, when suspended in pure water, will adsorb varying amounts of oil. Large proportions of oil tend to form magma, and smaller proportions plastic masses and coherent aggregates. The character of these oily magmas depends upon the amount and the character of the oil used. Thick oils give viscous coherent products, and thin oils give less coherent products. Oily magmas containing considerable proportions of oil will entangle and hold gaseous bubbles with a degree of persistency which depends on the viscosity of the oil. Sulphides carrying about 5% of adsorbed oil tend to attach gaseous bubbles, and this tendency increases as the proportion of oil diminishes, until a certain limit is reached, which is 0.5% or thereabouts.

GAS ATTACHMENT IN DIFFERENT WATERS

	Distilled Water	Air-free Distilled Water	Tap Water
Cleaned Foil	A few bubbles collected on the foil, but the foil did not float	Very few bubbles formed on the foil; when these were detached no more formed.	Foil floated by the buoyancy of the bubbles that became attached.
Uncleaned Foil	Many bubbles became attached and the foil floated to the surface	A few bubbles formed on the foil, on detaching which no more formed.	Same as cleaned foil.

(2) Adsorption is more pronounced with sulphides than with such minerals as quartz, feldspar and most of the acidic rocky minerals forming the gangue of ores.

(3) Some of the silicates and other gangue-forming minerals will adsorb oils in a manner approaching that of the sulphides, for example, rhodonite, garnet, magnetite and calcite.

(4) Tests on sized minerals show that the amount of oil adsorbed depends upon the extent of surface exposed.

(5) In acidulated solutions, sulphides will adsorb oil in the same manner to form oily magmas, plastic masses and coherent aggregations, as in the case of water and oil without acid. The amount depends on the extent of surface exposed by the minerals, as previously.

(6) Gangue minerals will not adsorb oils to nearly the same extent as when no acid is present.

(7) The maximum amount of oil adsorbed by sulphides in a stable manner, when crushed to pass through an 80-mesh sieve, is about 10 to 15% of their weight. This is shown by the absence of excess of oil on the surface of the solution in the above tests when the percentage of oil to mineral was at or near these values. The tendency of the plastic magma to break up and form less coherent aggregates at this point also indicates this limit of true adsorption.

GAS ATTACHMENTS

In my earlier paper it was shown that mineral particles adsorb gases to an extent not previously suspected, and that they retain the gas adsorptions with such persistency that they could neither be easily separated by mechanical means nor much affected by gravity and gas expansion. It was also shown that in the case of adsorptions consisting of a mixture of gases, the respective gases may be separated fractionally, the law of gaseous diffusion apparently not being obeyed. With the view of further investigating these gas adsorption phenomena, the following series of experiments was conducted:

(1) Pieces of copper and silver foil were cleaned by boiling in a solution of sodium hydroxide, washing in distilled water and drying. These cleaned pieces and similar uncleaned pieces of foil were then placed in a vacuum flask together with (a) ordinary distilled water, (b) air-free distilled water, (c) ordinary tap water, and subjected to a reduced pressure (26-in. mercury). The results are shown in the accompanying table.

On repeating these experiments with the various waters, to which a drop of oleic acid had been added and agitated, in all cases the cleaned and uncleaned foil collected gas bubbles. The uncleaned foil floated and remained floating, while the cleaned foil came to the surface repeatedly but did not remain floating. These experiments show that the persistency of the attachment of gas bubbles is increased when the surface of the foil is contaminated with some oily substance.

(2) Six steel needles were boiled in strong sodium hydroxide solution for half an hour, washed with distilled water and allowed to stand in absolute alcohol for half an hour. They were then dried in a desiccator. The needles would not then float on freshly drawn distilled water. When the water was allowed to stand for some time in an evaporating dish, exposed to the air, it was found that they would float.

Another set of needles and pieces of iron wire similarly cleaned would not float at first, but on being kept in a desiccator for two days would float on the surface of distilled water. Similarly some particles of sulphides when washed with alcohol would not float, but on exposure for some time floated. With a preliminary wash in dilute sulphuric acid, prior to the other cleansing, the behavior of the needles and wire was the same as in the case of the other method of cleansing. This preliminary treatment would remove any oily matter present. When the needles were dried by the aid of a lens and the sun's rays, their floating properties seemed to be improved. If the needles were handled they were found to float much more readily, becoming greasy by contact with the fingers.

CONDITIONS FOR FLOTATION OF CLEANED METAL

These experiments show that perfectly cleaned needles and iron wire will float on the surface of distilled water under the following conditions, viz: (a) If the water is allowed to stand for some time in contact with the air; (b) if the needles and wire are allowed to remain exposed to the air for sufficient time. In the first case probably a layer of fine dust collects on the surface of the water, and in the second case, probably the attachment of the air becomes greater after a certain time has elapsed.

(3) Cleaned and uncleaned pieces of iron wire on being immersed in a saturated solution of carbon dioxide showed the following results: The cleaned pieces collected very few bubbles on their surface, but the uncleaned pieces were at once covered with a frost of bubbles, and caused to float to the surface. If one of the cleaned pieces were rubbed between the fingers it behaved similarly to the uncleaned wire, and was caused to float.

These experiments also show that gas attachment is enhanced by the presence of some oily material on the surface of the metal.

In order to compare the amount of gas given off from oiled and unoiled surfaces the following test was carried out: Two cubical pieces of galena of approximately the same size, with the same extent of surface exposed, were taken, one of which was greased with a small amount of vaseline. The two pieces of galena were then placed under inverted separating funnels filled with a saturated solution of carbon dioxide and standing in a basin of the same solution. Bubbles of carbon dioxide gas were at once evolved from both pieces of mineral. The bubbles on the oiled fragment grew to a larger size,(and were held more tenaciously, but more gas was given off from the unoiled piece, as could be directly measured by the amount of solution displaced in the funnel.

Oil Assists But Does Not Cause Gas Attachment

These results show that the oil probably acts as an agent by which the gas bubbles are more tenaciously attached, but that it is the mineral itself which in the first place determines the gas attachment.

(4) Some Broken Hill jig tailings were treated with dilute sulphuric acid, and afterward with water, to separate the whole of the acid. On immersing in a saturated solution of carbon dioxide, bubbles of this gas collected on the sulphide particles, but, except in the case of a few garnet particles, they did not collect on the gangue. On dealing similarly with the same tailings without the acid treatment, bubbles of carbon dioxide collected on all the particles, there being no marked distinction between the sulphide particles and the gangue particles. This shows that the acid treatment tends to prevent gas attachment in the case of gangue particles, while it does not to the same extent prevent attachment of gas to the sulphides.

Analyses of Gases in Flotation Products

(5) Some of the flotation product produced at one of the Broken Hill mines by agitating zinkiferous tailings with an acidulated solution, and a small proportion of oleic acid, was collected, as it came to the surface of the solution. This product was collected in a bottle until the bottle was completely filled, thus displacing the air. The bottle was then stoppered, when the gas contained in the flotation product gradually became disengaged as the sulphide settled down. An analysis was made of this disengaged gas, with the following results: (1) Nitrogen, 72%; oxygen, 2%; carbon dioxide, 26%; (2) nitrogen, 82%; oxygen, 2%; carbon dioxide, 16%. These two samples were taken at different stages in the concentrating operation.

A sample was also obtained of a flotation product made by a process using acidulated solution without oleic acid. The material being treated in this case was Broken Hill slimes, which had been given a slight roast to oxidize the lead sulphide to sulphate in order to prevent the latter from floating. An analysis of the gas disengaged from this product was: Nitrogen, 95%; oxygen, 1%; carbon dioxide, 4 per cent.

(6) The flotation product mentioned in test (5), in which the zinc concentrate was produced by a process using a dilute acid solution and a small amount of oleic acid, was then treated as follows: The concentrate, after being deprived of all visible gas by allowing to settle, was placed in a small flask. The flask was nearly filled with sulphides, 70 gm., and allowed to stand, the slight excess of solution being drawn off. This solution was faintly acid to litmus. The flask was then filled with air-free distilled water, and connected to a vacuum pump, all the connections also being filled with air-free water. On lowering the pressure in the flask, the concentrates were observed to swell, and completely fill the flask, and an evolution of gas was at once apparent. This gas was collected and analyzed; its volume was 1.7 c.c., and it consisted of 58.8% carbon dioxide, 27% nitrogen, and 14.1% oxygen. The flask was then immersed in water, which was brought to the boiling point, at the same time continuing the exhaustion by means of the vacuum pump. An additional volume of 8.9 c.c. of gas collected, consisting almost entirely of carbon dioxide.

A sample of the second product referred to in test (5) was then similarly treated, except that the wet concentrate was made slightly alkaline with ammonia. On heating and subjecting to reduce pressure as before, the gas collected amounted to 18.5 c.c., practically the whole of which was carbon dioxide, only small quantities of nitrogen and oxygen being present.

Carbon Dioxide Has Greater Affinity for Sulphides Than Air

These two experiments show that carbon dioxide still clings to particles of sulphide on settling beneath the surface of the liquid, and after the visible gas bubbles forming the scum have become disengaged. The analysis of the gas disengaged in the previous tests show that it is mainly composed of nitrogen. Assuming that a proportion of oxygen that would give, with the nitrogen found, a mixture corresponding to atmospheric air was originally present, the fact that the gas evolved from the sulphides themselves, when subjected to reduced pressure, is carbon dioxide shows that the latter is attached more persistently than is air.

(7) An attempt was then made to collect any gas that might be evolved from dry minerals on subjecting them to a low pressure. The mineral to be tested was inclosed in a glass flask, and connected with a Toepler pump. The pump was then worked until no more gas could be obtained at ordinary temperature, the last portions of the gas being collected for analysis. The flask containing the mineral was then heated by immersing in a bath of boiling water, the pump being kept continuously working, and the further quantities of gas obtained were collected and analyzed.

Gas Film Not Removable from Minerals in the Dry State

Without describing in detail the method of collecting and analyzing the gas, nor stating in every case the results of the analyses, for which the reader is referred to the original paper, these tests showed that from sulphides and material containing sulphides, such as the Broken Hill tailings and slimes, as a rule more gas was obtained than from calcite and quartz. This gas consisted mainly of carbon dioxide. The residue gas, after absorbing the carbon dioxide and oxygen, was largely in excess of the proportion of nitrogen in atmospheric air, and may have contained hydrogen or an excess of argon. That the carbon dioxide in these tests was not derived from the decomposition of carbonates during the experiment is shown by the negative results on cerussite and calcite.

These results indicate that a concentration or condensation of gas consisting mainly of carbon dioxide occurs on the surface of sulphides, and to a much less extent on the other minerals tested. This gas is held persistently; it does not obey the laws of gaseous diffusion, and may therefore be present in liquid form. This is indicated by the fact that it is the more easily condensed gas, that is, the more persistently attached. The fact that finely divided material in the form of slimes will attach more gas than similar material in a coarser state indicates that the phenomenon is a surface action. It may be akin to the action of charcoal, which will absorb large volumes of the more readily condensible gases as carbon dioxide, sulphur dioxide, and ammonia. It is known that water vapor will cling most persistently to some surfaces even at high temperatures.[1]

In a previous investigation, I found that carbon dioxide was obtained from all sulphides by the aid of heat and exhaustion in the presence of water. It is probable that the gas film can be expanded for removal in appreciable quantities only in the presence of water, and that exhaustion in the dry state does not remove all the gas present. The film can be removed by solvents.

Experiments with Varying Amounts of Oil and Acid

The following series of flotation experiments was carried out to obtain data as to the effect of acid on the flotation product when an oil is used. The tests were performed in an enameled pot, with a stirring apparatus attached. The pot was heated from below by a gas burner. The method of effecting the flotation was to add the various materials to the 1400 c.c. of water in the pot, and gradually to heat the mixture, at the same time keeping the agitating propeller working continuously. On ceasing the agitation for a few minutes to let the flotation product come to the surface, this latter was skimmed off with a wire-gauze strainer. After each skimming another period of agitation was given, and in some cases, as noted in the accompanying table, more acid was added, and the flotation product reskimmed. Tailings No. 1 had a gangue consisting mainly of quartz and rhodonite, and those called No. 2 had a more calcitic gangue. In tests 1-10 inclusive, the tailings with the rhodonite gangue were used, and in tests 11-14 inclusive the tailings with the calcite gangue were used. Except where otherwise stated, 1400 c.c. of water were used in each experiment.

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[1] "Adsorption of Water Vapor by Quartz," Journ of Phys Chem., Vol IX, 1905, p 617

The results of the experiments show that:

(1) Without the addition of acid the flotation product made by oil contains much gangue material, and (2) the addition of acid up to a certain point decreases the amount of gangue in the flotation product.

FLOTATION EXPERIMENTS WITH OILS AND ACIDS

No.	Materials Taken for Test	Flotation Product, Grams	Zn., %	Insol Gangue, %	Residues, Grams	Zn., %	Insol. Gangue, %	Remarks
1	No 1 Broken Hill tailings, 400 grams, oleic acid, 0.8 gram, water, 1400 c.c.	272	22.4	46.6	119	14.3	39.6	Heated to near boiling point. Agitated repeatedly and skimmed.
2	Tailings, 400 grams; H_2SO_4, 3 lots of 8 c.c. each added	129	49.4	1.4	236	6.3	71.4	First 8 c.c. of acid gave little scum; 2d copious; 3d poor.
3	Tailings, 400 grams; H_2SO_4, 5 c.c.; oleic acid, 0.8 gram	93	46.3	1.1	292	11.0	60	Flotation distinct at 80° C.
4	Tailings, 400 grams; H_2SO_4, 10 c.c.; oleic acid, 0.8 gram..	105	46.8	1.2	276	9.8	69	
5	Tailings, 400 grams; H_2SO_4, 15 c.c.; oleic acid, 0.8 gram.	109	48.7	1.4	261	8.3	64.6	
6	Tailings, 400 grams; H_2SO_4, 1 gram; oleic acid, 0.4 gram ...	37.5	48	1.8	354	1.9	49.2	Skimmed and stirred about 20 times.
7	Tailings, 400 grams; H_2SO_4, 2 grams; oleic acid, 0.4 gram	84.5	33	23.2	308.5	17.5	53.6	Skimmed and stirred about 20 times.
8	Same as No. 7 with H_2SO_4, 4 grams	78	40.5	3.2	312	14.3	58	
9	Same as No. 7 with H_2SO_4, 8 grams	77	47.5	1.2	308	12.7		
10	Same as No. 7 with H_2SO_4, 12 grams	80	47.4	1.0	295	12.4	58.6	
11	No. 2 Broken Hill tailings, 400 grams; H_2SO_4, 4 c.c.; oleic acid, 0.4 gram	27.5	36.8	9.0	365	11.4	54.6	
12	Same as No. 11 with H_2SO_4, 8 c.c.	36	43.7	4.8	351	9.7	62.4	
13	Same as No. 11 with H_2SO_4, 12 c.c.	78	45.3	2.2	298	5.0	69.6	
14	Same as No. 11 with H_2SO_4, 16 c.c.	78.5	45.4	0.8	311	4.6	67	
15	Broken Hill slimes, 400 grams; water, 1500 c.c.; H_2SO_4, 7 grams; oleic acid, 0.8 gram.	122	31.5	11.0	277	15.1	34.2	
16	Same as No. 15, but with 14 grams H_2SO_4	217	32.2	9.0	166	4.8	54.6	Skimmed about 30 times.
17	Broken Hill tailings, 340 grams, slimes, 60 grams; H_2SO_4, 19.2 c.c., added in 3 lots of 6.4 c.c. each	(1) 38.5 (2) 72	42.9 51.2	2.8 1.0	262	8.4	64.8	The third addition of 6.4 c.c. produced no more flotation.
18	Same as No. 17 but with oleic acid, 0.4 gram; H_2SO_4 added in 3 lots of 6 c.c. each......	(1) 75.5 (2) 17.5 (3) 7.5	39.2 46.3 45.7	8.6 2.2 2.4	268	5.8	60.4	
19	Broken Hill tailings, 340 grams; slimes, 60 grams; fuel oil, 1.5 grams; H_2SO_4, added in 3 lots of 6 c.c. each	(1) 122.5 (2) 25 (3) none	38.2 47.9	10.8 5.1	230	18.8	44.6	
20	Broken Hill tailings, 340 grams; slimes, 60 grams; hydrocarbon oil, 0.8 gram; H_2SO_4, 20 c.c., in 5 lots of 4 c.c. each	(1) 7.2 (2) 22.7 (3) 16.8 (4) 8.5 (5) none	35.4 44.9 45.0 48.4	10.6 2.2 1.4 1.2	330	8.3	63.8	
21	Broken Hill crude ore, 200 grams, oleic acid, 0.4 gram; H_2SO_4, 2.4 c.c.	6.4	37.7	4.4	128	6.8	63.2	
22	Broken Hill crude ore, 200 grams; oleic acid, 0.4 gram	(1) 57.5 (2) 69.5	20.6 20.8	29.2 30.6	73	10.9	56	1st float 6 skims. Heated gradually to 80° C. 2d float 15 skims; 20 minutes' agitation.

SEPARATION OF LEAD AND ZINC SULPHIDES

One of the problems to be overcome in the treatment of lead-zinc ores is the separation of the two sulphides into suitable products for subsequent treatment. When these concentrates have been produced from fairly coarse ore, a fair separation of the galena and blende can be made by such appliances as vanners and concentrating tables. With concentrates produced from slime, the separation of the lead and zinc sulphides becomes much more difficult, and cannot be efficiently effected by gravity concentration. One method that has been used is as follows: The mixed sulphides are given an oxidizing roast at a low temperature, which hardly affects the blende, but causes a coat of lead sulphate to form on the surface of the lead-sulphide particles. The product is then treated by a flotation process, the blende floating while the sulphated galena behaves like gangue, and does not float. This is known as the Horwood process.[2]

I have tried various chemical solutions for the purpose of preventing the flotation of galena in such mixtures of sulphides. Some fairly good results were obtained by using a solution of ferric chloride. The action of the ferric chloride causes a permanent and not easily detached coat on the particles of galena. Blende is unaffected by the solution. This white coat formed on the surface of the galena particles consists of sulphur and lead chloride. When the ferric-chloride solution is used hot, the action is quicker. Some oxide of iron, thrown out of solution, is sometimes present in the substance forming the coat when the ferric chloride is allowed to stand on the mixed sulphides for some time. Any dissolved lead is reprecipitated by the sulphuric acid in subsequent flotation operations. The ferric chloride becomes reduced to the ferrous state, and can readily be regenerated if required.

RESULTS WITH FERRIC CHLORIDE IN SEPARATING MIXED SULPHIDES

The results of some small tests on various ores and products follow:

No. 1—Concentrates produced from an acid flotation on Broken Hill tailings, ground to pass 80-mesh sieve. Fifty grams taken and kept in suspension for half an hour, with 200 c.c. water containing 10 gm. $FeCl_3$, and allowed to stand 18 hours. Refloated with H_2SO_4 and a small amount of oleic acid. Zinc product, 45 gm., floated, 51% Zn, 6.2% Pb; lead product, 5 gm., not floated, 7.4% Zn, 47.6% Pb.

No. 2—Concentrates produced from an acid flotation on Broken Hill slimes, 200 gm. of the mixed concentrate kept in suspension for six hours, with 300 c.c. of a 10 per cent. $FeCl_3$ solution. Refloated with sulphuric acid and a small amount of oleic acid. Zinc product, 169 gm.,

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[2] "Treatment of Mixed Sulphides by the Horwood Process," E. J. Horwood, Proc. Aust. Inst. Min. Engr., June, 1911.

51.8% Zn, 5.3% Pb; lead product, 28 gm., 16.7% Zn, 38.1% Pb.

No. 3—Concentrates produced from an acid flotation on another sample of Broken Hill slimes. One hundred grams concentrates stood for 24 hours with 300 c.c. 10 per cent. $FeCl_3$ solution. Refloated with sulphuric and small amount of oleic acid. Zinc product, 67 gm., 48.5% Zn, 8.2% Pb, 25.25 oz. Ag; lead product, 31.5 gm., 7.7% Zn, 46.8% Pb, 13.25 oz. Ag.

No. 4—Crude zinc-lead ore from Tasmania; 200 gm. ore kept in suspension for 45 min. and then let stand with a 3 per cent. $FeCl_3$ solution. Floated the mixed sulphides with a small quantity of H_2SO_4. Zinc product, 77% by weight, 44.8% Zn, 5.7% Pb, 22.6 oz. Ag; lead product, 33% by weight, 10.8% Zn, 41.3% Pb, 9.4 oz. Ag.

No doubt these results could be greatly improved upon under better working conditions and by working on a larger scale. For instance, when working with a deeper flotation vessel, the lighter particles in the lead product have a better opportunity to settle, and are not so likely to be carried over mechanically with the flotation product. On refloating the zinc product, more lead can be separated as an unfloated residue.

Delay in Survey Field Work

WASHINGTON CORRESPONDENCE

As a result of the failure of Congress to pass the regular appropriation bills prior to the first of July, serious delay has been caused in the field work of the Geological Survey. The field men have not been able to get out owing to the lack of money and this has been particularly true of the Alaskan work, inasmuch as it has been customary there for the men to begin operations before the snow had fairly started melting. As things stand, the Alaskan force will not be able to go into the field even under the most favorable circumstances for some little time to come. The result will be an injurious delay in beginning operations even beyond what has already occurred and there will be a corresponding shortening of the season. The difficulty due to failure to act on the appropriations has been serious in all branches of public service that require an early knowledge of the moneys to be placed at their disposal, but it has been particularly injurious in those branches of the service which like the Survey must be prepared to make preliminary arrangements in order to start work on time. The passage of the Fitzgerald resolution will simply extend the appropriations of last year for one month at the same rate proportionally as last year. This will cause some special difficulties due to the fact that in work like that of the Geological Survey the money is not evenly disbursed month by month. The makeshift arrangement seems, however, to be about all that can be done under existing conditions.

Eight Years' Work on the Panama Canal

Under the title "A Summary of Eight Years' Work on the Panama Canal," *Engineering News*, June 27, 1912, epitomizes the progress on this piece of construction. We condense somewhat from their account. Eight years ago the United States assumed the undertaking of building this canal. This was 23 years after work had been inaugurated under De Lesseps, and after nearly $400,000,000 had been expended by the French companies. For their rights the United States paid $40,000,000. This amount paid for some 78,000,000 cu.yd. of excavation and a great variety of equipment, some of which has been in continuous use since, but far more has been sold as scrap metal. Of the 78,000,000 cu.yd. excavated, only 30,000,000 cu.yd. came within the canal prism as it has been constructed.

On May 1, 1912, 171,250,000 cu.yd. of material had been excavated and less than 24,250,000 cu.yd. remained to be removed, which is being done at the rate of 2,500,000 cu.yd. per month. Culebra cut is more than 90% completed. The steam-shovel cut is now less than 17 ft. above the bottom of the channel at Culebra, the summit of excavation. The greater part of what remains to be excavated lies between Empire and Gold Hill, a distance of about two miles. On May 1 the great concrete locks at Gatun and Pedro Miguel were almost ready except for the gates, and the locks at Miraflores were more than 65% completed, with the work advancing at the rate of 20,000 cu.yd. of concrete per week. At Gatun, for the locks and dam, nearly 2,000,000 cu.yd. of concrete have been placed since the work was begun. At the Pedro Miguel locks the total placed is about 840,000 cu.yd. and at Miraflores, nearly 900,000 cu.yd. This makes a grand total of about 3,700,000 cu.yd. The manufacture of the great steel gates was started in October, 1910, and their erection begun the following June. On Mar. 31, 1912, the erection of 58,000 tons of structural steel into 46 pairs of lock gates was already one-quarter completed, a task which entails the driving of 6,000,000 field rivets. The contract for machinery for operating the gates was let in June, 1911, and erection was begun in January, 1912; in May, one gate at Gatun has already been fully equipped and successfully operated. Of the valves which control the flow of water into the lock chambers, two had been put in place on Mar. 31, 43 were ready for erection and the contract for the entire 134 had been let, a total of 1876 tons of metal. The installation of the 120 special cylindrical valves which control the flow of water from the center culverts into the lock chambers is practically completed except for a few in the Miraflores locks.

The erection of the first of the six great emergency steel dams which will guard the upper levels of the locks in case of accidents to the gates has been begun at Gatun and the fabrication of the other five is under way. Each is built essentially of a pair of cantilever trusses, 263 ft. long, so pivoted that their longest arm may be swung across the 110-ft. locks and the wicket girders which form the dam dropped into place. The total weight of the six dams is 12,000 tons. The fender chains for preventing unmanageable ships from colliding with the gates and hydraulic apparatus for operating them are in the process of manufacture at the Boston Navy Yard, and one of them has recently passed a successful test. The fenders for the approach walls will soon be ready to place in position. The electrical apparatus required to operate the locks includes 944 motors, all of 220-volt, 25-cycle, three-phase alternating-current type, and of these 803 have already been contracted for. The contract for the hydro-electric plant at Gatun, which will furnish most of the power for the operation of the locks, has been let and work on the station building will soon be started. The Gatun dam is rapidly nearing completion. The concrete spillway is so far completed as to make possible the closing of the sluice gates, and in the course of a few months Gatun Lake will be at an elevation of 50 ft. above sea level. The west dam at Miraflores has been practically completed. The east dam there is to be a concrete wing wall and has not yet been begun. The work on the west dam at Pedro Miguel is also practically completed. Work on the fortifications to guard the canal was begun during the present year. Besides all this work in constructing the canal proper, almost the entire line of the Panama R.R. has been relocated and the work of rebuilding on the new location is nearly completed. Thus at the end of eight years the end of the great undertaking, without failure in any detail, is actually in sight. Already laborers are being discharged and greatest pressure of work has passed. To accomplish this the United States had expended up to Mar. 31, 1912, $252,000,000, including the payments to the French company and the Republic of Panama.

Alabama 1911 Coal Output

The Alabama coal output for 1911 amounted to 15,018,965 short tons, according to the U. S. Geological Survey, as compared with 16,111,462 tons in 1910. The amount of coal made into coke was 4,417,443 tons in 1910, and 3,129,332 tons in 1911.

Cost of Diamond Drill Equipment

By Heath Steele*

Hand-operated diamond drills may be used for drilling to depths not exceeding 350 ft.; for greater depths drills operated by horse, steam or electric power are required. The first costs of hand and power drills are given.

Diamond-drill outfits are made in more than 30 sizes and types to suit all conditions. The type of drill required depends upon the work to be performed. Drills are composed in the main of three parts, power, hoisting and drilling apparatus. The motive power may be steam, air, or electricity, and may be applied direct or by belt transmission. A machine may be operated by hand power to drill to a depth of 350 ft.; the same machine can be driven by horse power to drill to a depth of 500 ft. Traction boilers are generally used with steam-operated drills as they can be easily transported.

The Hoisting Apparatus

For shallow holes the hand-power machine requires no hoist, as the rods can be easily raised by passing the rope over the sheave wheel at the derrick head. For greater depths a hand-power hoist or block and fall may be used. With the power-driven outfits, suitable power hoists are provided. The derrick in general use is the tripod, varying in height and weight with the work to be done. For drilling to a depth of 1000 ft. or more, a more substantial derrick is required. Structural-steel derricks can be obtained from the drill manufacturers. To construct the tripod, three good poles each not less than 35 ft. long are necessary. These are fastened at the top by a bolt, from which the hoisting sheave is hung. Such an arrangement will give about 30 ft. in the clear for lifting the rods. With all surface drills, wire hoisting rope is furnished with the outfit and is included in the prices herein quoted.

The drilling apparatus consists of various types of swivel heads, or mechanism for rotating the drill and regulating the feed. The feed may be either screw or hydraulic; the latter being commonly used on large drills. A pump is included in the drilling equipment; for the hand-power machine a hand pump is furnished, but with the power-driven machine a power pump is provided. With the steam equipment, one pump will answer for both boiler feed and furnishing water to the drill. The remainder of a drilling outfit is made up of drill rods, couplings, core barrel, bits, carbons or black diamonds, diamond-setting tools, core lifters, water hose, miscellaneous tools, etc.

Cost of Outfit

Machines capable of drilling to a depth of 500 ft. may be divided under three heads: (1) Equipment operated by hand power; (2) equipment operated by horse power; (3) equipment operated by mechanical power. A hand-power drill capable of drilling to a depth of 300 ft. and cutting a $\frac{15}{16}$-in. core, will cost complete for drilling, not including carbons, $578.75; a bit set with carbons, approximately $366; a bit set with bortz about $114. The total price of the outfit and one carbon bit would be about $938.75 and the weight of the outfit, 1850 lb. A hand hoist is included in this outfit. In drilling to a small depth this can be deducted; the price is $35. If only 100 ft. of drill rod is wanted, $130 should be deducted.

A drill capable of drilling to a depth of 350 ft. and cutting a $\frac{15}{16}$-in. core, may be divided into packages weighing approximately 40 lb. each. It is provided with extension screws at the top of the column, and by removing the back braces may be used under ground. The price complete for drilling, not including carbons, is $668.75. The price of bit with stones is the same as above quoted; for complete outfit add the price of the bit. Make the same deductions as above if only 150 ft. of drill rods is needed. The shipping weight is one ton.

A horse-power drill capable of drilling to a depth of 300 ft. and cutting a $\frac{15}{16}$-in. core will cost, not including carbons, $593.75. For the horse-power attachment add $105, which brings the total cost to $698.75. To this must be added the cost of the bit as quoted for hand-power machines. If only 150 ft. of drill rods is required, deduct $130. The shipping weight is approximately 4000 lb. For each additional 100 ft. of drill rod, $65 and 285 lb should be added. A belt-driven drill, capable of drilling to a depth of 300 ft. and cutting a $\frac{15}{16}$-in. core, but not including carbons, will cost $593.75, to which a power-attachment cost of $65 must be added, bringing the total cost to $658.75. For this machine a 3-hp. gas engine is required. The price of bits must be added to the equipment as in the above cases. The shipping weight is 3000 pounds.

A higher type of machine capable of drilling to a depth of 500 ft., and cutting a $\frac{15}{16}$-in. core, including two bits set with carbons and an 8-hp. boiler will cost approximately $4172.75, and the shipping weight will be about 10,685 lb. For a drill of 1000-ft. drilling capacity and cutting a 1⅛-in. core, the total cost of equipment including two bits set with carbons and a 10-hp. portable boiler will be about $5064.40 and the shipping weight about 16,205 lb. For a drill capable of drilling to a depth of 1500 ft. and cutting a 1⅛-in. core, the equipment complete, including two bits set with carbons and a portable boiler will cost $6132.40 and the shipping weight will be about 19,275 lb. These prices are all f.o.b. Chicago. The prices quoted including carbons are approximate only, as the price of carbons fluctuates.

The steel derricks range in price from $125 for a 30-ft. derrick, to $575 for a derrick 63 ft. high. A 63-ft. three-leg derrick can be bought for $425. Shipping weights range from 1500 lb. for the 30-ft. to 5400 lb. for the 63-ft. derrick. In mild climates a roof is all the housing that is necessary; for cold weather a good shanty should be built around the drill and boiler. The cost, of course, will vary according to the cost of labor.

Drilling Costs

The principal items of cost in operating a diamond drill are, labor, fuel, water, carbon wear, repairs and renewals, casing, and depreciation of the outfit. For labor, the services of an expert drill runner are required, the wage paid ranges from $100 to $200 per month according to the place. Two helpers are usually needed on large drills; their wage is governed by the local scale. The cost of one or two teams should be included.

The cost of fuel, water, carbon wear, repairs and the rate of drilling are hard to estimate correctly for a given locality without some past experiences from which data can be obtained. Numerous costs are given as examples, but they lack detail. It is difficult to judge what the cost of carbons will be, as from all available data it is evident that the cost may range from about 30c. per ft. for rock of the hardness of limestone up to $3 or $4 per ft. for harder rock, while for some coal formation it may be as low as five or ten cents.

In the iron districts of Lake Superior, the cost of drilling is reported all the way from $1.50 to $2.54 per ft. It is claimed that near Ishpeming, Mich., drilling was done for 88c. per ft.; however, contractors generally charge from $3 to $3.50 per ft. and it is safe to say that the average cost is around $2.70 for most of this work.

Drilling in the coal measures of Scotland has been reported as high as $7.65 per ft. with diamond wear constituting 42% of the total, and contractors' profit including depreciation at 16.45%. A summary of costs in this country shows that drilling has been done for $1.60 per ft. in Colorado; $1.63 in Arizona; $1.26 in Tennessee; $1.50 in West Virginia; $3.50 in Nevada; and $2.50 in Mexico. A record of ten holes in the anthracite region of Pennsylvania shows an average drilling rate of 27.9 ft. per shift, at a cost or $1.36 per ft. for holes 375 ft. deep. The rate of drilling for six holes of an average depth of 115 ft., was 22.6 ft. per shift and the cost $1.74 per ft. These figures include all costs and 15% for depreciation and interest on the equipment.

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*52 William St., New York

The rate of drilling may be estimated at approximately 20 ft. per shift in a uniform limestone formation, down to five feet in the hardest and irregular formations. The above costs are given to indicate the minimum cost of drilling. It is apparent from statistics on diamond drilling that one must have complete data before any attempt can be made to more than approximate the cost of drilling in new territory. Even with several records of drilling in a given locality, it is possible to find costs varying considerably owing to the same difficulties not being encountered in all holes.

Fire Extinction by Frothy Mixtures

We have already commented upon the extinction of fires in combustible liquids by frothy mixtures (ENG. AND MIN. JOURN., Nov. 11, 1911), but have received many inquiries on the subject and give some additional details. The best results obtained, according to *Engineering*, Jan. 12, 1912, are those in which the compound is a mixture of two liquids which are kept separate until used. One liquid is a soda lye containing froth-forming ingredients (what, we are not informed) and the other is a solution of alum. Both liquids can be exposed to the atmosphere and require only that the water lost by evaporation should be replenished. They both stand a low temperature, as they do not freeze until the temperature goes to 23° F. The system, known popularly in Europe as the Perkeo-Salzkotten and Bartels-Harburg, has been taken up by Henry Simonis & Co. of the Victoria Works, Walthamstow, London.

The results of some experiments on the applicability of this process are reported as follows: 450 kg. of benzine were ignited in the tank 10 m. in diameter. After the liquid had burned 2 min. 15 sec. a jet of the two liquids mixed was applied under a pressure of two atmospheres. The falling foam made the burning benzine splash, but the fire was extinguished in 2 min. 26 sec. Later 15 tons of crude benzine were lighted in the same tank producing an enormous smoke cloud. After the fire had lasted 5 min., the foam was turned on under two atmospheres pressure. In 6 min. the fire was extinguished. About 400 gal. of the two liquids had been used. About 1000 gal. roughly, of foam was left floating on the benzine after extinction of the fire, although two-thirds of the original volume of the original frothy liquid were lost owing to the use of the hose and the exposure of the foam to air and flame.

The experts present at this test concluded that the frothy liquid should be applied under small pressure so that it could spread quietly without causing splashes and eddies which would rekindle the already stifled flame. The number and dimensions of the pipes and hose should be selected so as to insure a quiet discharge of the frothy liquid. In this last case it should be noticed that 10 min. after the fire had been extinguished, on scraping away the foam covering, the liquid would rekindle itself.

Another experiment was with a tar field 1300 sq.ft. in area, the field being covered with 1800 kg. of tar and four empty tar barrels. To start the fire 150 kg. of spirits were sprayed on the surface. After the fire had burned for 4 min. it was assumed that the highly volatile spirits had been consumed and that it was the tar itself which was burning. The hose of a tilting ejector which carries 33 gal. of liquid which mix when the tub, which runs on two wheels, is tilted, was then turned on this burning field. The froth itself issued under a pressure of 3.5 atmospheres and put out the flames in 1 min. 35 sec. The 33-gal. charge was not quite used in extinguishing the tar fire. It would appear from these experiments that large oil and spirit fires can be dealt with by this system and such installations are recommended around petroleum plants, oil and spirit store houses and docks, etc.

According to the *Engineering News*, May 16, 1912, one mixture for fire extinguishing is as follows:

LIQUID No. 1

	Parts by weight
Glue	1
Glucose	½
Soda bicarbonate	7½
Salicylic acid	¼
Water	100

LIQUID No. 2

	Parts by weight
Aluminum sulphate	10
Sulphuric acid	½
Water	100

Carbon-dioxide gas is generated by the mixture of the soda bicarbonate and aluminum sulphate. The glue renders the liquid viscous and causes it to produce the foam. The salicylic acid is added as a preservative for the glucose, which is intended as a stabilizer to prevent the too sudden precipitation of the aluminum as hydroxide. The sulphuric acid aids in starting the reaction and acts also as a stabilizer. It is possible that it may be found that the acid itself can be omitted and in such an event the corrosive effect of the mixture on the container and piping will be reduced considerably.

Useful Surveyor's Instrument

The instrument known as the rapid traverser was invented in the latter part of the nineteenth century, by James Henderson, an English civil and mining engineer. Accurate work can be done with this instrument, and although it is used in Cornwall for making even the most difficult of surveys, it appears to be little known to American mining engineers.

The rapid traverser may be described as a circular plane-table equipped with a brass alidade that can be revolved. The table is mounted on a tripod. It can be clamped to its support and the alidade to the table by the usual type of clamping screws. A white-enamelled, zinc disk is fixed to the circular table by drawing-pins made of any metal except iron. The alidade is grooved so as to pass easily over the pins. The disk is marked with a series of concentric rings. The fiducial edge of the alidade is notched, so that there is a distance between two notches equal to the diameter of each one of the rings on the disk. Each length or distance between notches is marked with a number indicating to which ring on the disk it corresponds, the object being to permit making several surveys on one disk or to avoid overcrowding of direction lines at any one place.

In use the instrument is mounted on a tripod, the table and alidade being firmly clamped. It is set up over the second station of the survey as at *B*, Fig. 1. and the alidade turned to the first station or backsight *A*. The direction of the first line of the survey, *A B*, is then marked with a sharp-pointed pencil on one of the rings of the disk as shown at the left and at the same time a number or letter is marked on the disk through the notches in the alidade. The alidade is then unclamped, sighted on the third, or forward station, *C*, and clamped again. Then the direction and number or letter of the foresight, *B C*, is similarly marked on the disk.

Three stands or tripods are generally used, one set up at the backsight and the third at the foresight. Having determined the direction of the first two lines of the survey, and having measured their length, the surveyor removes the instrument from the tripod and places it on the tripod at the foresight. The table is then sighted back to the second station and clamped. The alidade is then unclamped, sighted on the next forward or fourth station at which the tripod formerly at the first station has been set up, clamped in that position and the direction and number or letter of the third line of the survey marked on the ring. In a similar way the direction of all the lines of the survey are taken. In a closed traverse the first line may also be used as the last, in which case the first marks made on the disk should coincide with the last. The disk is then removed from the instrument and the marks on it used for drawing the lines of the survey in making the map.

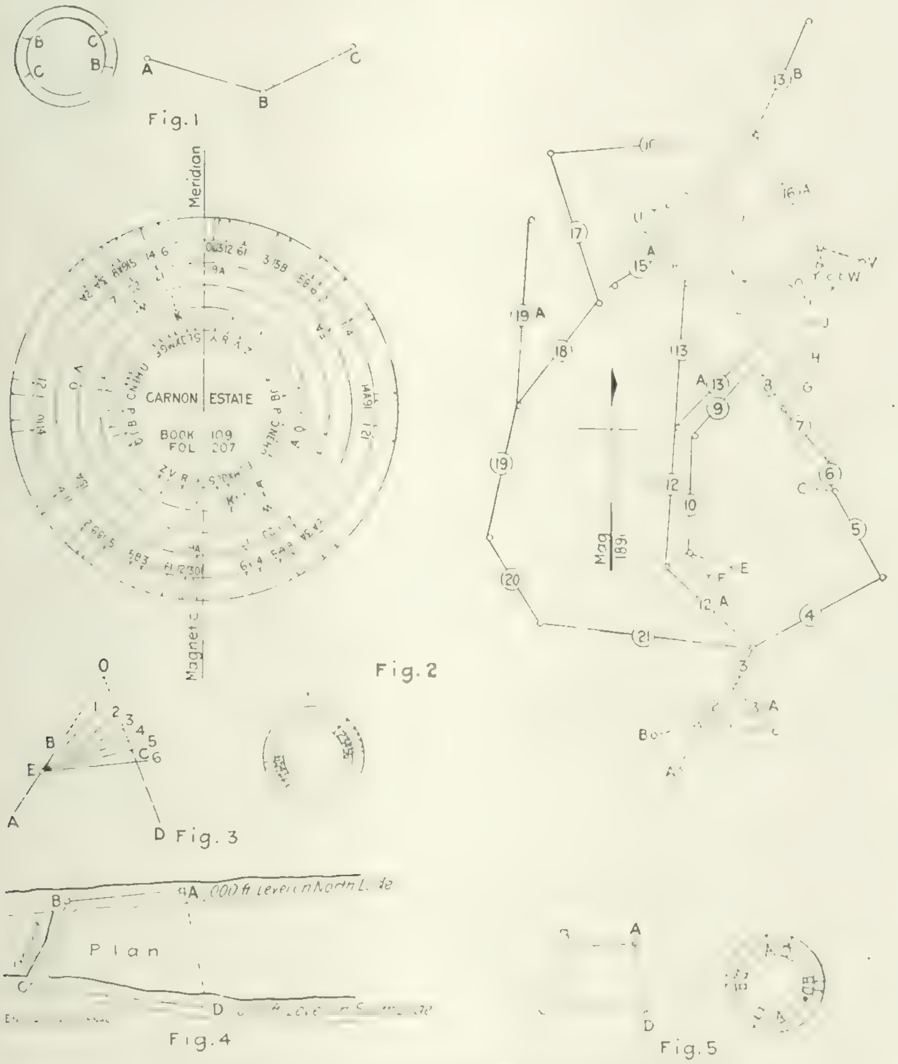

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Examples of Surveys Made with Rapid Traverser

The magnetic meridian can be taken at any convenient point in the survey by means of a trough compass which is placed against the back edge of the alidade. This with its compass is then revolved until the needle points to zero when the line of the magnetic meridian is marked on the disk. The lengths of the lines, offsets, etc., are taken in the usual way and entered in the surveyor's notes. The sights of the alidade are graduated to give angles of depression or elevation up to 25° and thus the rapid traverser with plane sights can not only be used for all ordinary surface surveys, but for the majority of coal mines and for the levels of metalliferous mines as well. An advantage of the instrument is that the disk can be kept for future reference, the name and date of the survey being recorded upon it, or the magnetic bearings of the lines can be easily read and entered in the usual manner in the surveyor's notes. An easy method of reading off the bearings is to place the disk in the center of an ordinary cardboard protractor cut out for the purpose, the protractor being fastened to the board and the disk fastened in its proper position.

The instrument has been used with success in a military survey in the mountains of Jamaica, and also in British government surveys on the Gold Coast. Fig. 2 shows the system of plotting by this instrument. As an example of surface work a method of setting out railway curves is shown in Fig. 3. The angle of intersection at *O* being read in the field in the usual way, and the distance *OE* chained, the lengths of the chords are calculated therefrom together with their subtending angles. The figure *AEBOCD* is next plotted in the office to any desired scale together with the radiating lines 1 to 6. A zinc disk is then laid down along the figure and the directions and numbers of the radiating lines are ruled upon it. The instrument with the disk attached is then taken into the field and set up at *E*. The alidade is next sighted to *O* or by a backsight to *A* and then unclamped. The assistants in the field are then guided by the observer at *E*, who unclamps his alidade on the radiating lines as shown on the disk in their proper order.

As a further example and one which is interesting from the point of view of its being used in connection with underground work, is the problem of setting out bearings. Fig. 4 shows two parallel veins connected at the 1000-ft. level by a crosscut as shown in the plan. As the ground was treacherous it was decided to drive a new crosscut and connect the levels at the point *A* and *D* driving north and south simultaneously from the respective points. In addition to the pegs *A* and *D* two other pegs were inserted in the "back" at *B* and *C*. The three survey lines were then marked on the disk of the rapid traverser in the usual way and the disk being removed was carried to the office where the three lines were run off on paper in their respective positions and according to their respective lengths as booked. The disk was then laid on the paper, care being taken to place it in its right position, so that any one line on the disk was exactly parallel to its corresponding line on the plan, as indicated in Fig. 5. The bearing *AD* was then run from the plan on to the disk and marked thereon. The disk was then carried underground and replaced on the instrument which was set up at *D*. A backsight was then taken to *C* and the alidade being unclamped was swung on to the line of *A* as marked on the disk. The bearing of the drift to *A* was then set out in the usual way. The instrument was next carried to *A* and being there set up the bearing of the drift to *A* was similarly given and set out. It will be observed that no tedious reading of figures and no calculations were required, the whole proceeding being of the utmost simplicity, and yet, as experience has shown, of the utmost accuracy. The distance from *A* to *D* was of course measured off on the plan.

Wallaroo & Moonta

Notwithstanding gradually decreasing ore reserves, the Wallaroo & Moonta Mining & Smelting Co., operating in South Australia, made a profit of £37,057 for the year ended Dec. 31, 1911. A total of 58,516 tons of material was smelted, from which was recovered 6079 tons of fine copper, 1222 oz. gold and 1400 oz. silver. There were also 182 tons of bluestone, and 4627 tons of sulphuric acid produced. Converters have been installed and the old reverberatories are being dismantled.

Safety in Mine Electrical Installations

The U. S. Bureau of Mines has just issued Technical Paper No. 19, on the subject, "The Factor of Safety in Mine Electrical Installation," by H. H. Clark. The author acknowledges the many advantages that attend the use of electrical machinery in mines, but urges that the requirements of safety as well as those of efficiency be considered when installing electrical mining equipment.

To quote from the paper: "The safe operation of electrical mining equipment is an engineering problem that involves the element of human life and that is influenced by conditions and events that can not always be foreseen. The successful solution of the problem will, therefore, depend largely upon the factor of safety that is considered in the selection, installation, and maintenance of such equipment."

The paper classifies the electrical accidents that may occur in mines and states the principal sources of danger incident to the use of electricity underground. The conditions surrounding electrical equipment in mines are compared to similar conditions above ground and the paper shows that the requirements of mining work present certain difficulties in the way of maintaining electrical apparatus in perfect condition. The effect of roof falls, dampness, dust, and acid water are mentioned and the observation is made that the temporary character of underground work limits the economical investment in electrical equipment and its installation.

The author does not regard the safeguarding of mine electrical equipment as a simple problem and states that there is no general formula for its solution. It is suggested, however, that a logical first step would be to remove contributory causes by placing lights and erecting guards at particularly dangerous points, and by selecting apparatus especially designed to offset the effect of dampness and dust.

The paper lays stress upon the importance of first-class installation at the outset and frequent inspection of equipment after it is in place. The author considers that a competent electrician is needed to insure the safest and most efficient operation of mine electrical equipment and dwells upon the responsibilities and requirements of such a position.

Data of Russia's Principal Mines and Oil Wells

By V. C. Svimonoff*

The data in the accompanying table have been compiled from the official reports of the Russian Imperial Department of Commerce and Industry and other statistical publications for the fiscal year 1910. The unit of weight used is the pood, which is equal to 36.11 lb. avoirdupois.

DATA OF RUSSIA'S PRINCIPAL MINES AND OIL WELLS

Mineral	Name of Corporation	Annual Output, Poods	Total Annual Income	Number of Workmen	Engine Equipment, Hp.
	Amur Prov.:				
Gold	G. P. Larin	43 50	$430,000		
"	Upper Amur Gold			2,437	12
	Co.	135 00	1,225,000	3,000	72
	Irkutsk Prov.:				
"	Lenskoe	520 50	4,890,000	3,835	3,600
"	Promishlennost	120 00	1,100,000	1,420	
	Orenburg Prov.:				
"	A. C. Antonoff	26 00	230,000	1,070	220
"	Prince Demidoff	6 50	..		
Platinum	Prince Demidoff	40 00			..
"	Ekaterinburgskoe		215,000	540	870
Gold	Kochkarskoe	50 00	400,000	3,000	770
	Perm Prov:				
"	Verhne-Issetskoe	30 00	250,000	1,200	560
"	Kyshtymskoe	10.10	160,000	1,442	658
"	P. S. Iakovleff	21 00	205,000	658	....
Platinum	Platina	28 00	256,000	960	.
"	Count P. Shuvaloff	69 00	600,000	5,300	544
	Viatka Prov.:				
Copper	Poklevsky-Kozell	3,700,000	200,000	1,200	160
	Ekaterinoslav Prov.:				
"	Aktionernoe	18,000,000	470,000	600	355
"	Aktionernoe on Olkovoi	10,000,000	255,000	200	2,500
Iron	Brianskoe	12,000,000	340,000	420	450
"	V. Galkovsky	15,000,000	450,000	389	295
"	Dubovaia Balka	24,000,000	.. ...	1,252	975
"	S. N. Kolachevsky	20,000,000	600,000	440	600
"	Nichopol-Marioupol	10,000,000	300,000	551	36
"	Russian Providence	18,500,000	1,500,000	2,500	12,000
Manganese	Russian Providence	509,000			
"	South Russian Dnieper	8,500,000	620,000	1,496	1,550
Iron	South Russian Dnieper	31,000,000			
	Caucasus Prov.:				
Manganese	Anonymnoe	2,900,000	125,000	200	27
	Oganezoff Brothers	3,000,000	158,000	600	
Lead and Silver	[illegible]	1,500,000	2,130,000	950	1,065
Copper	K. Siemens	5,932,000		943	
	Perm Prov.:				
Platinum	K. P. Vorobieff	17 10	$1,900,000	685	40
Asbestos	Korevo Asbest		250,000	560	140
Copper	Count Stenbock-Fermor	1,239,000	245,000	540	196
	Don Prov.:				
Coal and coke	Ruskoe-Gornoe	7,500,000	625,000	2,500	1,655
Coal	V. E. Borjovsky	9,000,000	388,000	625	60
Anthracite	Grooshinsky	13,000,000	670,000	1,178	1,115
"	Grushevsky anthracite	11,000,000	725,000	1,950	1,500
"	N. A. Kolber	5,000,000	235,000	420	238
"	J. D. Kucks	7,500,000	350,000	1,000	500
Coal	Alekseevskoe	30,000,000	1,500,000	3,250	2,015
Coke	Alekseevskoe	12,000,000			
Coal	Auerback	14,000,000	650,000	1,531	1,070
"	Kazakevitch	10,000,000	450,000	350	800
"	South Russian C'al	56,000,000	2,000,000	5,900	4,880
"	Rutchenkovskoe	61,000,000	2,225,000	5,300	4,803
"	Seleznevskoe	16,000,000	655,000	1,540	723
	Irkutsk Prov.:				
"	Rassushin	11,000,000	385,000	220	40
	Petrokov Prov.:				
"	Flora	17,000,000	735,000	1,542	3,439
"	Franco-Russian	12,000,000	1,060,000	2,150	1,257
"	Sosnovitzi C'l As'n	76,000,000	2,500,000	4,200	10,804
"	Saturn	42,000,000	1,750,000	2,189	8,712
"	Cheliadz	32,000,000	1,250,000	1,600	6,750
"	Shen Frantz	7,000,000	300,000	600	565
	Baku Prov.:				
Oil	Uzbasheff	3,000,000	400,000	70	340
"	Adamoff	5,500,000	535,000	......	......
"	Aramazd	12,000,000	1,200,000	325	......
"	Bakinskoe Neftianoe	25,000,000	2,500,000	2,000	8,500
"	Benkendorf	5,000,000	500,000	386	1,640
"	Bibi-Eibatskoe	10,000,000	1,000,000	564	1,550
"	K. V. Bihovsky	20,000,000	2,500,000	45	60
"	K. Zoobaloff	12,000,000	1,100,000	557	1,110
"	Caspian	20,000,000	2,000,000	......	...
"	Caucasus Oil	3,600,000	400,000	200	700
"	Caspian & Black Sea Oil	25,000,000	3,000,000	2,000	9,300
"	G. M. Lianozoff	27,000,000	5,000,000	100	78
"	A. Mantasheff	56,000,000	6,000,000	2,300	489
"	Nobel Brothers	62,000,000	11,000,000	13,500	14,600
"	G. Tagieff	23,000,000	2,800,000	250	275
"	Naftalanskoe	8,000,000	850,000	450	1,150
	Tersky Prov.:				
"	Spies Petroleum Co.	12,000,000	1,910,000	860	2,700

American mining machinery manufacturers interested in establishing commercial relations with any of these companies in Russia can obtain detailed mailing lists from the author.

According to Consul Julean H. Arnold there is said to be much graphite in the vicinity of Amoy, and it is anticipated, when mining operations are commenced in that section of China, that the region will be able to supply a considerable quantity of graphite.

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*237 Semple St., Pittsburgh, Penn.

Waldemar Lindgren

An announcement of great interest with reference to the reorganization of the geological department of the Massachusetts Institute of Technology was made by President Maclaurin as a part of his address to the students at the recent commencement exercises. When it was announced that Dr. T. A. Jaggar, Jr., is to be director of the Hawaiian Volcano Observatory, and is to reside in the Islands for about five years, it was realized that he could no longer be the head of the department in Boston. The Institute has been fortunate in securing for the vacancy, Prof. Waldemar Lindgren, chief geologist of the U. S. Geological Survey.

Professor Lindgren goes to the Institute not as a stranger, for during two years or more he has been special lecturer on economic geology, so that the authorities have had an opportunity to see and measure him, while he has been able to learn of the Institute's methods.

There is to be established a new chair, the William Barton Rogers professorship of economic geology. This will be a memorial peculiarly fitting to the great Virginian who founded the Massachusetts Institute of Technology. Himself a geologist, he was impressed with the value of economic geology. The more possible is it now to establish such a memorial through the great gift to the Institute of his wife and helpmate, Mrs. Rogers, for the Institute can now afford to lay aside a portion of the bequest for the endowment of the new chair, which it is expected will be devoted largely to research.

Professor Lindgren will also be named head of the department of geology at the Institute. Doctor Jaggar will be director of the observatory as already noted; Dr. Reginald A. Daly will, for the present, remain professor of physical geology; Dr. Charles H. Warren will be advanced to full professorship from associate professor; Dr. Hervey A. Shimer will be promoted to associate professor.

Professor Lindgren, Swedish by birth, has been connected with the U. S. Geological Survey for a long time. He was chief of field parties, becoming two or three years ago chief of the division of statistics of the metals, and six months ago, chief geologist. His work is known everywhere and his writings are voluminous, including several of the huge monographs of the Survey. A treatise on economic geology by him is in press.

The Massachusetts Institute of Technology has heretofore been relatively weak in its instruction in economic geology. It is safe to say that it will no longer be so since its good fortune in securing one of the few American economic geologists of international reputation.

The American Iron & Steel Institute

Preliminary plans are being perfected for the holding of a fall meeting of the American Iron & Steel Institute at Pittsburgh, during the latter part of October. The decision to hold the meeting in that city was reached at the monthly meeting of the directors of the institute at New York, June 28. The Pittsburgh meeting will be in charge of President James A. Farrell, of the United States Steel Corporation, as chairman of the committee on general arrangements, and of Willis L. King, vice-president of the Jones & Laughlin Steel Co., as chairman of the committee on local arrangements. Since May the Institute has received about 300 new members.

Statistical Work

Arrangements have already been made for taking over the statistical work heretofore carried on by the American Iron & Steel Association. The necessary announcements have already been sent to iron and steel manufacturers. Mr. Swank, general manager of the American Iron & Steel Association, who will retire Jan. 1, 1913, will, with his assistants, complete the statistics of all sorts, for 1911, and will also compile the figures of pig-iron production for the first half of 1912, which it has been the custom to issue semi-annually. The outputs of semi-finished and finished steel and other compilations for the year 1912 will be by the Institute under Mr. Swank's coöperation and supervisory attention.

It is the intention of the Iron & Steel Institute officers to issue statistical reports on the industry covering every half-year period in all lines of output.

Developments at Highgrade

Special Correspondence

The Sunshine prospect in the Highgrade district, Modoc County, Calif., was sold to Messrs. Dawson and Fulton, promoters from Los Angeles. Associated with them are the banking interests of Lakeview, Ore. Miners are now breaking ore to make a shipment of 30 tons to the Selby works. Edward J. Trevarrow, who managed the Vindicator mine at Cripple Creek for many years, will develop the Sunshine for the owners. It will be opened by shafts instead of by the tunnel system, which prevails in this district.

The Fort Bidwell Consolidated Mines Co. will have its annual meeting on July 15. General Manager A. J. Cummings stated that the Mt. View and Sugar Pine ground will be worked on company account. The rest of the estate will be leased under terms of 15% royalty and running five years. The 10-stamp mill on this property is being remodeled under the supervision of W. D. French. John Bell, formerly of Stratton's Independence staff at Cripple Creek, will have charge of developing the mine. The preliminary sampling shows about 1000 tons of ore now available for the mill. This ore is exposed on three sides and averages nearly $20 per ton.

There has been some friction between forest rangers and prospectors because of the posting of trespass notices on the cabins, demanding that the owners apply to the Government for the rental of cabins and grounds at a fixed rate to be made known upon application. The snow has about all disappeared and one can easily get into any part of the camp.

California Oil in May

The net production of petroleum in all California fields in May was 6,882,028 bbl. This is an increase in total production over April of 71,075 bbl. but a decrease in daily average production of 5031. The total shipments in May were 6,425,681 bbl., leaving a surplus of 456,347. This is an increase in shipment over April of 834,342 bbl. The fuel consumption in the fields was 422,291 bbl., which made the total gross production for the state 7,304,319 bbl. The record of field development for May in all the fields shows 51 new rigs, 67 completed wells, 5585 producing wells active, 800 producing wells idle, 421 drilling wells active, 362 drilling wells idle; 16 wells abandoned.

MAY OIL PRODUCTION BY FIELDS

District	Bbl.
Fresno County	
Coalinga	1,606,687
Kern County	
Midway	1,885,349
Kern River	947,117
McKittrick	501,936
Sunset-Maricopa	441,494
Lost Hills	112,136
Total, Kern County	3,888,032
Santa Barbara County	
Santa Maria, Lompoc, Cat Cañon	431,012
Summerland	4,350
Total, Santa Barbara County	435,362
Southern Counties and Fields	
Fullerton	481,292
Salt Lake-Sherman	232,005
Coyote-Lahabre	84,732
Whittier	61,853
Ventura	50,301
Los Angeles	31,842
Newhall	9,922
Total southern counties and fields	951,947
Total, all fields	6,882,028

The total stocks on hand amounted to 44,291,423 bbl., of which 27,151,534 bbl. were in the Kern River field.

According to the Cleveland *Iron Trade Review*, the Great Lakes Engineering Works, of Detroit, has booked an order for the construction of a big fleet of self-propelling steel barges, placed by an eastern firm of coal shippers. They propose to operate the barges on the Warrior River, in Alabama, in delivering coal to New Orleans and other ports. The contract price is said to be in the neighborhood of $70,000 each.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Dr. Henry M. Howe sailed from New York for Europe last week.

Henry B. Kaeding, of New Orleans, is in New York for a stay of several weeks.

Alexander P. Rogers, of New York, is engaged in professional work in California.

Dwight E. Woodbridge, of Duluth, has returned from Cuba, where he has been examining several iron properties.

C. W. Wright, who is conducting mining operations in Sardinia, has returned to this country to spend the summer.

D. A. Herron, manager of the Tomboy Gold Mines Co., Ltd., has returned to Telluride, Colo., from an eastern trip.

Frederick Keffer is acting as general manager of the British Columbia Copper Co., in place of E. G. Warren, deceased.

N. H. Emmons, 2d, is in the East on business. His address is care H. Nelson Emmons, John Hancock Building, Boston.

O. F. Brinton, formerly superintendent of the Alpha mine, has been appointed superintendent of the Gold Road mine in Arizona.

Arthur Howe Carpenter, of Denver, Colo., has been appointed research chemist for the American Vanadium Co., of Pittsburgh.

Arthur Houle has been appointed superintendent of mines and smelters of the Shattuck-Arizona Copper Co. at Bisbee, Arizona.

Horace G. Young has been appointed manager of the Trethewey mine at Cobalt, Ont., in place of Charles A. O'Connell, resigned.

A. Burnett, who had been superintendent of the British Columbia Copper Co.'s Emma mine, in Boundary district, B. C., has gone to Cobalt, Ontario.

Walter L. Reid, superintendent of the cyanide plants of the Smuggler-Union Mining Co., has returned to Telluride, Colo., from a professional trip to Oregon.

Hayes W. Young, instructor in metallurgy at Stanford University, California, has been visiting smelteries in Boundary and West Kootenay districts of British Columbia.

Ivan De Lashmutt, for some time past superintendent of a mine in Ainsworth camp, has succeeded W. M. Leete in charge of the Yankee Girl mine, Ymir, British Columbia.

W. Earl Greenough, of Wallace, Idaho, has been elected vice-president and general manager of the Marsh Mining Co., to fill the vacancy caused by the resignation of A. A. Booth.

A. G. Charlton and E. Mackay-Heriot have taken offices together as consulting mining engineers at Mansion House Chambers, 11 Queen Victoria St., London, E. C., England.

Prof. S. B. Christy, dean of the mining department of the University of California, has been reëlected corresponding member of the Institution of Mining and Metallurgy of London.

William Z. Price, mining engineer of the Tennessee Coal, Iron & R.R. Co., at Birmingham, Ala., has resigned to accept a similar position with the Pittsburgh Coal Co., at Pittsburgh.

F. J. Longworth is again superintendent of the British Columbia Copper Co.'s Napoleon mine and stamp mill at Boyds, Wash., after having been several months at the smeltery at Greenwood.

E. A. Thieman has been appointed assistant general manager of the Florence Iron Co., Florence, Wis., and is in charge of the company's properties in Florence, Iron and Gogebic counties

D. N. Muir, manager of the United States Smelting, Refining & Mining Co. in Mohave County, Ariz., and at Needles, California, has removed his office and residence from Kingman to Gold Road.

Jay P. Graves, general manager of the Granby Consolidated company, has returned to Spokane, Washington, from a visit of inspection to the company's Hidden Creek mines, Observatory inlet.

O. E. LeRoy, of the Canada Geological Survey, Ottawa, is in British Columbia, making preliminary arrangements for the visit to that province next year of numerous members of the International Geological Congress.

Corey C. Brayton has resigned as manager of the rock-crushing department of the Natomas Consolidated of California, and will engage in gold dredging in Seward Peninsula, Alaska. His address will be Solomon, Alaska.

OBITUARY

Capt. W. A. Dunn died at Houghton, Mich., July 9. He was well known in connection with the opening of the Baltic lode.

Henry Rhodes died at Jamestown, Calif., on June 13. He was born at Saco, Me., in 1825. He went to California in 1849, and followed mining in Tuolumne County.

Alexander W. Brooks died at Stockton, Calif., on June 24. He was 83 years old. He went to California in the early pioneer days and mined in Tuolumne County. In recent years he was engaged in steamboating.

Graham Pope, one of the pioneers of the Lake Superior copper district, and one of the best known men in the district, is reported dead by a dispatch from Houghton, Mich., July 9. We expect to publish a suitable obituary in our next issue.

J. Douglas Truman, an assistant in the Canadian Geological Survey, who was accompanying Director Brock in an exploration trip in the Rainy River district in Ontario, was drowned in Steep Rock Lake, June 29, in consequence of the upsetting of a canoe. Truman might have saved his life but lost it in rescuing Dr. C. D. Walcott, director of the Smithsonian Institution, who accompanied the expedition and who was in the canoe with him.

E. G. Warren, general manager of the British Columbia Copper Co., died July 4, at Greenwood, B. C., as the result of an automobile accident on June 29. He was on his way from Greenwood to Phoenix and was driving the car himself when it skidded on wet ground, turned over and fell down a steep embankment. Mr. Warren was caught under the car and received serious injuries, but it was at first thought that they were not fatal. The direct cause of his death was a blood-clot which worked its way to the heart. Mr. Warren had been with the British Columbia Co. for a number of years as superintendent of smelters, and in May, 1911, succeeded J. E. McAllister as general manager. He was a capable man and an experienced metallurgist and he had the respect and affection of all with whom he worked.

Societies and Technical Schools

American Institute of Mining Engineers—The next meeting of the Spokane Local Section will be held at Republic, Wash., July 26-28, 1912, invitations having been extended by the City of Republic through the mayor of the city, the Commercial Club, the Mine Owners and by members of the section resident there.

Canadian Mining Institute—The western branch of the Institute held its thirteenth general meeting at Greenwood, Boundary district, B. C., on June 27. Frederic Keffer was in the chair. The annual ballot for chairman resulted in the unanimous election of M. E. Purcell, superintendent of the Consolidated Mining & Smelting Co.'s Center Star group of mines at Rossland, B. C. The chief subject before the meeting was "The Copper Mining Industry of British Columbia," concerning which E. Jacobs, secretary of the branch submitted historical, statistical, and general notes, including copper smelting as well as mining in the province. Other papers were: "Method of Handling Ore on Surface at Center Star Mines, Rossland, B. C.," by M. E. Purcell; "Consolidated Mining & Smelting Co.'s Copper Smelting Department, Trail, B. C.," by Jas. Buchanan; "Copper Mining in the British Columbia Coast District," by W. M. Brewer; and "Notes on Voigt's Camp and Vicinity, Similkameen, B. C.," by Frederic Keffer.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

July 3—The Northern California Mining Co. is in litigation with W. W. Young who has attacked the legality of the election of directors. It is reported that the company admits there were improper votes registered but that they were necessary to prevent others from obtaining control. This company has installed a dredge at Jelly Ferry, Tehama County. It is a suction dredge which is provided with a digger at the end of the suction pump. The experiment is a new one in California dredging and it was expected that this company would prove the adaptability of this character of dredge to the shallow grounds in the northern part of the state. There are a number of tracts of land in northern California that have been proved to contain sufficient gold to warrant the investment necessary to install an inexpensive dredge. But the bucket-elevator dredge of the type commonly used cannot be operated economically in shallow ground, because of the initial cost and the short life of the field. There have been several dredges commonly termed dry-land machines tested in California fields, but there has been no dredge of this character that has yet been generally adopted.

The Southern Oregon & Northern California Mining Congress will be held at Yreka, on July 19 and 20. The congress will draw from all of southern Oregon and a part of northern California. There has been a number of these conventions held but it is expected that this one will attract more visitors and delegates than any of the others. W. H. Storms, State Mineralogist of California, will attend. It will be the first time that the state has ever been represented at these conventions.

Denver

July 5—Notwithstanding the richness of its ores, the La Plata district, in southwestern Colorado, has been little heard of and its camps have been devoid of excitement, but after 30 years of quietude it is suddenly assuming great favor among prospectors and investors, and the old mines are coming into prominence. One of the causes is probably the publicity given the suit between the Idaho and May Day mines, in which two smeltery sheets showed returns on cars of ore ranging from $11,000 to $30,000 per car. Added to this, several noteworthy strikes of high-grade gold ore have been made lately by prospectors in new territory. The district is confined to the vicinity of Durango and Mancos and is reached by the Rio Grande & Silverton, and by the Rio Grande Southern railroads. There is an abundance of timber, water power and cheap fuel, as the principal mines are within two or three miles of the Hesperus coal belt. The gold ores are chiefly tellurides similar to Cripple Creek, and found in lime contacts in the sedimentaries. The Durango Power & Light Co. will extend its lines to the mines from the Rockwood plant, on the Animas River, if the mine owners will guarantee 150-hp. per year, and it is said that this has been assured. The Board of Trade of Durango is raising a fund to advertise the La Plata and Oro Fino districts.

The Federal grand jury has returned indictments against A. E. Minium, W. A. Fisher and S. E. Coler, promoters of the International Asbestos Mills Co., North American Asbestos Co. and Wyoming Consolidated Asbestos Co., all of Natrona County, Wyo., for using the United States mails to defraud. It is said that about $285,000 were received from stock sales and that most of this money went into advertising and to the promoters instead of into development.

The output for the month of June from Cripple Creek was 73,173 tons, worth $1,191,456 in gold. These figures are given by the mills and smelteries.

As already chronicled in the JOURNAL, the Doctor-Jack Pot secured a judgment from the Work Mining & Milling Co., both of Cripple Creek, for ores extracted by the latter from a claim which apexed on the former's ground. Now comes a similar suit, filed by the Roxanna Mining & Tunnel Co. against the Doctor-Jack Pot Co. to recover damages of $1,000,000 for ore illegally extracted.

Butte

July 3—The report of the U. S. Assay Office, at Helena, shows that during June gold deposits from Montana amounted to $188,388, an advance over June, 1911, of $68,976. That the mines in the vicinity of Helena are operating on a larger scale than last year at this time, is shown by the deposit of Lewis and Clark County, which totaled $39,591 in June, 1912, as against $14,634 in 1911. The following is the list of deposits from the Montana counties: Beaverhead, $181; Broadwater, $105; Chouteau, $20,008; Fergus, $52,519; Granite, $100; Jefferson, $150; Lewis and Clark, $39,591; Madison, $70,984; Missoula, $3339; Park, $44; Powell, $1293; Silver Bow, $69.

It is expected that the extension of the Butte, Anaconda & Pacific R.R. will be completed as far as Silver Lake by Aug. 1, and to the terminal at Georgetown, with trains running, by Oct. 1. Three hundred men are on the payroll at present, and one-third of the grading has been completed. Work has been started on the construction of the bridges and steel is being laid on part of the road to facilitate work on a grade. The work of electrifying the road between Butte and Anaconda is progressing rapidly and should be finished by Dec. 1. This work began in the general yards at Anaconda, and the three-mile loop to the smeltery bins was completed first. Work then began on the main line, and had reached a point on the dividing line between Deer Lodge and Silver Bow Counties, near Gregson Springs, June 26, when the whole force of electricians, comprising more than 100 line and ground men, walked out, their grievance being the difference in the scale of wages existing in the two counties. Wages for this work in Deerlodge County, where Anaconda is situated, amount to $4.50 per day, and in Silver Bow, the location of Butte, $5 per day are paid. A request for an immediate increase of 50c. per day was made of the railroad management. Manager Harry Gallwey refused this request at the time, but negotiations are under way at present for an amicable adjustment of the difficulty.

Salt Lake City

July 5—The Utah Ore Sampling Co. purchased the McIntosh sampler, at Park City, June 29. Beginning July 1, the plant will be operated under the new management. It has a capacity of 500 tons per day, and, with the exception of the Silver King Coalition sampler, handles practically all the ores of the Park City district. While the Park City sampler is said to be in good condition, the new company undoubtedly will make improvements, and eliminate numerous small complaints made against the former management by producers. The Utah Ore Sampling Co. was formed two or three years ago to take over the Taylor & Brunton mill, at Murray, the Pioneer sampler at Sandy, and the Silver City mill at Tintic. Jesse Knight is president and A. W. Gates is general manager.

There is some dissatisfaction among mine owners with the present system of state taxation. The mine owner must pay an income tax to the government in addition to state taxes on the property, improvements and net proceeds. The net-proceeds tax is criticized, owing to the incompleteness of the law as to what shall be deducted as legitimate expenses in reaching the item of net proceeds. Taxes cannot be deducted, nor fire, nor liability insurance, nor damages paid through injuries of employees, nor legal expenses, in deriving the net-proceeds account. It has been suggested that the board be given wider discretion in the matter of mine taxation, especially in the taxing of idle or unproductive properties.

The regular meeting of the Utah Society of Engineers was held June 21, in the Newhouse Building. The proposed modified form of the constitution was presented by Pres. R. K. Brown and the executive committee. One of the principal features of the new constitution is the provision for associate and junior members, as distinguished from regular and honorary members. By this, junior members, such as students, will be given all the privileges of membership except the right to vote and hold office. This applies to associate members also. Prof. R. R. Lyman was to have read a paper on "The Use of Weir Measurements of the Flow of Streams," but was able only to give a brief outline of the subject, on account of the time consumed in discussing the modification of the constitution. The entire paper will be given at a later date. The amendments to the constitution will come up for final disposition at the next meeting of the society, in September.

Lovelock, Nev.

June 29—The Salt Lake smelting companies are searching Nevada for suitable smelting ores that will flux well with the Utah ores, seeking especially those with an iron base. The California smelters are offering special rates for siliceous ore, so that the position of the ore producer in Nevada is such as to command the best rates on either iron or siliceous ores, the freight being the most important consideration. This will, perhaps, soon create a condition that may invite smelters to build somewhere near the center of the state, where an industry of good proportions might grow up.

Miami, Okla

June 30—The mills at present under construction in the Miami district are as follows: Thirty-acre Mining Co.'s mill, L. C. Church, manager; Chapman & Lennan, Temple Chapman, manager, Webb City, Mo.; J. H. Malloy's mill, R. H. Danford, manager, Miami; Prairie Mining Co.'s mill, Samuel Sullivan, manager; Miami Royalty Co.'s two mills, J. F. Robinson, manager, Miami. The above are second-hand mills and are being moved from other leases in the Joplin district. In all except one, Bessemer gas engines are being installed for driving, with power varying from 135 to 150 hp.; Bessemer gas engines are also being installed to drive the air compressors for drills and hoists. The compressors are mostly Rand-Imperials.

The Chapman mill is being tuned up and the 30-acre mill was expected to be running by July 1. The remaining four companies have purchased mills and have commenced to dismantle and move them. The average cost of these second-hand mills, moved and rebuilt, is from $12,000 to $15,000; the average capacity is 300 tons per 24 hours.

The Carson-Dodson Mining Co., L. C. Church, manager; Chapman & Lennan Co.; Miami Royalty Co.; and George Moore, of Webb City, Mo., are planning the erection of four more mills this autumn, but have not purchased them as yet. In all probability these will be second-hand mills also, as the latter can be purchased, moved, remodeled and rebuilt for about 50c. on the dollar as compared to a new mill.

Negaunee, Mich.

July 6—One of the best advised companies in this field is the E. J. Longyear Co., of Minneapolis, which has recently made an extensive find near the Mastodon mine, southwest of Crystal Falls. This company, which has absorbed the old Longyear & Hodge Co., of Marquette, has lately turned its attention from Minnesota to Michigan, and under the direction of an experienced geological staff, of which W. J. Mead, of the University of Wisconsin, is the head, is investigating iron-ore possibilities in a systematic manner; it is reported that the Longyear company will send out four geological parties in the Michigan region this summer. North west of Iron River attention has lately been directed to the Atkinson region and its possible connection with the Amasa district, while diamond-drilling near Watersmeet on the Chicago & Northwestern Ry., has suggested the possibility of an extension of the Iron River district into Wisconsin, south of the Gogebic Range.

Sudbury, Ont

July 5—The Dominion Nickel-Copper Co., controlled by the Booth-O'Brien interests, of Ottawa, has purchased the Murray mine, which formerly belonged to the Vivan interests, of Swansea, Wales, and has also purchased some holdings of the Lake Superior Corporation, including the Elsie and Gertrude mines on the south range and the Victor on the north range. The company is already the owner of extensive nickel properties in this district, having acquired the interests of a Hamilton, Ont., syndicate, on the north range, three years ago.

The Dominion company has been carrying on exploration and development work for the last two years and is continuing it. It is expected that the company ultimately will erect a treatment plant at Sudbury and enter actively into nickel production. J. A. Holmes is the local manager of the Dominion company. Operations which were commenced last year by an English-German syndicate and also by Toronto men, have been permitted to lapse, with some sporadic drilling.

The Canadian Northern Ry. is building its trunk-line extension through the northeast corner of the Sudbury district and will furnish access to a number of properties that heretofore have not been available. The Manitoulin road will be completed to Little Current this season and will furnish direct connection between Lake shipping on Georgian Bay, and the Sudbury district.

Cobalt

July 5—Judge Demers, of Montreal, has dismissed the action brought by a number of the original shareholders of the Crown Reserve Mining Co., of Cobalt, to compel its trustees to distribute among them stock held in trust. This stock was not distributed when the original allotment of shares was made but was held back for future distribution to provide funds for development when needed. The claimants are no longer members of the Crown Reserve syndicate but they contended for the right to have the stock shared among them.

Porcupine

July 5—Considerable interest has been aroused here over the starting of the Porcupine Gold Mines Co.'s mill, as it is a radical departure from the general practice throughout the district. The mill, which is designed for a capacity of 100 tons per day, uses crushers and rolls for the preliminary crushing, and 4½-ft. Hardinge ball mills, instead of stamps. The pulp from the ball mills is classified, the oversize being returned to the mills, while the undersize goes to 6-ft. Hardinge pebble mills. The pulp from the pebble mills, over 95% of which will pass 100 mesh, goes direct to the amalgamating plates. No cyanide or concentration is attempted but it is expected that by having a large plate area, and by careful amalgamation, a saving of 85% will be effected. The tailings are being stored in case it is desirable to cyanide them later. The mill has been in operation only a short time but the results obtained to date are satisfactory. The development of this type of mill is important as the low initial cost, cheapness and simplicity of operation commend it for many mines.

The Mining News

The Current History of Mining

Alaska

Press dispatches from Fairbanks state that the most violent earthquake ever known in that vicinity occurred on July 6, the shock lasting continuously for 40 sec. Louis Anderson, foreman of a mine on Dome Creek, is reported to have been killed by a fall of ground, loosened by the shocks.

Alaska-Treadwell—This company is installing a power station at Nugget Creek, 15 miles from Juneau and has 90 men employed.

Alaska-Mexican—During May, 20,517 tons of ore were crushed, yielding $60,618 gross and net $20,868. Operating expenses were $29,652; construction, $10,096. Development totaled 147 ft. and the ore averaged $2.98 per ton.

Alaska-United—During May, 39,424 tons of ore were crushed, yielding $99,052 gross and net $23,055. Operating expenses were $54,363; construction, $21,633. Development work totaled 834 ft. The ore averaged $2.72 per ton at the Ready Bullion mill and $2.37 at the 700 Claim.

Arizona

Cochise County

Commonwealth—The matter of building a mill at the mine is still being considered by the Montana-Tonopah Mines Co., of Tonopah, Nev., the owner. It is stated that tests are being carried on by copper smelters looking to the use of Commonwealth ore for converter linings. It is expected to know within three months whether a contract can be made with the smelters for 300 tons of ore per day, in which event the construction of a mill will be unnecessary.

Gila County

The larger mines of the Miami district are gradually supplanting horses with motor trucks for hauling supplies from Miami to the mines. The Inspiration has a 3½-ton Alco, a 2-ton Velie and a 1500-lb. Velie. A 3-ton Velie is hauling supplies to the Live Oak mine and the Miami Copper Co. is using a 1500-lb. Velie.

Copper Reef—A second shaft has been put on at the mine, 12 miles south of San Carlos, and 22 men are now employed. The California tunnel is in 1095 feet.

Inspiration Consolidated—Charles E. Mills, general manager, has arrived in Globe, to assume charge of operations. He was accompanied by W. H. Aldridge, Dr. L. D. Ricketts and W. D. Thornton. Over 500 men are employed. It is intended to sink the main west working shaft 1000 ft. for the extraction of ore from the Live Oak orebody. The new Ingersoll-Rand compressor, of 1200 cu.ft. capacity, is in operation at the portal of the Inspiration tunnel and development of that orebody is progressing rapidly. New dwellings are being erected and grading is being done for the pumping station.

Miami—Preliminary figures give approximately 2,700,000 lb. as the production for June. There were mined 89,900 tons of ore during the month. One churn-drill is at work at the northeastern part of the property and a Sullivan diamond drill is in operation on the 570-ft. level. Manager B. B. Gottsberger states that the future policy will be to make public no more information on results of diamond drilling.

Old Dominion—The smeltery produced 2,112,000 lb. of fine copper in June, with an average of 2½ furnaces in operation. It is expected that three furnaces will be working in July as the amount of custom ore received is gradually increasing.

South Live Oak—Churn-drill hole No. 1 has been discontinued at a depth of 825 ft. without discovering ore. The drill is being moved to another site where it is proposed to drill on a faulted zone in the granite formation.

Rose—John Rose reports the discovery of copper-silicate ore in a 100-ft. tunnel in diabase on this group of nine claims north of and adjoining the Inspiration.

Mohave County

Banner—Two cars of ore have been shipped to the Needles smeltery by leasers on this mine. This shipment is said to average about 60% lead and $40 per ton in gold and silver.

Frisco—Manager E. H. Barton recently brought in a $6000 bar of bullion. This was the cleanup of two weeks' milling. The company is handicapped by its present mill equipment, the capacity of which is small for the amount of ore developed.

Boundary Cone—A strike of high-grade ore was reported recently on the 400-ft. level. The shaft is now being sunk to the 500-ft. level.

Arizona Southwestern Copper Co.—This company has two Avery auto trucks operating between Yucca and Copperville, one of three-ton capacity and the other of five. L. Hoffman, manager, states that a Saurer truck will also be placed in service soon. The structural material and the machinery for the mill are being delivered and construction is under way. The use of reinforced concrete for the sides of the building, is being seriously considered.

Mitchell—The shaft is being sunk to a depth of 500 ft. At present 35 men are on the payroll. Joseph Onetto is in charge.

Tom Reed Junior—The main shaft has reached a depth of 220 ft. and it is reported that it has been in milling ore from the surface.

Iowa—John H. Moore has a contract for sinking from the 200- to the 300-ft. level on this group. Ore running over $100 per ton has been encountered at a depth of about 240 feet.

San Francisco—Shaft sinking is still in progress under the direction of Clifford Goulding. The property is owned by the Yucca Mining Co., whose president, T. J. Purdy, of Sunbury, Penn., was in Kingman recently. A diamond drill will be used to assist in prospecting.

Yuma County

Clara Consolidated—This mine and smeltery at Bouse was recently examined for European interests that have an option. The property was financed and developed by George Mitchell but has been closed for about a year. It is reported that new interests will develop the mine and resume smelting operations.

California

Amador County

Kennedy—Preparations are made to deepen the 3500-ft. shaft to about 3700 ft. This is still the deepest vertical shaft in the state.

Keystone—This corporation has issued its financial report for the half year ended June 18, showing an expenditure of $28,771. The chief items are: Power, $2594; equipment, including compressor and blower, $6210; lumber, $3676; labor, $12,685; supplies, including powder, $945. The balance, $2661, covered office and legal expenditures. The inclined shaft has been unwatered, repaired and deepened to 1700 feet.

South Eureka—The deed transferring the Oneida mine and 250 acres of adjoining land to this company has been recorded. The company for several months has been reopening the Oneida and putting the 80-stamp mill in order.

BUTTE COUNTY

The Lumpkin district, 32 miles east of Oroville, is attracting attention. The Triumph has placed a stamp mill in commission, and a good cleanup was recently reported. The Richards and Sparks mine is reported to have encountered good ore.

CALAVERAS COUNTY

Petticoat—The new gallows frame is up, a 50-hp. Nagle engine installed, the new assay office completed and the shaft retimbered to the water line. The Afterthought shaft will be connected with the Petticoat at the 450-ft. level.

Comet—The 10-stamp mill is in commission and is running on high-grade ore.

Channel Mining Co.—A Dodge rotary pulverizer has been installed at this gravel mine, at San Andreas. D. A. Cavagnaro is superintendent.

Lloyd—This gravel mine, at Central Hill, has been redeemed from delinquent tax sale. The litigation causing the sale is being cleared, preparatory to reopening the mine.

Calaveras Copper Mining Co.—Reports state that the concentrator will be in commission about July 15.

ELDORADO COUNTY

Georgia Slide—It is reported that the Sacramento men who bonded this old hydraulic mine and were working it with a Beers mill, have relinquished the bond, and that the property is being operated by the owners.

Bright Hope—Work has been resumed at this mine, near Georgetown. The installation of a stamp mill is contemplated. J. N. Lawson is president.

GLENN COUNTY

Some excitement has been caused at Willows, by the report that there is gold in the gravel of Stony Creek in the vicinity of Stonyford.

MARIPOSA COUNTY

Original—The inclined winze, 185 ft. from the portal of the tunnel, is being deepened from the 160-ft. point. At 200 ft. depth the vein will be drifted on both north and south. The mine is equipped with an electric power plant, situated on Merced River. The electric current is generated by two Leffel wheels under a 24-ft. head. A 2-stage Ingersoll compressor is driven by a 133-hp. Westinghouse machine. Timber and machinery are on the ground for the construction of a 10-stamp Joshua Hendy mill of 1000-lb. stamps. Pacific vanners will be installed, built by the D. D. Demarest Co., of San Francisco. The Yosemite Valley R.R. provides transportation at El Portal. George W. Egenhoff, of Merced, is superintendent.

NEVADA COUNTY

Pittsburgh—The drift on the 1500-ft. level has been connected with the winze. The winze will be deepened 250 ft. Mark B. Kerr, Nevada City, is manager.

PLUMAS COUNTY

Droege Mining Co.—Contracts have been let to the Indian Valley Electric Light & Power Co. for power for this mine, at Greenville, to be available in September. A temporary 250-hp. steam plant will be installed for present use, and will be maintained as an auxiliary. E. O. Lindbloom is manager.

SHASTA COUNTY

First National Copper Co.—The company is reported to have sold its coke supply of 1000 tons to the Mammoth company. This may indicate that there is small hope of resuming operations soon.

SIERRA COUNTY

Telegraph—The company intends to erect a new power plant this summer, with a capacity of over 1000 horsepower.

Colorado

CLEAR CREEK COUNTY

Hoosac—The company is advancing its tunnel 150 to 160 ft. per month toward its property, on Quartz Hill. The tunnel is 8x8 ft., and its total length is 2000 ft. No. 8 Leyner drills are used. H. C. Perks is superintendent.

Lalla—This property is operated under lease by F. C. Dinsmore. The 10-stamp mill has recently been started. It is reported that the mine contains a broken reserve of gold-quartz ore, sufficient to supply the mill for more than a year.

Freeland—A meeting of stockholders is called in Idaho Springs, on July 9, to consider the question of providing funds for payment of the company's debts and for additional development. If the debts are not paid, the property will be sold by the sheriff on July 10, to satisfy an $83,790 judgment.

LAKE COUNTY—LEADVILLE

Surface water from melting snow and late heavy rains has stopped work in many shafts, besides making the roads so bad that the haulage of ore has been seriously hindered and prospecting in the outlying sections has also been interfered with.

Yak—Thirty sets of lessees are at work in the long tunnel and most of them are shipping. The monthly output is about 12,000 tons.

Big Chief—Fifty tons of carbonate-of-zinc ore and 50 tons of lead and iron ore per day are being shipped.

Little Miami—A good grade of iron ore, carrying gold, silver and copper has been shipped from the 400-ft. level by lessees in the Big Tom shaft.

Long & Derry—Lead-carbonate ore is being shipped from the 260-ft. level of the Estey shaft.

Bertha—Lessees are shipping 2-oz. gold ore, but work in the lower levels is being curtailed by the influx of surface water.

LA PLATA DISTRICT

Another discovery in the La Plata Mountains, in southern Colorado, is announced, and it is said that excitement prevails; many of the farmers in the Farmington section are said to be leaving their fields for the gold district, and the stages between La Plata City and Hesperus are crowded. Most of the ore in that district contains principally gold, but this discovery shows a vein that assays high in silver. Shipments have commenced.

SAGUACHE COUNTY

Rawley Mining Co.—During June the 7x8-ft. development and drainage tunnel was driven 488 ft., of which 92 ft. were driven during the last four days of the month. During the early part of the month, considerable hard, altered andesite, heavily impregnated with iron pyrites, and carrying much water, was encountered, making progress slow and difficult. On June 1, the tunnel was in 4684 ft. and it is expected that the total length of 6250 ft. will be completed in about three months. W. C. Russell, Bonanza, is manager.

SAN MIGUEL COUNTY

Nellie—This mill, near the head of Bear Creek, is equipped with stamps and amalgamating plates and until recently no attempt has been made to treat the tailings. A lessee has now installed two Wilfley tables to do this. Preliminary results have been satisfactory.

Ballard—Seven men are at work on this property, on Ballard Mountain, taking out ore for a test mill run. It is reported that the vein contains gold-bearing quartz, 3 ft. thick. Some of the ore shows native gold.

TELLER COUNTY—CRIPPLE CREEK

The old Rosebud mill, near Mound City, was burned down in 1893, and the tailings are now being shipped to the Golden Cycle mill, at Colorado City, yielding from $8 to $15 per ton.

Stratton's Independence—During May, production amounted to 3071 tons of ore averaging $15.25 per ton. Low-grade mine and dump ore amounting to 10,900 tons was milled. Special development cost $1550 and net profits at mine and mill were $14,500.

Elkton—On the 1100 level the main oreshoot has been opened and shipments show that the ore is richer than in the levels above. It is stated that there is enough in sight to produce 3000 tons per month for five years.

Old Gold—The shaft on Beacon Hill has been repaired and will be sunk 200 ft. from the 600 level.

Free Coinage—A rich strike is reported in the Pinto mine, at 450 ft. depth. J. B. Neville is general manager.

Findley—The output during June was eight cars of $25 ore. A crosscut is being driven from the 1500 level toward the Hill City claim, in which it is expected to cut shipping ore.

Specimen—This mine has three feet of ore, which ships at $30 per ton with little sorting. The output is five cars per week.

C. K. & N.—On the Rapp vein an oreshoot of rich telluride of gold has been found. A new drift is being run now from the 900 level in a cross vein which produced rich ore some years ago, and which is now rendered possible by the deep drainage tunnel.

Ocean Wave—A 6-ft. vein of ore is reported found. A shipment gave returns of $22.50 per ton and two cars per week will be sent out.

Idaho

Coeur d'Alene District

Caledonia—Boise dispatches state that suit has been filed against this company by the Bunker Hill & Sullivan Mining Co. The Caledonia recently opened an oreshoot, and the Bunker Hill & Sullivan's claim to this, below the 500-ft. level of the new mine, is based on the apex law.

Michigan

Copper

New Arcadian—The new shaft has reached bedrock, having passed through about 40 ft. of overburden. Diamond drilling is being done at various points on the property in the horizon of the Baltic lode.

Mass—Construction work at "C" shaft has been completed and ore shipments started. Production will be temporarily handicapped owing to the scarcity of underground labor that prevails throughout the district.

Houghton—Developments on the Superior lode at the 600-ft. level are continuing satisfactory. The ore that is being accumulated in the stock pile is rich and plans are being formulated for an extended mill run. The surface equipment includes an electric hoist and compressor.

Indiana—Shaft sinking is going forward and has reached a depth of over 1000 ft., in a trap formation. It is calculated that the felsite formation will be reached at a depth of about 1300 feet.

Adventure—Drifting is being done on No. 3 lode with encouraging results. The formations have been opened by a crosscut from the 1500-ft. level. No. 1 lode carried little copper and openings on No. 2 show the formation to be bunchy. The shaft is temporarily bottomed a few feet below the 1500-ft. level.

Onondaga Copper Co.—This company was recently organized with a capitalization of 150,000 shares. Reginald C. Pryor is president. The company starts out with $120,000 and 45,000 shares of stock in the treasury. It will explore and develop about 10,000 acres of land in Ontonagon County, in proximity to the White Pine tract of the Calumet & Hecla. Diamond drilling will be started soon; sufficient preliminary work has been done and Mr. Pryor has enough geological data to enable him to lay out a drilling campaign.

Naumkeag—Diamond drilling is reported to have started. This property lies west of the village limits of Houghton and is believed to be traversed by the Pewabic, Hancock and other lodes.

Mohawk—This company is asking for bids for the erection of a modern steel shaft house, for No. 6 shaft.

Iron

Republic—Shipping by steam shovel from stockpiles has been active at the company's shafts and the piles will probably be cleaned up this season. At No. 9 shaft, vertical, a new steel headframe is planned to replace the wooden one.

E. J. Longyear Co.—This Minneapolis exploration company is drilling in northern Wisconsin, near Watersmeet, Mich., for Frederick I. Carpenter, of Chicago, and associates, large owners of land and mineral rights in Wisconsin and Michigan. It is thought that there may be an extension of the Iron River district into Wisconsin, south of the Gogebic Range. The area to be explored extends from the Lake Vieux Desert, of Gogebic County, Mich., through Villas County, Wis., as far as Powell and Emerson, in Iron County, Wisconsin.

Yale—This mine at Bessemer has been shut down. Two months will be devoted to repairing the shaft. On July 1, the intention was to close the company's blast furnace at Ashland, Wis., for repairs.

Florence Iron Co.—This company, which has been drilling at Commonwealth, Wis., will sink an exploratory shaft near the school house there. It is planned to sink 300 ft. and drift on two levels. E. A. Thieman, formerly bookkeeper in the company's office at Florence, has been appointed assistant to Felix Vogel, general manager, and will have charge of the Ladenburg-Thalman operations in Florence County, Wis., and Iron and Gogebic Counties, Michigan.

Corrigan, McKinney—The Colby and Ironton mines at Bessemer are active. Each mine produces two high-grade, nonbessemer ores.

Missouri

Mine La Motte—After being in operation intermittently for nearly 200 years, this property is reported to have been closed down recently, following labor troubles. It recently passed into the hands of a St. Louis promoter but has been troubled with financial difficulties.

Montana

Butte District

Butte-Duluth Mining Co.—On June 27 this company was incorporated by Butte men, with a capitalization of 25,000 shares, par $10. The incorporators and directors are Alfred C. Kremer, J. B. Kremer, L. P. Sanders, W. M. Tuohy and C. M. Everett.

Beaverhead County

Butte & Vipond—Considerable development work is being done at the Martin mine near Dewey. The work is confined to the 200-ft. level, where crosscutting and drifting are in progress. A. J. McIntyre, who is in charge of operations there, has been in Butte arranging for the purchase of machinery and mining supplies, and after the former is installed the force will be increased.

Deerlodge County

Gold Coin—L. F. Ireland has an option on this group of mines in the Georgetown district and is waiting for the coming of the railroad, to begin operations with the 30-stamp mill on the property. There is some low-grade ore blocked out in the mine, and Mr. Ireland expects to treat from 50 to 75 tons per day. On the Butterfly claim, a 2-ft. manganese vein with 7 in. of talc, giving good assays on both foot and hanging walls, has been opened. Some of the other mines in the district that have been partially developed, and upon which work will begin with the coming of the railroad, are the Red Line, Bonanza, Red Fir, Venus, Iron Mask, Red Rose and Iron Chancellor.

Flemming—L. S. Ropes and J. P. Latsch, of Helena, have recently taken over this and the Willard group in the Warm Springs district. The property has been undergoing development for the last 48 years and considerable underground work has been done. In the oxidized portions of the lode the ore is unusually rich and in the sulphide zone contains 1¼ oz. gold and from 10 to 20 oz. silver, with some copper and lead.

Lewis and Clark County

Marysville Gold Mining Co.—This property is situated on the east side of Belmont Mountain. A portion of the group is known as the Annie Dillon property. The ground includes 100 acres, under development for four years. The Excelsior and Aztec claims have received special attention and the former has a 900-ft. tunnel which has opened an oreshoot 250 ft. long and 2 ft. wide. On the Aztec claim, sinking, crosscutting and drifting have opened the vein at 75 ft. depth. It is intended to install a 10-stamp mill soon, also an air compressor. Electric power will probably be obtained from the Missouri Power Co.'s plant at Lake Hauser. James Deering, Helena, is vice-president.

St. Louis Mining Co.—This company is working the Drumlummon mine and is operating a 20-ton stamp mill at full capacity; it is reported that this will be increased to 40 tons.

Bald Mountain—Colonel Cruse, of Helena, is operating this and the Belmont mines, keeping 20 stamps busy.

Bald Butte—This company is operating on a small scale and expects to start its stamp mill this summer.

LINCOLN COUNTY

Fisher Creek Mining & Smelting Co.—The company is negotiating with Eastern men for the sale of the Brick & Brannigan mine in the West Fisher district. The property consists of three placer and six quartz claims on Bramlett Creek, 35 miles south of Libby, and is said to have produced $85,000 in gold and silver. Some ore is in sight, averaging about $6 per ton, according to an inspection just made by a Butte engineer. The property is equipped with a 10-stamp mill.

Snowshoe—Concentrates are being hauled from the mine, 20 miles south of Libby, for shipment to the smeltery. The ore is being hauled from the mine to the Libby Lumber Co.'s logging railroad, a distance of eight miles, by teams. William Jennison is operating the property, as receiver.

Libby Placer—Continuous operations are in progress at the company's hydraulic plant on Libby Creek. P. J. Brophy, president, is superintending work.

MADISON COUNTY

Under the direction of W. B. McCubbin, of San Francisco, a California company has completed the relocation of 22 placer claims, extending from Granite Creek to the lakes, over ground believed to be the original channel of the famous Alder Gulch stream. The company has also taken an option on 1000 acres adjoining the claims. Development will be done, consisting of drilling with three Keystone drills. If pay gravel is discovered, a method of working used for some time in California will be tried. This will consist in running long tunnels into the hill east of Virginia City from the lowest level of Alder Gulch, and continued on a steep upgrade. A heavy stream of water will be piped from a reservoir on top of the hill and carried to the working breast to be used in sluicing the gravel. The gold will be retained in riffles in a flume carried along the floor of the tunnel.

POWELL COUNTY

Yellow Pine—A good vein of free-milling ore has been opened in this mine in the Elliston district, and Manager Frank Powers has recommended to the owners that a three-stamp mill and a cyanide plant be erected. A shaft has been sunk 150 ft. and while crosscutting on this level, the vein was opened, the ore carrying gold and silver.

Nevada

CHURCHILL COUNTY

Outlander—The company has recently bonded its nitrate lands in the northern part of the county, to W. C. Whitley and others, of San Francisco. It is reported that the lease calls for the payment of $1 per ton royalty, and $100,000 for the property.

Muttleberry—About one car per day is being shipped from these deposits to the Mason Valley smeltery.

Nevada Hills—Reports state that the company has made a contract with the International Smelting & Refining Co., for treatment of concentrates, and that the first shipment of two cars has been made.

CLARK COUNTY

Yellow Pine—The production during June consisted of 1500 tons of zinc concentrate, 300 tons of lead concentrate and 200 tons of crude zinc carbonate, averaging 40% zinc. The mill ran continuously. Plans are under way to add additional jigs and concentrating tables. Another pumping plant is to be installed at Goodsprings to operate in conjunction with the present plant, and a larger generator will be installed in the mill to furnish electrical power for the new plant, and for the pumps now driven by gasoline engines.

Tam O'Shanter—It is reported at Goodsprings that J. E. Newberry, of Los Angeles, will erect a concentrating plant to treat the mixed lead and zinc ores from this and the Calico groups. The mill, which will be modeled after the Yellow Pine, will be erected either at Sandy or Mesquite, and will have sufficient capacity to handle custom ores. This should cause activity on the western side of the range. It is also understood that the company is negotiating with the Santa Fé R.R. to extend its spur from Ivanpah through Stateline Pass and into this portion of the district.

Kirby—F. C. O'Kelly, manager for the Campbell estate, has let contracts for considerable development work on the Kirby group. The mine is to be equipped with a new hoisting plant and ore shipments are expected to begin in the autumn.

ESMERALDA COUNTY

Vernal—A raise has been started on a 4-ft. vein of quartz, known as vein No. 2. The crosscut on the 200-ft. level is over 60 ft. long.

Lucky Boy-Alamo—Frequent shipments are being made and the 10-stamp mill is in continual operation. Ore is being extracted principally from the 900-ft. level. Two new pumps are being installed at the station on this level.

Goldfield Consolidated—The estimated June production was 32,360 tons. Gross value recovered was $542,000; operating expenses, $200,000 and $342,000 net realization for the month.

HUMBOLDT COUNTY

Antelope & Superior—John W. Geiger is reported to have stated recently that the company will soon let a contract for driving 500 ft. further in tunnel No. 4, to tap the oreshoots that were developed by three upper tunnels at 400 ft. depth. Two new Wilfley tables are being installed.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended June 27, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,500	86,419
Tonopah Belmont	1,900	52,626
Montana-Tonopah	1,109	26,592
Tonopah Extension	1,076	25,257
West End	805	18,459
Midway	....	180
MacNamara	471	9,603
North Star		80
Totals	8,861	219,216
Estimated value	$221,525	...

According to dispatches a disastrous fire swept the business district of Tonopah on July 8, resulting in losses estimated at about $250,000.

MacNamara—On the 375-ft. level an oreshoot has been opened assaying over $100 per ton. Some good ore is also being developed on the 800-ft. level.

West End—A new oreshoot has been opened on the east drift on the 500-ft. level, carrying some $12 ore. The face shows 5 ft. of $38 ore.

WHITE PINE COUNTY

Nevada Consolidated—On July 7, an explosion of dynamite, in boxes, killed 10 and injured two men, engaged in loading a hole in the Eureka pit.

New Jersey

The Green Pond iron mines at Green Pond, near Rockaway, in Morris County, are reported to have been sold by the Central Iron & Steel Co. to J. G. Jones, who represents a California syndicate. The ore is magnetite, but high in sulphur and phosphorus. The purchasing syndicate claims to have a new process for concentrating the ore and eliminating the impurities. The mines have rail connection with the New York, Susquehanna & Western and the Central R.R. of New Jersey.

Mount Hope—At this iron mine, in Morris County, the Empire Steel & Iron Co. is preparing to put in additional equipment and to sink a new shaft.

New Mexico

Miser's Chest—This group, sometimes known as the Lena group, is situated five miles south of Lordsburg, and is owned by James G. Berryhill, Des Moines, Iowa. Several veins with prominent outcrops traverse the property, which consists of six 600x1500-ft. claims. The property is undergoing development by Capt. S. W. Maltbie, of Lordsburg, who has a bond and lease. Equipment consists of a gasoline hoist, a small Leyner compressor, steam engine, boilers and necessary miners' tools.

New York

St. Lawrence County

One zinc mine in this county has made small shipments recently and several small zinc and lead deposits are being explored. A lead furnace was once operated in the county. The deposits are in veins, with calcite, in the limestone.

Oregon

Independent—This copper mine near Riddles is under option to a New York company. It has been extensively developed.

Old Glory—C. L. Mangun, president, has received returns of $143 per ton on ore recently shipped to the Tacoma smeltery from this mine, 45 miles northwest of Grant's Pass.

Utah

Beaver County

Cedar-Talisman — Drifting is being done on the 500-ft. level.

Noonday—The shaft has been completed almost as far as the 200-ft. level, and timbering is being done as the work of sinking progresses. There are stringers of iron ore in the bottom of the shaft.

Lady Bryan—Drifting is being done on the 500-ft. level, and 5 ft. of ore are reported to have been opened.

Leonora—Drifting is being done to get under old workings, productive in the past.

Juab County

Tintic shipments for the week ended June 21 amounted to 189 cars; those for the week ended June 28, to 181 cars.

Crown Point—The annual report shows a cash balance of $1243. A large amount of development work was done and this is being continued.

May Day—Pending the completion of negotiations in regard to railroad rates on zinc ore, no shipments of this class of ore are being made, and attention is being given to the installation of a new electric hoist.

Yankee Consolidated—Two cars of zinc ore, carrying from 39½ to 47½% zinc, are ready to be shipped.

Salt Lake County

Utah Copper—During May, 10,068,336 lb. of copper were produced.

Alta Consolidated—This company is stated to have marketed about $6000 worth of ore since the opening of the roads this spring. Most of the ore has come from the fissure in the tunnel, which has been followed 300 ft. Recently the No. 1 raise reached the contact, and 6 ft. of shipping ore have been opened; new ore has also been found about 100 ft. to the west of this point, 145 ft. above the tunnel level.

Summit County

Park City shipments for the week ended June 29, amounted to 3,312,000 lb. The Daly-West, Silver King Coalition and Daly-Judge were the principal shippers.

Ontario—The Mines Operating Co., which has taken a 10-year lease covering the property down to the 900-ft. level, is remodeling the old Ontario mill, putting the property in shape generally for operation. New equipment has been ordered. The initial capacity of the mill will be 150 tons per day, and provision will be made to double this later. Old stope fillings and ore of too low a grade to raise to the surface in the early days will be treated. George H. Dern, general manager of the Consolidated Mercur Gold Mines Co., is largely interested, and is in charge of the remodeling.

Daly—The report that this company would resume operations during July has been denied by the management.

New York Bonanza—Ore is being mined on the 200-ft. level, and the second car for June is being loaded. The ore is expected to bring about $15 per ton.

Tooele County

Galena King—Work is being done in ore on several levels. A car recently marketed is stated to have brought between $800 and $900. Regular shipments are being made.

Ophir Hill—The mill is being enlarged, and will have a capacity of 300 tons per day. A quantity of concentrates is awaiting shipment over the new branch line to St. John on the Salt Lake Route. The road will be in operation soon; the rails are laid and the resurfacing of the track is being completed.

Utah County

Shipments are again in progress from American Fork Cañon, after the winter's closedown. Leasers at the Wild Dutchman have a car of 50 tons at the railroad. The Pacific property has been developing for the last two months and mining ore for shipment. Leasers from Tintic have taken a lease on the Pacific dumps of second-class silver-lead ore, and are making concentrates by jigging. The Pacific is developing a large tonnage of milling ore, and it is thought will eventually install a mill. The Mineral Flat property, adjoining the Pacific, is not being worked, but it is reported that operations are to be resumed.

Canada

British Columbia

New Canadian Metal Co.—The installation of hoisting machinery and the enlargement of the concentrator are nearing completion. Mining and milling will soon be resumed at the Bluebell mine, on Kootenay Lake. S. S. Fowler is general manager.

British Columbia Copper Co.—Work has been resumed at the company's Lone Star mine, near Greenwood, and at the Napoleon mine in Washington. Some good ore was found on No. 14 claim, of the Voigt group, and a compressor and six diamond drills have been taken in so that extensive prospecting may be done before a payment on the property becomes due in November.

Ontario

Dane Mining Co., Ltd.—This company owns six claims in Lebel and Teck townships, three miles north of Dane station, on the Temiskaming & Northern Ontario Ry., 60 miles north of Cobalt, and southwest of the Porcupine district. Montreal men are interested. Results of development to date are stated to be satisfactory; two lenses of chalcopyrite ore, averaging 16% copper, and from 0.02 to 0.03 oz. gold, with a width of about 3 ft., have been uncovered in one shaft, about 60 ft. below surface. Another shaft is 110 ft. deep on a 10-ft. vein of quartz carrying chalcopyrite and bornite averaging 2% copper with a little gold. A small plant has been installed and development work in the two shafts is being pushed under the management of Alexander D. McPhee. G. O. McMurtry is mining engineer.

Ontario - Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for the week ended July 5, and for the year to date, are:

La Rose......	75 53	1,823 17
Coniagas.	110 42	1,110.68
O'Brien		294 49
Right of Way		148 60
Chambers-Ferland		225 60
McKinley-Darragh	108 88	1,367 95
Nipissing	94 41	1,079 99
Hudson Bay	31 48	375 70
Buffalo	29 03	642 42
Crown Reserve		259 29
Cobalt Townsite...	32 07	768 63
City of Cobalt.....		145 84
Trethewey	12 05	283 09
Colonial		11 60
Kerr Lake	61 05	411 08
Cobalt Lake		341 59
Drummond		339 30
Temiskaming		586 92
Beaver		187 89
Wettlaufer		111 21
Provincial		22 22
Casey Cobalt		68 35
Lost and Found		15 00
Totals.	586 27	10,650 61

Bullion shipments in ounces

Nipissing....	123,891 18	1,910,909 49

Nova Scotia—This property has been taken over by the Dominion Reduction Co., of which D. M. Steindler is president and Eugene Steindler secretary. Alterations have been made in the mill to secure increased concentration in the treatment of conglomerate ores. Nothing will be done with the mine at present.

ONTARIO—PORCUPINE

McIntyre—An unusually righ oreshoot has been uncovered in the opencut near No. 1 shaft. The mill has returned $6000 during the last six days.

Porcupine Lake—This company will install a plant and will develop the ground under the lake.

Hollinger—On July 4, the first cleanup of bullion took place in the presence of a number of officials and shareholders. No official statement was made but the results are stated to have been satisfactory. Thirty stamps are dropping regularly. The winze near the main shaft is down 75 ft. below the 200-ft. level and is still in ore. The raise from the 200- to the 100-ft. level is completed and is all in ore. An oreshoot of 600 ft. has been opened on the second level, and it is stated that for 100 ft. it averages over $200 per ton. The Dixon vein has been cut at the 100-ft. level.

Porcupine Gold—The mill is crushing from 75 to 85 tons of ore per day. The ore is being taken from the 100-ft. level in the Godfrey vein. At the 300-ft. level it is found that the Godfrey and the Davidson veins apparently join. There are now over 6000 tons of medium-grade ore on the dump. Stoping from the 200- to the 100-ft. level is in progress.

Plenaurum—A quartz vein 3 ft. wide, running at right angles to the main vein, has been cut at the 200-ft. level.

ONTARIO-SUDBURY

Canadian Copper Co.—An inclined compartment shaft is being sunk in the foot wall of the Froud orebody. It will be continued to about 1000-ft. vertical depth and a similar shaft will be sunk on the same orebody 1000 ft. east. The intention is to connect the two shafts underground and to install an extensive underground mining system with electric haulage and other facilities to handle a large output. Drilling has been under way for about two years and shows a large orebody. This mine will be known as No. 3 and will be connected with the Copper Cliff smeltery by a railroad extension. The company is also drilling the Cryderman property in Falconbridge township, and the Rothschild tract, on Lake Wanahpatei. The capacity of the smeltery at Copper Cliff is being increased to between 3000 and 4000 tons per day. Five blast and five reverberatory furnaces are now in operation.

QUEBEC

McDonald Extension—Plans have been made for the exploration, by drilling, on land adjoining the McDonald copper mine at Weedon. Smith & Travers, of Sudbury, have the contract for drilling.

Mexico

DURANGO

Lustre—Extensive development is under way at this mine near Rosario, by the reorganization committee. The property is owned in Pittsburgh and a large investment in equipment was made several years ago, including a smeltery and a gas-producer power plant. Clawson & Gillingham, of Los Angeles, are in charge of the operations. W. L. Curry, of Pittsburgh, is the new president.

HIDALGO

New York men are examining properties adjoining the Santo Tomas in El Chico district, at Pachuca.

JALISCO

San Pedro Analco—This Mexican-owned mine, on the Santiago River in the Hostotipaquillo district, is under option to American men, supposedly associated with the United States Smelting, Refining & Mining Co. The mine was once a producer of silver. Hydro-electric power is obtained from a plant constructed on the Santiago River, about four years ago.

MEXICO

El Oro—A report recently issued states that, including the estimated profit for June, the total profit for the year ended June 30, 1912, will be approximately £180,000, which added to the amount carried forward from 1911, gives a total profit of £264,759. During the last six months development has proceeded in the northern orebody on the 286-, 486- and 550-ft. levels, and has opened considerable ore varying in grade from $6 to $7 per ton and from 5 to 20 ft. wide. Ore running from $5 to $8 per ton and from 35 to 60 ft. wide has been opened on the San Juan level of the southern orebody. Work has also opened ore of good grade on the 1000 and 1150 levels. On the 1300-ft. level the San Rafael vein, where opened, revealed low-grade ore. Some ore running from $5 to $10 per ton was disclosed on the zero level of No. 1 vein, from the San Patricio shaft. Crosscuts are being driven from an old shaft near the Chihuahua vein. The ventilating shaft was connected with the 1300-ft. level and the interior shaft was sunk to the 1000-ft. level, where drifting was commenced.

OAXACA

Santa Lucia—Operations at this copper mine in the northern part of the state, have been discontinued, owing to the exhaustion of high-grade ore. J. Samuel Coupal, of Boston, was in charge for the American company that had this option.

SONORA

West Coast Mining & Smelting Co.—This company, financed in Holland, has continued its development of the copper deposits about 50 miles west of Carbo, near the Gulf of California. Recently European engineers have visited the property and it is reported that plans for a smelting plant and a railroad to the Gulf are to be carried out. The district is a new one and has been under exploration for about two years.

Central America

COSTA RICA

Aguacate Mines—The amalgamating mill which was started last November was augmented on May 1, by the sand treatment department of the cyanide mill. Steam power was turned off on June 1, and power is now being supplied by the hydro-electric plant. The ore breaker and sorting floors are being transferred from the mill to a position over the mine bins. Inclined chutes for handling ore in the stopes have been replaced by vertical ones, resulting in a reduction of the cost of handling ore to the mill. New orebodies have been opened recently on the fourth and fifth levels. The west vein, which was cut off by a fault to the south, has been traced beyond the fault and the ore is being blocked out in a new section. The seventh level, being driven 220 ft. below the fifth, is expected to cut the vein about Jan. 1, 1913. This tunnel is large enough to permit electric haulage directly to the mill. P. G. Spilsbury, San Mateo, is in charge.

Montezuma—Construction and mine developments have been carried on during the dry season, as no power was available for milling. The rainy season has now set in and the power plant is in operation. The mill and cyanide plant will be kept running during the rainy season. H. B. Price, San Mateo, is manager.

La Compañia Minera Del Porvenir—A complete 10-stamp mill and cyanide plant have been purchased. Power will be furnished by steam engines using wood fuel, until electrical power is brought into the district. The mill will not be erected until the end of the wet season, in December, as hauling is difficult. Development has been under way for over a year. James Dagan is president.

South America

CHILE

Braden—On July 7, 30 men were killed by an explosion underground. The accident is supposed to have occurred near a winter storehouse and remote from actual mining operations, but it may have been in development workings.

Asia

CHOSEN

Oriental—Cable dispatches state that the June cleanup totaled $140,000.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, July 10—There is very little new to record in the coal trade in the West. Business at all the large consuming centers continues steady, but supplies are abundant and prices generally remain about the same. The Lake trade is improving as supplies at the Lake ports are more abundant. The supply of vessels, however, still exceeds the requirements. The Lake anthracite trade is behind, as there were practically no shipments made in May.

In the East, the bituminous trade is still dull and prices are low, but the coastwise trade is looking up a little. Anthracite trade is steady, dealers and consumers being more inclined to put in stocks. The demand for steam coal is very fair.

Anthracite shipments in June were 6,199,428 long tons, a decrease of 15,929 tons from June, 1911. For the six months ended June 30, the total shipments were 35,309,583 tons in 1911, and 26,104,761 in 1912; decrease this year, 9,204,822 tons.

British Coal Trade—Exports of fuel from Great Britain, with coal furnished to steamships in foreign trade, five months ended May 31, in long tons:

	1911	1912	Changes
Coal	26,255,066	20,416,679	D. 5,838,387
Coke	392,889	336,969	D. 55,920
Briquettes	717,655	526,634	D. 191,021
Total exports	27,365,610	21,280,282	D. 6,085,328
Steamer coal	7,884,191	6,564,682	D. 1,319,509
Total	35,249,801	27,844,964	D. 7,404,837

Imports of coal for the five months were 7652 tons in 1911 and 162,207 tons this year.

German Coal Production—Coal production of German Empire, four months ended Apr. 30, metric tons:

	1911	1912	Changes
Coal	52,462,032	56,083,434	I. 3,621,402
Brown coal	24,136,045	26,769,972	I. 2,633,927
Total mined	76,598,077	82,853,406	I. 6,255,329
Coke made	8,426,499	9,061,380	I. 634,881
Briquets made	6,949,956	7,856,712	I. 906,756

Of the briquettes reported this year 6,226,447 tons were made from brown coal or lignite.

IRON TRADE REVIEW

New York, July 10—The only change in the iron and steel trade which is to be noted this week is some falling off in the quantity of new orders, but this was generally expected. The flood of specifications which came in just before July 1, is keeping the mills very busy and the usual midsummer stops for repairs are being cut as short as possible.

The principal new business reported this week is in orders for cars which have been placed freely by several roads. There have also been a number of small orders for rails placed, including quite a proportion of trolley rails. Structural business has been mainly in small orders, but makes up a very comfortable total. Other lines have been quiet.

In pig iron buying continues rather freely for foundry in Seaboard territory while in the Central West basic is being taken quite freely. Some lots of bessemer pig are being taken by the steel companies from merchant furnaces. Prices are pretty firm generally, though without any quotable advance for early deliveries. Furnaces, however, are inclined to ask a little more for fourth-quarter iron and this is generally conceded by buyers. In the South accumulated stocks have been pretty well worked down and most furnace yards are now bare of everything beyond the small amounts usually carried.

Pig Iron Production—The reports from the blast furnaces as collected and published by the *Iron Age*, show that on July 1, there were 248 coke and anthracite stacks in blast, having an aggregate daily capacity of 81,700 tons of pig iron, an increase of 200 tons over June 1. Making allowance for the charcoal furnaces, the estimated make of pig iron in the United States in June was 2,465,250 tons; for the six months ended June 30, it was 14,028,050 tons. Of this total, 10,439,200 tons, or 74.4%, was made by the furnaces owned and operated by the steel companies.

Baltimore

July 8—Exports for the week included 339,045 lb. steel billets, 228,600 lb. trolley rails and 11,300 lb. rail splices to Glasgow; 4,047,810 lb. steel billets; 224,300 lb. lead to Antwerp. Imports included 1185 tons ferromanganese from Liverpool; 5850 tons iron ore from Cuba.

Birmingham

July 8—The pig-iron market in Southern territory is strong again, the general quotation for third quarter delivery being around $11.50 per ton, No. 2 foundry basis, while $12 is expected to be the minimum price for last quarter. A few small orders have already been booked at the latter figure and inquiries are in hand. The Alabama Consolidated Coal & Iron Co. receivers are operating only one furnace besides coal and ore mines, coke ovens, and other properties. The Woodward Iron Co. has blown in one furnace and has put out another to be rebuilt. This company is making a third furnace ready. The Tennessee Coal, Iron & R.R. Co. has made an appropriation to make improvements at its sixth furnace at Ensley and it will be placed in commission as soon as ready, in about four months. The Sloss-Sheffield Steel & Iron Co. has two blast furnaces almost ready. The Sloss-Sheffield Co. is the only one that has any accumulated iron on hand, but this is being removed steadily.

Foundries and machine shops are doing fairly well with prospects of a continuation through the summer. There is a good feeling among the scrap-iron dealers. Charcoal iron makers hold their product at $22@22.50 per ton, with the make about equal to the demand.

Chicago

July 9—The iron market shows decided strength as regards both pig iron and finished materials; the demand for pig iron continues light while that for iron and steel products of almost every sort is heavy, despite some advanced prices.

Such sales of pig iron as are being made are for small lots with delivery in the last quarter or last half—more being for delivery soon than later—at unchanged prices, Southern No. 2 bringing $11.50 Birmingham, or $15.85 Chicago and Northern No. 2 $14.50 at furnace, on nearly all the business done. Lake Superior charcoal sells for $15.50@16. The melters are not likely soon to begin buying heavily for this is their slack season.

Structural material continues in large demand for local and western new construction with material under 15 in. holding to 1.48c. Railroad supplies find a large sale with little business solicited, the problem being to take care of that which flows in. Bars are in good demand with the mills still crowded and soft-steel bars holding up firmly to 1.43c.; bar iron remains at 1.25c. For plates, sheets and wire products the demand is large everywhere, plates especially being strong at 1.43c. General business conditions support the belief that there will be no check soon to the heavy buying.

Cleveland

July 8—Iron-ore shipments for June have been very heavy, exceeding 7,500,000 tons.

Pig Iron—Sales have been fair only, but the market is strong and the tendency of prices upward. Two furnaces in this district have been obliged to blow out for repairs. Prices, Cleveland delivery, are $15.15 for bessemer, $13.75 for No. 2 foundry, $13.25 for gray forge and $17.50@ 18 for Jackson County silvery.

Finished Material—Specifications on contracts have been very heavy and the mills are well filled with work. New orders have been rather slow. The markets are strong at the recent advances.

Philadelphia

July 10—The disturbed coke situation is indirectly having an unfavorable effect on pig iron. Coke concessions are not in sight. Furnace interests argue with some plausibility that pig iron will rule higher before long, but to offset this possibility most large consumers are pretty well supplied for the time being. Inquiries have fallen off since July 1 and sales have been of moderate proportions. Makers are willing to allow a month or two to pass, to see how things figure out, before formulating any policy. The well oversold condition is their strongest point. Quotations are $15.50 for No. 2X, $15 for gray forge, with basic at $15.50 as an asking price, which could be shaded in favor for a large buyer.

Steel Billets—Billets are quiet under very little inquiry, due to unusual activity in weeks past.

Bars—Bars are doing well and much new business has been booked for car work, as a result of negotiations opened early in June.

Sheets—The sheet market is quiet and mills are pretty well oversold. Supplies for immediate delivery are being called for and this business commands a premium.

Pipes and Tubes—Cast pipe is very strong, though scarcely any new business has been placed. Merchant pipe is dull after some weeks of activity. Tubes are active and consumption is heavy.

Plates—The mills are rushing material with the greatest speed to make room for new business that is pending. All kinds of capacity is taxed.

Structural Material—A good week's business has been done, which consisted mainly of a closing of orders which have been on the market.

Scrap—A great deal of scrap is arriving for yard storage, mainly of low-grade material from country localities. Large lots, consisting of old rails and railroad scrap, are located at producing points and will be sold from those points.

Pittsburgh

July 9—Production of steel has been greatly curtailed by the hot weather. This being the first really hot spell the effect is most pronounced. Later hot weather will find the men more or less inured. Production was curtailed last week also by the national holiday, falling close to the middle of the week. Many mills, particularly sheet and tinplate mills, did not resume Friday, and thus lost a total of nearly three days' time, spent more or less profitably in making repairs. There are a few mills definitely off for repairs this week. Altogether, steel production this month is going to fall decidedly behind that of June. New business is lighter, on account of the season, and specifications have, on the whole, fallen off; as to many important cases, contracts expired June 30, and were succeeded by higher priced contracts on which specifications are naturally lighter.

The mill position is a strong one, there being a very large volume of actual business on books, probably the largest volume of really sound business on record.

Prices of finished steel products, as far as any trend is shown in this dull season, are hardening. In sheets and tinplates the hardening is decided. The tinplate market is quotable now at a minimum of $3.50. This is the level to which the American Sheet & Tin Plate Co. recently advanced its price, selling by independents at $3.40 continuing until recetnly, in the case of attractive business Some of the mills have tinplate specifications sufficient to run them well into September.

Pig Iron—The pig-iron market is in a very unsatisfactory position from the sellers' standpoint. There is no life to the inquiry, and it is impossible to obtain a measure of the advance which should occur if the advances in steel products averaging more than $3 a ton, furnish any criterion. Even the strenuous effort of the Connellsville coke operators to obtain $2.50 for second-half coke has not served to stiffen pig iron. That movement has made no material progress in the past week, the deadlock continuing. There are suspicions that a few of the operators have sold prompt coke at under $2.50, although that is the prevailing quotation, and it is also rumored from the East that some furnaces have banked, in an effort to avoid complying with the terms of the operators. Sales of pig iron in the past week have been very light. Prices have been maintained, but have not advanced, despite the fact that a number of furnaces have raised their asking prices. We continue to quote: Bessemer, $14.25; basic, $13.25; No. 2 foundry, $13.25; malleable, $13@ 13.25; forge, $13, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Business in ferromanganese is light, but occasional inquiry is developing for second-half deliveries, as well as for deliveries over the first half of next year. A contract for 100 tons a month over the present half-year has been closed with a steel casting plant outside this district. Prompt ferromanganese is $50@ 52, Baltimore, while the regular contract price prevails for forward delivery, $48.50, Baltimore.

Steel—Billets and sheet bars are very scarce for any delivery in July or August, but there is considerable inquiry for odd lots, which goes to brokers, who can frequently furnish material by making deals of one sort or another. The steel mills cannot make any early deliveries, and for late deliveries are disposed to hold off. Prices quoted are partly nominal: Billets, $21.50; sheet bars, $22. f.o.b. maker's mill, Pittsburgh; billets, $21@ 21.50; sheet bars, $22, f.o.b. maker's mill, Youngstown. Rods continue to be quoted at $25, Pittsburgh, but an attractive inquiry would probably bring out a price of $24.50 per ton.

Sheets—Late on July 3 the American Sheet & Tin Plate Co. advanced its price on blue annealed from 1.40c. to 1.45c., for No. 10 gage, being sold up for seven weeks or longer, with the independents also well sold up. The new price immediately became the general market Black sheets have continued to stiffen, and 1.95c. is the absolute minimum of the market, with little tonnage available at that figure. Automobile manufacturers and others requiring a regular supply are placing contracts for second half or the late months of the year, usually at a premium of $1 a ton above 1.95c., on account of the extended delivery and because they wish to be assured of a regular supply. Specifications have been coming in at an excellent rate and the mills are filled up farther ahead than at any time for a year or two. We quote: Blue annealed, 10 gage, 1.45c.; black, 28 gage, 1.95@ 2c.; galvanized, 28 gage, 3c.; painted corrugated, 28 gage, 2.15c. per lb.; galvanized, 3.05c. per pound.

St. Louis

July 8—The iron market has not been active the past week. Besides the holiday a number of the larger foundries and steel plants have shut down to make repairs, and present needs for iron are light. Most foundrymen have enough iron on hand to last for two or three months and are not inclined to make any large purchases until the summer season is over. Southern No. 2 foundry is quoted at $11@ 11.25, Birmingham, or $14.75@ 15, St. Louis. Northern No. 2 foundry is quoted $14.50@ 15 at furnace.

The coke market has had quite an advance and good foundry coke is quoted $5.65, St. Louis.

Iron Ore Trade

Iron-ore movement from Lake Superior is heavy. On the Great Northern shipments from mines have beeen delayed by capacity of equipment, and ore boats have been held up at the Allouez docks in consequence. The shipments from Steel Corporation mines on the Hill leases have been very heavy.

Imports of iron ore into Great Britain, five months ended May 31, were 3,021,361 tons in 1911, and 2,313,281 in 1912; decrease 708,080 tons. Imports of manganese ore were 156,850 tons in 1911, and 118,676 in 1912; decrease, 38,174 tons.

Foreign Iron Trade

German Foreign Trade—Exports and imports of iron and steel, and of machinery, in the German Empire, five months ended May 31, metric tons:

	Exports	Imports	Excess
Iron and steel..	2,413,073	268,784	Exp. 2,144,289
Machinery......	204,329	36,025	Exp. 168,304
Total..........	2,617,402	304,809	Exp. 2,312,593
Total, 1911.....	2,240,464	271,875	Exp. 1,968,589

Increase in exports this year, 376,938 tons; increase in imports, 32,934 tons.

METAL MARKETS

New York, July 10—The metal markets have been a little unsteady, and copper has reached a lower level.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January....	110	111	July........	112	......
February..	115	109	August....	117	......
March......	112	111	September	111	......
April.......	114	115	October....	112	......
May	118	118	November.	111	......
June........	115	117	December.	110	......

Year 1909, 115; 1910, 115; 1911, 112.

Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
May 1912..	$ 4,450,899	$ 3,346,491	Exp. $1,404,408
" 1911..	6,817,149	5,014,741	Exp. 1,802,409
Year 1912..	26,225,801	19,653,285	Exp. 6,572,516
" 1911..	10,176,807	29,005,312	Imp. 18,828,505
Silver			
May 1912..	6,725,781	4,345,032	Exp. 2,380,749
" 1911..	5,054,304	3,555,842	Exp. 1,498,462
Year 1912..	28,623,028	20,384,764	Exp. 8,238,264
" 1911..	28,665,500	18,454,155	Exp. 10,211,345

Exports from the port of New York, week ended July 6: Gold, $2,191,869, chiefly to Paris; silver, $1,315,434, principally to London. Imports: Gold, $365,988, nearly all from Mexico; silver, $77,559, mainly from South America.

Gold—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for Germany. In New York $4,000,000 more was taken for shipment to Paris.

In addition to the gold recently reported shipped from London to India in the five months, ending with May, further sums of £4,845,000 from Australia and £3,700,000 from Egypt were shipped to India, making the total amount of gold sent to that country in the five months, £13,150,000. Since June 1, more shipments have been made from Australia.

Iridium—The current price of this metal is $63 per oz., New York.

Platinum—The market is quiet and prices are still unchanged, dealers asking $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

Our Russian correspondent writes under date of June 25, that there is practically no business at St. Petersburg. Speculators have bought small lots at Ekaterinburg from the starateli at a little lower price. They will not, however, reduce their quotation for large lots and no considerable quantity of the metal can be bought below the quoted figures. Nominal quotations are 9.80 rubles per zolotnik at Ekaterinburg and 37,500 rubles per pood at St. Petersburg for crude metal, 83% platinum. These prices are equal to $36.85 and $36.75 per oz., respectively.

Silver—The market has weakened on official reports of unfavorable monsoon conditions, and on selling by Chinese Banks, dropping to 27 15/16d. in London, but closes steadier at 28 1/16d. on Indian Bazaar buying. It is too early yet to form any opinion of crop conditions in India.

Silver in New York, July 3, was 61⅛c.; in London, 28⅛d.

SILVER AND STERLING EXCHANGE

July	4	5	6	8	9	10
New York....	..	61⅛	61	60¾	60⅞	61
London ..	28 3/16	28⅛	28 1/16	27 15/16	28	28 1/16
Sterling Ex..	....	4.8730	4.8730	4.8725	4.8730	4.8735

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

NEW YORK

July	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
3	17⅜ @17⅝	17.20 @17.25	45¼	4.75	4.65 @4.67½	6.90 @7.00	6.75 @6.85
5	17⅜ @17½	17.15 @17.25	45⅜	4.75	4.62½ @4.65	7.05 @7.15	6.90 @7.00
6	17⅜ @17½	17.15 @17.25	45¼	4.75	4.62½ @4.65	7.10 @7.20	6.95 @7.05
8	17¼ @17½	17.05 @17.15	45	4.75	4.62½ @4.65	7.10 @7.20	6.95 @7.05
9	17⅛ @17⅜	17.00 @17.05	44	4.75	4.62½ @4.65	7.10 @7.20	6.95 @7.05
10	17⅛ @17⅜	17.00 @17.05	44⅜	4.75	4.62½ @4.65	7.10 @7.20	6.95 @7.05

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

July	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
3	76 15/16	77 13/16	82¼	205	201	18 9/16	26¼
4	77	77 13/16	82¼	205	200¾	18½	26¼
5	76 11/16	77½	82¼	206	201	18½	26¼
8	75 11/16	76 11/16	81¼	204	198½	18½	26¼
9	74⅛	75	79¾	201	196	18⅜	26
10	74¼	75⅜	80	202½	197	18⅜	26

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ±£25 = 5.44c.; £70 = 15.22c. Variations, £1 = ±21¾c.

Copper—The market during the week of July 4-10 has been unsettled by the demoralization in the London standard market. Copper in Europe has declined very much below our parity, transactions in electrolytic having been reported at as low as 16½c., and under these circumstances American producers could not, of course, sell in Europe without meeting the European price, which they have not been inclined to do. On this side consumers have naturally refrained from buying pending a settlement of the present disturbed conditions. Some of the agencies, which have well filled their books at higher prices, are quite indisposed to recede therefrom, and having no object in offering copper maintained their previous price of 17¾c., delivered usual terms, as their price nominally asked, meaning simply that they do not want to sell any copper at the market. Other agencies, who are disposed to sell, invite inquiries and bids but hesitate about making offers under present circumstances inasmuch as there is but little chance of placing round lots. Under these circumstances the market is chiefly made by speculative resales and the transactions of *arbitrageurs*, to the latter of whom the great disparity between London and New York offers opportunities. Some relatively small sales of electrolytic have been made by first hands down to the basis of 17c., cash, New York, during the latter part of the week, and even less. Some round lots of Lake copper have been sold by producers to American consumers who needed to re plenish their supplies, in which respect the Lake market has differed from the electrolytic. The close is unsettled at 17⅛@17⅜c. for Lake copper, and 17@17.05c. for electrolytic copper in cakes, wirebars and ingots. Casting is quoted nominally at 16⅞@17c. as the average for the week.

The London standard market, after having declined for some weeks, continued the downward pace at an accelerated rate, the movement culminating in a sharp break, which took place on Tuesday morning, when prices touched £71 12s. 6d. for spot, and £72 10s. for three months. Since then, there has been a sharp reaction, and the market closes sensitive at £74 5s. for spot, and £75 12s. 6d. for three months. The crash has taken out of the market a great many weak accounts, and the position at the end of the week, while still very nervous, indicates that the speculative markets are decidedly on the mend.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6248 long tons. Our special correspondent reports the exports from Baltimore at 940 tons.

The *Echo des Mines* of June 20, reports a sale at Antwerp of 279 metric tons of pig copper from Katanga, which brought 192 fr. per 100 kg.—equal to 16.8c. per lb. A second lot of 30 tons was held for another sale.

Tin—The movement of the market during the week has been rather uncertain, showing the activity of speculation, of which the ultimate tendency has not yet developed. After declining all the week, the market shows a better tendency, at the close, which is cabled at £202 10s. for spot, and £197 for three months.

The quotations here show a diminution in the premium for near-by tin, the close being firmer at around 44⅜c., New York.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in June at 1317 tons, all from Bolivia.

Lead—The leading interest advanced its price on July 3 to 4.75c., New York. A fair-sized business has been done on that basis, while St. Louis is quoted at 4.62½@4.65 cents.

The London market for lead, after advancing to £18 12s. 6d., has had a slight reaction, the close being somewhat easier at £18 7s. 6d. for Spanish lead, and 2s. 6d. higher for English.

Spelter—The market for spelter has been very dull, the principal buyers not even having invited any offers. Several important smelters report no transactions at all. Some speculative interests who needed to make good their contracts appeared in the market and bid up the price on relatively small business. Some tonnage of August spelter is reported sold to consumers at 7c., St. Louis. Any belated consumer needing July spelter will undoubtedly have to pay a handsome premium, which has in fact been realized on some carload business, the supply for this delivery being very short. On the other hand there are no buyers for even September spelter. Under these circumstances the market is in an awkward position for all parties. The close is firm at 6.95@7.05c. St. Louis, and 7.10@7.20c. New York.

The London market is unchanged, good ordinaries being quoted at £26, and specials at £26 5s. per ton.

Base price of zinc sheets was advanced 10 points on July 6, and is now $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—Business continues good for the season and consumption still appears to be large. The quotation is firm at 22½@23c. for No. 1 ingots, New York. The foreign market is steady.

Antimony—Business during the past week has been very good and large sales have been made. Prices are again firmer. Cookson's brings 8.25@8.50c. per lb. and Hallett's 7.87½@8c. For Chinese, Hungarian and other outside brands, 7.25@7.50c. per lb. is paid.

Quicksilver—Business has been rather quiet and there is no change reported in prices. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London price is £8 10s. per flask, with £8 7s. 6d. asked from second hands.

Cadmium—The latest quotation received is 700 marks per 100 kg., f.o.b. works in Silesia, Germany. This is equal to 75.6c. per lb., at works.

Imports and Exports of Metals

Exports and imports of metals in the United States, five months ended May 31, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess	
Copper, long tons	155,960	78,460	Exp.	77,500
Copper, 1911...	137,439	65,760	Exp.	71,679
Tin, long tons..	294	23,876	Imp.	23,582
Tin, 1911.... ...	504	18,469	Imp.	17,965
Lead short tons	32,019	40,329	Imp.	8,310
Lead, 1911 ..	45,271	39,619	Exp.	5,652
Zinc, short tons..	4,987	2,745	Exp.	2,242
Zinc, 1911 .	2,799	933	Exp.	1,866
Nickel, lb.	10,914,439	14,988,043	Imp.	4,073,604
Nickel, 1911....	10,006,806	11,756,902	Imp.	1,750,096
Antimony, lb.....	50,460	6,850,135	Imp.	6,799,675
Antimony, 1911.	150,704	3,956,796	Imp.	3,806,092
Platinum, oz.....	....	40,870	Imp.	40,870
Platinum, 1911.	47	41,863	Imp.	41,816
Aluminum, lb....	9,656	10,179,879	Imp.	10,170,223
Aluminum, 1911	....	....	....	
Ores, etc.				
Zinc in ore, lb...	12,117,607	13,282,996	Exp.	1,165,38
In ore, 1911....	11,146,207	12,941,984	Imp.	1,795,77
Zinc oxide, lb. ..	15,653,983	....	Exp.	15,653,98
Zinc oxide, '11..	14,802,491	....	Exp.	14,802,49
Zinc dross, lb....	384,695	....	Exp.	384,69
Zinc dross, '11..	4,033,416	....	Exp.	4,033,41
Chrome ore, l.t..	....	23,351	Imp.	23,35
Chrome ore, '11	5	16,479	Imp.	16,47

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Quantity of zinc ore imported in 1912 was 24,462 tons; exported, 10,702. Imports of aluminum were not reported previous to July 1, 1911. The metal exports given above include re-exports of foreign materials.

Zinc and Lead Ore Markets

Platteville, Wis., July 6—The base price paid this week for 60% zinc ore was $55@56. The base price paid for 80% lead ore was $55@57 per ton.

SHIPMENTS, WEEK ENDED JULY 6

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point........	688,160	....	....
Shullsburg............	605,280	....	....
Benton................	541,700	....	358,900
Platteville...........	419,050	....	181,800
Hazel Green..........	320,000	....	......
Cuba City............	82,770	....	......
Galena	82,000	....	....
Harker...............	60,900	....	......
Total.................	2,799,860	....	540,700
Year to date..........	106,915,330	4,496,470	15,374,070

Shipped during week to separating plants, 1,904,250 lb. zinc ore.

Joplin, Mo., July 6—The high price of zinc sulphide ore this week was $61, the base per ton of 60% zinc $53@58. Zinc silicate sold at $29@31 per ton of 40% zinc. The average price all grades was $54.08. The high price of lead ore was $60.50 base per ton of 80% lead, and the average price all grades was $58.54 per ton.

The zinc ore market, while showing no change on the high-grade ores, was much stronger on the middle or second grades, much of that class selling for $56@57 per ton base. The production was cut about 1500 tons this week on account of the observance of the Fourth; many mines did not restart during the week.

SHIPMENTS, WEEK ENDED JULY 6

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,880,590	......	1,055,780	$141,739
Joplin	1,818,150	......	310,410	60,817
Galena.	817,950	......	48,900	24,222
Duenweg.....	702,590	......	83,460	22,091
Alba-Neck....	564,500	......	......	16,370
Jackson......	483,440	......	......	13,535
Granby	1,660	577,390	21,620	10,265
Oronogo......	492,070	......	......	11,170
Spurgeon	139 120	194,540	67,690	8,969
Miami.......	280,470	......	......	6,731
Quapaw......	131,010	......	......	3,537
Cave Springs.	106,010	.....	6,770	3,150
Aurora..	65,260	57,020	.....	2,616
Springfield .	69,000	......	......	2,000
Carl Junction	63,590	......	......	1,875
Lawton	61,360	......	.....	1,718
Totals	9,676,770	828,950	1,594,530	$330,805
27 weeks...	272,891,630	16,911,690	46,278,720	$8,414,053

Blende val. the week, $270,580; 27 weeks, $6,897,175

Calamine, the week, 13,547; 27 weeks, 251,834

Lead value, the week, 46,678; 27 weeks, 1,265,044

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41 85	$44 90	$40 55	$43 54	$55 68	$58 92
February	40 21	45 75	39 16	43 31	54 46	52 39
March	39 85	51.56	38 45	49.25	54 57	54.64
April	38 88	52 00	37 47	50.36	56 37	54 18
May	38 25	55.30	36 79	53.27	55 21	52.45
June	40.50	55 88	38.18	54 38	56 49	55.01
July	40 75	.....	38 36	......	58 81	...
August	42 50	.....	41 28	.....	60 74	...
September	42 63	......	41 29	.....	59 33	......
October	42.38	.....	40 89	......	54.72	.....
November	45 40	.....	43 25	.....	57 19	....
December	44.13	....	40.76	.....	62 03	.....
Year	$41.45	.....	$39.90	....	$56.76	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Cement

The Atlas Portland Cement Co., on July 8, announced an increase of 5c. per bbl. on portland cement, making the price 70c. per bbl. at mill. The demand for cement has recently been large and the sales heavy.

Chemicals

New York, July 10—The market generally is quiet and no activity is expected during July.

Arsenic—Supplies are better as arsenic is now coming in regularly from Canada and Mexico, besides a little from England. Apparently they do not exceed consumption and prices are unchanged at $3.75 per 100 lb. for spot and $3.62½ per 100 lb. for futures.

Copper Sulphate—The market is quiet and unchanged at $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade in this article is rather quiet but prices are steady, 2.45c. per lb. being asked for both spot and futures.

Imports and Exports—Imports and exports of chemicals and raw material in the United States, five months ended May 31.

	Imports	Exports		Excess
Copper sulph. lb.	....	7,280,235	E.	7,280,235
Copper sul., '11	....	7,166,034	E.	7,166,034
Bleach, lb.	29,238,111	400	I.	29,237,711
Bleach, 1911	39,537,249	17,368	I.	39,519,881
Potash salts, lb.	274,434,808	1,578,332	I.	272,855,976
Potash salts, '11	340,189,824	2,077,000	I.	338,112,824
Soda salts, lb.	4,873,954	200,712	I.	4,673,242
Soda salts, 1911	15,015,946	237,755	I.	14,778,191
Acetate lime, lb.	....	29,927,147	E.	29,927,147
Acetate, 1911	....	32,485,710	E.	31,485,710
Nit. of soda, tons	197,497	4,224	I.	193,273
Nitrate, 1911	273,096	3,233	I.	269,863
Phosphates, tons	....	468,548	E.	468,584
Phosphates, '11	....	498,257	E.	498,257
Sulphur, tons	7,414	18,513	E.	11,099
Sulphur, 1911	10,602	4,786	I.	5,816
Pyrites, tons	380,731	....	I.	380,731
Pyrites, 1911	418,429	....	I.	418,429
Magnesite, lb.	76,836,305	796,992	I.	76,039,313
Magnesite, 1911	115,941,052	1,123,125	I.	114,817,927
Sul. ammonia, lb.	50,096,146	134,715	I.	49,961,431
Sul. am'nia, '11	90,021,481	....	I.	90,021,481
Arsenic, lb.	1,794,920	850	I.	1,794,070
Arsenic, 1911	2,119,879	....	I.	2,119,879

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total quantity of sulphur imported this year was 159,706 tons.

MINING STOCKS

New York, July 10—On July 5, the Exchange opened dull after the holiday and many of the leading stocks were off. Amalgamated copper declined 2½, American Smelting and Refining Co. 2⅝. The other coppers dealt in on the Exchange were also off several points. On the Curb the copper stocks generally were weaker but with considerable dealings. Cobalt shares were steady and other mining stocks quiet and unchanged.

On July 6, the Exchange was quiet and rather narrow, with very few changes. On the Curb dealings were less active and rather irregular. Coppers were firm on small dealings, while Cobalt shares were weaker. In other mining stocks there were moderate dealings in Tonopah and Yukon Gold.

On July 8, there was heavy selling on the Exchange, with a number of declines. United States Steel weakened on large sales. On the Curb there was activity in spots but on the whole dealings were rather narrow, especially in the copper stocks. Motherlode and El Paso Consolidated were active but at lower prices.

July 9 and 10 the Exchange was irregular with sales lighter, and price changes mixed. The Curb was quieter, mining stocks being in fair demand, with few changes except in copper stocks, which were weaker.

Sales at auction in New York July 3 included the following: United States Reduction & Refining Co., $5000, first mortgage, 6% bonds, 31% of par value; Colorado Fuel & Iron Co., 25 shares preferred stock, $100 par, $110.50 per share.

Boston, July 9—Copper share prices have received quite a setback from the high levels made the latter part of June. The recession has come largely during the last week. The break in London copper warrants today proved an unsettling factor for a brief period, but the June report of the Copper Producers' Association and partial recovery in London offset the earlier effects and copper shares received quite a stimulating effect.

North Butte, which should naturally be the leader, was active and strong today, advancing from a low at $29.50 to $32, with partial setback. Reports are current of favorable underground findings at the property. The Calumet & Hecla subsidiaries also maintain a firmer tone after moderate reactions. Calumet & Hecla broke from a high at $541, its record price of the year, to $515, but quickly came back to $527. Ahmeek made a record price at $370, a few days ago. Superior and Isle Royale also show good support when the market is strong. Butte & Superior, which continues a market leader, broke $4.25 to $43.25, but came back to $45 per share.

Curb trading has been of fair propor-

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	April	May	June
Alaska shipments	1,243,911	1,720,391	4,134,569
Anaconda	25,480,000	25,800,000	......
Arizona, Ltd.	3,400,000	3,500,000	3,300,000
Copper Queen	6,806,425	7,024,087	7,622,733
Calumet & Ariz.	4,104,000	4,424,000	4,160,000
Chino	1,150,000	1,275,850	.....
Detroit	2,506,718	2,092,478	1,959,634
East Butte	1,400,000	1,445,000	....
Mammoth	1,718,450	....	....
Mason Valley	1,503,056	1,520,000	.....
Nevada Con.	6,115,095	6,063,462	....
Ohio	675,000	....	....
Old Dominion	2,167,000	2,180,000	2,130,000
Ray	2,611,920	2,924,913	2,992,500
Shannon	1,544,000	1,464,000	1,270,000
South Utah	284,215	236,884	....
United Verde*	2,250,000	2,500,000	....
Utah Copper Co.	8,615,775	9,564,919	....
Lake Superior*	18,250,000	21,250,000	....
Non-rep. mines*	7,625,000	8,400,000	....
Total production	97,400,495	....	....
Imports, bars, etc.	26,842,014	25,836,519	....
Total blister	124,242,509	....	....
Imp. in ore & matte	9,350,972	6,410,226	....
Total American	133,593,481	....	....
Miami†	2,554,352	2,565,000	2,584,950
Brit. Col. Cos.:			
British Col. Copper	1,043,173	875,000	996,000
Granby	1,941,797	1,914,460	1,888,400
Mexican Cos.:			
Boleo†	2,149,280	2,260,160	1,851,920
Cananea	4,654,000	4,600,000	4,310,000
Moctezuma	2,797,718	2,892,521	3,176,819
Other Foreign:			
Cape Cop., S. Africa	954,240	754,880	....
Kyshtim, Russia	1,545,000	....	....
Spassky, Russia	649,600	694,400	....
Famatina, Argen.	.. ..	... .	....
Tilt Cove, Newf'd	119,869	123,087	....
Exports from:			
Chile	6,496,000	3,696,000	....
Australia	9,408,000	7,840,000	....
Arrivals in Europe‡	12,064,640	9,976,860	....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries Domestic	Deliveries for Export
VI, 1911	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650

VISIBLE STOCKS

	United States	Europe	Total
VII, 1911	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,388
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004

tions and prices have generally followed the trend of the big market. Calaveras rose to $3 on announcement that the company was making small ore shipments. Davis-Daly shows strength and Houghton Copper is fractionally below the recent high.

Assessments

Company	Delinq	Sale	Amt
Best & Belcher, Nev	June 3	June 27	$0 10
Buffalo, Mont	June 4	July 2	0 002
Challange, Nev	June 8	July 2	0.10
Chollar, Nev	July 7	Aug. 5	0 10
Confidence, Nev	July 15	Aug. 9	0.20½
Crown Point, Nev	June 24	July 17	0.10
Exchequer, Nev	May 23	June 13	0.05
Glen Dale, Utah	May 25	June 25	0.00
Gould & Curry, Nev	July 19	Aug. 12	0 05
Great Falls, Utah	June 26	July 27	0.002½
Hale & Norcross, Nev	July 2	July 29	0.05
Houghton Copper, Mich	May 17	....	1.00
Julia, Nev	May 15	June 5	0.05
Mineral Farm, Ida	July 15	Aug. 15	0 002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida	July 18	Aug. 19	0.001
Overman, Nev	June 29	July 23	0.10
Savage, Nev	June 4	June 26	0.10
Seven Troughs, Nev	June 15	July 2	0.002½
Sierra Nevada, Nev	July 4	July 30	0 10
Silver Mt., Ida	July 15	Aug. 15	0.002
Tintic Central, Utah	June 14	July 6	0.005
Union Consolidated, Nev	July 12	Aug. 7	0.15
Utah Antimony, Utah	June 1	....	0.03
Utah, Nev	July 12	Aug. 6	0.05
Yankee Con., Utah	....	....	0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53 795	56 260	24.154	24.865	25.887
February	51.534	52 222	59 043	23 794	24 081	27.190
March	51.454	52.745	58.375	23 690	24 324	26 875
April	53 221	53.325	59.207	24 483	24 595	27.284
May	53.870	53 308	60 880	24 797	24 583	28 038
June	53 462	53 043	61.290	24.651	24 486	28 215
July	54 150	52 630	.....	25 034	24 286	..
August	52 912	52.171	.....	24 428	24 082	.
September	53.295	52 440	......	24 567	24 209	. .
October	55 490	53.340	.....	25.596	24.594	.
November	55.635	55.719	...	25 680	25 649	.
December	54.428	54.905	...	25.160	25.349	
Year	53 486	53 304	...	24.670	24 59[illegible]	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12 295	14.094	12.680	14.337	55 600	62 760
February	12 256	14.084	12.611	14.329	54.974	62 893
March	12 139	14.698	12.447	14.868	54 704	65 884
April	12 019	15 741	12.275	15.930	54.034	70 294
May	11 989	16.031	12.214	16 245	54 313	72 352
June	12 385	17 234	12.611	17 443	56 365	78 259
July	12 463	..	12 720	..	56 673	
August	12 405	...	12 634		56 266	
September	12.201	....	12 508		55 253	. . .
October	12.189	....	12.370		55 170	.
November	12.616	.....	12 769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.973	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	.
February	41 614	42 962	August	43 319	....
March	40 157	42 577	September	39 755	..
April	42 185	43 923	October	41 185	. .
May	43.115	46.053	November	43.125	...
June	44 606	45 815	December	44.655	.
			Av Year	42 281	.. .

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4 435	4 334	4.327	13 009	15.619
February	4 440	4 026	4 266	3 946	13 043	15 738
March	4 394	4.073	4 238	4.046	13 122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4 373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13.260	17 588
July	4.499	......	4.397	......	13 530	.....
August	4 500	......	4 406	......	14 260	......
September	4 485	.....	4 356	......	14 744	.....
October	4 265	.....	4.139	......	15 332	......
November	4.298	......	4.181	......	15 821	......
December	4.450	......	4 332	......	15.648	.....
Year	4.420	......	4 286	......	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23.887	26.642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5.563	6.626	5 413	6.476	23 016	26.048
April	5 399	6.633	5 249	6 483	23 743	25 644
May	5 348	6.679	5 198	6 529	24 375	25 790
June	5 520	6.877	5 370	6 727	24.612	25.763
July	5 695	......	5 545	.....	25.006	......
August	5 953	......	5 803	....	26 801	....
September	5 869	......	5 719	.....	27 750	.....
October	6.102	......	5.951	......	27.256	......
November	6.380	......	6.223	......	26.795	......
December	6.301	......	6.151	......	26.849	......
Year	5.758	......	5.608	......	25.281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15 90	$15.12	$14 40	$13.32	$14 75	$14.00
February	15 90	15.03	14 50	13.28	14 81	14.01
March	15.90	14.95	14 65	13.66	14.96	14.10
April	15 90	15 13	14 65	13.90	15 00	14 15
May	15 90	15.14	14 30	13.90	14 72	14.12
June	15 90	15.15	14 06	14.11	14 56	14.22
July	15 90	.....	14 03	.....	14 53	......
August	15 90	.. .	14 00	.....	14 47	.....
September	15 90	.	13 57	......	14 40	... ..
October	15.43	......	13.44	.....	14.34	. ...
November	14.92	. . ..	13.30	....	14 25	......
December	15.15		13.10	....	13.90	......
Year	$15 72	....	$13 94	.....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS July 9

Name of Comp.	Bid
Acacia	.04¼
Cripple Cr'k Con.	01½
C K & N	15
Doctor Jack Pot.	05¼
Elkton Con	.65
El Paso	.92
Findlay	05
Gold Dollar	.18
Gold Sovereign	.02
Isabella	.13¾
Jack Pot	.04¾
Jennie Sample	.05
Lexington	‡ 02
Moon Anchor	01
Old Gold	04
Mary McKinney	.70
Pharmacist	.01½
Portland	.93
Vindicator	80
Work	.01¼

SALT LAKE July 9

Name of Comp.	Bid.
Beck Tunnel	08
Black Jack	14
Cedar Talisman	02
Colorado Mining	.17
Columbus Con	31½
Crown Point	02
Daly-Judge	‡5.60
Grand Central	60
Iron Blossom	1 27½
Little Bell	‡ 41
Lower Mammoth	01¼
Mason Valley	13 25
May Day	11
Nevada Hills	2.00
New York	04¾
Prince Con	1 50
Silver King Coal'n	2.75
Sioux Con	.06¼
Uncle Sam	.20
Yankee	.12

TORONTO July 9

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	†7 10	Hollinger	13 00
Hudson Bay	†70 00	Imperial	01
Temiskaming	37	Pearl Lake	22
Wettlaufer-Lor.	55	Porcu Gold	38
Apex	03	Porcu Tisdale	01
Central	†5 56	Preston E. D.	03
Crown Chartered	12	Rea	25
Dobie	† 25	Standard	‡ 01¼
Dome Exten	.20	Swastika	11
Foley O'Brien	.12	West Dome	20

SAN FRANCISCO July 9

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.03	Belmont	9.87½
Belcher	.45	Jim Butler	.61
Best & Belcher	.09	MacNamara	.23
Caledonia	.94	Midway	.51
Challenge Con	.13	Mont.-Tonopah	2.62½
Chollar	.11	North Star	.15
Confidence	.40	West End Con	1.80
Con. Virginia	44	Atlanta	.26
Crown Point	.44	Booth	.08
Gould & Curry	01	C.O.D. Con	.10
Hale & Norcross	19	Comb. Frac	.15
Mexican	2 75	Jumbo Extension	.37
Occidental	50	Pitts.-Silver Peak	1.00
Ophir	1.00	Silver Pick	.12
Overman	.68	St. Ives	.30
Potosi	.05	Tramp Con	‡.01
Savage	12	Argonaut	‡2.00
Sierra Nevada	.20	Bunker Hill	‡4 50
Union Con	.45	Cent. Eureka	.42
Yellow Jacket	.45	So. Eureka	‡2 90

N. Y. EXCH. July 9

Name of Comp.	Clg.
Amalgamated	81½
Am. Agri. Chem.	59½
Am.Sm.&Ref.,com	82¾
Am. Sm. & Ref., pf.	108
Am. Sm. Sec., pf. B	87¾
Anaconda	40½
Batopilas Min	1¼
Bethlehem Steel pf	68¼
Chino	31¼
Comstock Tunnel	‡.12
Federal M. & S., pf.	43⅛
Goldfield Con	4⅛
Great Nor., ore., ctf.	43½
Guggen. Exp.	55¼
Homestake	95
Inspiration Con.	18½
Miami Copper	28
Nat'nal Lead, com.	57¼
National Lead, pf.	107½
Nev. Consol	20⅝
Pittsburg Coal, pf.	93¼
Ray Con	20⅝
Republic I&S, com.	26¼
Republic I & S, pf.	85
Sloss Sheffi'd, com.	55
Sloss Sheffield, pf.	100
Tennessee Copper	44⅜
Utah Copper	60¾
U. S. Steel, com	68¾
U. S. Steel, pf.	111⅞
Va. Car. Chem.	48⅝

N. Y. CURB July 9

Name of Comp.	Clg.
Barnes King	30
Beaver Con	.44
Braden Copper	7
B. C. Copper	5⅝
Buffalo Mines	‡1 40
Caledonia	40
Con. Ariz. Sm.	9/16
Davis-Daly	2⅛
Diam'field-Daisy	9
Ely Con	7/32
Florence	1⅛
Giroux	5
Gold Hill Con	⅜
Greene Cananea	9¼
Greenwater	05
Internat. S. & R.	124
Kerr Lake	2⅞
Keystone	2⅝
La Rose	3¼
McKinley-Dar-Sa.	1 13/16
Min Co of A. new	3
Motherlode Gold	1
Nev. Utah M. & S.	03½
Nipissing Mines	7⅝
Ohio Copper	7/16
Pacific Sm. & M.	[illegible]/32
South Live Oak	3⅜
South Utah M. & S.	¾
Standard Oil (Old)	865
Stand'd Oil of N.J	392
Stand'd Oil Subs.	525
Stewart	1 3/16
Tonopah	6⅝
Tonopah Ex	2
Tri-Bullion	½
Tulatosa	‡ [illegible]
Union Mines	3/16
United Cop., pfd.	10
Yukon Gold	3⅞

LONDON July 10

Name of Com.	Clg.
Camp Bird	£1 8s 6d
Dolores	1 10 0
El Oro	0 16 0
Esperanza	1 10 0
Mexico Mines	7 0 0
Oroville	0 5 9
Stratton's Ind.	0 3 1½
Tomboy	1 6 6

BOSTON EXCH. July 9

Name of Comp.	Clg.
Adventure	8¼
Ahmeek	355
Algomah	5¾
Allouez	44⅞
Am. Zinc	30½
Ariz. Com., ctfs.	5¼
Bonanza	.40
Boston & Corbin	7⅜
Butte & Balak	‡3½
Calumet & Ariz	74¾
Calumet & Hecla	526
Centennial	24
Con. Mercur	‡ 05
Copper Range	57½
Daly West	5½
East Butte	13¼
Franklin	11
Granby	53
Hancock	31½
Hedley Gold	17
Helvetia	1¼
Indiana	16¼
Island Cr'k, com.	61
Island Cr'k, pfd.	88
Isle Royale	34
Keweenaw	1¾
Lake	35¼
La Salle	6¾
Mass	7
Michigan	3
Mohawk	69
New Arcadian	3¾
New Idria Quick.	6⅞
North Butte	31
North Lake	6
Ojibway	4½
Old Dominion	57
Osceola	115
Quincy	91
Shannon	15½
Shattuck-Ariz	21½
Superior	44½
Superior & Bost.	2
Tamarack	41
Trinity	6
Tuolumne	3⅜
U. S. Smelting	45¾
U. S. Smelt'g, pf.	50
Utah Apex	2⅜
Utah Con	10
Victoria	3⅝
Winona	5⅞
Wolverine	110
Wyandot	2

BOSTON CURB July 9

Name of Comp.	Last
Bingham Mines	4¼
Boston Ely	1
Boswyocolo	02½
Butte Central	6¼
Cactus	10
Calaveras	2¾
Chief Cons	1¼
Corbin	99
Cortez	1
Crown Reserve	3½
First Nat. Cop.	1¾
Majestic	48
Mazatan	‡½
Moneta Porc	‡ 07
Nevada-Douglas	3½
New Baltic	2
Oneco	2½
Raven Copper	.27
Rhode Island Coal	32
San Antonio	‡3
S. W. Miami	5½
South Lake	8½
Trethewey	.40
United Verde Ext.	30
Vulture	‡5.00

‡Last quotation.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

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International Congresses

Two international congresses of considerable importance are soon to be held in the United States. The International Association for Testing Materials will meet in New York, Sept. 3 to 7. This body includes national associations in this and the principal European countries, and its object is to establish standard tests and rules for the materials of construction. In this work a good measure of success has already been attained, and the coöperation of government bureaus has been secured. Its membership includes representatives of engineering societies, construction and manufacturing companies in many different companies. The committee in charge of the New York meeting includes such well known men as Henry M. Howe, Robert W. Hunt, Rudolf Hering and J. A. Holmes.

The second meeting is that of the International Congress of Applied Chemistry, which will open in Washington, Sept. 4 and then hold its business meetings in New York, Sept. 6 to 13. This is an important organization including many large and active national and local societies. Both congresses will be followed by excursions which will give foreign visitors opportunities of seeing and studying the industrial development of this country.

The International Geological Congress will hold its twelfth triennial session in Canada next summer. As the leading topic of the last meeting, held in Sweden, was the "Iron Reserves of the World," the central discussion next year will be on the "Coal Resources."

Rio Tinto Pyrites

We hear that the Pyrites Co., which is the principal handler of Rio Tinto pyrites in America, finding its largest market among the southern manufacturers of fertilizers, is going to erect a factory in the South, probably in Virginia, where it expects to work up into lump form for iron furnaces the cinders from Spanish pyrites ores. We infer that this departure is caused by a desire to fill the want of such a plant at a suitable center where these byproducts from the large number of fertilizer works can be made into a form acceptable to the manufacturers of pig iron, and that the works will be established near a market.

The pyrites used by fertilizer manufacturers often contains a small amount of copper and we understand that when it is found that any of the cinders contains sufficient copper to warrant extraction, they will be lixiviated, thus rendering the material more desirable for the iron furnaces and at the same time saving a few hundred tons of copper per annum.

This is a decidedly new departure in the handling of Rio Tinto pyrites in this country and the development of the new plan will be of much industrial importance.

The Cuyuna Iron Range

Those men who have helped develop the Cuyuna iron range, in Minnesota, from the time when that region was an unobtrusive farming country until it is now a regular shipper of iron ore, have reason to be proud of their faith and the results of their work. In marked contrast to the physical features of the surface on the Mesabi and Vermilion ranges in Minnesota and the older Michigan ranges, there was and is nothing in the surface topography or geology of the Cuyuna range to aid the prospector in any way. It is true that the early surveyors noticed great variations of the compass there, but it remained for someone at a later time, about 10 years ago, perhaps less, to interpret the fact in a way that would give a definite meaning. From that time on, dip needles have been used to work out the lines of attraction. It should also be credited that in a U. S. Geological Survey monograph, the opinion was expressed that iron deposits might be found there, this opinion being based on deductions from evidence offered by the other Lake Superior iron ranges.

It took faith to continue dip-needle work to a point where something was really indicated, and even then, the "something" was a questionable quantity. After this, drilling was necessary, and this was not only costly, but frequently disappointing. Many operators on the other ranges considered it all a waste of time and money. The work went on, however, railroads were built, and last summer one mine shipped. More will probably ship this summer and a number of others are in the development stage. The existence there of an iron range is an assured fact. Judged by some present standards, it may perhaps be called low grade. The ore, however, has its use and undoubtedly will have as long as iron is in use anywhere. Like the other Lake Superior ranges, there is a quantity of ore there at present unmarketable. It is only a question of time before this will be available, either due to exhaustion of better ore or improved processes of mining and treatment. The finding and successful opening of this interesting range may be credited to three things: Geological study, the use of the dip needle, and finally churn and diamond drilling.

The American Iron and Steel Institute

The plans of the American Iron and Steel Institute for broadening the scope of the association and increasing its membership are meeting with success, according to statements given out by its officers. Since the annual meeting in New York, in May, nearly 300 new members have been added, and these are largely metallurgists and engineers interested in the iron industry. As at first organized, the membership was chiefly composed of representatives of the large steel companies, and the general impression was that the institute was intended to bring those companies together and to treat economic and industrial rather than technical questions. The present plan for increasing the membership involves an extension of the technical side, without altogether neglecting economic questions.

In accordance with these plans, it has been decided to hold a second meeting each year, in addition to the annual meeting in New York. The fall meeting will be devoted largely to the reading and discussion of technical papers, and will be held at some point prominent in the steel industry. The first of these meetings is announced for October next, at Pittsburgh.

No reference is made in any of the publications of the institute to the American Institute of Mining Engineers, but it looks as if the execution of its plans might interfere to some extent with those of the recently established iron section of the older society. The popularization of the Iron and Steel Institute and the extension of its technical activities will certainly have a tendency to draw engineers to it, as is already shown by the large increase in membership recently made.

Hydro-Electric Power

That efficiency and economy are not synonymous at all times and places is borne out by the practice at certain mines where the supply of water for power purposes is so greatly in excess of the requirements as to make the question of power consumption one of little importance. At such mines, of which the Lluvia del Oro in Mexico may be cited as an example, the cost of operating the plant is constant whether the maximum output of the generators driven by water power or only a portion of the current is utilized. There are few mines so fortunately situated in regard to power. That there are others that may in the future be so situated is sufficient excuse for the following remarks.

Where an abundant supply of power is available at little cost, it is possible to utilize with economy many highly inefficient devices which, were the power conditions different, could only be regarded as luxuries and extravagances in mining and milling. But in order to have these conveniences larger power-plant equipment is necessary, attended by greater capital outlay. At no mine so fortunately situated should there be installed a power plant capable of generating at full load only enough power to meet the requirements of mine and mill. Where the consumption of power has no appreciable effect on costs no alert manager will fail in time to find many applications for that power, and because he may use machinery the power-efficiency factor of which is low, he may be able to reduce operating expenses more than the mere fact that power is not a factor in the costs would at first seem to indicate.

On the other hand, due regard must be observed of the possible extension of plant and operations. With such enlargement all the power that can be developed may be required. The situation would then indeed be unfortunate if much expensive, but inefficient machinery had to be scrapped. Economy is more to be desired than efficiency at a mine over supplied with power but the fact that should not be lost sight of, is that the machinery by which economy is secured at the expense of efficiency may, later in the life of the mine, entail extravagance in the consumption of power.

Not for many years has the labor situation in the Lake Superior copper district been as acute as it is at present. During the last few years the low price of copper led to the curtailment of many mining and exploring operations with the result that men were thrown out of employment and forced to seek other fields. They left the country and probably some of them found work on the iron ranges in Michigan and Minnesota. Now that copper has advanced in price and the companies have found it desirable to increase the scale of operations, they are confronted with the difficulty of securing the quantity and quality of labor that they wish. Iron-mining operations are demanding all the labor that can be found and copper mining elsewhere is equally in need. This situation is causing some embarrassment to several of the companies which would like to increase their production, and is comparatively new to the district, where labor has always been plentiful and fairly cheap.

Eastern furnaces are to have a large supply of iron ore from Venezuela, as well as from Cuba. An indication of this is the arrival of a second cargo of iron ore from Imataca, in Venezuela, and the prospect that it will soon be followed by others. The promised abundance of the supply and the possibilities of cheap water carriage may serve to restore to the iron makers of the East some of the advantage they lost when Lake Superior began to supply the furnaces of the Central West. So far as they have been opened the Imataca mines are in the hands of a Canadian organization, the Canadian-Venezuelan Ore Co.; but it is understood that prospectors from the United States are seeking iron deposits in the same region.

By the Way

Steam shovel No. 257, a 91-ton shovel, working in the west borrow pit of the Gatun dam, at Panama, excavated 84,519 cu.yd. of material during 26 working days of May, or an average of 3250 cu.yd. of material per day. Of the material excavated, 42,259 cu.yd. were classified as earth and 42,260 cu.yd. were classified as rock. This is the highest record for a month made by any steam shovel on the Isthmus since the beginning of operations.

We are amazed to note in a contemporary that "when selenium is heated together with acidulous selenium, the product obtained represents a mixture of acidulous selenium and acid of selenium," likewise "Selenium does not *congelate* at a fixed temperature," that certain modifications "are soluble in *bisulphate* of carbon," and that "red amorphous selenium is precipitated by the aid of an electrolysis" (not simply "by electrolysis," you see) "of a solution of an acidulous selenium at the negative pole." The negative pole seems slightly displaced.

An interesting report on a gold mine in Japan was recently examined by an engineer. It was written in Japanese English and signed by the "discoverer and miner." The conclusions were as follows: "This gold mine is believed to be the best, unequally by any in the world. The ore principally consist of clay and silex, colors being whitish, reddish and light blackish. Gold is present in the ore sometime so richly that it can be seen with naked eyes, but it is generally distributed in silex and clav together with small quantity of silver. Analysis of two specimens of the ore showed that one contained gold at the ratio of 1.5 to 10,000 and the other contained at the ratio of 4 to 100,000, while the proportion of silver to gold was 1 to 9. Explanation as to the methods of working the mine, refining process and business system are omitted."

If it is true that the decline in copper metal was brought about on the initiative of a few bear speculators, the large producers of copper ought to be grateful, says the *Evening Post*. They, the producers, had been saying all along that the rise was too fast, that they feared it would become uncontrollable, and that they knew of no way to stop it, though they sincerely wished, for the larger sake of the trade, that it could be stopped. It was once suggested, in the way of cynicism, that they might stop it by selling more copper, to which they painfully replied that there was no more copper to sell. Then suddenly, the price of metal on the world's largest open market, which is in London, broke sharply, and it was indignantly announced that some bears did it. Two weeks later, the price having never quite recovered from the first attack, it broke sharply a second time, £4 per ton, and this likewise was pronounced again as the work of a bear crowd. A bear crowd, to sell copper metal down, would be taking a great risk, if the metal did not exist. It ought to receive the thanks of the producers, who had been unwilling themselves to take that risk.

"Many evils are charged to the Standard Oil Co.," says the Wonder, Nev., *News*, "but there is one blessing for which the big monopoly must be given credit. The empty gasoline or kerosene can is a blessing to the denizens of the desert. Four of them filled with water make just the right load for a jackass One holds just a dime's worth of water. Split endwise, a bachelor's dishpan is the result. An experienced housekeeper cannot do without them. Cut the top out one and you have a vessel just the right size to boil a ham. Cut around three edges of one and you have a box with a door, which mice cannot molest. If the roof leaks cut up an oil can and patch it. If you want an ash pan, cut one in two and there you are. Partly fill half of one with ashes and you have a spittoon. In face, if you want to make anything, get an oil can and go to work. Long live the oil can!"

The unfortunate practice of men of prominence in lending their names to enterprises in which they have no training or in which they do not realize the necessity of employing competent advice, is again illustrated in the experience of Admiral Robley D. Evans. The California Consolidated Oil Co. was exploited on the strength of Admiral Evans' name and many people bought stock therein because he was president. What Attorney Wack, of the stockholders' committee, called the "obsequies" of the company were held at 42 Broadway on July 8, when 40 men and women constituting the committee heard that their property had been juggled out of their hands by certain of the directors. Admiral Evans is said to have put into the treasury of the company all the emoluments of his office and in addition, advanced the company $2300 which is now owing to his estate. Two months before his death, Admiral Evans addressed a letter to stockholders in which he stated that the Lincoln Stock & Bond Co., the fiscal agents, had sold Consolidated stock in a way in which the latter company received no benefit whatever. Last autumn, the Consolidated obtained a controlling interest in the Yellowstone Oil Co. On Dec. 29, 1911, three directors of the Yellowstone, who were also directors in the Consolidated, caused the stock of the Yellowstone company to be assessed 5c. per share. The Consolidated company could not pay its $26,000 assessment and its stock was forfeited. Then in February, the directors decided to assess all Consolidated shares 10%; a large salary bill to J. Q. A. Walker was passed by the directors, and in other devious ways Admiral Evans saw the stockholders being mulcted while he was powerless to aid those whom his name had drawn into this mirage of "investment." The Admiral tried to block the attempt of the clique of directors to wreck the company and had picked up and was reading a pettifogging letter of Director Walker's when he was seized with an attack which brought on heart failure. Friends assert that the Consolidated killed him.

It is to be spelled "Timiskiming" hereafter, instead of "Temiskaming." At least the Dominion Geographic Board has so ruled. The judicial district is to be henceforth spelled Timiskaming, as is likewise the important mining division of that name, and Chairman Englehart, of the T. & N. O. Ry. has announced that the railway commissioners intend to adopt the new spelling. Many names in various parts of Canada are spelled in different ways by the Dominion and Provincial authorities and it is the purpose of the Dominion Geographic Board to standardize the spelling of these places. While the multiplicity of "i's" in Timiskaming does not appeal at first sight, we presume the Geographic Board has sound reasons for the change, but it will probably be difficult for the people of Quebec to forsake their picturesque "Temiscamingue" for the new spelling. The ruling of the board, according to the Cobalt *Nugget*, has also been extended to Temagami, which will in the future appear on the government maps as Timagami.

Some time ago the JOURNAL reported adversely about a certain metallurgical process. In spite of our unfavorable remarks, one of our subscribers in Idaho, evidently disposed to take a sporting chance, communicated with the exploiting company, sent it for test a sample of his ore at more or less expense, incidentally mentioning what the JOURNAL had said. An officer of the company in reply mentioned that the JOURNAL'S description of its process was "about as accurate as would be a technical description of a faro game, written by an Eastern Sunday-school superintendent who had never been west of the Hudson River." Our subscriber's experience was unsatisfactory to him and after correspondence extending over a year he finally declined the invitation of the promoting company to go further with the process, remarking in a letter to it: "No, we know out here when we are stung. We regret very much that we did not take the gentle hint from the ENGINEERING AND MINING JOURNAL in the first place. It seems to know more about the difference between a straight faro game and a brace game than you're willing to give it credit for. In the future we shall try to profit by its advice."

Venezuelan Iron Mines

Advices from Venezuela note a large degree of activity at the Imataca iron mines, which are on the Orinoco River near the point where it passes through a pass or cañon in the Imataca Mountains. The work there is being done by the Imataca Ore Co., which is controlled by a Canadian organization, the Canadian-Venezuelan Ore Co., having its headquarters at Montreal. This company has secured possession of a large area, on which tests have been carried on for two years past, disclosing the existence of large bodies of ore of good grade. Another area has been denounced by agents who are said to represent Pennsylvania iron makers. The ore is chiefly hematite, with some limonite. The operations of the Canadian company are described in a report from United States Consul W. D. Henderson at Ciudad Bolivar. The only difficulty in transportation is found in the fact that not more than 14 ft. draft is possible up the Orinoco to the mines, which would prevent the use of large steamers in carrying the ore.

The Imataca Ore Co. commenced prospecting some 18 months ago, and actual operations, with a view to exploitation, began last November. Since then the "Alabama," of 1100 tons, has made three trips from Philadelphia with machinery and supplies, returning once in ballast and twice with a full cargo of ore. The equipment brought down for handling and loading the ore is of modern design, being operated by electricity generated in a 1000-hp. station equipped with Babcock & Wilcox boilers. Two endless-rope haulage tramways, one from the east and one from the west, will transport the ore from the different tunnels and open cuts to a central hill, where the cars will run out to a tipple trestle and be dumped into large pockets excavated in the hill on either side of the trestle, each capable of holding 10,000 tons of ore. Beneath each of these pockets are tunnels of reinforced concrete with chute openings, whereby the ore may be run out to an endless belt conveyor. This belt conveyor will carry the ore to a pier and elevate it to a trestle whence a chute will pour a steady stream of ore into the waiting steamer. The rope tramways and conveyors are operated by 100-hp. electric motors.

For construction and repairing purposes the company has a machine shop, with modern machine tools, a woodworking shop, and a sawmill. A large warehouse and store and a refrigerating plant are also a part of the equipment. All dwellings and buildings are constructed of expanded metal and concrete, and are both sanitary and cool.

At the present time the east tramway, power house and pockets are well under way, and a few months more will see them in full operation. The company is giving employment to some 400 laborers, machinists and miners, recruiting from all parts of Venezuela, British Guiana, and the West Indies. This labor has proved satisfactory, and the supply seems ample, for as the mines are better known the daily ingress of men is increasing. So far the only actual mining has been temporary opencut work, sufficient to load the supply steamer with a return cargo.

An analysis of a cargo of Imataca iron ore, shipped by the Canadian Venezuelan Ore Co., of Montreal, is given by *Iron Age*, May 2, 1912, as follows: Fe, 68.2%; P, 0.016; S, 0.042; SiO_2, 1.4; TiO_2, 0.231 per cent.

Arizona Commercial

GLOBE CORRESPONDENCE

The property of the Arizona Commercial Copper Co. was sold by the receiver, Charles L. Rawlins, at a public sale on the courthouse steps, in Globe, on June 11, to Charles S. Smith, president of the new Arizona Commercial Mining Co., who bid $1,000,000 for the property, his bid being the only one offered. The sum represents the par of the bonds of the old company, to be exchanged for stock in the new company. This is virtually the final step in the reorganization. The new company is incorporated under Maine laws with 300,000 shares, par $5, of which 140,000 shares will be given to the holders of the $1,000,000 bonds of the old company, 120,000 shares will be exchanged for the 120,000 shares of the old company upon the payment of $3 per share, which money is now in the hands of a trust company, and 40,000 shares will remain in the treasury. The treasury stock is under option at $5 per share to the men that financed the reorganization. After the money expended by the receiver for the development of the property during his receivership, and other expenses have been deducted, there will be nearly $300,000 left in the treasury. Regarding future development, President Smith stated:

> Equipment for hoisting from a depth of 1000 ft. has been ordered for the Copper Hill shaft and I hope to see it erected and in operation within 90 days. The double-drum steam hoist at the Eureka shaft will be moved to the Copper Hill shaft and will be electrically equipped and the air compressor at the former shaft will be moved to the Old Dominion power house. An air line and electric power line will be built to the shaft from the Old Dominion power house, giving us cheaper power and air than we could obtain by having our own steam plant. In the meantime we will continue retimbering and enlarging the shaft with our present equipment and will be building the new headframe. The railroad will be leased to the Old Dominion Co., under some equitable arrangement whereby they will haul our ore and freight as, with their railroad equipment and repair shops, they can operate it much more cheaply than we could. After the shaft has been equipped, we will begin aggressive mining and development work on the several veins. We believe that the vein which has thus far been worked is a continuation of the Old Dominion vein and experience in the Old Dominion and Gray mines leads us to believe that good bodies of ore will be found. The ground has been pretty well stoped out above the fourth level, but I think considerable ore will be found between the fourth and eighth levels, the latter being the lowest level to which the workings extended. . . . The other veins will be explored at various levels. Profitable ore has been taken from the adjoining United Globe mine within a few hundred feet of our end line, and I believe that similar ore will be found within our lines. The fourth level is now connected with the third level of the Gray shaft of the United Globe mine and arrangements will be made with the United Globe company to make further connections at greater depth to comply with the new mine-inspection law which states that more than one means of egress shall be provided for men engaged in stoping operations. The arrangement will also give ventilation to both mines and should prove economical to both companies.

Mining Appropriations

WASHINGTON CORRESPONDENCE

The Senate committee on appropriations has reported to the upper chamber a revised draft of the sundry civil appropriation bill. The bill includes an important provision with reference to the Bureau of Mines, it being intended to enlarge the allowance for that Bureau so as to extend its work to metal mining. The latest draft of the bill made public on July 16 contains the following new provision regarding the metal-mining activities desired for the Bureau and the pecuniary provision which it is proposed to make for them:

> For inquiries and investigations into the mining and treatment of ores and other mineral substances, with special reference to safety and waste, including personal services in the District of Columbia, and expenses of attendance at meetings in behalf of the purposes of this appropriation, $100,000: Provided, That no part thereof may be used for investigations in behalf of any private party.

The bill also provides additional allowances as follows: "Investigation as to causes of mine explosions, $27,900; for mine inspector for Alaska and per diem $7500; total, $35,400."

The Senate draft of the bill also contains some important items of increase for the Geological Survey, providing additional sums, as follows: "Topographic surveys, $25,000; geologic surveys, $25,000; gaging streams and determining water supply, $25,000."

The Senate has passed a measure providing for the use by the Mint of the unexpended balance for refining bullion, until regular appropriations are available.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

The Kinsavvy Mine

In the Feb. 17, 1912, issue of your popular publication, there appeared as special correspondence, under the caption, "History of a Once Famous Arizona Gold Mine," a statement, that in 1892, the Fortuna mine, near Gila, Ariz., was discovered in consequence of a prospector picking up a piece of rock to throw at his burro, which he found to be full of gold —that is, the rock, not the jackass.

This alleged discovery is a "pale, pink-tea" plagiarism on the original discovery of the Kinsavvy mine, at Whiskey Flat, against which all the inhabitants of that formerly famous camp now designated under the more modern and perhaps more respectable name of Kernville, most earnestly desire to protest.

Panorama Showing Split Mountain

Which the same I would rise to explain.

The discovery of what was subsequently known as the Kinsavvy mine, was the first, and, as Whiskey Flat firmly believes it to be, the only discovery of a mine by the interposition of a jackass—all the glory whereof is due to a man locally known as "Lovely Rogers":

And I will not deny.
In regard to the same,
What that name might imply.

When it is remembered that in early days a man acquired his sobriquet from the opposite of qualities possessed by him, such as "Truthful" for the biggest liar in camp, "Parson" for the wickedest, "Skinny" for the fattest, and "Whispering" for the man with the loudest voice, the imagination may be left to supply an inventory of the attributes which gave to Rogers the handle of "Lovely"; but, nevertheless, in combination with his jackass and a piece of quartz, Lovely Rogers discovered the Kinsavvy mine.

In its own humble way, Lovely's jackass was also a distinguished local character. It is known that it would pass by a bale of hay with an expression of supreme contempt, to seek its favorite diet of cactus, with a dessert of granite, on which it sharpened its teeth and its evil temper at the same time. This is important, because it was due to these traits that the discovery of the Kinsavvy mine was made by Lovely Rogers.

When what is known as the first gold rush up Kern River occurred, Lovely Rogers, accompanied by his burro and outfit, followed and finally camped at what became known as "Whiskey Flat." As was usual in those days, when camp was made the burro was turned out to subsist on the country, but, owing to his perverse appetite, instead of remaining to feed upon the soft, sweet grasses along the banks of the beautiful Kern River, he pointed his obstinate head toward Split Mountain and mounted to the foothills, where cactus and granite were plentiful.

In the morning, when Lovely was ready to continue his journey, the jackass had failed to return, and, after the usual time spent in denunciatory remarks of an unprintable character, Lovely Rogers sought him out and found him at what has since become known to fame as the Kinsavvy mine.

With considerable heat, Lovely picked up a good-sized chunk of rock to throw at his "Burroship," but, good prospector as he was, Lovely, not the jackass, discovered by its weight that he held a prize in his hands.

Back to camp he ran, when crushing and horning disclosed that the rock was full of free gold; whereupon he made his location, and others following, making further discoveries, Whiskey Flat soon had a large population, with abundance of gold and all the picturesque attractions of an early, flourishing camp, with its wide-open gambling halls, fandangos, rapidly filling graveyard, and Wild Bill roadagents, keeping watch on each departing bullion train.

In course of time Whiskey Flat changed its name to Kernville, and became the county seat of Kern County; the court supplanted the miners' meeting; the gamblers and fandango stars each became *persona non grata;* and the signal, three pistol shots, ceased to call a community convention. Instead, the sweet sound of the Sabbath bell summoned the worshipper to his devotions, and the school bell called the young to their daily tasks—for long ago both church and schools came to stay.

The later generations are proud of these monuments of a milder civilization, and proud of the distinguished and successful commercial and professional men whom they have produced and sent forth into the great outer world; but the old timers seem to feel that these softening influences mark the passing of the sterner qualities of the pioneer, and often sadly sigh:

For the days of old,
For the days of gold,
For the days when men were bold.

But, as to the discovery of the Kinsavvy mine by Lovely Rogers and his jackass, there is no such division of sentiment. The old men of Whiskey Flat, and the young men of Kernville, all unite in loyalty to this tradition.

This will be readily understood when it is stated that it is proposed to erect in the public square, at the foot of Split Mountain, a statuary group composed of

Kinsavvy quartz and portland cement, to commemorate the discovery, as soon as the cost of concrete shall have become cheaper. In fact, local sculptors are busily engaged at present in considering an appropriate design. The most talented of these artists proposed to place a life-sized figure of the burro upon a proper pedestal with the usual prospector's pack, roped on its back with a squaw-hitch, prospecting pan at the apex, and the figure of Lovely Rogers squatted thereon, Turk fashion, holding a piece of quartz in the right hand, and pointing with the left to Split Mountain.

It was suggested, however, that Lovely Rogers was a Missourian, not a Turk, and that this design might be construed to be a reflection on Missouri. As the type of Missourian, "keerless with a gun when riled," still abides with us, for obvious reasons this design had to be wholly abandoned.

One old-timer said the design should show the jackass similarly packed, with Lovely yanking on the halter and planting his heavy boot in the burro's ribs.

It has the advantage of being true to nature, as this life-like pose was often observed, whenever Lovely had planned a prospecting tour to the south, and the jackass had scheduled the trip to the north; but right here, another controversy arose. Fidelity to nature demands that the true size of the foot should be depicted. The Missouri foot is not of lady-like proportions, which, however, does not prevent a Missourian from being sensitive on this subject; wherefore, it is to be feared that this admirable design will likewise have to be forgotten in the interest of peace and to avoid possible bloodshed.

This digression from history to art may happen to be wholly irrelevant, but it will serve to show the fixed and unalterable determination of this community to preserve in imperishable form, the fact of the first and only genuine discovery of a mine by the jackass method.

Unfortunately, Lovely Rogers is dead, and the jackass also is dead, otherwise the town would be able to afford irreproachable evidence of the fact of this important discovery; but, where historical facts are concerned, what does death signify? Julius Cæsar is dead, but the war horse on which he crossed the Rubicon still exists as a means to a liberal education.

Napoleon Bonaparte is dead, but the mule on which he crossed the Alps still lives in story.

George Washington is dead, but the cherry tree still figures among our arboreal statistics. Santa Claus is dead—but it is unnecessary to multiply illustrations. Suffice it to say, that, although Lovely Rogers has yielded up the ghost, and like the grave of Moses, the last resting place of the jackass is unknown, the memory of a discovery vital to the fame of Whiskey Flat must, and shall be, preserved.

No upstart camp by the Gila shall be allowed to dim the glory of its fame. The idea, too, of Arizona trying to lay claim to importance!

Why, Mr. Editor, when Lovely Rogers and his jackass discovered the Kinsavvy mine, Arizona was a wilderness of sand, cactus and sage brush, fit abode of such denizens as the horned toad, side-wiper, the coyote, and the scarcely superior Yumas, Mohaves, Apaches and Maricopas, whose highest conception of a *costume dé rigeur* was a gee-string cinched around the belly, with a sort of diaper tied thereto, fore and aft.

Positively insufferable is this felonious attempt of Arizona, thus to appropriate to its own renown, the laurels of a California jackass.

It may be asked why such seriousness and strong desire to secure justice is shown in support of the claims of an humble and despised quadruped like Lovely's jackass? The answer is that honor should always be vigorously maintained.

Every locality has a just right to feel proud of its distinguished but departed heroes, and Whiskey Flat may easily find justification in the fact that every hamlet in Greece contends for the honor of being the birthplace of Homer.

Why, therefore, should the melodious memory of the distinguished jackass be less sacred to Whiskey Flat than the songs of Homer to Greece?

The right of Lovely's jackass to equal distinction is indisputable, because it is founded on equally authentic history—

Which the same I am free to maintain.

Now, Mr. Editor, if you will kindly publish these few lines in your most excellent journal, the truth of history will be vindicated, and you will greatly oblige,

GAMBUSINO JAMES,
Alias GARRULOUS JAMES.

Whiskey Flat, *alias* Kernville, Kern County, Calif., June 29, 1912.

P. S.—No relation to Taciturn James, Prayerful James, Philospher James, or Truthful James. G. J.

Quantity of Reagents Used in Analyses

In commenting on the iodide method of determining copper, R. L. Hallett, in the JOURNAL of July 13, 1912, makes the statement: "If care is taken to use only a slight excess of the different reagents the method will be found quick and accurate . . . ." That is a statement that many engineers who are now and then obliged to do some analytical work would do well to paste in their hats. I have observed that inexperienced graduates and engineers unaccustomed to such work are prone to use quantities of reagents many times in excess of those actually required. Trained chemists, of course, know their business, but to the man who only infrequently makes copper analyses, I would suggest, if the work seems messy to him, to try using a smaller quantity of acids and keeping down the volume of the filtrates.

C. S. CASE.

New York, July 8, 1912.

A Long Raise

In regard to your editorial in the JOURNAL of June 22, describing a long raise in the Rolling Mill No. 2 Iron Mine, in Michigan, I venture to present a few facts in regard to a longer raise which came under my notice, in the hope that they may be of interest. I regret that at the moment I have not the figures by me so as to be able to give you perfectly accurate data.

The example I mention is the raise at the Monarch mine of the Coeur d'Alene North York Mining & Milling Co., Murray, Idaho, where I was employed in 1909. The total height of the raise was 950 ft. The rock dimensions were about 9x13 ft.

The rocks cut by the raise were a tough blue slate and a hard quartzite belonging, respectively, to the Prichard and the Burke formations. The rock was cut with hammer drills of the telescope type, the Waugh drill being settled upon after a number of makes had been tested. The timber was framed by hand, after being squared with a broadax. The material was mostly dead-pine standing timber resulting from a forest fire a number of years before. Ventilation was provided by means of an 8-in. exhaust flue which communicated through about 3500 ft. of tunnel, with a rotary water-driven blower. Air was furnished by a compressor driven by a Pelton wheel under about 90-ft. head.

The work was done by contract, by four Swedish miners, who worked two shifts a day in pairs. Each shift had an engineer, paid by the contractors, who handled the men and supplies by means of a compressed-air hoist working over a sheave in the top of the raise, which was moved up with every 15 ft. of advance. A mucker with a horse was employed on the day shift to take out the muck and handle supplies through the adit, which, as mentioned above was 3500 ft. long. The timber was framed by company men, two in number. One blacksmith was employed on the job.

The raise was timbered in two compartments, one for the cage and manway, the other one was boarded off to serve as a chute for the muck. At the time I was there the rate of advance was about 190 ft. per month. The raise was successfully holed through into the upper-shaft workings about the beginning of 1910.

STEPHEN ROYCE.

Cambridge, Mass., June 24, 1912.

Falls of Ground in Mines

Because more care is exercised in inspecting treacherous ground, accidents from falls of roof are less frequent than in mines where the roof is strong. In the Transvaal the law forbids natives to enter a stope until a white "ganger" has inspected the roof. There, it is advocated that inspectors be appointed whose only duty shall be to examine the condition of the roofs, as in that way it is believed the number of accidents can be reduced.

Note—Excerpts from a paper by James Chilton on "Accidents in Transvaal Mines," read at the November meeting of the Chemical, Metallurgical and Mining Society of South Africa, and printed in the Journal of the Society.

It is well known that the majority of serious mining accidents are due to falls of ground. With frequent vibrations set up by explosions, and the constant percolation of water, combined with roof tension and distortion of strata, ground which appears sound and rings clearly, may in a few days collapse without warning. As accidents from this cause usually occur singly, they do not excite anything like the sensation produced by a large spectacular disaster and most of them pass unnoticed or only arouse a languid interest.

ACCIDENTS MOST COMMON IN GOOD GROUND

Mining men all the world over have observed that most accidents from falls of ground occur in districts or mines having good roofs. When the hanging wall is known to be insecure, special precautions are taken and various systems of timbering are tried until one is evolved suitable to local conditions; on the other hand, with a good roof the most elementary preventive measures are neglected, pillars are left too far apart, or not left at all, until the overhanging weight overcomes the resistance of the roof beds and a fall occurs.

Article 97 of the Transvaal Mines Regulations requires:

"Before commencing work either at the beginning of the shift or after blasting, the ganger of the shift shall be the first to enter the working place and until he considers it safe he shall not allow any workman to proceed there except those required to make the place safe."

This regulation, if carried out, would prevent a large number of accidents, but in most mines it is disregarded and many natives enter the working place before the ganger arrives, with the too frequent result that a slab of hanging kills or injures some of them. Miners on contract allow this practice because they profit by the extra work done, and many mining officials wink at the contravention, having the short-sighted idea that it is good mining practice. In some mines an underground official makes surprise visits to the stopes in the early morning and promptly prosecutes any native found there before his white ganger has arrived.

Back stoping and resuing are probably the best methods of preventing disastrous falls of ground, but these methods are only suitable with ideal conditions. The former method is advantageous with highly inclined stopes, but has few merits in flatter workings, while the latter is only suitable for hand-labor conditions, and since hand-stoping, owing to scarcity of native labor, is likely to become a "lost art," the practice of resuing will probably accompany it to the limbo of forgotten things.

With increasing depth it follows naturally that roof pressure will increase even though the angle of dip remains unchanged. Most Transvaal deep mines, however, show a serious flattening of the orebody, and as this becomes more horizontal with increased depth greater pressure will be thrown upon the hanging walls and pillars, causing falls of ground to become more numerous.

The detonation of heavy charges of explosives, due to the increased use of rock drills, subjects the roofs to great shock and vibration and greatly increases the number of subsidences and falls underground. Accidents due to tension blasts or "air blasts" are also becoming more numerous with depth. This latter class is difficult to account for and more difficult to prevent, but is probably due to some distortion of strata that is taking place in the Witwatersrand beds.

ROOF INSPECTORS SUGGESTED

For the prevention of accidents from falls of ground, the author advises the appointment of roof inspectors and the systematic timbering of stopes. In some of the Transvaal gold mines an official has been appointed whose sole duty is to prevent accidents from falls of roof and sides. This person visits the working places as often as possible and submits a daily report to the underground manager, giving a detailed account of the condition of the roof and sides in the places visited. This report, coupled with the reports from the shift bosses, enables the underground manager to keep in touch with the varying roof conditions all over the mine, and measures of precaution can be taken before the roof pressures get beyond control.

At present there are two methods of stope timbering in the Transvaal mines. In one no timber is used except under isolated slabs or areas that are obviously dangerous. In the other, while dangerous ground is closely timbered additional supports are inserted at fairly regular intervals under hanging that apparently needs no support.

This latter is a near approach to what is known as systematic timbering. This method was first employed at the Courrières collieries, in France, where, owing to the peculiar formation of the coal seams, ordinary methods of timbering were found to be insufficient to prevent accidents from falls of roof and sides. Experience there showed that a large proportion of accidents occurred from falls of roof in which no slip or fault could previously be detected and this danger could only be met by timbering being done at regular intervals regardless of varying roof conditions. After a year's trial of the new method it was found that the accident rate from falls had decreased 87.5 per cent.

FEATURES OF THE ENGLISH LAW

In 1901 a commission of mining inspectors was appointed by the English Home Office to visit these collieries and report on the system with a view to its adoption in the English coal mines. As this report was favorable, systematic timbering was embodied in the Coal Mines Regulation act and became law in the United Kingdom. This law, though severely criticised when promulgated, is universally recognized as a step in the right direction, and the new regulations which will come into force in July, 1912, are as follows:

> The manager shall by notice specify the manner in which the supports are to be set and advanced and the intervals to be observed on roadways and at the face:
>
> (a) Between each row of props.
>
> (b) Between adjacent props of the same row.
>
> (c) Between the front row of props and the face.
>
> If the inspector of the division considers that the system of supporting the roof is unsatisfactory by reason of the distances fixed or any of them being excessive or otherwise he may require the manager to fix some lesser distance or othrwise modify the system.

All methods of timbering must be based on the methods of working, the nature of roof, slips, faults and foot wall; these differ considerably even in the same mine and at times in the same stope. The maximum distances between supports can only be presented in these rules, and it will frequently be necessary to set timber above the requirements of the rules. The erection of these additional supports must be left to those working in the stope who alone are aware of the momentary changes in the roof conditions.

In 1910, the Transvaal bill for round mining poles and lagging amounted to £162,895 or less than 1½d. per ton over the mineral output; this coupled with the expense of setting would probably amount to 4d. per ton. If systematic timbering was produced, probably timbering costs would rise to 6d. per ton. Against this rise of 2d. per ton there would be a larger labor force, a greater freedom from accidents, less compensation costs, the recovery of large quantities of broken ore that is now buried under collapsed stopes, less cost in the rewinning of stope faces and less waste rock sent to the surface. The amount saved on these items would leave a handsome profit over the cost of systematic timbering. Even if systematic timbering raised mining costs considerably, humanity demands that this or some other method must be tried, and that this waste of human life must not continue.

In succeeding discussion Tom Johnson expressed the view that in the Transvaal there are not enough inspectors of mines, adding: "The inspectors at present have no time to visit a mine except when they go to see about an accident, and then they have no time to inspect anything except the site of the accident. Inspectors should be appointed to do nothing else but inspect the mines in rotation, and they should have nothing to do with accidents. Then they should make more examples when they find things wrong. There is plenty of room for it. Punishment is about as good as anything for stopping accidents."

Capt. William A. Dunn

Capt. William A. Dunn died at Houghton, Mich., July 6, aged 71 years Born at Glengary, Ont., he was obliged to earn his living at an early age and was for a number of years employed in lumbering and contracting work. In 1867 he went to the copper country and for two years worked for the Calumet & Hecla. In 1869 he sunk the shaft of the New York mine, where the city of Ishpeming now stands. He opened the Kloman mine at Republic in 1872. He operated this mine for nearly three years and then he turned his attention to the manufacture of high explosives. In 1872 he assisted Jacob Houghton in introducing high explosives at the New York mine. He had faith in the practical value of nitroglycerin as a mining explosive, if it could be used with an absorbent material to lessen its danger. He experimented with sugar, powdered slate, charcoal dust. The slate proved best for the purpose and this crude dynamite was used successfully by its originator. He it was who introduced nitroglycerin into the Calumet & Hecla. In the years following Capt. Dunn opened several mines on his own account or for Moore, Benjamin & Co., of New York. He became one of the leaders of business and political affairs in Houghton County and in 1892 was elected sheriff, serving two terms, ending in 1896. When Capt. Dunn had completed his terms as sheriff he turned his attention again to mining. The Baltic lode had been located and a test pit had been located on Six-Mile Hill, now the site of the Baltic mine. Unaided, Capt. Dunn set about the development of this pit and in a short time, comparatively, he demonstrated that a mine was there. Then the Stantons became interested with him and the present South Range mines are the results of Capt. Dunn's faith in his own judgment of copper-bearing ground. For some years following his development of the Baltic Capt. Dunn lived in virtual retirement. Then in 1902 an attempt was made to revive the old Phœnix in Keweenaw County. Here Capt. Dunn worked for nearly three years, till the project was abandoned. Since then he had lived quietly at his home in Houghton.

Graham Pope

Graham Pope, one of the best known of the pioneers of the Lake Superior copper country, died at his home in Houghton, Mich., July 7, aged 71 years. He was born in Boston, educated in the public schools of that city and for a year following his graduation worked at the bench in a nautical and scientific instrument shop. He then took a position in a large Boston mercantile house that controlled a number of woolen and cotton mills. Here he acquired his business education. The last year of this service he spent in reporting on conditions in the machinery and economy of the mills. In 1861 he went to the copper country to enter the employ of the Isle Royale Mining Co., but soon after enlisted in the 23d Michigan Infantry, in which he served through the Civil War. On his return he went back to the Isle Royale, with which he remained until 1871, when he was made treasurer and manager of the Houghton Copper Works, which institution was obliged to close in 1873 on account of lack of capital. For a few years Mr. Pope was engaged in tribute mining and in 1878 became a member of the mercantile firm of Pope, Shepherd & Co., later becoming sole owner. In 1892 he re-entered the mining field as manager of the Franklin mine and in 1899 he again gave up mining owing to pressure of private affairs. He closed up his mercantile business about this time and retired to private life. For several years past his health had not been good and he spent his winters in the South.

This brief summary scantily expresses the fullness and activity of his work. He bore his full share of the labors and hardships of the early days in the copper country. He was connected at one time or another with nearly all of the older companies, and was intimately acquainted with their history. At more than one meeting of the Lake Superior Mining Institute his reminiscences of the early days were an enjoyable feature. He was a member of Stiles Post, Grand Army of the Republic, Hancock, and is the donor of the handsome soldiers' monument, dedicated to the memory of the Houghton County soldiers in the Civil War. This monument was dedicated last Memorial day, and it was unfortunate that Mr. Pope's ill health prevented his presence at the ceremonies. He always had been prominent in municipal affairs in Houghton, a leader in every movement for the civic good. He was one of the first citizens of the village of his adoption and his death will be mourned sincerely throughout the district.

Mr. Pope was married in 1864 to Miss Alice H. Fuller, of Houghton. Mrs. Pope died in 1876. She and her husband are survived by three children, George E. Pope, of Nevada, Miss Helen G. Pope, of Houghton, and Mrs. May T. Cranston, of California.

British Columbia 1911 Mineral Production

The annual report of the minister of mines for British Columbia for 1911 shows that the total value of the mineral production was $23,499,072, a net decrease of $2,877,994 from 1910. The details of the 1911 production are as follows: Placer gold, $426,000; lode gold, $4,725,513; silver, 1,892,364 oz.; lead, 26,872,397 lb.; copper, 36,927,656 lb.; zinc, 2,634,544 lb.; coal, 2,193,062 long tons; coke 66,005 long tons; miscellaneous products, $3,547,262, this being the only item showing an increase.

The decrease in production is largely due to the shutdown of the coal mines of East Kootenay district for eight months owing to labor difficulties. There was also a strike of the Crow's Nest miners which cut off the supply of coke for copper-smelting purposes for about five months at the Granby smeltery, resulting in a reduction of the quantity of metals produced.

The tonnage of ore mined in the lode mines of the province during 1911 was 1,770,755 tons, a decrease from the preceding year of 445,673 tons or 20%. This total tonnage was produced by the various districts in the following proportions: Boundary, 70.25%; Trail Creek, (Rossland), 14.36%; Fort Steele (East

Kootenay), 1.74%; Coast, 8.09%; all other districts, 5.56%. The number of mines from which shipments were made was 80, and of these only 45 shipped more than 100 tons each during the year, while but 30 shipped in excess of 1000 tons each.

Of the total production of placer gold, $225,000 was from Atlin division of Cassiar and $170,000 from Cariboo and Quesnel divisions of Cariboo district. Rossland mines contributed nearly $2,412,000 of the lode gold; Boundary mines, $1,814,000; those of the Nelson division $365,000 and of the Coast district $120,000.

Slocan district mines, including Ainsworth, produced silver to the value of $441,000; East Kootenay, $167,000; Boundary, $166,000; Coast, $51,000; Rossland, $45,000; Nelson, $39,000; Lardeau, $34,000. Of the lead production East Kootenay produced $683,000; Slocan and Ainsworth, $278,000; Nelson $77,000; Lardeau, $20,000, and nearly $10,000 from Portland Canal district.

The chief output of copper was from the Boundary district with a production of $2,764,000, the Coast mines coming next with $1,362,000, followed by Rossland with $425,000. The production of zinc, valued at $129,000, was chiefly from the Van Roi mine, near Silverton, Slocan Lake. The total number of men employed at the mines of the province in 1911, was 10,467, distributed as follows: 3594 at metal mines and 6873 at coal mines.

Indian Refining Co.'s Martinez Plant

The Indian Refining Co. is proceeding rapidly with the construction of its new receiving plant at Martinez, Calif., says the San Francisco *Chronicle*. The grading for the refinery building and oil-storage tanks is progressing fast. This is the second large station being built on the coast by the company. The first is being completed in Seattle. A third station is being planned for San Pedro harbor. It is proposed to purchase most of the refining oil in Borneo and Sumatra from the Shell-Royal Dutch Co. It will be conveyed to California in ocean tankers. Much of the trade will be with the Orient in competition with the Standard, and the remainder of refined products will be sold on the Pacific Coast.

Electrostatic Zinc Plant Sunnyside Mill

By Warren C. Prosser*

At the new zinc plant of the Sunnyside mill, Eureka, Colo., the American Zinc Ore Separating Co. installed Huff electrostatic machines to treat the zinc middling produced in the wet-concentrating plant.

The fact that this product, nearly 90% of which will pass a 150-mesh screen, is being successfully treated speaks well for the usefulness of the process for the treatment of the lead-zinc-iron ores of the district. This type of ore is especially abundant in that part of the district tributary to Eureka, Gladstone, Animas Forks and Mineral Point.

Electrostatic Zinc Plant, Sunnyside Mill, Eureka, Colo.; Wet Concentrator in Background

The equipment of the new plant includes a car elevator, original middling bin, Ruggles-Coles dryer, trommels and Huff electrostatic machines. The zinc product is shipped to zinc smelters at Caney, Kan. and the highly desirable lead-iron-copper product is handled at the Durango plant of the American Smelting & Refining Co. These two constitute the separated products of the machine. In the accompanying halftone the wet-concentrating plant is shown in the background and the new zinc plant in the foreground.

South Australia Mineral Production

The official report shows the following mineral production in South Australia in 1911: Copper, 5922 long tons; crude salt, 65,000 tons; iron flux, 42,300 tons; gold, 3537 oz.; limestone flux, 28,700 tons; phosphate rock. 5800 tons; silver, 1400 oz. There were also productions not enumerated by weight, but given by value, as follows: Gypsum, £7275; bluestone, £4163; sulphuric acid, £6940; pyrites, £2580; all else. £1464; a total value of £450.054 is given to the mineral output. The greatest changes are the decreases in gold and silver production, from 6603 to 3537 oz., and from 6250 to 1400 ounces.

Operations at Goldfield Consolidated for May, 1912

During May, 1912, the total production of the Goldfield Consolidated Mines Co. was 30,215 tons, containing $550,656, an average of $18.22 per ton; of this 29,029 tons were milled with an average extraction of 91.44%, and 1186 tons were shipped of an average grade of $28.25 per ton. The net recovery from all ore was $16.69 per ton and the total net realization was $309,622 or $10.17 per ton.

Development work amounted to 2911 feet.

The total cost of mining, development, transportation, milling, office and general expense was $6.72 per ton.

MAY OPERATING COSTS AT GOLDFIELD CONSOLIDATED

Mining		
Development	$0 82	
Stoping	2 45	$3 27
Transportation		0 08
Milling		2 20
Marketing		0 07
General expenses		0 67
Bullion tax		0 11
Marketing ore shipped		0 25
Construction		0 07
Total cost of operation		$6 72
Miscellaneous earnings		0.12
Net cost per ton		$6 60

At the Combination, the new stope in the Reilly vein southeast of the shaft produced 1100 tons of $56 ore. The 328 sill produced 50 tons of $30 ore. The downward extension of the 402-C stope produced 260 tons of $28 ore. This is the greatest depth at which ore has been found in this mine. At the Mohawk, the sill floor of the 3-D stope in the Sheets-Ish workings on the 150-ft. level produced 200 tons of $39 ore. The 215-X intermediate drift under the 111 stope has been extended about 80 ft. through $12 ore. This orebody is the downward extension of the big 111 stope and will produce a large tonnage of good ore The 307-V raise on the third level passed through 10 ft. of $80 ore. This ore is the upward extension of the 307 stope that was cut off by the Mohawk fault. The 354-Q stope on the 450-ft. level produced 260 tons of $45 ore. A new section of the 407 stope on the 600-ft. level produced 648 tons of $52 ore.

Superintendent Thorn states that at the Clermont, the greater part of the development work is being done on the lower levels, where good results are being obtained, especially on the 1300-ft.

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*Mining engineer, Silverton, Colo.

level of the Grizzly Bear shaft. From this level the third compartment of the shaft is being raised to the 1000-ft. level, and is progressing 20 ft. per day. A drift is also being driven on the new orebody, which has been advanced about 80 ft. through $20 ore. The crosscut has been stopped until the shaft has been enlarged and a double-drum hoist installed. After this work is completed, development on this level, as well as sinking the shaft to the 1450-ft. level, will be carried on more rapidly. In the Laguna the sump below the 720-ft. pump station and the main station have been completed, and a pump installed to take all the water to the surface in one lift. The work of prospecting the large quartz mass on this level is now in progress. The Jumbo has been connected on the 250-ft. level with the workings on the south end of the property under the old Zinn lease, and the work of stripping and extracting pillars resulted in a production of 537 tons of $46 ore.

The University of Illinois Mining Laboratory

The Department of Mining Engineering at the University of Illinois at Urbana, Ill., is just completing a new mining laboratory 100x42 ft., divided into two equal sections; one for the treatment of ores and one for the washing of coal. The crushing end of the building contains an 18x20-in. Jeffrey coal roll, a Williams pulverizer, an Allis-Chalmers gyratory crusher, and a Colorado Iron Works 12x12-in. roll for ore. This end of the building also includes sample crushers and screens, and two steel sampling floors, one for ore and one for coal. The crushed material is elevated in a 15x20-in. continuous Peck carrier equipped to dump automatically along the upper run into any one of a row of steel bins, each holding five tons of coal. Beneath these bins is an Avery automatic traveling scale through which the material is delivered to any one of the screens or the washing or concentrating appliances. On the coal side there is a Holmes Brothers shaking screen and a Webster revolving screen, each fitted to separate four sizes and each about 13 ft. long. On the ore side is a vibrating screen. Beneath each of these screens is a set of bins from which the screened material is taken by wheelbarrows to a dormant scale and then delivered to the lower run of the Peck carrier which elevates it to the upper tier of bins. Through the automatic traveling scale the coal is delivered to a three-compartment American concentrator jig or to a Stewart jig. A Luhrig jig and a Jeffrey-Robinson cone washer will be added later. The washed coal is delivered into a 1300-gal. setting tank from which it is elevated by a Webster bucket elevator to an overhead bin and from thence carried by the Peck carrier delivered to a bin outside the building from which it is carted away to the boiler plant. The coal side of the laboratory has a capacity of five tons per hour.

On the ore side the material may also be crushed in a stamp battery. The fine-screened ore is mixed with water and delivered by a Traylor centrifugal sand pump to a three-compartment classifier, the products from which go to a 6-ft. Williams & Chalmers' vanner, an 11-ft. Traylor concentrating table and a buddle. These three machines deliver to four Callow tanks beneath which are drying tables. In the adjoining room is a completely equipped chemical laboratory and assay rom for carrying on such tests as are required. The equipment also includes an assortment of hard jigs, Munro classifiers, a spiral separator, a small Jeffrey-Robinson tub and a small laboratory concentrating plant made by the General Engineering Company. The machinery is being erected by the Burr Co. of Champaign, Ill.

The department is also equipping a new blasting and explosives laboratory, a rock-drilling and coal-cutting laboratory, and is building a new rescue station for giving training with oxygen helmets and other rescue appliances. The offices, drafting rooms, library, and recitation room of the Mining Department are located in the new Engineering Building which will be ready for occupancy Sept. 15. In this building there is also a completely equipped laboratory for the study of mine gases and safety lamps.

Pipe Lines as Common Carriers

WASHINGTON CORRESPONDENCE

A petition for an injunction against the orders of the Interstate Commerce Commission in the pending pipe line case has been filed with the Commerce Court by the Prairie Oil & Gas Co., a corporation of Kansas, doing oil business in Kansas and Oklahoma. The commission holds that the pipe lines are common carriers and as such are subject to the interstate-commerce act. It was, therefore, held that the pipe lines should file schedules of rates and should accept for transportation through their pipe lines oil of competing companies. The order of the Commission is to become effective Sept. 1 next. In bringing its petition to the Commerce Court the Prairie Co. says:

> Your petitioner has not now and never has had any schedule of rates and charges for the transportation of oil. It has never transported nor offered to transport any oil other than its own oil. Its corporation was procured, its stock prescribed and sold, for the purpose of engaging in a private business, in manner and form in which said business is now and heretofore has been conducted by your petitioner. That the stockholders and directors of the Prairie Oil & Gas Co. have never given their consent or in any manner authorized the managing officers of your petitioner company to divert the property owned by it or any part thereof from the necessary private uses in which it is now employed to the public service, or to the service of any other person, and the pipe lines of the Prairie Oil & Gas Co. cannot, nor can any part thereof be employed in the transportation of oil for the public or any private person without impairment and destruction of the value of the same to its owner as a necessary, economical and efficient means of carrying on, conducting and maintaining the business in which it is now engaged.

For these reasons it is requested that the order of the commission be set aside. This case was investigated by Commissioner Lane last summer and after it had been referred to the Interstate Commerce Commission it was decided that the pipe lines are common carriers. It was understood at the time that the existing pipe lines in the Southwest had exerted a harmful influence on the small producers of oil by refusing them a means of transporting their product to the markets. The commission thought that this was an injustice that should be corrected.

International Nickel Co.

The report of the International Nickel Co., for the 12 months ended Mar. 31, 1912, show earnings of $5,019,703, by the constituent companies, and other income, $69,263. From this administration expenses of $222,553 were paid, $497,520 allowed for plant depreciation, $139,782 for mineral exhaustion, $201,500 for bond sinking fund, $445,650 paid as interest on bonds, leaving as earnings applicable for dividends, $3,581,960. On the preferred stock, $534,749 (6%) was paid; on the common, $2,143,412 (18½%), leaving $903,799 to be carried to surplus, which now stands at $3,938,093. No details of operations are given.

Tin Lodes in Alaska

In addition to the Alaskan production of tin by dredging, lode tin mines have been opened near York, says the U. S. Geological Survey (*Bull.* 520-M). Production in 1911 was negligible, but promising results were said to have been attained, and development is being continued. It is hoped to smelt the concentrates at Seattle.

Gypsum Production in 1911

The gypsum production of the United States in 1911 was 2,323,970 tons, a decrease of 1.05% from 1910, according to the U. S. Geological Survey. The smaller old mills have been replaced by modern centralized units, so that prices on the finished products should ultimately be lower. Gypsum is produced in 17 states and in Alaska.

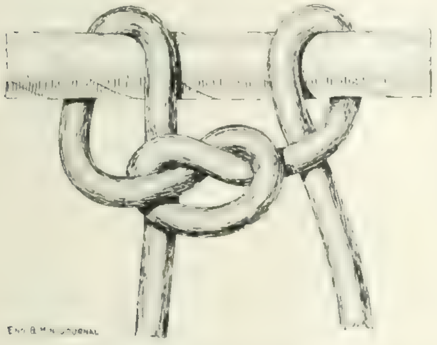
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Wicking Method of Lighting Fuse

In the Flat River lead district of southeastern Missouri stopes are carried with a top breast or heading that is reached from the floor of the stope by a steep-sloping bench, to ascend or descend which is a rather difficult task, especially for a miner who is hastening away from a round of lighted holes.

In order to somewhat delay the firing of the holes, without unnecessarily lengthening the fuses, it is the custom to light the fuses by wicking. This method consists in tying around the fuse a knot of ball wicking the strands of which have been soaked in oil. The knot is tied, as shown in the accompanying illustration so that it hangs straight down under the fuse, as also do the ends of the strands of wicking. Thus the flames rise and impinge upon the bottom side of the fuse insuring ignition of the powder train within.



Ball Wicking for Igniting Fuse

While it is claimed by some that the method of spitting a fuse is more rapid and surer, the delayed action obtained by the use of wicking gives the miner a better chance before the blast to reach a point of safety, when he is compelled to descend a sloping bench 40 to 60 ft. high or perhaps even higher.

The method of tying the knot in the wicking is clearly shown in the illustration. First a simple knot is tied in the middle of the strand, the two ends are then thrown over the fuse and brought back between the bight and fuse. The ends are then pulled tight, which draws the knot in the center of the strand close up under the wicking. The wicking is then ignited.

This method of igniting the fuse is somewhat similar to that used in the Calumet & Hecla mines in the Lake Superior copper district and has been developed in the Flat River district from the same force of circumstances, the necessity on the part of the miner to get away quickly from a round of lighted holes. However, in the Lake Superior country the snuffing method, as described in the Journal of Nov. 18, 1911, is used, but the wicking method seems to be better because less trouble is experienced from air currents. In wicking fuse the miner should remember to concentrate the flame as much as possible below the fuse; this is the purpose of the knot. In this way the flame is kept under the fuse as long as possible and the ignition of the powder train within is assured.

Cold Water in Drifting

By H. Y. Russel[*]

When a vein is being developed by a tunnel, one does not expect to strike a flow of water that demoralizes the working forces for months, not only making it almost impossible to get men, but also making it difficult to get materials into the tunnel against the flow. Such a flow occurred in a tunnel in the West several years ago. This tunnel had been driven about 5000 ft.; several small veins had been cut but no water had been encountered, and no ditch had been made, the manager evidently thinking that no water would be encountered. The temperature at the breast of the tunnel was about 60° F., and although the only ventilation was from the compressed air, no difficulty was experienced getting into the tunnel even after a protracted shut down.

The course of the tunnel was west. To the north was a mine from which a flow of water, amounting to 2000 gal. per min., had been running for years. The tunnel was 400 ft. lower than the lowest mine workings and 4000 ft. distant. About 5100 ft. from the mouth of the tunnel a vein 4 to 7 ft. wide was cut, the vein filling, which consisted of mineralized gangue and quartz, was rather soft, the strike was northeasterly and parallel to the vein in the mine to the north. The tunnel at the intersection was about 1200 ft. below surface.

The tunnel company wanting someone to plan and carry out the development of the vein offered me the position of superintendent, and drifting along the vein in a northeasterly direction was started. From the first the vein was slightly wet but not at all bad. In places forepoling had to be resorted to and the square sets had always to be kept within 10 ft. of the breast; the ground was not heavy. When the drift on the vein had been driven 500 ft. a stream of water three inches in diameter was noticed running from the breast; as there was no pressure behind it we did not expect trouble. Two hours later we were engaged in a frantic struggle to prevent our dump buildings from being washed away by a heavy flow of water from the tunnel. On reaching the breast of the drift we found the water was pouring out of a hole about four feet above the floor. As we watched it the water broke through at the roof until finally all the water was coming from a hole 13 or 14 ft. above the track. Later measurements showed the flow amounted to 8000 gal. per min. The temperature of the water was 40° Fahrenheit.

Having planned the drift as the main working level for the vein, it had been driven 5½x8 ft. in the clear, this made a hole 8x11 ft. over all. After sizing up the situation we decided to ditch the tunnel as it was almost impossible to get a car in against the water, which was flowing from 5 to 10 in. above the rails. The ditch was made alongside the track; one hammer drill was used, and from 300 to 500 ft. of ditch was completed per week.

While the ditch work was going on efforts were made to shed the water back from the breast so that drifting could proceed. On account of the pressure, volume and, worse than all, the frightful coldness of the water, no one could work against it for more than a few minutes at a time, and as the temperature of the tunnel rapidly fell to that of the water one could not get warm, it being impossible to put in a dry house on account of the distance from the mouth of the tunnel and insufficient ventilation. The best we could do was to partly break the force of the water and shed part of it far enough back from the breast to allow some work to be done.

Our first plan was to use 2-in. planks, 8 or 10 in. wide as spiling, getting them close enough together to prevent the water from coming between them, and the ends as close as possible against the breast. On account of the force and weight of the water these planks had to be put in one at a time. When a couple of planks had been placed, thus confining the water slightly, the trouble began; as further planks were placed the water bent the toe of the planks down so that when the breast was reached the toe was from two to four inches below the next plank, leaving a space for the water to run through. This space was kept open by small rock and gravel lodging in it and making it impossible to close the gap. Frequently when the roof had been completed a rush of fine rock would choke the space between the spiling and the roof and the spiling would break down.

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[*] Mining engineer, 123 Guy St., Montreal, Que.

We then tried using 2x4-in. timbers set on edge, and the points sharpened to take in the inequalities of the breast. These were forced in one at a time and then spiked together. Owing to the roughness of the lumber and the points spreading when forced against the breast it was impossible to seal the cracks. The fine rock was forced into these cracks by the water, gradually widening them until most of the water came through. The only good the roof did was to break the force of the water.

An attempt was made to flume the water by building the entrance of the flume large enough to cover the hole from which the water came. It was found impossible, however, to hold the flume against the breast strongly enough to stand the water pounding and the occasional rush of fine rock. Many variations of these plans were tried, but I must say that nothing better than a makeshift was evolved.

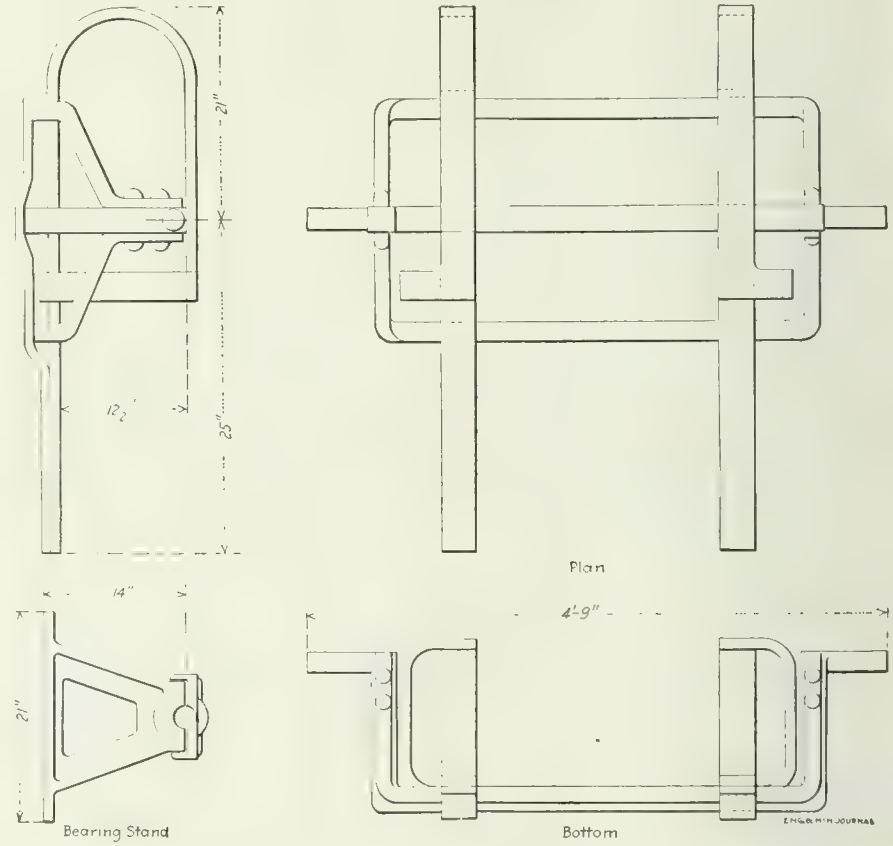
As the staging had for a time to be removed when we blasted and as it took about one shift to put it up whenever it fell or was taken down, our progress did not create any enthusiasm among the directors.

The only men that could be obtained were those who were so badly broke that they had been thrown out of every boarding house in town and could get work nowhere else. No financial consideration was sufficient to get men to stay and the tunnel became a by-word in three counties.

In driving the drift one of our greatest difficulties was missed holes. The cold water froze the powder almost before it could be tamped. The lifters always missed. It was then necessary to grope under from one or two feet of ice water to find the holes, clear the collars, reprime and shoot. It frequently took several attempts before the primer would explode the frozen powder. Four or five shifts were usually necessary to shoot a round of six holes. Extra holes had always to be drilled to relieve the water pressure on the holes that were to be loaded.

When the flow was first encountered and came out of the top of the drift it was 12 ft. above the track. The height of the drift was reduced to 6½ ft. and an attempt was made to get past the water, or rather under it. Twice we succeeded and twice it came back into the breast. The last time it filled the drift with fine quartz for 30 ft.

It was then decided to continue the drift in the hanging wall alongside the vein. The wall, being fairly hard, stood up and most of the water stayed in the vein, coming out only where the change was made. As the drift in the wall was slowly pushed ahead it was noticed that large springs of water were breaking out of the floor close to the vein. As these springs increased the flow from above slackened until all the water was coming from below. The drift at this point was about 1500 ft. below surface. When the water started to come up the mine to the north became perfectly dry. The distance from where the water was first encountered to where it began to come up from the bottom was 200 ft. It took six months to drive the distance.



Dumping Cradle for Mine Cars

The flow continued at 8000 gal. per min. for about five months, then it gradually decreased until in 18 months it amounted to 2000 gal. per min., at which point it has since remained. The flow is slightly larger in summer than in winter. The temperature remains about the same.

Many times in the years following this experience I have been ashamed of the crude methods that we used to handle the water and have tried to figure out a better, or I might say more scientific method, but I have never succeeded in doing so. Everlasting patience and perseverance seemed the only thing that counted.

Tipple for Mine Cars

By Claude T. Rice

A description of the car dump or tipple used at the mines of the Copper Range Co. in Michigan, was published in the Journal of March 16, 1912. That type of dump is designed for long cars and is not at all suitable for the mine cars generally used at metal mines in this country, where the length of the car is only a little greater than the height or the width.

In the accompanying illustration are shown the details of the car dump used at the Doe Run, the St. Joseph, the Federal and at some of the other mines in the Flat River district of Missouri, where the ore is hoisted to the surface in cars. This tipple is made entirely of iron, and as shown in the drawing, is designed for dumping a 1-ton car.

The iron bars that serve as rails run back to a sole plate under the track rails leading up to the dump so that the bars will come flush with the tops of the rails. The other ends of these bars are bent and brought back far enough to come over the tops of the back wheels when the car has been run forward on the dumps. To strengthen these tops or retaining straps, they are tied to the lower part by two straps.

The dump is so proportioned that the center of gravity of the loaded car will be slightly ahead of the shaft of the dump, when the car is pushed ahead so that the front wheels are engaged by the front loops, yet not far enough ahead but that, after the ore has run out, the weight of the back rails of the dump will be enough to put the car and tipple back into a horizontal position. Consequently the proportions have to be made according to the dimensions of the cars used. The drawing shows only the general design of a style of tipple that has given excellent service after years of use. To prevent the tipple or dump from going too far around for it to right itself, a chain is tied to the back and is fastened to the floor above the bin into which the ore is being dumped.

This tipple is used at the surface as well as underground where the ore is dumped into skip pockets. The dump is strong; that is the essential requirement of a good tipple. This type of dump has been found to be more satisfactory on account of its quick action than any rotary style of dump as such dumps give endless trouble because of greater complexity of design and the rack and strain that they have to undergo.

A rotary type of tipple was tried several years ago in the Flat River district for dumping single cars, but the dump worked too slowly and considerable trouble was experienced in cold weather on account of the guide wheels becoming coated with frozen mud, which made the turning of the tipples by hand difficult.

Automatic Call System

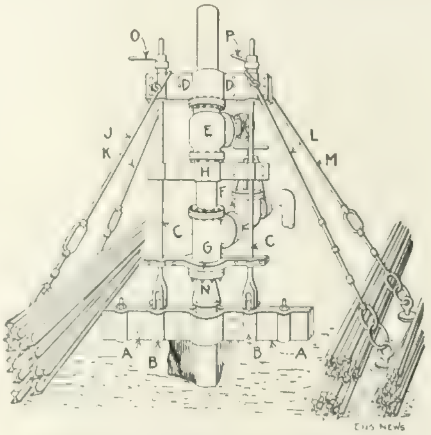
At the plant of the St. Louis Smelting & Refining Co., in the Flat River district of Missouri, an automatic call system manufactured by the Autocall Co., of Shelby, Ohio, is used. Electric call bells are placed about the plant at the most favorable places for attracting the attention of the officers of the company. The heads of departments and other men that have to be called frequently are designated by numbers.

When a certain man is wanted the telegraph operator is called; he plugs the number of the man wanted on the call board, thus setting all the bells in the system to ringing that signal. Either the man wanted or some one who knows the call hears it so that the man sought is soon reached and he rings up on the nearest telephone.

These call bells are operated by storage batteries. The system is well liked at this property, and seems to have a special field at mines where the workings are scattered, and where it is frequently necessary to summon heads of departments quickly. The bells ring loudly so that the sound carries a long distance.

Closing a Spouting Oil Well

Closing a well which is spouting a heavy flow of oil under high pressure is a difficult problem which has had to be solved many times on the oil fields of this country. *Engineering News* has published a description, abstracted from the *Engineer*, May 17, 1912, of the method employed to close such a well at Potrero del Llano, Vera Cruz, Mexico. The well was spouting for 108 days, and it is estimated that about 10,800,000 bbl. of oil were discharged before the well was closed; all of this was lost, except about 3,000,000 bbl. held in a temporary reservoir. The oil was struck at a depth of 1900 ft., and the flow rapidly increased from 10,000 to the enormous amount of 160,000 bbl. per day. The device used to close the well is shown in the accompanying sketch, and is described as follows:



Method of Closing a "Gusher" in a Mexican Oil District

In the well was about 1700 ft. of 8-in. casing. First of all a heavy clamp in halves was placed so as to embrace the top of this casing where it projected above ground level. This clamp *A A* carried two eyes *B B* which were used as hinges for two 2-in. rods *C C*, the upper ends of which were threaded. The upper ends of these rods were passed through a clamp *D D* above an 8-in. T-piece, which was provided with two 8-in. stop valves *E* and *F*, one being on an arm of the tee and the other on the tail. Two other clamps *G* and *H* embraced the T-piece so as to give increased rigidity. The top clamp *DD* was provided on both sides with hooked tie-rods *J, K* and *L, M;* these were hitched to turnbuckles, the lower ends of which were connected to anchorages of concrete firmly embedded in the ground and weighted down with many tons of rails. At the lower end of the arm of the T-piece, which it was intended should finally come above the orifice of the well, was fixed a short length of pipe *N* tapering from 10 to 8 inches.

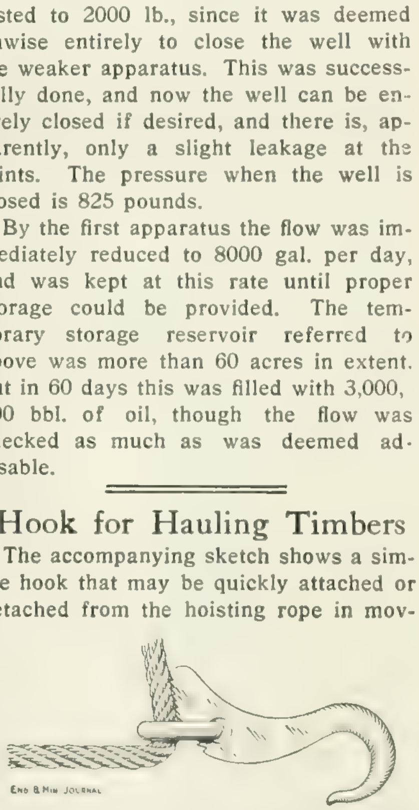
When all was ready the apparatus was laid on its side in correct position near the well, and by the aid of guy ropes was gradually raised until vertical over the spouting bore hole. The valve *E* was kept open so that there was unobstructed egress for the oil. By the spanner levers *O* and *P* the nuts on the threaded rods *C C* were tightened gradually, and the taper nipple *N* was gradually brought down over the well casing, packing being inserted so as to make the joint as tight as possible. The operation was entirely successful. When the valve *E* was gradually closed and the valve *F* opened, the oil was found to be under control and could be diverted into the reservoir.

The apparatus had been tested to a pressure of 800 lb. per sq.in., and as the pressure in the well was thought to exceed this, it was decided to install another apparatus with pipes and valves tested to 2000 lb., since it was deemed unwise entirely to close the well with the weaker apparatus. This was successfully done, and now the well can be entirely closed if desired, and there is, apparently, only a slight leakage at the joints. The pressure when the well is closed is 825 pounds.

By the first apparatus the flow was immediately reduced to 8000 gal. per day, and was kept at this rate until proper storage could be provided. The temporary storage reservoir referred to above was more than 60 acres in extent. but in 60 days this was filled with 3,000,000 bbl. of oil, though the flow was checked as much as was deemed advisable.

Hook for Hauling Timbers

The accompanying sketch shows a simple hook that may be quickly attached or detached from the hoisting rope in moving timbers through a drift or up a winze. The device consists of hook and link; the back end of the hook being enlarged, shaped like a cam, and toothed.



Detachable Hook for Hauling Timbers

When the rope is passed through the link and the hook is straightened by the load, the toothed cam seizes the rope and pressing it securely against the link holds it tightly until the load is released or the hoisting rope is slacked off. This hook can be attached or detached quickly and in some places will prove to be more convenient than the slower method of tying hitches or knots.

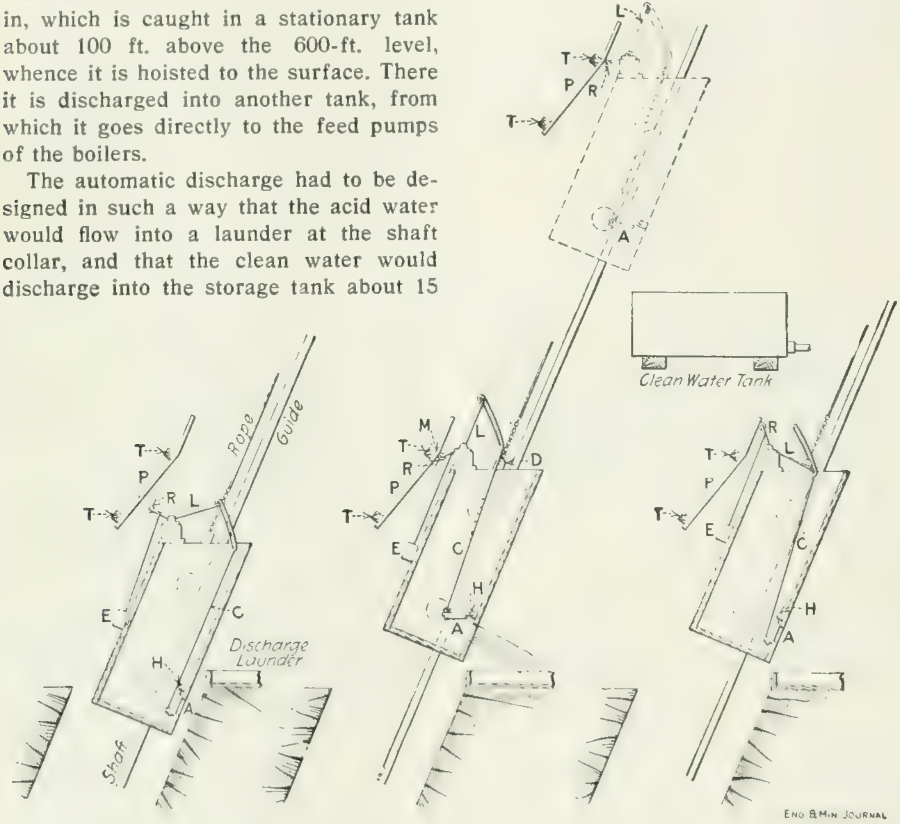
Deflection of drill rods is more apt to occur in a vertical or horizontal hole than when the hole is inclined at right angles to the dip of the strata, as it has been found that rods have a tendency to turn in a direction at right angles to the strata.

Self Discharging Bailing Tank

BY M. G. SOHNLEIN*

At the Maestro shaft of the mine "Socavon de la Virgen" in Oruro, Bolivia, the water is bailed with tanks of 400 gal. capacity. The water contains a considerable amount of acid and sulphates so that the tanks have to be constructed of wood. The vertical depth of the shaft is about 600 ft. and the flow of water amounts to 5500 gal. per hr. Along the sides of the shaft some clean water flows in, which is caught in a stationary tank about 100 ft. above the 600-ft. level, whence it is hoisted to the surface. There it is discharged into another tank, from which it goes directly to the feed pumps of the boilers.

The automatic discharge had to be designed in such a way that the acid water would flow into a launder at the shaft collar, and that the clean water would discharge into the storage tank about 15 ft. higher. The same bailers are used for either acid and clean water and at the beginning of the shift a few buckets of fresh water are first hoisted.



BAILER FOR RAISING ACID WATER

The arrangement can be readily understood from the accompanying sketches: *A* is the valve hinged at *H*. As soon as the roller *R* strikes the plank *P* which is placed a little more inclined than the shaft, the lever *L* is lifted and the valve is opened by the connecting rod *C*, Fig. 1. At the point *M* the valve has reached its largest opening. The upper part of the plank, which is connected with the lower part with angle irons, is placed at the same inclination as the shaft. If the tank should be lifted a little higher, as frequently occurs, the roller travels on this part of the plank, keeping the lever in the same position as it has at *M*, and consequently the valve stays wide open until the roller leaves the plank, when the lever falls back, shutting the valve. By placing another plank higher up, the discharge of clean water is led into the tank, shown dotted in Fig. 2. When hoisting fresh water the engineer passes the first plank quickly so the valve only opens for a very short time and but a small quantity of the water is lost.

When lowering again the roller has to pass the first plank. Therefore the fork at the end of the rod *C* is slotted over such a distance that the bolt which connects the rod and the lever can slide through this fork until the roller comes into such a position that it freely passes the plank, shown in Fig. 3. After leaving the plank the lever is brought back into its proper position by the counterpoise *E*. The latter arrangement also makes the apparatus safe against overhauling. Even if the engineer should hoist the tank so high that the roller leaves the plank entirely, he can lower again and then hoist it to its proper position. Further construction details can be easily understood from the sketches. The lever is curved to prevent its striking against the distance piece *D* in the tank. The same applies to the bend in the rod *C*. The planks are fixed to the timbers of the headframe with crosspieces *T*. This arrangement has been in satisfactory use at the shaft for several months.

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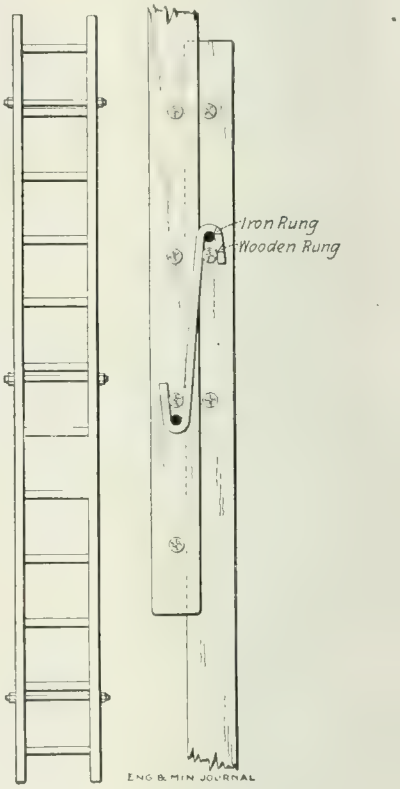
*Care of Cia. Minera de Oruro, Oruro, Bolivia, S. A.

Method of Hanging Ladders

When ladders are required only for temporary use in raises and millholes in the mines of the Copper Range Co., in the Lake Superior country, it is the custom to use several 12-ft. ladders; the lower one rests upon the ground while each of the others is carried by ⅝-in. round-iron, S-shaped hooks from the ladder below, as shown in the accompanying sketch.

The ladders are made of oak with 2x4-in. legs and rungs 1½ in. in diameter spaced one foot apart. Three tie-rods are used; one at the center; one below the second rung from the bottom; and one above the second rung from the top. The S hooks grip the ladders by the tie-rods and the ladders overlap at the junction. It is better to place the overlap of the lower ladder on top of the upper one as that arrangement makes it easier for a man coming down to know when he has come to a junction.



METHOD OF HANGING LADDERS IN A RAISE

A temporary sollar is usually put in the raises at intervals of every two ladders whenever three or more ladders are used. Sprags are used to prevent side swing. The overlap is so long that there is no danger of hinging of the ladders at the junctions.

The tendency for diamond-drill rods to deflect at a certain point in the hole being drilled is often overcome by cementing the hole to a point slightly above the troublesome one and by drilling through this solid cement.

Details of Metallurgical Practice

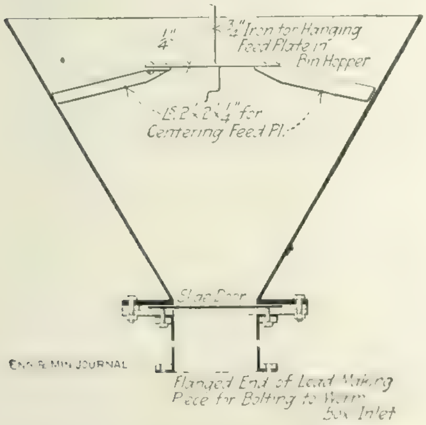
Records of Experience in Ore Dressing, Cyaniding and Smelting

Dry Tube Milling

By H. T. Durant*

In some milling operations it is necessary to crush the ore while dry, in all the various stages up to, and including the final tube milling. In such cases unless the moisture in the tube-mill feed be carefully watched the output of the mill will be seriously affected, or the mill may become more or less clogged.

In a particular case the ore came from the calcining furnaces and was allowed to cool before being sent to the tube mill bin; this roasted ore was of a hygroscopic nature, and experience showed that if the required fineness of the product were to be maintained the output of the tube mill had to be halved when the moisture in the feed rose to about 1%. At one time the moisture in the mill feed was unfortunately allowed to rise to more than 1½%. After about six hours running, the interior of the mill began to "make up" or to become lagged with ore in which the pebbles were firmly embedded, the whole mass adhering to the mill liners; this naturally reduced the working diameter of the mill and put most of the pebbles out of action. This lagging up of the interior of the mill is, of course, gradually evident from the change in the sounds during running. The clearing of the mill is not easy, especially when it has only one manhole door. The mill slowly cleans itself if fed with sharp dry sand.


1/4"
3/4" Iron for Hanging Feed Plate in Bin Hopper
L'S 2×2×1/4" for Centering Feed Pl.
Slide Door
Flanged End of Lead Making Piece for Bolting to Worm Box Inlet
ENG. & MIN. JOURNAL

Feed Hopper for Dry Tube Milling

Dry tube milling need not be dusty work if the feed and discharge ends are well arranged. Where the feed end consists of a horizontal worm box feeding through the hollow trunion, as shown in the accompanying sketch, the flanged intake on the upper side of the worm box can be set a few inches vertically below the discharge end of a hopper-bottom bin of any convenient size, such as one to hold a 24-hr. run. At the bottom of the hopper bin will be the ordinary slide gate for regulating the feed, and between this and the intake of the worm box will be flanged and attached by setscrews to a short making-up piece made of about 10-lb. sheet lead; this will be more convenient than a stuffing box.

By this method of construction it will be found that, since the bin itself may settle or rise ever so little with its varying loads, the line of the worm box will not be affected, as the lead making-up piece connecting the bin to the worm box will respond more readily than a stuffing box could.

A 1-in. hole should be made in each of two opposite sides of the lead making-up piece. These can be closed with corks or other plugs. When adjusting the feed by the sliding gate which is just above this lead making-up piece, it is an advantage to be able actually to see the feed, and this is easily done by removing both corks and placing an electric light at one hole, then looking through the other.

A steel feed plate, centrally hung in the hopper portion of the bin at about two feet above the slide gate and centered by four short pieces of angle iron riveted to it, will insure a steady feed from the bin to the worm box without any chance of the ore in the feed bin blocking or bridging. If the cross-section of the hopper at the level of the feed plate is three feet square, then the plate itself will be about 14 in. square. It is advisable to guard the entry to the tube-mill feed bin by screens, so that under no circumstances can anything enter it which is too large to be easily passed along by the feed worm.

Chemical Consumption at the Liberty Bell Mill

At the Liberty Bell cyanide plant, Telluride, Colo., the consumption of chemicals is as follows; cyanide, 1.2 lb.; zinc, 0.487 lb.; lime, approximately 7 lb.; lead acetate and litharge, 0.415 lb.; and sulphuric acid, 0.076 lb. per ton of ore milled.

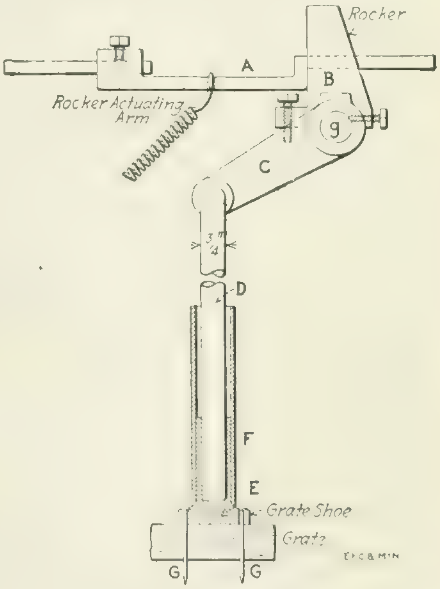
Device for Clearing Jig Grates

After the zinc-lead ore from the mines of the Joplin district is crushed, the broken pieces may be classified according to composition, as follows:

(1) Nearly pure metallic minerals that constitute the major portion of the concentrates.

(2) Gangue nearly free from metallic minerals and which is discarded as waste.

(3) Valuable metallic minerals and worthless gangue in approximately equal proportions.



Details of Grate-cleaning Mechanism

Pieces of ore of the last mentioned class are known as "chats." The gangue is chert, which breaks into angular fragments and therefore the chats are more angular than the pieces of nearly pure metallic mineral.

The chats, because of the angular shape, clog jig screens to an annoying degree. Therefore in most of the Joplin mills, cast-iron or wooden grates are used in lieu of screens to support the bed of material in the jigs. The cast-iron grates are made as long as the jig compartment is wide, and about six inches in width. But even the grates become clogged by the chats, making it necessary to dig down into the beds to dislodge the caught particles about once per hour. This is often done by inserting a blunt chisel-like tool about two inches wide through the bed and into the slots of the grates. This operation is known as spudding.

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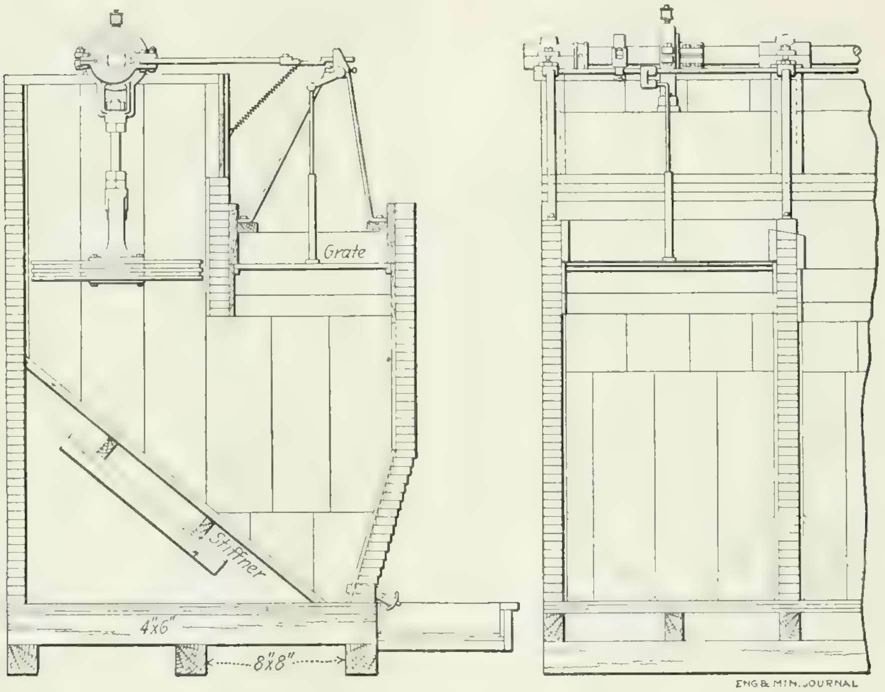
*Metallurgist, 3 London Wall Bldg., London, England.

As the mill attendants are inclined to neglect this work, S. C. Byrd and C. Pierce have devised and patented an automatic spudder. As shown in the accompanying sketch, the device is held in place by two 60-d. nails that pass through holes in the shoe and extend down into the open spaces between the bars of the grate. A 1-in. pipe *F*, 18 in. long, fits snugly over the upper extension of the shoe *E*, forming a cylindrical chamber in which a ¾-in. rod *D* moves up and down. An eccentric on the jig shaft moves the horizontal arm *A*, which engages the rocker *B*, mounted on a shaft *G*, that is supported by bearings mounted on the partitions between the cells of the jigs in such a manner as not to interfere with the flow of pulp. The rocker *B* actuates the rod *D* by the arm *C*, which is fixed to the rocker shaft *G*. When the eccentric is approaching its position of maximum forward throw, the shoulder on the arm *H* engages the rocker *B*, causing it to move outward and to lift the arm *C* and the rod *D* upward.



Cooley Jig with Grate-cleaning Device

As the eccentric turns past that position, the shoulder on the arm *A* is withdrawn from the rocker *B*, so that it returns suddenly to its normal upright position, permitting rod *D* to drop freely upon the grate at the time that the plunger of the jig is making its downward or pulsion stroke. The jar of the rod dropping on the grate loosens the chats caught in the slot, so that the upward flowing current of water will carry them up into the bed.

The throw of the eccentric is about one inch. A spring is attached to the arm *A*, as shown in the illustration, to prevent chattering of the arm in the slot of the rocker. So far the device has been used only on the roughing jigs, no attempts having been made to use it on the cleaning jigs that are operated at greater speed. The area of each compartment of these jigs is 36x48 in., and eight grates are required for each compartment. One arm *C*, one rod *D* and its shoe *E* are required for each grate, but not only one eccentric, one arm *A* and one rocker *B* are needed for each compartment.

Electrically Driven Crushers

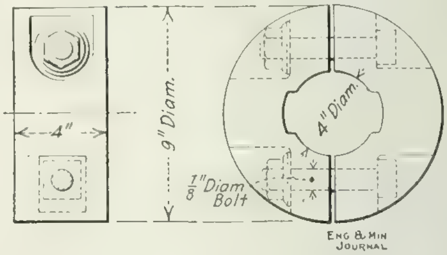
In the operation of a mine one of the most important machines used is the crusher. In these days when extensive use of electricity is being made in mines it is of interest to cite defects which were experienced in connection with the operation of some electrically driven crushers, owing to the fact that it was somewhat difficult to determine accurately the actual power that would be required.

As originally installed there were two crushers each driven by a 15-hp. motor. The installation was designed to crush to about three inches, but in order to get more ore through the mill the jaws were afterward closed to one inch and it was then discovered that considerable overload was thrown upon the motors, to an extent which was hardly appreciated at the time. Evidence, however, of the severity of the work was soon forthcoming in the shape of trouble from coils burning out, and if the feed was continuous, it was found that the motors were actually slowed down. This trouble persisted until, owing to the fact that the mill was being seriously handicapped because of lack of ore, it was decided to take out the overloaded motors and substitute for them motors of exactly double the power. This cured the trouble so far as the electrical portion of the equipment was concerned, inasmuch as the motors were then well able to stand up to their work, but the trouble was only transferred to another part of the mechanism, for it was then discovered that too many shafts were bent on the crushers owing to the torsional strains.

In order to overcome this second difficulty the keys were taken out of the driving pulleys and shear-bolts put in their place in order to make the provision that if the crushers became choked or were fed too quickly the bolts would be bent or sheared, thus saving the shafts. By this additional safety device the crushers could be operated at a high speed and crush to one inch with comparatively few interruptions of any serious magnitude or duration.

Compensating Weights for Stamps

Stamp shoes gradually wear away, and on account of breakages, the stems become short, and also the heads or bosses are worn by abrasion of the pulp in the water box, all of which cause the stamps to lose weight. Compensating weights are often used to make up for the decrease in weight in order that the full crushing capacity may be maintained. The early forms of these compensating weights were crude in design, and often a head was placed upon the top of the stem above the upper guide or an extra tappet was used above the one by which the stamp was lifted.



Stamp Weights Used on the Rand

A simple type of compensating weight is described by G. O. Smart, in "A Text-Book of Rand Metallurgical Practice." These compensating weights consist of a split disk, which weighs about 60 lb. and is of the same diameter as the tappet. These weights are clamped with a bolt on either side of the stem, and placed as low down as possible. If a compensating weight be placed above the tappet, it is useful in taking the place of the tappet-set formerly employed when altering the height of stamp drop. Since the use of compensating weights in a 200-stamp mill will increase the crushing capacity by 10 to 20 stamps, it is obvious that the small amount of additional labor and trouble required in using them is well repaid by the advantages gained.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Quicksilver Consumption at Alaska Mills

At the Alaska Treadwell 240-stamp mill during the year ended May 15, 1911, as stated in the annual report, 75,345 oz. of quicksilver were used in milling 395,332 tons of ore; 69,077 oz. being used at the batteries, 5670 oz. on the plates and 598 oz. at the vanners. This is equivalent to one ounce of quicksilver to 5.18 tons of ore. The quicksilver loss amounted to 36.08% of the total used, or approximately one ounce for every 14.5 tons of ore milled; 99% was reported as lost in the mill and the remainder in retorting. The total supply of quicksilver including that reported on hand and received from retort and store amounted to 93,088 oz. or about one ounce for every 4.25 tons of ore milled. Expressed in ounces of quicksilver per ton of ore, the average feed was as follows: To the batteries, 0.1747 oz.; on the plates, 0.0143 oz.; and at the vanners, 0.0015 oz.; a total of 0.1905 oz. of quicksilver per ton of ore. On the basis of gold contents one ounce of quicksilver was fed for every $7.53 of free gold recovered.

At the 300-stamp mill of the same company and during the same period, 83,234 oz. of quicksilver were used in milling 374,752 tons of ore of which 67,180 oz. were fed on the batteries; 6697 oz. on the plates; 448 oz. on the vanners and 8909 oz. used in cleaning amalgam. This is equal to about one ounce of quicksilver for every 4.5 tons of ore treated. The quicksilver loss was 30,956 oz. or 37.19% of the total used, which is equivalent to one ounce for every 12.1 tons of ore, approximately 99% of this loss occurred in the mill and 1% in retorting. The total supply of quicksilver from all sources was 99,907 oz. or almost one ounce for every 3.74 tons of ore treated. The feed to the batteries equaled 0.1792 oz. of quicksilver per ton of ore; to the plates, 0.0179 oz.; to the vanners, 0.0012 oz.; and in cleaning amalgam, 0.0238 oz. or a total of 0.2221 oz. per ton of ore treated. One ounce of quicksilver was fed for every $6.13 of free gold recovered.

At the Ready Bullion Claim mill of the Alaska United during 1911, 48,425 oz. of quicksilver were used in milling 223,668 tons of ore which is equal to about one ounce for every 4.6 tons of ore treated, or 0.2165 oz. of quicksilver per one ton of ore of which 0.1787 oz. were used at the batteries, 0.0079 oz. on the plates, 0.0031 on the vanners and 0.0268 oz. in cleaning amalgam. The total supply of quicksilver from all sources was equivalent to about one ounce for every 2.7 tons of ore treated and the loss was 35.51% of the total used, or one ounce for every 13 tons of ore milled, practically all of which was lost in the mill, only 240 oz. being lost in retorting.

The 700-Ft. Claim mill belonging to the same company and operating during the same period used 39,990 oz. of quicksilver in treating 215,666 tons of ore, or one ounce for every 5.15 tons of ore treated. The loss was equivalent to one ounce for every 21.3 tons of ore or approximately 24.10% of the total used. The amount fed at the batteries was 0.1138 oz. per ton of ore; on the plates, 0.0164 oz.; at the vanners 0.0018 oz. and in cleaning amalgam, 0.0534 or a total of 0.1854 oz. per ton of ore. The total supply from retorting, store, and that on hand was equal to one ounce for every 3.7 tons of ore treated.

The Alaska Mexican mill used 51,743 oz. during 1911 and crushed 236,383 tons of ore. The total amount fed equaled 0.2189 oz. per ton of ore of which 0.1731 oz. were fed at the batteries, 0.0114 oz. on the plates, and 0.0344 oz. used in cleaning amalgam. The total amount used is equal to about one ounce for every 4.56 tons of ore treated and the loss was 27.37% of the total fed, or one ounce for every 16.7 tons of ore. The supply was equivalent to one ounce for every 3.57 tons milled.

Sons of Gwalia

The directors' report and statement of accounts of the Sons of Gwalia, Ltd., for the year ended Dec. 31, 1911, states that 165,664 tons of ore were treated at a total cost of $5.13 per ton, made up of $1.01 for development, $2.16 for ore extraction, $1.57 for treatment, 37c. for general expenses, 8c. for bullion charges, making a total of $5.19 per ton from which 6c. is deducted for rebate on stores.

Development work consisted of 7802 ft. of drifting, sinking, raising, etc.; 9400 cu.ft. of flat cutting and shaft bins and 1050 ft. of diamond drilling. The main incline shaft was sunk 199 ft. at an average cost of $106 per ft.; drifting 3759 ft. cost, $18.09 per ft.; crosscutting 1449 ft., $18.20 per ft.; raising 1086 ft., $16.05 per ft.; sinking 1309 ft. of winzes, $20.63 per ft.; and 1054 ft. of diamond drilling, $4.32 per ft. drilled. Ore extraction or stoping was made up as follows: Breaking ore, including ore from development, $1.15 per ton; filling stopes, 25c. per ton; and trucking and haulage, 76c. per ton.

Treatment charges consisted of 9c. for rock breaking, 3c. for ore transportation, 28c. for milling or stamping; 6c. for concentration per ton of ore, or $4.24 per tons of concentrates; 36c. for slime treatment by filter process per ton of ore, or 75c. per ton treated; 3c. per ton of ore for fine grinding of concentrate or $1.93 per ton of concentrates ground; 3c. per ton of ore for cyaniding by agitation, or $1.92 per ton handled; 27c. per ton of ore for cyaniding by percolation, or 56c. per ton treated; 24c. per ton of ore for fine-grinding sand, or 46c. per ton of sand ground; 1c. for filtering concentrates per ton of ore, or 44c. per ton of concentrate handled; 14c. for disposal of residues per ton of ore and 3c. for precipitation, smelting and slag treatment. The general expenses were composed of salaries and wages, 16c. per ton of ore; miscellaneous, 12c.; maintenance and supplies, 1c.; and rent and insurance 8c. per ton of ore. The average yield of the ore was 0.426 oz. of gold per ton of ore milled. The mill consists of 50 stamps which ran 97.83% of the total time during 1911, crushing 9.278 tons per stamp per day.

Briseis Company, Tasmania

According to the annual report for 1911 of the Briseis Tin & General Mining Co., Derby, Tasmania, 418,000 cu.yd. of drift were sluiced in the recovery of 573 tons of black tin which produced 414 tons of metallic tin. This means that approximately 730 cu.yd. of dirt are sluiced for every ton of black tin recovered and that it takes one ton of black tin to equal 0.723 ton of metallic tin. The average net price received for metallic tin during 1911 was approximately $903 per ton. The average daily supply of water during the year was 129 sluice heads, each equivalent to 24 cu.ft. per min. or a total of 21,500,000 gal. of water per day. From this it may be estimated that it requires about 18,500 gal. of water to sluice one cubic yard of dirt.

The cost of producing tin was £21.11 per ton of black tin or £29.173 per ton of metallic tin. According to the figures stated it costs £21.11 to sluice and treat 730 cu.yd. of dirt (the average amount of dirt required to produce one ton of black tin) which is equal to about 14c. per cu.yd. made up as follows: 46.4% for sluicing, hydraulicking, cleaning reef, breaking, wheeling and stacking fallen overburden and modern alluvial; 12.3% for extending pipes and races in faces, erecting elevators and maintenance; 2.9% for cleaning up, dressing and bagging; 5.1% for electric lighting; 6.1% for maintenance and repairs to race heads; 5.2% for general supplies, timbers and explosives; 11.2% for pumping, repairs and renewals to plant and other general expenses; and 10.8% for salaries to staff, foremen, shift bosses and general office expenses.

The charges for cartage, freight, etc., were equivalent to $37 per ton of metallic tin shipped. On the Ringarooma section 354,000 cu.yd. of overburden were removed at an average cost of 12.8c. per cu.yd., compared with an average cost to date of 11.98c. for removing 1,525,500 cu.yd. of overburden. The smelting loss is figured at two units per ton of metallic tin which indicates that the black metal was dressed up to 74.3% metallic tin at the mines.

RECORD OF FOUR GOLD DREDGES IN TASMANIA

Dredges	No 1	No 2	No. 3	No 4
Running time, hr...	5,332	4,974	5,652	1,786
Turnover, cu.yd.....	311,750	299,500	577,450	141,950
Turnover per hr., cu. yd..............	58	60	102	79
Average depth, ft...	39	24.5	32.3	18
Gold won, oz.......	1,173	1,726	1,968	731
Contents per cu.yd., grains...........	1.8	2.8	1.6	2.5
Contents per cu.yd., pence...........	3.49	5.34	3.16	4.77
Running expenses, £	4,216	4,026	5,083	1,554
Cost per cu.yd., pence...........	3.25	3.23	2.11	2.63
Details of cost				
Actual dredging, pence	1 033	1 055	0 700	1.146
Fuel and feedwater, pence...........	0.615	0.552	0.400	0.393
Upkeep of plant, pence...........	1.012	1.195	0.780	0.550
Supervision, pence..	0.158	0.165	0.099	0.196
Other work, pence..	0.428	0.259	0.134	0.343

Gold Dredging

In the accompanying table is given a record of four dredges operated by the company on its Wallace property. The total turnover was, 1,330,650 cu.yd.; average value per cu.yd., 3.90d. To the running cost must be added lease rents, commissions to landowners, lease surveys, rates, legal expenses, etc., 0.28d., making the total cost 4.18d. per cubic yard.

Smelting and Refining Copper

The 13th census of the United States shows that in 1909, 16,832 men were engaged in the smelting and refining of copper. Of this number 275 were officials, 929 clerks, and 15,628 wage earners. Officials equaled 1.6% of the whole, clerks, 5.5%; and wage earners, 92.8%, of whom 99.9% were males, and 0.1% under 16 years of age. There were 38 companies engaged in the industry in 1909, 84% reporting a production amounting to $1,000,000 or over, or 99% of the entire production, as compared with 40 concerns in 1904, of which 77.5% made a production valued at $1,000,000 or over, and 99% of the total production. The total horsepower reported used by all concerns was 158,126. The expense for smelting and refining was divided as follows: Salaries, 0.7%, wages, 38%, materials, 94.4%; and miscellaneous expense, 1.1 per cent.

Greene-Cananea Costs

The 1911 anunal report states that the cost of operations at Cananea, Mexico, was as follows:

The 1911 cost of mining, $2.46 per ton, compares with $2.75, $2.22, $2.13 and $3.28 for the four previous years. Included in the mining cost for 1911 is 51,784 ft. of development, of which 696 ft. was shaft sinking and 9811 ft. raises and winzes. The average cost was about $8 per ft. for development work. The cost of concentrating 528,412 wet tons of ore was 72.2c. per ton, of which 7.6c. was for improvements and betterments. The total ore treated consisted of 78.5% company ore, concentrated at the ratio of 2.4 : 1 and the remainder, custom ore, at the ratio of 5.17 : 1.

MINING COSTS PER TON OF ORE

Mine	Tons	Stoping	Development	Dead work and surface expense	Total
Puertecitos	6,505	$3.373	$4.561	$1.976	$9.910
Henrietta	16,796	1.984	1.946	1 240	5.170
Elisa	58,771	2 020	1.303	1 013	4 336
Capote	75,425	1 318	0 528	0 999	2 845
Oversight	394,389	1.010	0.138	0 331	1 479
Veta Grande	237	1.562			1.562
Kirk	95,059	1 738	1 183	0.864	3.785
Cobre Grande..	22,669	1.313	0 540	0 843	2 696
60% S de Cobre	81,611	1.446	0 736	0 556	2 738
	751,462	$1.311	$0.557	$0.592	$2 460

The cost of reduction per dry ton of new copper-bearing material was as follows: Sampling, 2.22c.; bedding, 5.84c.; reclaiming, 2.02c.; blast-furnace costs, $1.4055; reverberatory cost, 31.97c.; calcining costs, 5.10c.; converting costs 65.18c.; indirect custom ore costs, 3.51c.; flux, 0.71c.; making a total of $2.571 per dry ton of new copper-bearing material treated. The total tonnage treated was 580,060 tons. Owing to the grade of matte being lower than formerly the converting department was congested and the amount of by-products to be handled greatly increased, the total cost of smelting was not lowered to $2.25 per ton as predicted in the 1910 annual report. The cost in previous years, to 1907 inclusive, was $2.69, $3.09, $3.86 and $6.82 respectively, per ton.

The cost of McDougal roasting was 40c. per dry ton, made up of sampling, bedding, and reclaiming, 12.62c.; operating furnaces, 18.94c.; transportation of calcines, 2.28c.; and general expenses and flux, 6.19c. per ton. Of the total charge to the reverberatories, 113,782 dry tons, 36.2% was flue dust, 58.5% calcines, 4.25% siliceous ores and 1.05% flux. An average of 1675 lb. of calcines was produced per ton of concentrates. The total cost at the reverberatory furnaces per ton of charge was: Labor, operating, 29.82c.; labor, repairs, 15.47c.; shop expense, 1.51c.; supplies and material, 20.70c.; power, 0.95c.; fuel oil, $1.4882; flux, cost of, 2.23c.; and sundry expense, 5.66c.; making a total of $2.2516 per ton, from which a steam credit of 82.45c. was deducted, making a net operating cost of $1.4271 per ton; and a construction charge of 22.32c. per ton for rebuilding No. 1 furnace and flue makes the total net cost $1.6503 per ton of charge.

The cost per indicated horsepower was $5.568 against $6.54 in 1910. The total cost of mining and treatment, up to and including the sale of refined copper, per ton of ore has been as follows: In 1906, 947,977 tons, $10.210 per ton; 1907, 1,305,291 tons, $7.625; 1908, 295,554 tons, $5.976; 1909, 835,929 tons, $5.459; 1910, 792,856 tons, $5.765; and in 1911, 741,873 tons at $5.257 per ton. Included in the 1911 cost is 37.7c. per ton for construction repairs and replacements of all kinds.

The total cost per pound of refined copper, including all expenses, was 11.666c., made up of 9.568c. for mining, milling and smelting; 0.755c. for construction; and 1.343c. for freight on copper to New York, refining, marketing, etc. A credit of 1.823c. per lb. for precious-metal contents and miscellaneous earnings makes a net cost of 9.843c. per lb. of refined copper. The actual yield of the ore treated was 50.01 lb. against 45.58 and 44.12 lb. of copper per ton for the two preceding years.

At the Copper Queen, by substituting smaller stulls and closer filling for the old square timbers, the consumption was reduced from 26.9 ft. to 23.3 ft. per ton of ore extracted. The distribution of timber used was: For stoping, 16.6 ft. per ton ore extracted; exploration and development, 3.9 ft. per ton; underground repairs, 2.7 ft. per ton and surface repairs and construction, 0.1 foot.

Acme Graphite Mines and Mills

By H. M. Beattie*

The graphite mines at Byers, Penn., were worked intermittently for about 40 years by opencut and crude underground methods; in 1910 systematic mining methods were adopted. The graphite occurs with quartzite in pre-Cambrian gneisses. Different concentration systems are used for treating hard and soft ores; the concentrates are reconcentrated in a finishing mill.

The mines of the Acme Graphite Co. of New York are the most westerly of a series of graphite deposits, more or less continuous, extending from below Pikeland to a little beyond Byers, Chester County, Penn. This company's property consists of two mines formerly known as the Pennsylvania, and the Continental. Of these the former is the older, having been in operation with some intermissions for 40 years. There is a record of a quantity of flake of excellent grade being sold, in 1876, to one of the Jersey City crucible companies.

At this time the mine was operated as an opencut, but a little later underground operations were started in a crude way. The property was "gouged," only the rich pockets, some of them containing as high as 30% carbon, were touched, and as mining methods were but little understood by the managements, the stopes were insufficiently supported and soon caved, when operations would be transferred to some other rich outcropping. Mills were built at various sites depending on the situation of the mining operations. More recently a slope was sunk in the hanging wall of the deposit to a vertical depth of 70 ft., and operations were carried on from levels run from this slope. A vertical shaft was also sunk to a depth of 154 ft. but this shaft is used only as a sump.

After changing hands a number of times the Pennsylvania and also the Continental, which is situated about ¼ mile to the west of the former, were purchased in 1910 by a New York corporation, and attempts were made to operate on an economical and more efficient basis. At the time this company took over the properties, there was on the Pennsylvania a mill in bad state of repair, designed specifically for the treatment of soft ore, which makes up a large proportion of the output of this mine. At the Continental was a mill designed for the treatment of hard-rock ore, and a finishing mill in good condition. These mills will be taken up in detail later.

Graphite Occurs With Quartzite

All of the graphite deposits of this valley occur in a well defined ridge with a strike closely approaching east and west, and extending with some breaks from below Pikeland to beyond Byers. The deposits are in pre-Cambrian sedimentary gneisses, the graphite occurring in conjunction with quartzite, with which the carbonaceous material, which afterward became graphite, was probably contemporaneously deposited. The crystallization is undoubtedly due to movement, of which there is good evidence in the exposures in the opencut. The crystallization was intensified by the intrusions of pegmatite, as is well shown in specimens of the ore taken from various parts of the mines.

Opencut of the Pennsylvania Graphite Mine, Byers, Penn.

In the Continental mine the graphite-bearing quartzite is not thick, and so far as present development work shows seems to be confined to one particular lens not over 150 ft. in length, and averaging about 5 ft. in thickness. The Continental, as developed, has all the features of the feathering out, or end of some large deposit. The extensive development work that was needful in this mine, with the probable small amount of ore that would be opened up led to the abandonment of the mine after the development work had been carried to a point which showed up the feathering-out feature above alluded to.

In the Pennsylvania mine the graphite appears in a number of quartzite strata, three principal ones of which are worked at the present time, and there are good indications that still another stratum underlies those already opened up. All indications go to show that the graphite will extend to a reasonable depth without alteration, except that the ground will probably become harder as we leave the area affected by decomposition which has taken place near the surface, resulting in a clay and sandy loam gangue, and that the gangue will be a quartzite or micaceous schist, the nature of the gangue varying in different parts of the orebody. The body has been opened up to such an extent that there is reasonable ground for stating that the deposit is continuous for a distance of at least 1500 ft. and that over this length would average at least 10 ft. in thickness, this taking into account the barren areas, and the fact that over some distance the thickness is fully 30 feet.

As the Continental has been abandoned I will take up only the methods employed at the Pennsylvania. Under the old regime the work was carried on by opencut, and later from slopes put down in the ore, the slope being widened and gouged out and the roof supported by timbers.

Since in many places the deposit is from 15 to 30 ft. thick, and could be opened only for a thickness of 12 ft. at the most by the use of stulls, a great deal of valuable ore was left in place, and as these workings afterward caved it became almost impossible to recover the ore so left. Very often these small stopes were carried to within a few feet of the surface, and later operations show that they could have been much more economically and satisfactorily worked by opencutting.

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At present the mine is operated from the opencut in connection with haulage on the main level. Development work is also carried on, underground, most of the bodies being so opened up as to furnish immediately accessible reserves, in the case of bad weather making the opencut unavailable. The present management found the opencut worked to such a depth that it had become impossible to handle the waste. Additional raises were therefore put through from the main level, so that at present both waste and ore are hoisted to the surface. Underground stoping is done by the filling system, raises being run through to the surface, and the waste from the opencut used as filling, thus doing away with the use of timbers except for temporary supports for the roof which, when the ground is damp has a decided tendency to slough off, but when dry will stand as long as necessary for the stoping operations.

As the method for treating the hard ore differs from the treatment that the soft ore has to undergo, different methods of concentration are used, and these will be taken up separately.

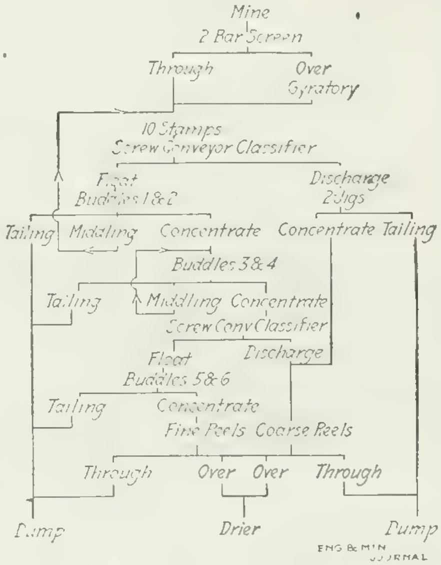
CONCENTRATION OF THE HARD ORES

The ore as it comes from the mine is dumped into an ore bin, over a 1½-in. grizzly, the fine material going directly to the stamps, while the coarse material goes to a Gates gyratory crusher. This breaker does not give satisfaction as a breaker for graphite ore, as the graphite tends to lubricate the bell and liner necessitating a great deal of sledging to force the rock through. It has been thought that the use of corrugated plates for liners might obviate this difficulty. The fine crushing is done in a 10-stamp battery, the stamps weighing 850 lb. Screens of 8-mesh iron-wire cloth are used, it having been found by numerous tests that crushing to this size frees all the graphite from its containing gangue, and at the same time the mesh is sufficiently coarse to prevent undue breaking up of the flakes. The capacity of the stamps crushing to this mesh is 120 tons per 24 hours.

From the stamps the ore goes to a screw conveyor set at an angle of 20° to the horizontal, which screw acts as a classifier, the float or overflow going to 20-ft. buddles, the coarse material going to a jig of the type used in some of the garnet mines of New York State. A jig of the New Century coal-jig type, would in the opinion of the superintendent, give much more satisfactory results but up to the present the change has not been made.

The tailing from this jig is sent to the sand dump by gravity, the concentrate, being the coarser flake, is sent either direct to the reels or if not clean enough to the buddles. The buddles effect a good concentration when the ore has largely quartzite gangue, but when the ore comes from near the surface, and contains a large percentage of loam or clay, the concentrate carries a considerable percentage of this clay, which balls up in rolling over the surface of the buddle, and is difficult to remove at any later stage.

There are in the mill six buddles altogether; the first two, 20 ft. in diameter, are filled and cleaned alternately, the later buddles treating middling from the first buddles. A large amount of middling gradually accumulates from this method, especially after the fourth buddle, and at present this middling is dumped back into the bin and re-treated by going through the entire circuit. It was thought that a table of the Wilfley type might be used to good advantage on this middling but the table purchased, the Traylor, on account of its flexible table top, set up currents on its surface which hindered the concentration, and gave too large a middling product. A Wilfley, Deister, or James table would work to much better advantage.



FLOW SHEET OF HARD-ORE MILL

From the buddles the concentrate goes to hexagonal reels, which remove a greater portion of the mud, that has collected with the concentrate at the edge of the buddle. This part of the process can best be studied by a perusal of the flow sheet. The overflow of the first four buddles goes to a settling tank of the Callow type, the overflow going to a centrifugal pump, which pumps the water back through the system, while the sludge is washed on reels, giving a clean but fine concentrate. The concentrate is shoveled into a steam dryer from which it goes to the stock bin of the finishing mill. It might be said in this connection that the direct dryer gives much better satisfaction than the steam dryer, for there is, with the concentrate, a certain amount of wood fiber or small chips, which have to be gotten out before finishing, and when the wet concentrate is dried in a rotary kiln this wood is all burned out.

CONCENTRATION OF THE SOFT ORES

The ore at the Pennsylvania occurs in a softer gangue, a great deal of the graphite breaking free from its gangue by simply rubbing in the hand. The harder rock coarser than 1½ in. is broken in a Blake jaw crusher, but the soft ore is dumped on a platform and shoveled into a Sturtevant rotary crusher. This crusher gives excellent service so long as the nuts have good cutting edges, but when made from cast iron these parts used to give their best service for only about two weeks. The company then changed over to manganese parts which gave more than five times the service for twice the original cost.

The ore then goes to a hexagonal shaft agitator revolving at 14 r.p.m. During this agitation the ore is further broken, most of the graphite that is contained in a clayey gangue being freed. From this point the ore passes through the system as shown in the accompanying flow sheet, the idea being always to float the graphite out as early in the process as possible, and it has been found that this is better done the closer the material is sized.

The log washer does not furnish an ideal method of concentration, as the grinding action causes excessive sliming so that, even though the sand discharged from the washers assays only in the neighborhood of 1.5% carbon, yet the actual final extraction is only in the neighborhood of 40%. Up to a short time ago no saving of graphite finer than 60-mesh was attempted as no means had been devised for separating the more finely divided graphite from the mud and fine sand. After some experimenting it was found that a reasonably good separation took place if this fine tailing from the 60-mesh was dewatered by running through a 100-mesh silk reel, and the overs from this reel discharged on a cement table, having a pitch sufficient to carry off the graphite but not sufficient to float the fine sand.

This method has worked satisfactorily and gives a considerable amount of additional concentrate of high percentage carbon, which when it has passed through the finishing mill yields a grade of dust worth from two to three cents per pound. It has been thought that this fine material might be concentrated on a Frue vanner with good success, but up to the present no experiments have been made to verify this supposition. A buddle cannot be used as the currents set up by the action of the brushes are sufficient to so disturb the mixture of fine sand and graphite that no separation takes place.

The use of the cement table after the reels and then the use of a final reel to take out what fine silt has run through the system so far, has brought the carbon extraction up from 35 to 43%, and at the same time gives a concentrate assaying 60% to 70% carbon as against previous assays of from 35% to 50%. This bettering of the concentrate has served to raise the average value of the total output from 3.6c. to 4.2c. per lb., based on the same prices for the various grades. But the accompanying table showing the large percentage of loss that takes place in the slime will show that the room for improvement is still great.

TREATMENT DATA AT THE PENNSYLVANIA MILL

	Tons per Day	Assay	Tons Carbon per Day
Ore	35.2	6.35	[illegible]
Sand tailings	14.5	1.02	0.148
Concentrates	1.72	58.82	1.006
Slimes (by difference)	19.02	5.68	1.081
Carbon extraction	45%		

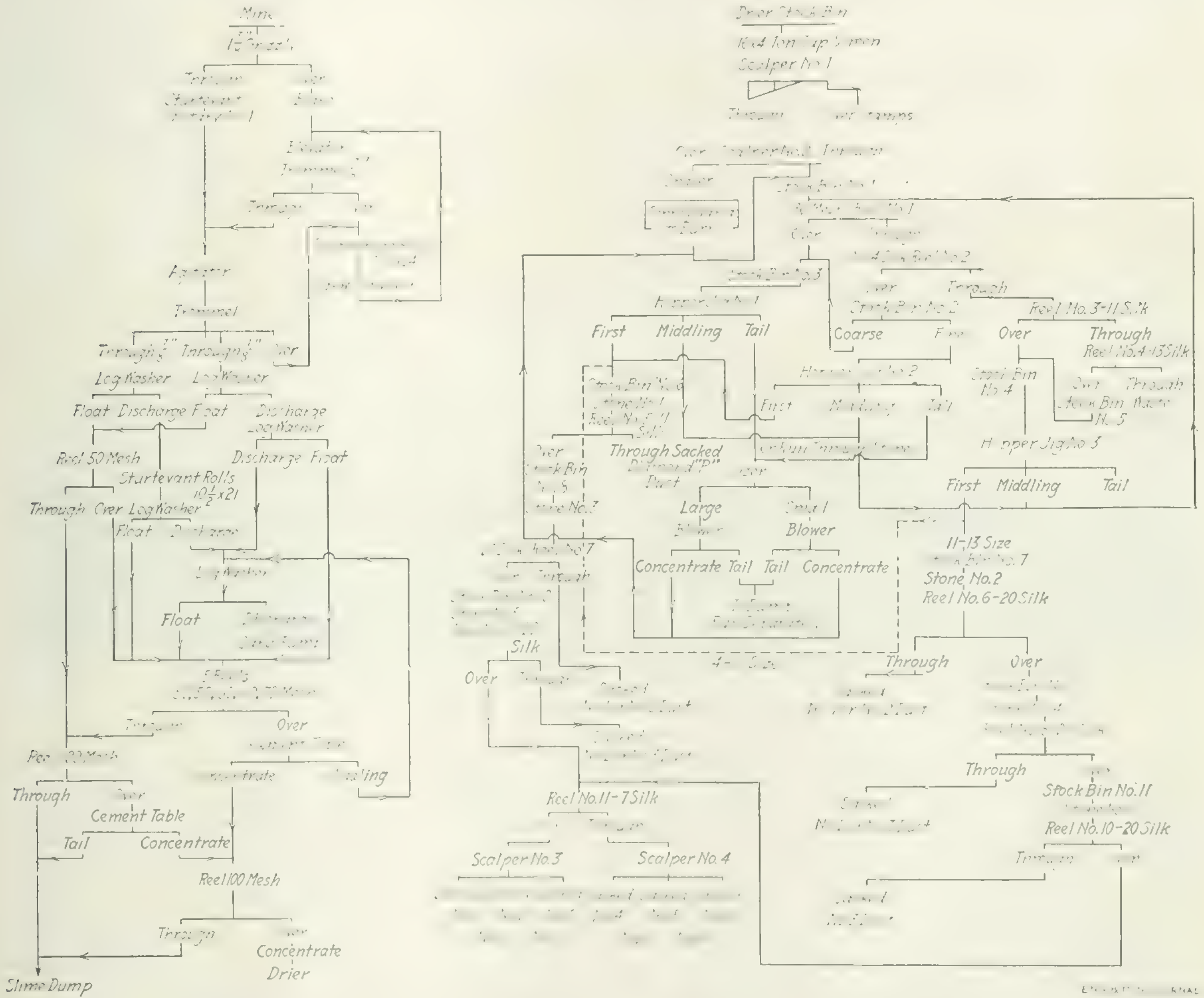
The concentrate in this mill is dried in a rotary kiln, at a red heat, this heat being employed for the purpose of burning out any wood that may be carried in the concentrate, and also in the endeavor to so change the physical character of the mica that may be contained, as to make it more easily ground out in the finishing mill.

Concentrates Treated in Finishing Mill

The first requisite for the production of a high-grade finished product, is to have a high-grade concentrate to work on, and a difference of 10% in the carbon content of the concentrate will give finished products running from 10 to 15% higher in carbon, and commanding correspondingly better prices for each grade. The dried concentrate as it comes to the mill is first run through a sizing reel covered with 16x4-mesh wire cloth, all the overs from this reel being returned to the concentrating mill.

From this point the graphite passes through other sorters and sizers, and then the various sizes are treated on the Hooper air jigs, of which there are three in the mill, and others will be installed later. The Hooper jig does efficient work when operating on a closely sized material, and it is for this reason that another machine should be installed so that the material passing the 40-mesh could be more closely sized, and better results obtained. The other machinery in this part of the mill does not need description.

Each grade of concentrate passes over three stones, and after each stone the dust is taken out, different grades being produced as shown on the flow sheet. The dust from the first cut, called "P" dust, since the changes in the concentrating end of the mill have been made, has decreased to an almost negligible quantity, forming less than 4% of the whole as against 20% of the whole output when a 35% concentrate was being sent to the mill. The stones used in the grinding and polishing are French Buhrs over-runners dressed as in flour mills. Over-runners are used entirely in this mill. The stones have to be dressed not oftener than once in six

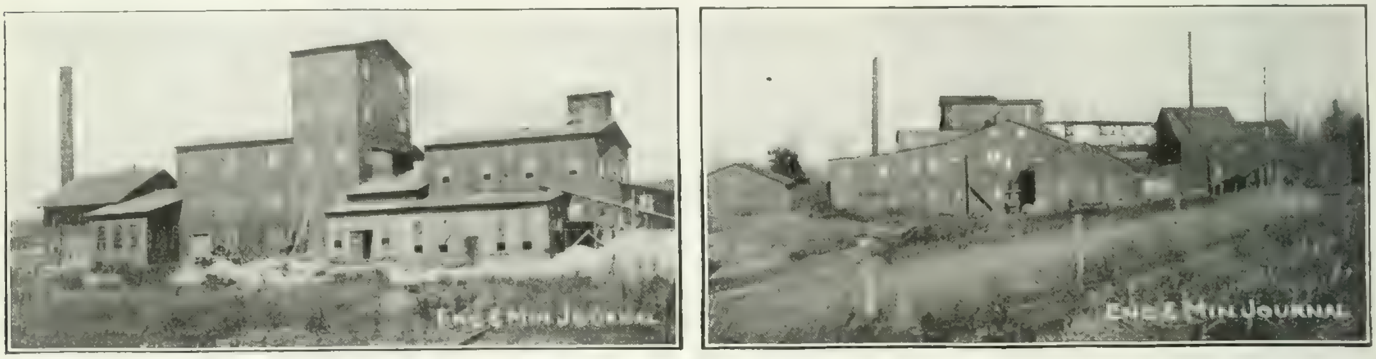


Flow Sheets of Soft-ore and Finishing Mills of Acme Graphite Co., Byers, Penn.

weeks, and the last stones only about once in three or four months. Given a good concentrate, the wear on face of the stone is slight, but with a large amount of grit in the concentrate, the wear is rapid and serious.

One of the most serious difficulties which the graphite operators in the Chester Valley have encountered is the elimination of the mica which occurs in association with the graphite, and on account of its physical character, being thinly laminated like the graphite, if it once gets to the finishing mill, it is almost impossible to get rid of it. One way of doing this is to raise the temperature to such a point in the drying that a certain change takes place in the mica, puffing it up and making it brittle so that it grinds out in the stones. This change, however, does not take place with all the kinds of mica, being more pronounced in the case of the darker than the lighter colored micas.

Some experimenting was done with the Wetherill magnetic separator, and the tests as run at the Massachusetts Institute of Technology were so satisfactory that a machine was purchased, but the present operators of the mine and mill are unable to obtain any commercially satisfactory results. The idea was to treat the finished product, but this is on the face of it unreasonable, since the total iron content of the better grades of flake is not over 1%, and usually only one-half of that, and this iron is chemically combined in the mica so as to be, so far as the present management has been able to determine, nonmagnetic. Careful sorting of the ore in the mine, and thorough burning in the dryer, seem to be the best methods that have so far been devised for the elimination of this troublesome adulterant.



Acme and Pennsylvania Mills of Acme Graphite Company, Byers, Penn.

Total Cost About $4 Per Ton

Although careful cost sheets have been kept since the present owners have been operating, so much of the work has been of an experimental nature, and so many repairs have been necessitated on account of the bad condition of the machinery, that it is impossible to give an accurate statement of the costs. Having taken all things into consideration, the management would feel safe in estimating an average cost of $4 per ton to include all charges including depreciation and interest on investment, this charge based on an output of 150 tons per day and continuous operation. On the same basis the cost per ton of finished product would be $70, although this cost might be better in case a high-grade ore was treated. All these costs are based on a 6% ore. Of course on a larger tonnage they could be considerably reduced.

The producer of American flake graphite confronts certain market conditions, difficult to overcome, the principal one being a prejudice among the members of the crucible manufacturers against the flake graphite, this prejudice arising from the fact that they have so many times in the past bought from samples submitted and then the shipment has not come up to the standard of the sample. Or else the manufacturer has bought one or two carloads and when he goes to purchase a third finds that the operator has gone out of business. They are sure of their Ceylon graphite, and for that reason if for no other prefer to use it. Some claim that the Ceylon graphite makes a better crucible, but others claim that a mixture gives the best results. Either a cause or effect of the state of the market is the difficulty of competing with the Ceylon graphite in price, quality being equal. The graphite can be produced so cheaply in Ceylon that even with the freight to this country, it can be landed in New York at about the same price that American flake can be produced.

When methods have been devised for obtaining a higher extraction at less cost, and when the American users of graphite can be convinced that the American flake is better for their use than the Ceylon, then will the graphite companies be able to declare dividends, and get beyond the hand-to-mouth stage, in which condition they have been up to the present time.

The hope of the American flake-graphite producer lies in the increasing of the carbon extraction, and in production on such a scale that the finished product can be produced at a cost which will enable the producer to place his flake grades in the hands of the crucible manufacturers at such a price as to induce them to use it in quantity in competition with the Ceylon grades.

The finer flake grades find an outlet in the lubricating trade, but I do not see a very bright future for this business as the prejudice is well founded among engineers against using as a lubricant a material which soils and blackens everything with which it comes in contact, especially as the question is disputed as to whether the graphite adds sufficiently to the lubricating properties of suitable oils to warrant the trouble and expense of mixing. The stove-polish trade consumes a large proportion of the dust grades, the remainder finding an outlet in the foundry facing trade and as a base for graphite paints.

Ontario 1911 Mineral Production

The following final figures for the mineral production of Ontario for 1911 are furnished by Thomas W. Gibson, Deputy Minister of Mines: Silver, 31,507,880 oz.; pig iron, 526,610 tons; nickel, 17,441 tons; copper, 8966 tons; iron ore, 175,631 tons; cobalt, 853 tons; gold, 2185 oz.; total value of metallic products, $29,102,867. Of interest among the nonmetallic products is portland cement, 3,010,849 bbl.; salt, 88,689 tons; petroleum, 10,102,081 imperial gal.; corundum, 1471 tons; pyrites, 43,629 tons, and arsenic, 3806 tons. Of the Ontario iron ore, as noted above, 67,631 tons were smelted in the province's own furnaces.

Missouri Lead Ore in 1911

There were 3,974,712 tons of crude disseminated lead ores produced in southeast Missouri in 1911, carrying an average content of 3.7% lead, says the U. S. Geological Survey. The concentrates produced from this carried 67.3% lead. The total output of the state in galena concentrates amounted to 258,006 tons and 234 tons of carbonates. These concentrates contained a total of 16,098,120 lb. of lead.

Copper Mining at Lake Superior—I

By Claude T. Rice

The bedded lodes in the Michigan copper country occur either as amygdaloid flows or as conglomerates. Only one conglomerate, the Calumet & Hecla, is now being worked. The mining methods used depend upon the dip of the lodes. The dip varies from 30° at the north end of the range to 70° at the south. The mines where the dip is less than 40° are considered here.

The ore in the Lake Superior copper district occurs in two ways. The first ore discovered was that in the fissure veins of Keweenaw County, followed later by the finding of the vein deposits of Ontonagon County, farther south. The fissure veins, although productive in the early days, are no longer worked as practically all the profitable ore has been extracted from them. This copper occurred in masses and its mining was a different problem from that of working the bedded lodes.

AMYGDALOIDS AND CONGLOMERATES

The bedded deposits, in turn, are of two kinds; some of the ore is a mineralization of amygdaloidal flows of basalt, while in other bedded deposits the copper occurs in conglomerates. Where the fissures that cut across the Keweenawan series, as the copper formation is called, are productive, none of the amygdaloids and conglomerates as yet have been shown to be mineralized sufficiently to be profitable. On the other hand also, in the part of the district where the bedded deposits are profitable, the only cross fissures that carry copper are the three small veins of mohawkite that cut across the Kearsarge lode in the Mohawk mine and the two in the Ahmeek.

The Keweenawan series of rocks in which the copper ores are found consists mainly of basaltic lava flows, many of which, when extruded, were laden with large amounts of gas and so were filled with numberless vesicles when the flows consolidated. Intercalated among the flows are sedimentary deposits, mainly conglomerates and sandstones, 30 or more in number. Two of these conglomerate beds, the Allouez, sometimes called the Boston & Albany, and the Calumet & Hecla, have been found to contain copper in varying quantities. The ore along the Allouez conglomerate is bunchy and of late years its mining has not proved possible, while the Calumet & Hecla conglomerate has shown itself by far the most productive and the richest formation in the Lake Superior copper district, although its paying portion is restricted to the two-mile stretch that outcrops in Calumet & Hecla ground and underlies the Tamarack. Five of the amygdaloid flows are sufficiently rich in copper to make their mining profitable, while several of the others are almost rich enough to pay for working them, under the present economical Lake methods.

With the exception of a small amount of copper that has been obtained from the copper-arsenide seams that cut across the Kearsarge amygdaloid, all the copper from the Lake Superior mines has come from ores carrying the copper only in metallic form. The manner in which this native copper was deposited in the lodes is still a doubtful point, but as this series of articles will deal strictly with the mining of the ore, it is not necessary to go into that discussion. Only sufficient geology will be given here to make clear the effect that the manner of occurrence has on the method of working the deposits.

The native copper was deposited in the vesicles of the flows and also in vugs and open spaces; some of the latter are jointings due to the contraction of the basalt as it cooled and others were formed by subsequent fracturing of the rock due to dynamic stressing. In general, the grade of the ore varies inversely with the compactness of the rock and in the northern part of the district fine copper is rarely found in any but the more porous and somewhat altered parts of the flows. Many of the vesicles have been filled with calcite and laumonite, and the mineralized portions of the flows often have been much epidotized. The wide span of green epidote near the red copper on the Wilfley tables in the amygdaloid stamp mills is noticeable. In some cases the copper forms pseudomorphs after calcite and in others the copper is found replacing earlier epidote. Some native silver occurs in the ore, more in the old vein mines than in the amygdaloid lodes, and this silver has been precipitated without alloying to any great extent with the copper. One of the oddities of the ore is the "half-breed" nuggets, in which native copper occurs side by side with native silver. The masses of copper masses in the sense that the term is used in the amygdaloid mines, but not such as characterize the fissure veins, were formed in the cracks and vugs and many of them have peculiar shapes.

COPPER MAKES DRILLING DIFFICULT

It is these masses of copper that make the drilling in some parts of the lode difficult, as often a hole will strike one and an hour will be lost before the drill batters its way through the copper or the machine men decide to abandon the hole. Some of these masses form irregular bunches, having an area of 4 or 5 sq.ft., and a few are found 7 or 8 ft. long and 2 ft. wide by a few inches thick; in robbing one of the shaft pillars at Hecla No. 7 shaft, on the conglomerate lode, a continuous mass of copper 150 ft. long and from ½ to 6 in. thick was found extending from foot to hanging, the cutting of which with dynamite was difficult work. The amygdules are generally confined to the top of the flows, in which part also is found most of the fine copper. However, some vesicles formed during solidification near the bottom of some flows and that portion was much cracked and broken during solidification. Consequently copper is often found making off into the foot wall and sometimes even extending into the top of the flow below.

The copper along the foot wall is much less regular than along the hanging and is of lower grade. Indeed only in recent years has its mining been profitable. As the amygdaloid lodes are mineralized flows, the copper occurs irregularly and cuts off suddenly, while the hanging is rough and comes in and swells out, as the top of such extrusions would be expected to do.

ORE WIDENS AND CONTRACTS

The more compact portion of the flow approaches and recedes from the hanging wall, causing the band of good ore to widen and contract in a perplexing manner. These compact portions of the lodes are called trap. A slight lateral movement has occurred along the lodes, rarely being over a few feet, and the mining of the ore progresses as though no displacement had taken place. There are signs of slickensides along some of these slips, but the movement was of an up-and-down jiggle rather than a heave; only at the Mohawk No. 5 workings, toward the south end of the mine, is there any noteworthy movement of the lode in the northern part of the district. There one fault has thrown the Kearsarge lode 40 ft. to one side, while in a short distance a compensating fault has thrown the lode back into alignment again.

The machine men, if attentive, can easily tell when they get out of the lode into the wall rock, by the change in the color of the sludge. Also by watching the sludge where it runs down over the rough face, it is possible to tell something of the grade from the amount of copper that concentrates out in this crude manner. However, following the ore in the amygdaloid mines is not easy even for one accustomed to any particular lode, and the mine maps show many places where considerable work was necessary to find the lode again after the miners had lost it.

Determining the Value of the Ore

The amygdaloid ore cannot be sampled accurately and all mining must be guided by the eye. Familiarity with the ore in a particular mine makes the captain expert in guessing the grade of the ore from the general appearance of the face, but it is still all guesswork, and only from the recoveries at the mill and the grade of the tailings can the true grade of the ore be obtained or even approximated. In judging the grade much dependence is placed upon the amount of coarse copper, as the fine copper generally bears a relation to the amount of the coarse found in the "rock," as the ore is called in the district. With a little exposure the copper tarnishes and is hard to see. When that has happened one can judge roughly of the grade by running the hand over the face of the stope.

Some of the copper in the amygdaloid ores will pass a 200-mesh screen and a good portion of the copper lost in the tailings is still locked up in the rock, although in many of the amygdaloid mills much of the ore is ground fine before it is given the final concentration The grade of the ore varies suddenly in short distances and if an accurate sample could be broken from a face, it would show only the grade of the ore exposed in the stope at that particular time. It would indicate little about the real grade of the ore in the block, even if the sample weighed several tons, for at the Osceola mine of the Calumet & Hecla company, and the same is true to a large extent at the other amygdaloid mines, if the mill runs are considered in lots of 85,000 tons, the recovery per ton of ore will vary as much as 15% at times for the different lots, although the grade of the tailings remains practically constant at about 3½ lb. of copper per ton.

Ore Hard to Sort

Because of the difficulty in obtaining the grade of the ore, the latter is hard to sort and at most of the mines the only place where it can be done with economy is in the stopes. Even with the greatest care in sorting amygdaloid ore at the ore houses, it is almost impossible for the sorter to keep the grade of the discarded rock so low but that it will carry enough copper to be profitable, if milled and smelted. For that reason little sorting is done on surface. In the northern part of the district only the compact gray ore of the Mohawk mine seems to be adapted to sorting at surface; in this ore most of the copper occurs coarse with comparatively little fine accompanying it.

The Calumet & Hecla conglomerate is composed of well rounded pebbles and boulders, some of them as large as a man's head. The pebbles are derived mostly from porphyritic felsites and quartz-porphyries. The cementing material is composed of siliceous and felspathic grains, but in the paying portions this cement is almost completely replaced by copper. Many of the pebbles themselves have been wholly or partially replaced with copper, so that the conglomerate ores must be ground much finer than the amygdaloids, and even in the undersize from a 200-mesh screen, many of the copper particles are still contained in the grains of rock.

Conglomerate Red in Color

The conglomerate is stained red with iron oxide, the richer part being somewhat lighter in color than the lower-grade portion, on account of the alteration that resulted from the precipitation of the copper. The upper half of the conglomerate lode is finer grained and generally richer than the lower half, and occasionally bands of sandstone are found in the lode, some of which are mineralized although they are generally lower in grade than the surrounding portions of the conglomerate. The conglomerate is frozen tightly to the flows above and below, so that in stoping the ore does not always break readily from the wall rock, but brings down portions of the roof with it. However, mining in the conglomerate lode is greatly aided by the fact that the grade of the ore is fairly uniform throughout a stope and all of the rock that is broken is profitable. Also, owing to the greater regularity of the distribution of the copper in the conglomerate, it is possible to estimate the grade of the ore by sampling. The grade of the ore in both the amygdaloids and the conglomerates decreases appreciably with depth, but this decrease in the grade is more rapid in the conglomerate than in the amygdaloids.

Most of this decrease no doubt is real, but in the case of the amygdaloids some is merely apparent, as much of the ore mined now was entirely too low grade a few years ago to pay for removing it from the stopes. For instance, about eight years ago the Osceola Consolidated could obtain just a moderate profit on amygdaloid ore yielding 26 lb. of copper per ton, while at present ore yielding only 15 lb. per ton is mined by the Calumet & Hecla company from the same lode at a fair profit. Indeed, the Osceola company had to leave in the foot wall of its workings rock that would be almost bonanza ore in the amygdaloid stopes of today.

The Dip of the Lode and Its Effect on Mining

The copper-bearing formation has a general northeast-southwest strike and a northwest dip. The latter increases from the Ojibway on the north to the Baltic on the south end of the range. The dip at the Ojibway is a little over 30°; in the north end of the Mohawk about 37° at surface, decreasing to 34° as depth is attained; at the North Kearsarge 38°; at the Wolverine 40°; 37½° on both the amygdaloid and conglomerate lodes of the Calumet & Hecla, while at the old Atlantic and the Quincy, the dip is 54°, although decreasing to 37° at depth in the latter mine. At the Isle Royale and the Superior mines, it is 60° and at the Baltic, Trimountain and Champion mines, 70°, the steepest in the district.

The dip of the lode determines the mining method used and as the mines in the northern part have a low dip, the practice there is different from that in the southern portion. Since the lodes dip at angles greater than 42° in the latter section, it is possible to use either ore- or waste-filled stopes in getting the ore. In describing the mining methods, therefore, the practice of the two groups of mines must be considered separately. In these articles, the mines where the lodes have dips of less than 40° are considered.

Mines under Consideration

The producing mines in this part of the district are the Mohawk, Ahmeek, Allouez, Osceola Consolidated, Wolverine, Calumet & Hecla, and the Tamarack, in which are worked the Kearsarge and the Osceola amygdaloids, and the Calumet & Hecla conglomerate. The Tamarack and the Calumet & Hecla companies alone are working on the conglomerate, while at present only the Calumet & Hecla company mines on the Osceola amygdaloid. The other mines are all on the Kearsarge lode, which is the most persistent of any in the district, as it is productive for nearly eight miles and has produced more than any of the other amygdaloids.

The method of mining the ore in the conglomerate and amygdaloid lodes differs radically, although there is so much in common in the general practice that I will describe them together. In the conglomerate, owing to the great weight of the hanging wall, the stopes must be timbered closely, for the richness of the ore would forbid the leaving of pillars even if the ore were strong enough. As it is, however, the ore shears badly under weight and scales off so that if a pillar were left in a stope it would be of little effectiveness. Due to the strength of the hanging wall and the lower grade of the amygdaloid ore, which stands well in pillars, it is possible to do the mining without any timber in the amygdaloid mines. This difference in the strength of the hanging wall in the two deposits makes itself felt even in the smaller development workings, as while drift stopes 9x19 ft. in size are good practice in the amygdaloids, the drifts in the conglomerate mines cannot with economy be made larger than 6x11 ft. and most of them are not more than 8x8 feet.

Hanging Wall of Conglomerate Lode Is Heavy

The hanging wall of the Osceola lode is considerably weaker than that of the Kearsarge, but it is not so poor as the hanging of the conglomerate workings. The great weight in the conglomerate mines is due partly to the nature of the flows both above and below the conglomerate and partly because of the great weight on all rocks at depths approaching a mile vertically beneath the surface; lateral drifts paralleling the conglomerate, even when placed 200 ft. away in the foot wall, give much trouble owing to the swelling of the foot and the scaling away of the sides and roof. It is a peculiar fact that the amygdaloid flows near the conglomerate are stronger than the more compact flows, and the drifts give less trouble than when in the less vesicular lavas.

Profitable Grade of Ore

In the low-dip mines, an amygdaloid ore yielding 13 lb. of copper per ton, with copper at 12c. per lb., is about the limit of profitable ore; the limit of profit in the conglomerate mines at the present depths of from 6000 to 8000 ft. on the dip of the lode, is about 20 lb. of copper per ton, although in the Red Jacket workings of the Calumet & Hecla, ore yielding 15 to 16 lb. per ton can now be mined at a profit. But these are nowhere near the limits of what can probably be done in the amygdaloid lodes, as James MacNaughton, general manager of the Calumet & Hecla company, predicts in the near future a total cost of $1 per ton for producing the copper from the amygdaloid ore, while no doubt considerable economies are yet to be made in the mining of the conglomerate ore. The latter, however, will not be as great as in the amygdaloids, as the weight of the hanging wall will prevent the concentration of the hauling and other advances that seem to be approaching in the mining of the amygdaloid ore, where a greater latitude is allowed owing to the great strength of the hanging wall.

One-man drills will soon be in general use in the stopes, in spite of the great width of the lodes that makes their handling much more difficult than in the stopes of Western mines. Greater concentration of mining operations, with attendant decrease of tramming and hoisting costs; provision for storing more waste in the stopes instead of hoisting it; reduction in the cost of operation through greater centralization; increase in saving at the mills and reduction in the cost of transportation, are at hand to help out in the reducing of the mining expenses and in bringing down the grade of the ore that is the limit of profit. Owing to such economies the limits of profitable ore will be greatly increased in the next few years and there can be no question but that the limits in depth that J. R. Finlay has given for these mines, although probably warranted at present, especially when valuing mines for taxation purposes, will be greatly exceeded. The abandoned merger would doubtless have greatly hastened the attainment of these economies.

Hoisting Practice

Each district in the United States has its peculiarities in its mining practice, but probably the Lake Superior copper district is one of the most unique in this respect. The mines are the deepest in the world and they are handling the lowest grade of copper ore in the United States, not excepting even the so called porphyry mines. From some of the shafts 2000 tons of ore are hoisted in the two shifts per day that are worked. It is surprising, therefore, to learn that some of the deepest mines on the Calumet & Hecla conglomerate are served by shafts having only one hoisting compartment. One of the South Hecla shafts serving conglomerate workings 6500 ft. deep with timber, and through which 1000 tons of ore per day are hoisted, has only one hoisting compartment; also Calumet No. 4, which serves the Red Jacket workings that extend to a depth of about 8000 ft. on the incline, with timber and other mining supplies, has only one hoisting compartment.

One reason is that there is not so much advantage in balanced hoisting in inclined shafts as there is in vertical shafts, and what is more important at the conglomerate mines, balanced hoisting is not as flexible as unbalanced hoisting. Further, the engines are designed to compensate in efficiency of operation, for any loss that may result from not hoisting in balance; all the conglomerate hoists which are operating out of balance, are driven by Leavitt tandem-compound condensing engines connected to the drums by gears. The drums have a diameter of 25 ft., and are driven by 7-ft. pinions having hickory teeth, so that the engines run almost noiselessly. The drum is thrown into gear with a clutch and lowering is done with the brake.

Hoisting Drums Covered with Lagging

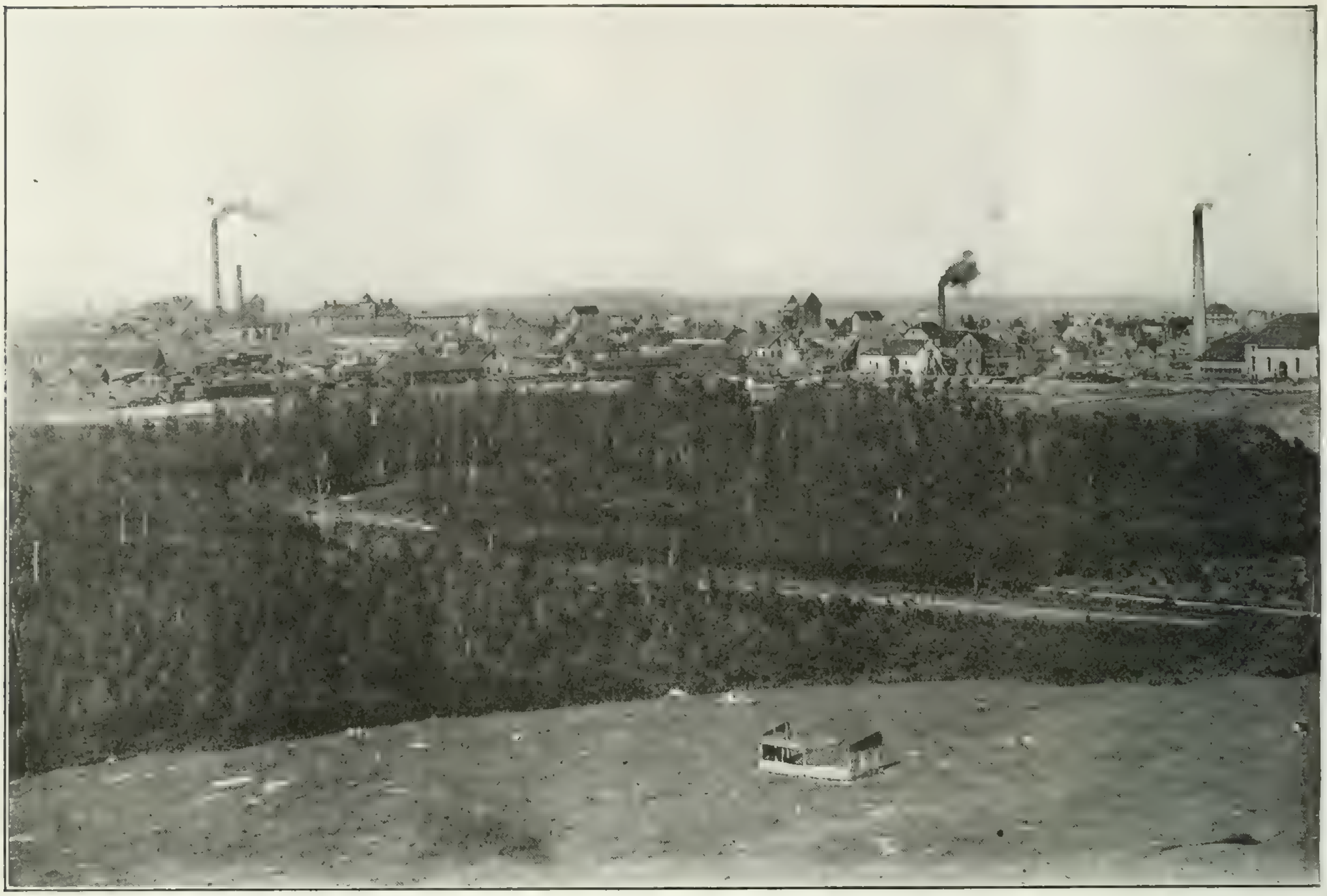
In order to dissipate the heat that would be generated, the drum is covered with easily replaceable maple lagging, while the brake band is water-cooled. In this way heating of the drum is avoided, together with the expansion strains that would result. In order to keep the part of the brake strap that takes the strain, away from the heat as much as possible, shoes are riveted to the brake band proper. The part of the band under tension is thus kept from overheating and crystallizing, which would cause it to deteriorate rapidly.

It has been found best to have each compartment served by its own hoist and that engine operated by its own engineer, even in shafts on the conglomerate workings that have two compartments. In this way the greatest flexibility is obtained in the hoisting and that is the most important thing in gaining low-hoisting cost at the conglomerate mines, where a large part of the hoisting capacity is expended in lowering timber and other supplies to the stopes, and not more than 65% of the time can be devoted to hoisting ore. This is not merely supposition, for hoisting in balance was tried at one of the conglomerate shafts and it was found that one side of the shaft was practically useless when timbers were being lowered on the other side; that little more rock could be hoisted in the shaft through the two compartments when operated in balance, than with one side.

Unbalanced Hoisting at Conglomerate Mines

Unbalanced hoisting is characteristic of practice only at the conglomerate shafts; balanced hoisting is used at the amygdaloid mines. However, this balanced hoisting is not done with the drums designed to clutch in and out of balance, as is characteristic of Western hoisting, but the two ropes are wound on one drum. The reason for this is that only two or three drills are operated on a level in most of the amygdaloid mines and therefore there is no concentration of the hauling; only two successive trips can be made with the skips from a level. The manner of loading the skip is also different from Western practice, as loading pockets are not used and the cars are dumped directly into the skip. This is due to the width of the veins, about 12 ft., the tonnage from which is not thought to justify the cost of cutting pockets, at least not on each level.

Another reason is that most of the shafts are sunk in the lode and it is not good practice to cut large stations at the levels so that cars can be stored until several skip loads have accumulated. Therefore there would be no gain in operating efficiency through the use of a two-drum hoist and if two drums were used, the truss form of drum design would have to be abandoned. The only drawback in the balanced system used is the overrunning of the level each trip; when both ropes are wound on the same drum one skip must go to the bottom of the shaft every time that the other goes to the surface with its load. While this increases the wear and tear on the track and rope, it is a small disadvantage. Indeed, the capacity which can be obtained



PANORAMA OF CALUMET & HECLA COMPANY'S OPERATIONS ALONG THE CALUMET &

HECLA CONGLOMERATE LODE, IN MICHIGAN. LEFT TO RIGHT IS NORTH TO SOUTH from these two-compartment shafts is surprising.

CAR STORAGE INSTEAD OF BIN STORAGE

A feature of the hoisting at the deep conglomerate mines is that car storage is preferred to bin storage. At the Tamarack mine the ore is hoisted from the deepest workings in 2½-ton cars and a 200-ft. level interval is used. At the Red Jacket shaft, subshafts are used to concentrate the haulage on the tramming levels, which are driven 300 ft. apart on the dip of the lode, and on these tramming levels rope haulage is used to take the ore to the vertical shaft. At the latter, the ore is stored in the cars and dumped into the measuring pocket as fast as the latter is empty. This measuring pocket holds 7½ tons or one skip load. Only one compartment at each level is served by the pocket and time is thus obtained between trips for dumping the three cars that it takes to make a skip load. As it is of primary importance that nothing goes wrong with the dumping mechanism, an air piston with a chain having a hook on the end of it, is used to dump the cars into the pocket, for a tipple arrangement would be more likely to get out of order.

This system requires a man at each hoisting level, who does nothing but dump the cars. However, as it permits concentrated hoisting without cutting large openings around the shafts, it is more conservative practice than would be the cutting of ore bins and loading pockets. In case that hoisting from a level, once each round trip, does not provide time enough for the filling of the pockets, the hoisting interval can be increased by drawing from another level before returning; since there is a dumper or skip-loader at each level, there is no disadvantage from jumping the level. This system of hoisting has proved so economical that if electric haulage were used at the amygdaloid mines and the tramming and hoisting concentrated upon every fourth or fifth level, some operators think that it would be better to keep a man at each level to load the skip and dump the cars than to use storage bins and make the large openings about the shafts that these bins entail. Such large openings in time result in great trouble. This method of handling and storing ore at shafts generally would not occur to the Western manager.

HOISTING CENTRALIZED

Most Western mining men consider it essential that the hoisting engineer shall have a clear view of the collar of the shaft. The drums at the large shafts in the copper country, owing to their size, have to be placed at about 300 ft. from the collar of the shaft with the ore house in between. Consequently a man is kept at the collar of the shaft to signal to the hoisting engineer, as well as to oil the wheels of the skip from time to time and to warn the men at work on the crusher when a load is about to be dumped. Another peculiarity is the frequent placing of the hoists that serves two or more shafts, in one central building so as to enable the concentration of the boiler plants. This feature originated with the Calumet & Hecla company at its conglomerate shafts, and has been used since at the South Kearsarge, at the older shafts of the Ahmeek and Mohawk companies, and at the Baltic mine, on the south range. When the Calumet & Hecla company was formed, it found itself with a number of shafts close together, partly as a result of mining necessity and partly owing to the consolidation of the two neighboring properties, working the same lode. The heaviness of the ground and the limited capacity of a shaft, due to the large amount of timber and supplies that had to be lowered into the conglomerate workings per ton of ore mined, made the company reluctant to close down any of these shafts, especially after it found by experience that it was likely to lose some of them by fire.

It is well known, of course, that a hoist is not an economical user of steam. While running, it demands a large amount of steam for the work being done, and, when idle, the condensation loss is great. By generating in one boiler plant, the steam for several hoists, it is possible to operate the latter with less boiler horsepower than if each hoist had its own boilers. Instead of piping the steam, the Calumet & Hecla company decided to lengthen the rope and to place the hoist in a central building near the boilers. Then, in case it was decided to close down a shaft, the engine could be used without moving and resetting. Further, it was thought as economical to wear out hoisting rope as to pay for a large condensation loss between boilers and hoist.

This principle has been carried so far that in one of the engine houses there are four hoists serving as many different shafts, one of which is 2600 ft. away. The engines are set at right angles to the lode, and each rope is carried from a sheave wheel back to the orehouse to its engine, over a line of idlers having wood-filled rims, that are carried by low towers about 50 ft. apart. These idlers are loose on their axles, so that they work into line as the rope winds from one side of the drum to the other. This construction also minimizes the number of babbitted bearings that have to be maintained. This centralization of the hoists is made feasible by the flat topography, but owing to the increasing distance between shafts, now characteristic of amygdaloid practice, it is no longer followed and each of the newer shafts has its own steam plant.

(*To be continued*)

Tenderfoot Gold Discoveries

By W. Weston

It seems as if in the majority of cases in Colorado it is the "tenderfoot" who makes the discovery of big gold mines. He has no theories as to the "proper formations" in which to search for gold, he looks in any old rock, and follows unknowingly the principle that "gold is where you find it." In the early days of Cripple Creek a man came down from the mines to Colorado Springs, and a friend meeting him on the street said: "Well, how are things up at the Creek?" "Oh!" said the miner, "the miners are looking for the gold where it ought to be, and the tenderfeet are finding it where it is."

In Ouray two tenderfeet went to the top of a sheer cliff of sandstone, just north of town, and tying a rope to a quaking-asp sapling, one lowered the other about 30 ft. down the face so that he could crawl into a hole which they had seen from the valley below. The floor of the cave was covered with about a foot of red dirt, which assayed 10 oz. gold per ton, and this was the discovery of the American Nettie, since credited with an output of over two millions.

Stratton was not exactly a tenderfoot, but he was a carpenter and not in any sense a miner, and prospected in the summer, and took for assay some common red granite that he found sticking up like a vein. And when his first carload of Independence granite rolled into the yards of the Boston & Colorado Smelting Co., the manager laughed exceedingly, but it sampled 3 oz. gold to the ton, and has produced over ten millions.

The Camp Bird was staked by a greenhorn just out from the Royal School of Mines, of London, the first vein he had ever seen except in books, and it has produced over twenty-two millions.

Another great gold mine in the State, which shall be nameless so as not to hurt anyone's feelings and which has paid many millions in dividends, was discovered by a plumber, and some time later when he had become a millionaire and had learned to wear a clawhammer coat and boiled shirt, and mix with the "quality," he was dining out, and the host said to a friend next him, "See that man down the table? Well, not over three years ago he was doing a job of plumbing in my cellar, and he got into the wine bin and drank up a lot of my finest brand of champagne."

But it is not always thus with the tenderfoot, for it is recorded of the Osceola at Ophir that one of them refused to stake the outcrop, which showed quantities of free gold, on the grounds that it was "native brass" and therefore worthless. However, enough wonders have been worked in the way of discoveries by tenderfeet to show that no formation must be classed at sight as nongold-bearing, not even the grindstone or the jug handle.

Present Smelting Rates in Utah

Special Correspondence

There are four smelteries being operated in and near Salt Lake Valley. The U. S. Smelting, Refining & Mining Co. at Midvale and the American Smelting & Refining Co., at Murray are smelting lead ores, as are also the two lead furnaces of the International at Tooele. The last company has four reverberatories smelting copper ores. At Garfield the copper smeltery of the American Smelting & Refining Co. (Garfield Smelting Co.) is treating concentrates from the Utah Copper Co's mills and custom copper ores; it is operating five reverberatories and two blast furnaces. More sulphides are being received than formerly, and some of the plants are increasing their roasting capacity. Two Dwight & Lloyd sintering furnaces have recently been added to the plant at Murray. There is a good market for ore of all classes.

Smelting Charges and Penalties

The smelting charges are dependent upon the character of the ore, tonnage, etc. Where the ores come from, Tintic, Bingham, or Park City, is of small consequence, though some of the Park City producers pay a flat smelting-rate. In general, on silver-lead ores (sulphides) lead is settled on a basis of 90% of assay at New York quotations, less 1¼c. per pound for transportation and refining; if the ore contains less than 5% no payment for lead is made.

Copper in silver-lead ores is paid for on the wet assay less 1%, less from 3 to 4½c. per unit on New York quotations as per Engineering and Mining Journal. If copper is present in small amount, i.e., less than 2%, it is sometimes added to the lead assay, and paid for as lead. Silver is paid for at 95% of the assay at New York quotations on date of assay. Less than one ounce is not paid for. Gold is paid for at $19 or $19.50 per ounce, if over 0.02 oz. In some cases, 95% of the gold is paid for at $20 if over 0.025 oz., which amounts to about the same. Ores containing several ounces of gold being a higher price. Iron is paid for at from 5 to 10c. per unit, while silica is debited at from 7 to 12c. per unit. Zinc is allowed free up to 10%, but is penalized at 30c. per unit above this. In some cases zinc up to 17% is allowed. Arsenic and antimony in speiss is penalized when in excess of 5% at 20 to 25c. per unit. Sulphur up to 2% is not penalized, but above this is charged for at 25c. per unit, with a maximum sulphur charge of $2 or $2.50 per ton. In some cases these charges are covered by a higher treatment base, which ranges from $1.90 to $4 per ton.

Oxidized Lead Ores in Demand

On carbonate lead ores containing 40% lead or more there is frequently no smelting charge, but 1¼c. per pound is deducted from the quotation for lead. For oxidized lead ores containing much iron, for example some ores from the Santaquin district in Utah County, a nominal smelting rate of less than $1 per ton is paid. At times, there is either no charge for smelting or the shipper receives credit for the iron. Oxidized lead ores are always in demand.

Park City silver-lead ores contain much zinc, especially the ores mined from fissure veins. The zinc is separated as middling, which is treated locally by the Grasselli Chemical Co., of Utah, or a zinc concentrate is made which is shipped to eastern plants. Zinc ore is received by the U. S. Smelting Co. at Midvale, and is treated at its Huff electrostatic plant. The ore is either bought outright or treated on a custom basis approximately as follows: A treatment charge of $3 is made, a roasting charge of $1.50 per ton, and 10% of the silica is charged for at 12c. per unit. Gold is paid for at $18 per ounce; 80% of the silver is paid for at the market price; 80% of the lead is paid for, less 1½c. per pound; 60% of the iron at 6c. per unit, and 30% of the zinc at 2c. per pound.

On copper ores of the usual grade, about 3% sulphides with an excess of iron, the charges are: Copper, 1% off, less 2¾c. off market quotations; iron ranging from 15 to 20% is paid for at 5c. per unit, while silica is debited at 10c.; silver and gold are paid for as mentioned for lead ores, and there is a flat treatment rate, usually from $2 to $3 per ton. Sulphur is not debited in this class of ore, as it furnishes part of the fuel.

Some Park City ores are treated on a flat-rate basis; others pay a base rate of $1.25 and more, with a premium on lead of 10c. per unit for lead in excess of 25%. Silica is debited at 10c. per unit while iron is paid for at the same price. Copper in small amount is added to the lead assay, and paid for as lead. When in larger quantity it is settled for, as previously mentioned. Silver and lead are paid for at the usual rates.

Transportation Rates Calculated on Gross Value of Ore

Transportation charges are based on valuation, being 40c. per ton from Bingham to Murray, Midvale, Garfield, or Tooele on ores worth less than $15 per ton. Above this, the rate is 75c. per ton. The freight is figured on the gross value, before any charges are deducted, and not on the net value of the ore. The rates are subject to correction according to valuation furnished by the smelting company at destination. Park City ores pay a flat rate of $2 per ton on crude ore and concentrates.

The following transportation charges on ore from the various mines to the valley smelteries will give an idea of the rates on low-grade, medium, and high-grade ore: Ores from Tintic, (Mammoth, Eureka, and Silver City) to Tooele (International, Utah) via the San Pedro & Tooele Valley R.R. range from $1.10 per ton on $5 ore to $1.25 on $10 valuation; $2.50 per ton for ore between $25 and $50; $100 ore is charged $3 per ton, and $300 ore $7.50. Iron ores of no value for the lead, copper, silver, or gold contained, are charged 85c. per ton.

From Beaver County, Milford or Frisco, to the valley smelteries the freight ranges from $1.25 per ton on $5 ore to $10.50 per ton on ore valued at $300, the rate on $20 ore being $2.40. From Newhouse the freight charges are from 25 to 50c. per ton higher. Iron ores not exceeding $5 in value can be shipped for $1.25 per ton from Milford. From Modena in Iron County the rates are $1.75 per ton on $5 ore to $4.50 on $50 ore. From Ophir (St. John station), Stockton and Del Monte, in Tooele, County, from $1.10 on $5 ore to $3 on ore valued at $100. From Santaquin in Utah County, the rates are approximately the same. From American Fork, $1 per ton for ore not exceeding $100 in value.

Rates Apply to Minimum Shipments of 20 Tons

The minimum weight for shipments at the above rates is 20 tons. Ore in carload lots is allowed to stop in transit at Salt Lake City, Midvale, Murray, International, or Silver City, Utah, for sampling without charge, except when sampled at International, a charge of $10 per car is made by the Tooele Valley Ry. for the haul from Tooele to International and return. If consignee desires to resample at another sampler, a charge of 10c. per ton is added to the through rate.

Sampling costs 50c. per ton at the Utah Ore Sampling Co.'s plants at Murray or Silver City, or at the McIntyre sampler at Park City, both independent plants. The smelters have their own samplers and make no charge for sampling. When sampling is done by the latter, it is usual for the shipper to employ a watcher to be present when the sampling is done, and look after his interests, principally in the matter of moisture samples. On smelting contracts for a term of years (from one to five years) more favorable rates for the shipper than those herein mentioned may be obtained.

Mining Casualties in Newfoundland

By Frederick L. Hoffman*

Newfoundland has had a rate of 2.6 deaths per 1000 for a five-year period. A careful examination of the accidents seems to show that the government regulations are good, and that lack of individual care is the chief factor in determining the mortality.

The mining industry in Newfoundland is relatively of limited extent, employing only about 2000 persons, chiefly in the mining of iron ore. Copper pyrites are mined to a limited extent at Tilt Cove, primarily for the sulphur contents, and there is a small amount of copper mining at other points, particularly at York Harbor. The Newfoundland government does not publish an annual report on the statistics of the mining industry, but an abstract is furnished to the Chief Inspector of Mines for the United Kingdom, and is included in the colonial and foreign statistics issued by that office. According to the last published report, there were 1913 persons employed in Newfoundland mines and quarries in 1908 and of this number 1489 were employed in iron-ore mining, 325 in copper mining, 49 in slate quarries and 50 in other quarries and workings. The total value of the mineral production in 1909 was £271,000, which for the Colony is quite suggestive of the relative industrial importance of iron mining as a source of remunerative employment.

REQUIREMENTS UNDER THE MINES REGULATION ACTS

During 1908 there were nine fatal accidents in the iron mines, which, on the basis of the available information as to the number of employees, would be equivalent to a rate of eight per 1000. This experience was, however, rather exceptional, and during 1909 there was only one fatal accident in iron-ore mining, but the number of employees for this year was not returned. It is somewhat doubtful whether these returns are entirely trustworthy, in the absence of an official statement by the Newfoundland government. With regard to the iron-ore output, it requires to be taken into consideration that practically the entire production comes from Bell Island, Conception Bay, amounting in 1909 to 1,004,050 tons. The operation of mines in Newfoundland is governed by the Mines Regulation Acts of 1906 and 1908, which include a provision for statistical returns as to the specific occupation, name, age and nationality of the injured employee, as well as the length of service and required duty, understanding of the English language, the extent of the injury, and questions as to negligence or fault, and other facts of importance.

The reference to the notice of accidents to the Government Engineer in the mines regulation act reads in part as follows:

> Where in or about any mine, whether above or below ground, either-
>
> (a) Loss of life or any personal injury to any person employed in or about the mines occurs by reason of any explosion of gas, powder, dynamite, or other explosive, or of any steam boiler; or
>
> (b) Loss of life or any serious personal injury to any person employed in or about the mine occurs by reason of any accident whatever, . . . the owner, agent or manager of the mine shall, within 24 hours next after the explosion or accident, send notice in writing of the explosion or accident, and of the loss of life or personal injury occasioned thereby, to the government engineer, and shall specify in such notice the character of the explosion or accident, and the number of persons killed and injured, respectively, and as soon after as possible and before the end of each year a return of facts relating to such accident or explosion in the form given in the schedule *to* this act.

POWERS OF THE GOVERNMENT ENGINEER

The reference to the powers and duties of the Government Engineer with respect to the mining industry reads that:

> The government engineer shall have power to do all or any of the following things, namely:
>
> (a) To make such examination and inquiry as is necessary to ascertain whether the provisions of this act relating to matters above ground or below ground are complied with in the case of any mine;
>
> (b) To enter, inspect and examine any mine, and every part thereof, at all reasonable times by day and night, but so as not to impede or obstruct the working of the mine;
>
> (c) To examine into and make inquiry respecting the state and condition of any mine, or any part thereof, and the ventilation of the mine, and the sufficiency of any special rules for the time being in force in the mine, and all matters and things connected with or relating to the safety of the persons employed in or about the mine or any mine contiguous thereto;
>
> (d) To exercise such other powers as are necessary for carrying this act into effect.

The Government Engineer is required to report the results of his investigation to the Minister of Agriculture and Mines, so that there is not only adequate government protection, but also provision for the proper reporting of his findings to the Government.

Through the courtesy of the Government Engineer, T. A. Hall, I have been provided with a return of the fatal accidents in the mines of Newfoundland during the period commencing Nov. 15, 1901 and ended Nov. 21, 1911. The return includes 26 fatal accidents described briefly and with a due regard to the conditions under which the same occurred. As a contribution towards the study of the accident problem in metal mines, the details are of considerable interest and well deserving of serious consideration on the part of those immediately responsible for the safety of men in mine operations.

FATAL ACCIDENTS AT BELL ISLAND

Nov. 13, 1906, crusherman, age 20, "caught between picking-belt pulley and frame on his way to pull switch of picking belt. He went down on the wrong side."

June 1, 1907, driller's helper, age 23, "the driller whom he was helping drilled into a partially fired hole containing dynamite and caused explosion."

July 27, 1907, trammer, age 17, "while he and his mate were pushing an empty car to the bin to be loaded, the engine driver, on a signal from another workman who says he signaled to slack up, started the car in the opposite direction, and the man was knocked down, the car going over his body."

Aug. 26, 1907, shoveler, age 26, "while using a pick to loosen ore recently shot which was being loaded into cars he struck a piece of dynamite lying in the ore and caused an explosion."

Sept. 3, 1907, driller, age 24, "hanging wall fell in on him while setting up his machine for work. He had been warned repeatedly that roof was settling down, but disregarded the warning which three other workmen with him acted upon and escaped."

Sept. 26, 1907, trammer, age 19, "riding on car to his work contrary to regulations. Loaded car broke away and crashed into car he was on."

Nov. 25, 1907, face cleaner, age 52, "buried under fall of ore while engaged taking same down to make room safe for ordinary miners."

Jan. 24, 1908, shoveler, age 18, "riding up slope on loaded car contrary to rules, and after being specially warned not to do so. Had coat over his head, and was struck on head by overhead roller and killed."

Feb. 22, 1908, driller, age 30, and assistant driller, age 18, "were drilling a second lift of a slope bottom when they drilled into hole of first lift containing unfired 'rippite' which caused explosion, killing one and fatally injuring the other."

Feb. 21, 1908, flogger, age 22, "knee crushed between two ore cars. Death caused by septic poisoning combined with low condition of health."

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*Statistician, Prudential Insurance Co., Newark, N. J.

Feb. 25, 1908, foreman blacksmith, age 40, "while putting belt on pulley his coat sleeve got caught in set screw of pulley tearing his arm from the trunk. He died of shock. The shafting should have been stopped by him before he attempted to adjust the belt."

Feb. 29, 1908, muck foreman, age 46, shoveler, age 17, "a man who was using a pick to loosen the ore recently mined struck a piece of dynamite and caused an explosion. Two other workmen received bad injury and one was slightly injured on this occasion."

Feb. 28, 1908, gate tender, age 14, "empty runaway car jammed him between gate post and wall, crushing his body. He should not have been standing where he was but was inexperienced."

Mar. 5, 1908, track layer, age 28, "body was found by two shovelers buried under fall of ore from roof. The roof was known to be in doubtful condition, but foreman face cleaner failed to warn him and to see that he did not work there."

July 15, 1909, trammer, age 20, "crushed between two cars at pier through own want of care."

Mar. 4, 1910, shoveler, age 32, "another workman when shoveling ore, struck piece of dynamite which caused an explosion. The man died 10 days afterwards from injuries received."

Nov. 30, 1910, messenger, age 15, "struck by swinging cable, which broke from control pulleys, and was thrown a considerable distance causing fracture to skull. Died in hospital 10 days later."

June 15, 1911, skip man, age 63, "jammed between stationary and moving car on trestle. Reason for his being in position of danger not explainable."

June 16, 1911, trammer, age 22, "when riding up on full trip of cars he jumped off into the parallel track, and was run over by an empty trip going down the main slope. This occurred in daylight and can only be explained by deceased taking a perilous risk."

Oct. 10, 1911, drill helper, age 24, "while on his way to work was struck by runaway trip of full cars in main slope. Evidently thought he was in position of safety. Had ample warning and space in which to take refuge."

Nov. 21, 1911, shoveler, age 21, "came in contact with electric lighting current carrying 220 volts. Wire was insulated for 600 volts, but insulation although not broken had become defective. Tests taken immediately afterwards showed leakage of 125 volts. Believe this is a unique case of such low voltage shock resulting fatally. He was removed almost immediately from contact."

Fatal Accidents at Tilt Cove

July 16, 1907, miner, age 43, "struck in calf of leg by rope which was suddenly pulled taut knocking him down. He fell on back of his head on tram rail fracturing his skull."

Mar. 11, 1910, miner, age 47, "ore pile at which he was working, "ran" and he was caught and pinned down by some large pieces and badly crushed."

Oct. 14, 1911, miner, age 53, "A large piece of ore fell from north wall of mine, and alighting near him broke into several small pieces which rebounded striking him and causing internal injuries."

York Harbor Mining

July 4, 1910, miner, age 23, "was sent down skip with special instructions to pick up a wrench that fell down skip-way and lodged on cross-beam out of reach of ladder way. While being raised he evidently put his head out over edge of skip, and coming in contact with a beam got his neck broken. Daylight in shaft."

Nov. 2, 1910, miner, age 40, "crushed by 30-ton fall of ore and rock. After warning was given by foreman to escape another man further away from place of safety got clear of fall, and not explanable why deceased did not escape also."

Average Death Rate, 2.6 per 1000

Assuming that the average number of persons employed in the mining industry of Newfoundland was 2000 the average rate on the basis of 26 deaths for the five year period would be 2.6 per 1000 per annum. This cannot be considered an excessive fatality rate considering the dangerous character of the opencast mining at Tilt Cove and the peculiar mining conditions at Bell Island, including subaqueous works. In part the favorable results are to be attributed to the effective method of mining supervision involving at the same time a minimum degree of official interference in mine management. There are a number of excellent provisions of the mine regulations which are deserving of consideration, but the most important of these is the requirement that "special rules must be established in every mine appropriate to the particular state and circumstances of each mine to serve for the conduct and guidance of the persons acting in the management, and of those employed in or about the mine, with a view to prevent dangerous accidents, and to provide for the safety, convenience and discipline of those employed therein."

The special rules are required to be approved by the government. Those of the management at Bell Island are a model of brevity, and practically inclusive of all that appears to be essential for the safe and satisfactory administration of mines. The rules of special interest are those having reference to the drill foreman, the magazine storekeeper and the blaster, and any deviation from these rules or non-compliance therewith subjects the offender to instant dismissal. The duty of the general inspector provides that

> He shall attend daily to his duties in or about the mines, examining all ropes, pulleys, engines, drills, pipes and machinery under his care, and reporting in detail on the same to the engineer, and that he shall order any defective machinery likely to endanger life or property to be stopped until properly repaired.
>
> Any person employed at the mine who knows that any other person has neglected, or committed a breach of any provision of the acts or special rules, shall immediately report the fact to the manager or under-manager, and any person failing to observe this rule himself shall be held responsible as an accessory to the commission of the offence so known to him, and shall be liable to be convicted as a principal."

The foregoing brief account of certain aspects of the metal-mining industry of Newfoundland would be incomplete without a reference to the pending bill providing for the manufacture, storage, and importing and sale of explosives. This bill includes brief but effective regulations and heavy penalties for non-compliance. The making of regulations is left to the Governor in Council, but the administration of the act is with the Government Engineer.

Reference also requires to be made in this connection to an act passed under date of Feb. 18, 1908, with respect to compensation of workmen for injuries suffered in the course of their employment and an act passed under date of March 29, 1911, providing for the payment of old age pensions.

Ignorance the Chief Cause of Accidents

The Newfoundland experiment in the regulation of the mining industry and the amelioration of the social and economic condition of the people employed therein has apparently been successful, considering the rather exceptional conditions under which the industries are carried on. A study of the accidents in detail, however, would seem to warrant the conclusion that much remains to be done to provide for the required degree of personal security in mining operations, and the necessary education of mine employees in the proper discharge of their hazardous and frequently quite complex duties. The mining problem in Newfoundland is seriously complicated by the quality of the available labor supply. A large number of so called miners are former fishermen, with a limited amount of actual experience in blasting and other kinds of underground work. There is, however, the decided advantage that, on the whole, the class of labor employed is industrious, sober, and law-abiding, with the result that the accidents which have occurred are chiefly due to ignorance of mining methods, rather than to deliberate indifference to the risk incurred.

As far as it is possible to judge from a rather limited amount of available information, the government supervision of the mining industry in Newfoundland is carried on in an effective manner with a minimum degree of governmental interference. The tendency is apparently towards an increase in the attention which is being given to the elimination of needless danger and the installation of safety devices wherever practicable. At least, with regard to the company operating the mines at Bell Island, it may be said that not much is left undone to meet the requirements.

It is announced in *Echo des Mines*, June 27, 1912, that the country between Fez and Tangier possesses deposits of pitchblende which will be exploited for radium as soon as the country is completely pacified.

Rand Ore Reserves

By A. Cooper Key*

The accompanying table shows the total ore reserves of practically all the Rand producing and developing mines at the end of 1910 and the end of 1911. In some instances the company's fiscal year is not coincident with the calendar period and in such case the latest figures are given. Some companies adjust the ore-reserve statements to the quarterly periods, but this procedure is by no means general and, in any event, the figures must be regarded as less reliable than those presented in the annual report.

RAND ORE RESERVES

	December, 1910			December, 1911		
Crushing Mines	Tons	Dwt	Inches	Tons	Dwt.	Inches
Aurora West	339,000	5.85	36	345,600	5.85	36
Bantjes Cons	958,500	7.6	41	772,201	7.3	
pillars	87,000	7.6	41	123,886	7.6	
Benoni Cons	606,000	6.4	....	522,671	6.8	43
Brakpan Mines	1,720,000	6.56	52	1,925,346	6.73	58
Cinderella Cons	422,000	6.8	....	740,157	6.73	
City Deep	2,273,000	8.2	58	1,941,883	8.1	
pillars	141,000	8.2	58	136,992	8.2	
City & Suburban	829,000	7.2		789,000	7.6	51
Cons. Langlaagte	401,000	(a) 6.37		397,017	(a) 5.9	
deep level	179,300	9.25		1,222,630	(a) 6.9	47
Cons. Main Reef						
Crown Mines	6,283,000	7.6		10,124,072	7.25	
Durban Rood Deep	867,550	6.7		965,650	6.6	
pillars, etc	194,426	7.3		322,421	7.2	
East Rand Prop	10,250,000	6.6		6,761,605	6.9	55
Ferreira	600,000	8.1	77	324,603	8.13	81
Ferreira Deep	1,779,000	9.6		1,837,808	9.7	....
Geduld Prop.	445,000	9.09	37	607,300	8.18	44
probable	102,300	10.7	41	190,500	9.08	42
Geldenhuis Deep	2,521,500	6.1	46	2,262,840	6.2	
Ginsberg	341,000	(a) 6.55		367,646	(a) 6.8	
Glencairn	1,121,000	4.00		925,000	(a) 3.5	
Jupiter	1,074,000	5.8		1,089,000	5.74	
Knight Central	320,000	4.98				
	700,000	6.00	62	644,300	6.00	60.6
Knights Deep	(b) 1,700,000	5.5		1,650,000	5.2	
Lancaster West	431,000	6.76	39.4	472,700	6.65	
pillars, etc	43,500	9.33	45.7			
Langlaagte Est	1,267,769			1,281,307		
Luipaardsvlei Est	398,000			432,000	5.2	
				(partial) 142,000	5.3	
Main Reef West	430,100	7.9	48	...		
May Cons	300,500			212,707		
Meyer & Charlton	249,000	8.6	....	347,000	9.09	
Modderfontein B	2,788,000	7.0	48	2,355,700	7.5	51
New Goch	742,000	5.3	53	962,600	5.06	63
New Heriot	485,600	8.4	46	569,716	8.4	46
New Kleinfontein	1,057,400	7.47	39.6	1,146,531	7.49	44
New Modderfontein	2,581,000	7.0		3,341,830	7.6	56
New Primrose	491,000	(a) 7.8		423,311	(a) 6.7	
New Rietfontein				361,484	(a) 6.1	
New Unified	285,000	(a) 6.8		288,343	(a) 6.73	
Nourse Mines	(b) 2,142,000	6.5		(d) 2,050,000	6.6	
Princess Est	283,000	8.6		} 656,500	7.26	27.4
pillars	11,000	12.6				
Randfontein Cent.	5,828,000	7.4		6,637,271	6.63	
Robinson	1,794,000	11.77		1,526,661	11.4	73
main reef	2,202,000	4.24		1,307,000	4.2	
Robinson Deep	(c) 1,100,000	7.2		...		
Roodepoort United	617,700	5.47	38.5	..		
partial	112,500	4.97	42	448,800	5.49	42
Rose Deep	3,553,500	6.1	55	3,670,160	6.0	57
Simmer & Jack	2,650,000	6.3		2,500,000	6.4	
Simmer & Jack, East	925,750	5.4		934,000	5.4	
Simmer Deep	1,255,000	5.0		1,312,000	4.9	
partial	114,000	5.17				
Van Ryn	1,591,000	6.4		1,655,910	6.4	
partial	203,000	6.9		86,872	5.76	
Village Main Reef	1,775,000		....			
West Rand Cons	1,125,000	5.5	46	1,003,000	5.25	49
	216,000	5.5	46	418,000	5.25	49
Witwatersrand	1,233,000	(a) 5.8		1,225,084	(a) 6.65	
Witwatersrand Deep	1,700,000	7.16		1,436,000	6.79	49
Wolhuter	760,000	6.4		808,800	6.45	52
Developing Companies						
Apex	75,000			258,060	6.5	54
Rand Collieries				374,200	5.37	42
Van Ryn Deep				603,716	7.17	

(a) Recovery value; (b) July, 1910; (c) March, 1910; (d) July, 1911.

Of the two great consolidations, the Crown Mines' increase more than offsets the decrease evidenced in the case of the East Rand Proprietary Mines. It will be recalled that the decline in the latter case was due to the exclusion of all ore of a value of under 4.3 dwt. as against 3.1 dwt. for 1910, the latter value now being deemed too low. In other cases, e.g., Modder B., modified views have been taken, which have resulted in smaller calculated aggregates. In certain instances depletion by milling operations has exceeded the rate of replacement by current development. The scarcity of native labor coupled with big mill demand, has had much to do with this condition of affairs.

The large decrease shown in the Main Reef reserve of the Robinson is due to the exclusion of certain blocks which have proved unpayable in stoping, loss due to caving and transfer from payable to unpayable consequent upon higher pay limit assumed. New Kleinfontein shows a bigger aggregate of much the same value as last year and the Village Deep a substantial advance in aggregate. Witwatersrand reveals a marked improvement in value. The Consolidated Langlaagte has added over 1,000,000 tons to the reserve of the southern section, the value of the 1,250,000 tons opened being a shade under 7 dwt., which is an excellent value especially as it is calculated over a considerable width. The new mill of this company is due to start in the course of the next few months.

Brakpan Mines and Benoni have been transferred from the developing to the producing category. The former is doing excellently, but the returns of the latter have been indifferent. Van Ryn Deep has over 600,000 tons developed of a value of well over 7 dwt. On the whole the ore-reserve position may be regarded as satisfactory. It must not be forgotten, however, that working costs are showing a tendency to rise. E. T. Way, consulting engineer to the Anglo-French Exploration Co., has recently said that the average is about 20s. per ton. Workmen's compensation and contributions to the miners' phthisis fund represent several pence per ton.

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*Editor, South African Mining Review, Johannesburg, South Africa

Michigan Copper Mining Co.

The report of the Michigan Copper Mining Co. for 1911 shows a deficit of $15,639, which added to the accrued deficit as of Dec. 31, 1910, gives a total deficit of $83,572. No work was done in 1911 except by tributors working on the Branch vein of this property. The superintendent advises the resumption of diamond-drill work, stating that had their 1910-1911 drill results been on any other lode than one the working of which several miles away had proved unprofitable, it would have created great excitement. An assessment will be necessary to follow up this drilling further.

NEW PUBLICATIONS

THE AMERICAN FERTILIZER HAND BOOK, 1912. 8x11, pp. 307, illus.; $1.50. Ware Bros. Co., Philadelphia, Penn.

MINERALOGICAL NOTES, SERIES 2. By Waldemar T. Schaller. Pp. 113, illus. Bull. 509, U. S. Geological Survey, Washington, D. C.

METHODS OF AIR ANALYSIS. By J. S. Haldane. 5¼x7¾, pp. 30, illus. Charles Griffin & Co., Ltd., London; J. B. Lippincott Co., Philadelphia.

COALFIELDS AND COLLIERIES OF AUSTRALIA. By F. Danvers Powers. 6¼x8¾, pp. 412, illus.; 25s. Critchley Parker, Melbourne, Australia.

THE MINERALS OF TONOPAH, NEVADA. By Arthur S. Eakle. 7x10½, pp. 20, illus., paper. Bulletin of the Dept. of Geology, University of California, Berkeley.

GEOLOGY AND MINERAL RESOURCES OF THE PEORIA QUADRANGLE, ILLINOIS. By J. A. Udden. Pp. 103, illus. Bull. 506, U. S. Geological Survey, Washington, D. C.

THE GABBROS AND ASSOCIATED ROCKS AT PRESTON, CONNECTICUT. By G. F. Loughlin. Pp. 158, illus. Bull. 492, U. S. Geological Survey, Washington, D. C.

ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1910. By John McLeish. Pp. 328. Mines Branch, Canada Department of Mines, Ottawa.

THE TIN-MINING INDUSTRY AND THE DISTRIBUTION OF TIN ORES IN NEW SOUTH WALES. By J. E. Carne. Pp. 378, illus. Mineral Resources No. 14, New South Wales Dept. of Mines, Sydney.

SUR LA PRODUCTION, LA DISTRIBUTION ET L'EMPLOI DE L'ELECTRICITE PAR LES CHARBONNAGES. By Félix LePrince-Ringuet. 6½x10, pp. 136, illus., paper. Ch. Béranger, Paris, France.

GEMEINFASSLICHE DARSTELLUNG DES EISENHUETTENWESENS. Herausgegeben vom Verein deutscher Eisenhüttenleute in Düsseldorf. 6x9½, pp. 404, illus.; 5 marks. Verlag Stahleisen, m. b. H., Düsseldorf, Germany.

DIE METALL- UND EISENGIESSEREI MIT BESONDERER BERUECKSICHTIGUNG DER LEGIERUNGEN UND GATTIERUNGEN FUR DEN MASCHINENBAU. By Hugo Wachenfeld. 5¾x8½, pp. 104, illus., paper; 4.50 marks. Wilhelm Knapp, Halle a. S., Germany.

MINING CONDITIONS UNDER THE CITY OF SCRANTON, PENN. By William Griffith and Eli T. Conner, with a preface by Joseph A. Holmes, and a chapter by N. H. Darton. Pp. 89, illus.; accompanied by numerous maps. Bull. 25, U. S. Bureau of Mines, Washington.

THE SUBWAYS AND TUNNELS OF NEW YORK—METHODS AND COSTS; with an Appendix on Tunneling Machinery and Methods and Tables of Engineering Data. By Gilbert H. Gilbert, Lucius I. Wightman and W. L. Saunders. 6x9¼, pp. 372, illus.; $4. John Wiley & Sons, New York.

CONCRETE COSTS: Tables and Recommendations for Estimating the Time and Cost of Labor Operations in Concrete Construction and for Introducing Economical Methods of Management. By Frederick W. Taylor and Sanford E. Thompson. 5x8, pp. 709, illus., $5. John Wiley & Sons, New York.

INTRODUCTION TO THE STUDY OF MINERALS. By Austin Flint Rogers. 5x7½, pp. 522, illus., leather; $3.50. McGraw-Hill Book Co., New York.

Contents: The form of minerals; physical properties; optical properties; chemical properties; the determination of minerals; the description of important minerals; occurrence, association and origin; the uses of minerals.

LA CONSOMMATION DE COMBUSTIBLE DANS LA FUSION DES MINERAIS DE CUIVRE ET PLOMB. By Georges Ralli. Reprint from Revue Universelle des Mines, Tome XXXIV, p. 213. 6¼x9½, pp. 187, illus., paper. Charles Desoer, Liège, Belgium.

This is a scholarly treatise on the burning of coke in the blast furnace. Every point is touched upon, and nothing is taken for granted, from a reinvestigation of Peters' figures for jacket-water losses to a correction of Austin's method of determining the total heat of fusion. To anyone interested in the theoretical side of blast-furnace thermo-chemistry, the book will be of great interest.

TEXT BOOK OF CYANIDE PRACTICE. By H. W. MacFarren. 6½x9½, pp. 291, illus., $3. McGraw-Hill Book Co., New York.

This book is a general treatise on the subject of cyanidation, covering both theoretical and practical phases. Each branch of cyaniding is taken up in sufficient detail to enable the prospective cyanider to obtain a good working knowledge of the process. The cyanide operator should find the book a valuable aid in the study of his everyday problems. The excellent comprehensive classified bibliography will be especially appreciated by those desiring to learn what has been written on cyanidation and allied subjects.

CHEMICAL ARITHMETIC AND CALCULATION OF FURNACE CHARGES. By Regis Chauvenet. 6½x9½, pp. 302; $4. J. B. Lippincott Co., Philadelphia.

This book covers completely every type of chemical calculation which the student or practical chemist will be called upon to make. The author himself states that the expert will regard the explanations as puerile, and that they are meant to be, and that his lecture-room work has shown detailed, laborious explanations have been found necessary by him. In this one must defer to the experience which Doctor Chauvenet has had in teaching. But it is certain that the practitioner with any mathematical instinct, and a knowledge of chemical equations, will find the book hard, not to say irritating reading, although we will concede that it probably has great merits for the ordinary run of students.

DER PRAKTISCHE HOCHOFENBETRIEB. By Theodor Bender. Pp. 121, paper; 5.40 marks. Wilhelm Knapp, Halle, a. S., Germany.

This is a concise, comprehensive reference book of blast-furnace practice, written by an experienced man for the benefit of beginners in the industry. It is not very general in its application, except by inference, but gives the results of the writer's own experience in a somewhat restricted field. Principles are not often dwelt upon, but, on the other hand, there are many data and figures not readily found elsewhere, such as lists of necessary materials, cost prices, etc. It would be more valuable for the purpose of telling the beginner what experiences and difficulties he might meet, than to give a student a general understanding of the principles of the art. The contents are as follows:— Construction of the furnace, 37 pages; cost prices and operating expenses, 8 pages; raw materials (ore, lime, coke), 8 pages; products (pig iron, slag, gas, flue dust), 6 pages; blowing-in, 12 pages; operation, control and precautions in ordinary practice, 30 pages; repairs, 6 pages; irregularities, 11 pages; banking the furnace, 3 pages; blowing out, 5 pages; index, 2 pages. It is a book recommended to beginners or students who expect to engage in blast-furnace operation.

DAS TIEFBOHRWESEN. Unter Mitwirkung von Arthur Gerke and Leo Herwegen, bearbeitet von Hans Bansen. 6¼x9¼, pp. 517; 688 illus.; 16 marks. Julius Springer, Berlin, Germany.

This is the most exhaustive treatise on the subject of boring that has come under our notice. It is not limited to boring in rock, but includes boring in earth, by various kinds of augers, sinking of driven wells, the jetting process, etc. As is natural, the tools described are found mainly in Europe; no such wide variety of odd-shaped bits and accessory apparatus was ever seen, or found necessary, on this side of the Atlantic. Each separate type, no doubt, was designed to serve a definite purpose, but the aim of the American drill runner is to use as few varieties of tools as he can get along with, and these are usually of simple and uniform design.

The book describes in general outline, and in detail, the following principal methods of boring: European and Canadian rod methods; American oil-well system (very briefly); other rope systems; driven wells; earth augers; diamond drill; calyx drill (very incompletely); reaming; casing; recovering lost tools; surveying bore holes. In the last named chapter in particular the European fondness for delicate and complicated mechanism reaches its full scope; the simple, but effective, hydrofluoric acid or gelatin tube is barely mentioned.

A number of sections, dealing with the speed and cost of drilling are highly praiseworthy. In a number of respects the book ought to be valuable to American manufacturers, if only for a broadening of ideas; many of the European types have certain merits that deserve careful study, if not actual imitation. Among these might be mentioned those variations applied to the cable tool or the rod method for the purpose of accelerating the down stroke of the bit, causing it to strike a sharper blow and cut faster. This is impossible with the American rope system. A hammer drill, actuated by water pressure, or by electricity, and suspended from the end of a rope in the hole, is another European device that might be studied.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Edwin C. Holden, of Madison, Wis., was at Nelson, B. C., early in July.

T. Lane Carter, of Osgood, Carter & Co., Chicago, is in Montana on professional business.

Rensselaer Toll, of Denver, has taken the management of the Mineral Farm mine, at Ouray, Colorado.

Charles O. Whitten, of Boston, has been chosen a director of the Isle Royale Copper Co., in place of J. Nelson Perkins, resigned.

Albert E. Hall, of the Dome mine, South Porcupine, Ont., is in New York for a few weeks on a combined business and pleasure trip.

J. B. Cleveland, formerly manager of the West Dome mine, Porcupine, Ont., is now in charge of the work at the Hudson Bay Porcupine property.

Dr. E. M. Kindle, of Washington, D. C., has accepted the position of invertebrate paleontologist in connection with the Geological Survey of Canada.

Peter McLaren, engineer in charge of the Scottish-Ontario mine, Porcupine, Ont., has gone to London in connection with the affairs of the company.

Ellis P. Earle, president of the Nipissing Mines Co., has been elected a director and member of the Executive Committee of the Tri-Bullion Smelting & Developing Company.

Henry E. Monroe, a San Francisco attorney, has been appointed a member of the board of trustees of the California State Mining Bureau, to succeed Frank W. Griffin, whose term has expired.

Frederic R. Weekes, of New York, has been spending the summer at Voigt's camp, near Princeton, Similkameen, B. C., where the British Columbia Copper Co. is developing several mineral claims.

Roscoe Wheeler, superintendent of the Hedley Gold Mining Company's 40-stamp mill at Hedley, Similkameen, B. C., has been visiting other gold stamp-mills to familiarize himself with their practice and processes.

M. S. Davys, managing director of the Silverton Mines, Ltd., opening a silver mine in Slocan district of British Columbia, arrived in that province at the end of June to remain several months at his company's Hewitt-Lorna Doone group near Silverton.

E. A. Vageda, of Buda-Pest, Hungary, representing the Society of Engineers of Austria-Hungary, recently visited Ottawa in the course of an investigation into the peat resources and industry of Canada, and had a conference with Dr. Haanel, Canadian Director of Mines.

T. G. Janney, superintendent of the Shasta Dredging Co., operating a bucket-elevator dredge on Clear Creek in Shasta County, Calif., will leave for Japan on Aug. 3. He will be succeeded by Moreau Ashley, who has for several months been superintendent of the Alta Bert dredge in Trinity County.

W. H. Storms, state mineralogist of California, has accepted the invitation of mining men at High Grade, Modoc County, to visit that camp. He will go there in the latter part of July. As Mr. Storms recently criticized some of the methods of promoters in attracting miners and investors, his report of what he may learn from a personal visit will be looked for with considerable interest.

With a view of increasing the efficiency of the inspection of purchases made by their companies, and, at the same time, have the work performed more economically, the Harriman Lines have abolished their inspection and testing department and placed the work in charge of their engineering department, and directly under the supervision of Consulting Engineer John D. Isaacs. He has made an arrangement with Robert W. Hunt & Co., under which that firm on July 1 took into their employ 58 inspectors who had been connected with the railway organization, and assumed all the inspecting and testing work, including locomotives, cars, etc. Robert W. Hunt & Co. have been for many years inspecting the Harriman companies' bridges and rails.

OBITUARY

Joseph Robbins died at Robbins Station, Penn., July 12, aged 89 years. He was born in the house where he died. He was one of the pioneer coal operators in the Youghiogheny Valley and was associated in opening those fields with Andrew Carnegie, William Thaw and Thomas S. Clark. It was largely through his efforts that the Youghiogheny was made navigable by dams. He was also one of the promoters of the Pittsburgh & Connellsville R. R., now part of the Baltimore & Ohio.

George Manson Hill died at San Francisco July 10 of typhoid meningitis. He was 45 years old and was born in San Francisco. He graduated from the University of California as a mining engineer in 1889. He was superintendent of the Caribou mines in British Columbia, and had also engaged in mining in Placer County, California. In recent years he made his home in Alameda, engaging in real estate in San Francisco. In 1911 he was appointed a state harbor commissioner by Governor Johnson, and by reason of experience as an engineer, was selected by the board to take charge of the engineering department of the commission, and had planned great improvements in the shipping and harbor facilities at San Francisco.

Edward George Warren, general manager of the British Columbia Copper Co., whose death and services with that company were noted last week, was born at Hawkesbury, Ont., in 1874. He was educated at the high school, Hawkesbury, and Trinity College, Toronto, taking his science course with honors at the latter. In 1896 he removed from Ontario to British Columbia and for three years was engaged with mining companies at Rossland. After a short period spent in Colorado, he returned to British Columbia and was for a time connected with mining at Camp McKinney, in Boundary district. Later he was manager of the Greenwood Electric Light Co., which position he filled for some years. In 1908 he became superintendent of the British Columbia Copper Co.'s smeltery, under J. Edgar McAllister, the company's general manager, and when, last year, Mr. McAllister removed to New York, Mr. Warren succeeded him as general manager at Greenwood. In 1902 he married Miss Wilhelmina Hirsch, of Ingersoll, Ont., who survives him. For some years Mr. Warren was active in provincial politics, and was a well known member of the Conservative party in British Columbia. In 1907 he contested the Greenwood constituency for the Legislative Assembly of British Columbia, but was defeated. He was active in local affairs, having been connected with several clubs; an ardent supporter of field sports, and in other ways a prominent and useful member of the community in which he lived for about 12 years.

Societies and Technical Schools

Miami Engineering Society—The first regular meeting was held at Miami, Arizona, June 8. The society has about 30 members, consisting of the technical staff of the Miami Copper Co. General Manager B. B. Gottsberger is president, and Mill Superintendent F. W. Solomon, vice-president of the new society, which has been formed for the purpose of giving its members an understanding of the work being done outside of their own departments, thus broadening their knowledge of mine operation.

American Chemical Society—A circular from the secretary, dated July 10, says that a meeting of the Council will be held in New York Sept. 9, to consider changes in the Constitution made necessary by the growth of the society if its business is to be legally conducted. A general meeting of the society is called for Sept. 11 in the Doremus Lecture Theater of the College of the City of New York to pass upon any action taken by the Council if such confirmation is found to be necessary to secure proper legality. Out of courtesy to the Eighth International Congress of Applied Chemistry no meeting for the reading of papers will be held at this time.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

July 11— A report has gained some attention recently that the thiogen process being tested at the Campo Seco smeltery in Calaveras County, has proven unsuccessful, and that another method is to be tried. This is not true. The thiogen process, invented by Doctor Young, of Stanford University, has not been abandoned, nor has it by any means been declared or found to be unsuccessful. The furnace is being improved and the experiments are still in progress. The recent improvements and developments in neutralizing the smoke are not made public and will not be until the experimental work is completed. Both the inventor and Superintendent Busey are satisfied with the progress so far made. The farmers in Shasta County are still making a show of fighting the Mammoth smeltery at Kennett, but are not likely to carry the matter to the courts again. The smeltery at Coram is still idle, but it is believed that if the Young process is proved to be completely successful, the Balaklala company will adopt it and the smeltery placed in commission again.

The reported evidence of Charles W. Eberlein, former acting land agent of the Southern Pacific R.R., in the government hearing regarding the Elk Hills lands, that he suspected the land might be oil-bearing at the time he made the non-mineral affidavit, is now denied by Mr Eberlein; he is now reported as saying that he had no suspicion whatever that the land might be oil-bearing when he made the affidavit. The recent sessions of the hearing have included evidence as to the knowledge of the Southern Pacific officials that the lands were known or believed to be oil-bearing.

Denver

July 12—Like many other Colorado camps long dormant, but now much alive, is Creede. It was stated a few weeks ago in the JOURNAL that the Triune Mines Co. is sinking a three-compartment shaft from the old Amethyst level, intends to sink another on the United and a third on the New York and Chance, and is also building a 300-hp. electric plant in the town of Creede to electrify its mine and mill.

The Creede United Mines Co., a strong corporation, is carrying out plans which mean a large production in about six months' time. The company owns the North Creede, Park Regent, Reno, White Star Leasing Co., a 15-year lease on the Wooster tunnel, three miles long, and controls the 300-ton Humphreys mill at its portal. The tunnel is being equipped with a 60-hp. motor and 32-lb. rails, and will be driven 1000 ft. further, after which sinking, raising and drifting will be done. It is said that the work planned will take 18 months to accomplish, and will create 10 years of ore reserves. Since September the mill has been equipped with four Wilfley triple-deck slimers and a Norwalk compressor and three miles of air line have been added for the mine. Seventy-five men are employed. A. E. Humphreys is at the head and ex-Governor C. S. Thomas and W. H. Bryant, of Denver, are prominent members of the company. It is the same story with this company, that is heard from many others; ore left standing by the old workings as unprofitable, is now being mined and milled at a profit; last month $20,000 worth of concentrates were shipped.

From the Cresson mine on Raven Hill 2300 tons of $25 ore were shipped in June. The Victor mine on Bull Hill shipped 35 cars, the average being about $25 per ton. The Granite company shipped 85 cars, of a general grade of $30 per ton. The American Eagles shipped 10 cars of high-grade ore and the Abe Lincoln, in Poverty Gulch, five cars of mill ore. The output of the Isabella was 38 cars of 1-oz. gold ore. The flow from the deep-drainage tunnel is about 10,000 gallons per minute and the recession of water in the mines, for June, about 10 feet.

The ore conditions in the El Paso mine, since it was unwatered by the deep-drainage tunnel, are better than were anticipated. The first level drained was the 700, where it is said that the oreshoot is 1500 ft. long and 3 ft. wide, with average 1-oz. gold ore. This shoot will now be mined on the 800- and 1000-ft. levels. This vein system can be worked at 1350 ft., the drainage-tunnel level.

Fortunately for the legitimate and honest worker in mining in this state, it is becoming dangerous for fraudulent promotion schemes to be worked through the United States mails, for recently W. T. Wintemute, who was indicted two years ago by a Federal grand jury for this offence, was after a three weeks' trial sent to a federal prison for one year by Judge Hough in the U. S. District Court of New York. The fraud was in connection with the Gold Run Mining & Tunnel Co., of Boulder County.

Press dispatches state that an unusually severe cloudburst following heavy rains, broke over Cherry Creek on July 14, and the resulting flood that swept through Denver did heavy damage to property. The loss of life was small.

Butte

July 10—That the employees of the copper mines will not be the only ones to receive the increase in wages brought about by the recent contract entered into by the Anaconda company and the Butte Miners' Union, is evidenced by the fact that the management of the Butte & Superior company, operating a zinc mine, has declared its intention of following the lead of the Anaconda. Managers of all other properties being operated in Silver Bow County have also ordered the increase to be made. The contract applies to all members of the Butte Miners' Union, and has been carried into effect in all classes of mines, from the hill mines to those being worked on leases. On July 3, the contract was officially signed by a committee of the Miners' Union and by C. F. Kelley, vice-president of the Anaconda company, John D. Pope, manager of the North Butte company, and representatives of a number of other companies, and by the terms of acceptance, the scale went into effect beginning the first day of June.

At the Mountain View mine of the Anaconda, one of the cylinder heads of the engine used to operate the cages in the air-shaft, blew off on July 29, causing a cessation of work in that shaft until repairs can be made, which will require about 10 days more. As the work on the 1600- and 2000-ft. level was conducted solely through this shaft, nothing has been done there since. Up to the time of the accident a station 20 ft. wide, 30 ft. long and 20 ft. high had been cut on the 2000-ft. level, and a crosscut driven north 30 ft.; drifting had also been done for 20 ft. A 35-ft. sump has been cut below this level and a Knowles sinking pump is caring for the water, which amounts to between 15 and 20 gal. per min. at that point. A similar pump has been placed in the shaft at the 1900-ft. level, to assist the pump 100 ft. below. From this point the water joins the main flow from the mine, which is conducted into the High Ore mine through connecting workings and lifted to the surface by the large pumps at the latter mine. To counterbalance the effect of the temporary loss of ore from the 1600-ft. level, the miners on that level have been put to work in reserve stopes in other parts of the mine, thus preventing any decrease in the daily amount of ore hoisted.

Salt Lake City

July 11—Work has been started at the International smeltery at Tooele on the installation of the third lead furnace, which has been found desirable on account of the increasing tonnage of lead ores being received and contracted for. The present sintering capacity has been found to be inadequate, and four additional Dwight & Lloyd sintering furnaces have been ordered. A large force of men is at work, preparing for the additions and work is also being done on a new lead bag-house system and other improvements. The International has recently established a branch office at Spokane, to secure ores from the Cœur d' Alenes, and has also opened an office at Goldfield, to obtain further consignments in that section. A contract has been made with the Nevada Hills company for concentrates from the mill at Fairview. The concentrates carry much silver, reported to be about 600 oz. per ton. The Marsh mine in the Cœur d'Alenes is shipping several cars per week to the International and is preparing to double its output. Four reverberatory furnaces out of five are in operation smelting copper ores. The chief source of supply is the Utah Consolidated, at Bingham, though smaller shipments of copper ore are received from other Bingham mines. A contract has recently been made with the Bingham-New Haven, and its ores, both copper and lead, will be shipped over the new Highland Boy tramway, when bins, which are being built at the terminal for this purpose, have been completed. The expert investigation as to damage by smeltery fumes near the smeltery, shows that no injury is being done.

The completion of the Strawberry tunnel, one of the largest engineering undertakings of the kind in the state or in the West, was celebrated at Spanish Fork, July 2. This tunnel is 19,000 ft. long and was driven by the United States Reclamation Service, under the direction of J. L. Lytel, project engineer, to bring water from the Strawberry River and Basin, into Utah Valley, to irrigate 60,000 acres of land in the southern part of Utah County. More than $2,000,000 was spent in the work. The last blast connecting the east and west end of the tunnel was fired by pressing a button during the ceremonies of July 2. The project will be fully completed next year, and it is expected that the land to be reclaimed will prove to be the equal of any farming land in the intermountain region.

Deadwood

July 11—Close observers in the Black Hills district are of the opinion that there are more prospectors working in this section than for a number of years. This appears to be true in view of discoveries reported and a cursory census of the outlying camps. This condition of affairs is naturally gratifying to residents of the Hills, as without the prospector plying his vocation the chances for discoveries of new properties are small. This stimulation is probably largely due to two factors, one being the inquiries for mining investments which are being received in increased numbers by local brokers, and the other without doubt being the free-assaying service for prospectors instituted last fall by the Deadwood Business Club.

Purchases of gold bullion at the U. S. Assay Office at Deadwood for the first six months of 1912, amounted to $3,832,000, according to L. P. Jenkins, assayer in charge. Of this amount $1,949,000 was purchased in the quarter ended June 30. All of this was South Dakota gold. This does not represent the entire production of gold for this district for the six months, as not all of the bullion output is marketed at this office, and the figures do not, of course, include the value of ores shipped to smelteries outside of the Hills.

Houghton, Mich.

July 13—The most interesting work that has taken place in this district for some years, is the deep vertical shaft being sunk by the Hancock Consolidated Mining Co. This company's land adjoins the Quincy mine on the south, and the deep workings of the latter, together with geological evidence, indicated that the Pewabic lode, worked profitably for several decades by the Quincy company, traverses the Hancock company's land. The outcrop of the Pewabic lode was not available on Hancock land, however, and to intersect the underlay at a desirable point required the sinking of a deep vertical shaft. It is generally understood that no deep drill holes were sunk, preliminary to shaft work. This shaft was started about six years ago, was planned to sink over 3000 ft. and is about 9x30 ft. in size. It is now over 3700 ft. deep and is believed by the management to have entered ground adjacent to the Pewabic lode, the objective point. As sinking has progressed, the shaft and top works have been completely equipped with the most modern appliances for handling the ore economically, from the stope to the mill. Even a millsite has been procured. Long before the zone of the Pewabic lode was reached, the shaft passed through hitherto unknown lodes, one of which, at least, has been shown to be valuable.

Negaunee, Mich.

July 13—The Crystal Falls district is active in shipping ore after several years of desultory operations and it is hoped that this situation will continue. The Corrigan-McKinney mines, the principal ones in the district, are shipping all the ore that can be hoisted and steam shovels are working at the Dunn, Tobin and Armenia mines with indications that these large stockpiles will be cleared up this season. The Great Western stockpile so far has not been touched; the Bristol mine of Oglebay, Norton & Co. is shipping ore from stockpile and the Hemlock mine of Pickands, Mather & Co., at Amasa, is active. The latter mine, which was diamond-drilled recently under the direction of Professor Leith, with indifferent results, is reported to have found the continuation of its orebody on the bottom level, giving it a new lease of life.

Toronto

July 12—As a result of the action of some of the Cobalt mine managers to suppress high-grading, which has been practiced extensively in spite of the increased severity of the law, John Mitchell, Robert Pearce, and Peter Cassells were arrested on July 7 charged with stealing 240 lb. of ore. George P. Williams, a Pinkerton detective, secured evidence against them. For several weeks he assumed the character of a theatrical manager and gained the confidence of the suspected men with whom he proposed to coöperate. The ore is stated to have been taken from the Timiskaming mine.

Four hundred men are working on the construction of the Elk Lake branch of the Timiskaming & Northern Ontario Ry. and 11 miles of grading have been completed, on which the rails will be laid as soon as they can be obtained. It is expected that the line will be completed before the end of the year.

Cobalt

July 12—Chief Justice Falconbridge has adjourned the suit of David Faskin against the Timmins-Dunlap-McMartin Syndicate, until Sept. 23 for further hearing. The basis of the suit is a claim by Mr. Faskin for $640,000, being a 10% commission on the sale of the La Rose mine by the defendants to E. P. Earle, Col. W. B. Thompson and associates in New York. In this transaction the plaintiff says he acted as the broker or agent of the owners of the La Rose. The defendants state that Mr. Faskin did not act as agent, but solely in the capacity of legal adviser and that he accompanied them to New York only for that purpose.

During June, 17 Cobalt mines shipped 1751 tons of ore as compared with 2173 tons for the corresponding period of the preceding year.

The Mining News

The Current History of Mining

Alabama

A petition seeking to throw the Southern Iron & Steel Company into involuntary bankruptcy was filed in the Federal court at Birmingham last week. Three local creditors, claiming amounts of less than $1000 due them, filed the petition. James Bowron, president of the company, issued a statement when officially informed that the petition had been filed, in which he announced that certified checks for the amounts claimed would be tendered to the petitioning creditors and the effort to throw the company into litigation resisted. A motion was made the following day before Judge W. I. Grubb, of the Federal court, offering a demurrer to the petition and asking for a hearing on the demurrer by a jury. This will have the effect of delaying the matter a while at least. President Bowron asserts that the Southern Iron & Steel Co. was doing well under the conditions. The company is a reorganization of the Southern Steel Co., which was in litigation a few years back. Much foreign capital is invested in the concern.

Alaska

Cable dispatches state that a stampede is in progress to a new gold field in the Aniak district. The first discoveries are said to have been made last autumn. The district is difficult of access and freight taken in by the Kuskakwim River must be transported up Aniak Creek in poling boats or small gasoline launches. Conditions are said to be encouraging.

Arizona

GILA COUNTY

Inspiration Consolidated—The main west shaft is 110 ft. deep and is sinking 5 ft. per day. The main east shaft has just been started. A headframe is being erected and a 25-hp. Fairbanks-Morse gasoline hoist installed. The Scorpion shaft was sunk 111 ft. last month. On the Inspiration orebody, the first haulage level is being opened 90 ft. below the tunnel level, 18 faces being worked. A large number of raises are being driven above the tunnel level. It is estimated that 16,000,000 tons of ore are extractable through the first haulage level.

Southwestern Miami—Churn-drilling continues steadily with fair progress. Holes 6, 7 and 8 are 550, 580 and 340 ft. deep respectively and are all in the schist formation. Hole No. 5, being drilled jointly with the Live Oak and the Barney, is 980 ft. deep in the same formation. None of the holes has yet reached ore.

South Live Oak—Churn-drill hole No. 2 has been started in the granite formation at a point about 500 ft. westerly from hole No. 1. The new hole is now over 175 ft. deep in iron-stained granite.

Globe-Ray—John Gibson, superintendent of the Independence mine 14 miles southwest of Miami, being operated by this company, is making arrangements to ship ore to the Old Dominion smeltery. About 200 tons have been mined and sorted and are on the dump. The ore runs 7% copper, 4 oz. silver and $4 gold per ton.

Copper Reef Consolidated—This mine is situated 12 miles from the railway and consists of 125 unpatented claims. Equipment includes: One Ingersoll-Rand, Imperial 10-hp. compressor, two Ingersoll-Rand, butterfly-valve, C-110 rock drills and necessary equipment for compressor and drills; one 60-hp Stover engine; one pump for supplying mine and camp, and necessary pipes; tanks to receive 8000 gal. of oil, also a 2000-gal. supply tank. C. W. Saxman, San Carlos, is general manager.

California

AMADOR COUNTY

Zeila—Thirty stamps have been hung up while preparations are being made for the development of the orebody on the 140-ft. level.

Memphis—This mine near Plymouth is being opened. The installation of a 5-stamp mill is contemplated. The Memphis Mining Co. is the owner and J. E. Sciaroni is superintendent.

Hardenberg—The new vertical shaft has been sunk to 1025 ft. N. S. Kelsey, of Jackson, is superintendent of this mine and the South Amador. The properties are owned and operated by the interests that own the South Eureka and Oneida.

BUTTE COUNTY

Forbestown Consolidated Gold Mines—The Gold Bank group has an inclined shaft 1600 ft. deep, the bottom of which intersects the Gold Bank 8x8-ft. working tunnel. The Forbestown fissures are about 8 ft. between walls, carrying $8 in gold, with some silver and copper. M. J. Cooney, Oroville, is president.

CALAVERAS COUNTY

Lightner—A 10-ft. vein of good ore is reported to have been disclosed at the 900-ft. level. It has been contended that this and other mines in Angels Camp would be found to carry pay ore after the talc intrusion had been passed. B. C. Clark, of Angels, is superintendent.

ELDORADO COUNTY

Adjusta—It is reported that good milling ore has been disclosed and that a new stamp mill will be installed. C. A. Ingraham, of Placerville, is the owner.

MARIPOSA COUNTY

Marble Springs—J. A. Flink of San Francisco, has taken a purchase option on this mine near Kinsley. Mr. Flink recently purchased the Deer Flat mine near Coulterville.

MODOC COUNTY

Sunshine—Several wagonloads of ore from this mine were hauled to New Pine Creek for rail shipment on July 4.

Hess—This mine, 32 miles southwest of Modoc, is leased by P. A. Keegel and J. L. Harvey. The ore is treated in an uptodate 10-stamp mill; the sands are treated by percolation and slimes agitation and a saving of 90% of the assay values is reported. Steam and electric power are used. W. D. Bridges is in charge at the mine and P. A. Keegel, Adin, is general manager.

NEVADA COUNTY

Black Bear—This mine in the Rough-and-Ready district is being reopened. Mr. Woods is superintendent.

Mountaineer—Gold-bearing ore has been opened. The mine adjoins the Champion. P. and J. Bender and F. J. Sloat, of Nevada City, are owners and operators.

SAN BERNARDINO COUNTY

Oro Belle Mines Co.—This property at Hart consists of 52 acres of mineral land. A water supply has been developed on two millsites owned by the company, 1½ miles from the mine. Equipment for the delivery of water to the mine has been installed. The vertical shaft is timbered to a depth of 560 ft. and approximately 3500 ft. of development have been done. W. B. Andrews, Duluth. Minn., is president and general manager.

SHASTA COUNTY

The statement of the county assessor of the assessed valuation of Shasta County property shows a decrease of about $60,000 at Coram caused by the closing of the Balaklala smeltery. The total is thus reduced to $24,600. The total at Kennett, where the Mammoth smeltery is still in operation, is $205,950.

Sixteen-to-one—An attempt is being made to treat the sulphurets at this mine, one mile below the Oakman, by heap-roasting the slimes and concentrates.

Red Ledge—The leasers of this mine, south of Washington, have relinquished their bond. The property has reverted to the Williamson brothers.

Solano County

Pinal Dome Oil Co.—This is a new incorporation, capital stock $4,000,000, organized to prospect and develop oil lands in this county.

Yuba County

Marc Antony—The old shaft of this mine, at Smartsville, is being cleaned out preparatory to exploring the orebody that was opened at a depth of 200 ft. about 40 years ago.

Colorado

Clear Creek County

Mineral Chief—The mill, which is operated under a 5-year lease by Stephens & Old, started on July 8 with two 12-hr. shifts and it is expected that about 70 tons of ore per day will be concentrated. Twenty men are employed in mine and mill.

Creede—In the Wooster tunnel a station 70 ft. high has been cut by J. H. Berkshire & Co., of Kansas City, lessees, who will install machinery and sink a shaft 500 ft. They have a 20-year lease on the Creede United properties below the tunnel level.

Black Eagle—Lessees have recently made small shipments. Work is in progress on the 200- and 250-ft. levels near the shaft. The vein is about 2 ft. wide.

Oneida—John Owen, manager, has been making a series of cyanide tests on the lower-grade ores to determine the advisibility of erecting a cyanide plant. Preliminary results have been satisfactory.

Kelly—The compressor and mill at this tunnel are being overhauled preparatory to early resumption of work. At present development is conducted through the Moline tunnel on the New Boston vein. Dr. H. O. Marcy, of Boston, is the principal owner.

La Plata—An 8-in. vein of 230-oz. silver ore was recently opened by Joseph Broad, manager and principal owner, and he estimates that a small output can be maintained.

Humboldt—One new Wilfley table has been added to the milling equipment and ore from the Lamartine dump is being treated.

Capital—The company is installing equipment to drill an 8-in. horizontal hole for air purposes, a distance of 1100 ft., to connect with the ninth level of the Capital Prize mine.

Roadside—Development of the claims in Spring Gulch has been resumed under Ira Pollard, superintendent.

Lake County-Leadville

Park—During the last month Mankuss & Anderson shipped nine cars of iron ore, and six tons of high-grade gold ore from the Park lode in Adelade Park.

Lafayette—The five Lafayette claims at the foot of the Mosquito Range, are being operated under lease by E. M. Moorman, of Denver, with G. Nicholson as superintendent.

East Lake Creek—D. Thomas, superintendent, is driving a tunnel, now in 3200 ft., and he has driven 600 ft. of laterals on intersected veins.

Ella Beeler—A 2-ft. vein has been opened in this tunnel by A. S. Sharp & Co., 1800 ft. from the portal.

Small Hopes—Frank Zaitz, of Leadville, manager, is doing systematic development and is driving for the zinc orebodies in the Forest City ground.

Ouray County

The first train from Silverton into Ironton arrived July 1 and will begin hauling ore from the Barstow and Joker lease. The Gennessee and Congress mines are stacking high-grade ore for shipment to the railroad.

Wanakah—The Bright Diamond and Memphis groups, 13 claims, have been deeded to this company, John T. Roberts, Jr. manager.

Brown Mountain Smelting and Refining Co.—A. C. McCall, president, states that on Aug. 1 the smeltery will begin to buy ore.

Tomboy—During June the mill crushed 10,000 tons of ore, yielding bullion worth $17,000; concentrates worth $89,500 were shipped. Gross receipts were $106,500; expenses, $46,000; profit, $60,500. During the month $13,714 were spent on permanent improvement.

Teller County-Cripple Creek

Jerry Johnson—The output for June was 25 cars of $18 ore, from a new vein on the 550 level.

Gold Sovereign—Royalties from leasers are running about $1200 per month.

Henry Adney—Two cars of ore have been shipped from a new oreshoot and shipments are expected to be increased.

Mary McKinney—The main shaft has been sunk 190 ft. since the unwatering by the deep drainage tunnel and will be sunk 40 ft. more and the ninth level opened.

Modoc—Five cars of smelting ore were shipped during June.

C. K. & N.—The output for June was 27 cars of ore.

Idaho

Blaine County

Minnie Moore Mines Co.—This company, recently organized with a capital of $500,000, has purchased the properties and equipment of the Idaho Consolidated Mines Co., including a new 150-ton mill. The property was purchased, together with the 600-kw., hydro-electric power plant, at a receiver's sale on June 10, by L. R. White, formerly connected with the Idaho Consolidated. I. E. Rockwell is president and general manager, John A. Blomquist, of Boise, vice-president and L. R. White secretary. Mr Rockwell will be in charge and active development will be done.

Lipman—It is reported that the Mayflower, Bullion, Jay Gould and Red Elephant mines have been combined into one company and that this tunnel will open the properties at a depth of about 600 ft. below the present deepest workings. J. W. Sawyer, mining engineer, will be in charge.

Latah County

Mizpah Copper Mining Co. Ltd.—The company is installing an air compressor and drills, as hammer drills have been found too light for the formation in No. 5 tunnel. Vein No. 4 is 50 ft. wide and one car shipped ran 6% copper and $3.60 per ton in gold. It is hoped to commence shipping from the 250-ft. level soon. The ore will be hauled with teams or power trucks to the railroad until the latter is constructed to the mines. It is expected to grade the ore to about 10% copper and to ship one car per day for the present. The property is situated in the Hoodoo district in Latah County; Palouse, Wash., is the nearest shipping point. J. C. Northrup, Palouse, Wash., is manager.

Michigan

Copper

In the Journal of June 15, 1912, page 1199, we stated that the Algonquin company had been organized by R. C. Pryor, Hayden, Stone & Co., and Paine, Webber & Co., of Boston. We are informed that neither Hayden, Stone & Co. nor Paine, Webber & Co. have anything to do with this corporation, our correspondent having been in error.

Isle Royale—The mine is gradually increasing production. The company is handicapped in securing additional underground labor. A head in the Lake Milling company's plant will be used to handle the increased tonnage, and the concentrating department has recently been remodeled along modern lines.

Laurium—The shaft is temporarily bottomed at the 13th level, with drifts extending from the 11th, 12th and 13th levels. No stoping has been done and the ore is being stockpiled.

Oneco—This company is drifting north and south at the 11th and 12th levels. The lode is about 20 ft. wide, carrying copper throughout with about 3 ft. of it highly mineralized.

Calumet & Hecla—The construction work at Lake Linden is going forward satisfactorily. The piling for No. 2 regrinding mill has been completed and the foundation for the electric power plant extension is completed and ready to receive the structural steel which will be on the ground soon.

Hancock—No. 2 shaft is bottomed again in a copper-bearing formation which was encountered at about 3720 ft. depth. The lode has been opened for 10 ft., shows an encouraging amount of copper and the formation is of a more uniform character than any of the other formations that have been exposed recently. The management has not yet pronounced it the Pewabic lode, but it has the characteristics of that formation.

Iron

Oglebay, Norton & Co.—A general strike of miners has occurred at the Montreal and Ottawa mines on the Gogebic range. The men object to the company's interpretation of the contract system, claiming that when they make good wages the latter are cut down.

Cleveland-Cliffs Iron Co.—As an auxiliary to the new power plant at Marquette, the company is preparing to build a dam at Forty-acre Falls, on the Carp River north of Ishpeming, for water-storage purposes.

McPherson Exploring Co.—This company is drilling a hole on the site of the new Chicago & Northwestern Ry. union station for Iron River and Stambaugh. The fee owners desire to know if there is iron formation on the land, before building commences.

Montana

Butte District

Anaconda—At the Mountain View mine about 730 men are employed in underground and surface work, and an average of between 1800 and 1900 tons of ore per day is being shipped to the smeltery. On the 1400-ft. level a more direct haulage route for ore from the northeast vein system to the main hoisting shaft has been nearly completed, and within a month this ore will be hauled at a considerable saving in distance. Horses are still being used on the ore trains on this level, but heavy steel has been laid in preparation for the installation of electric motors, which will be made soon.

Broadwater County

East Pacific—R. A. Bell, owner of this mine near Winston, has given a lease and bond to J. H. Longmaid, of Helena. The mine was formerly worked through four main and four intermediate tunnels. Mr. Longmaid is having an examination made before starting operations.

Cascade County

Block P—The Barker Mines Co., which has been operating this property near Neihart for some time, has had the lease extended with an option to buy. The property comprises two quartz claims and a full complement of surface buildings and mining machinery.

Jefferson County

Elkhorn—Operations are still being carried on in the upper levels by the Longmaids, of Helena, and work will be continued for about a month before abandoning the mine. The pumps were pulled several months ago but the water has risen only to the 1400-ft. level and it will probably be six months before the upper levels are entirely flooded.

Madison County

Copperville—E. C. Hosner and the Elling estate, owners of this group of claims 12 miles from Virginia City, have sold the property to Butte men. During the last few years Mr. Hosner has done considerable development on the property with good results and the new owners will continue work. They intend to erect a mill eventually.

Bedford—Work has started on the construction of a road from the railway near Laurin to this mine, eight miles up Ramshorn Gulch. The property has been developed during the last two years by the Watters Tunnel Co. and a quantity of silver-lead milling ore blocked out. Preparations are being made to erect ore bins and shipments will begin soon.

Betsy Baker—Men are at work on this and the Gold Coin claims adjoining the Bedford mine. This property contains principally gold ore, with some silver and lead. William Walker and Martin Johnson, of Virginia City, are the owners.

Nevada

Churchill County

Copper deposits are said to have been found recently on the east side of the Silver Range, near Dixie Springs. These properties are owned by Winnemucca men.

Paul G. Reid has recently discovered a new district, called Adaven, about 35 miles west of Lovelock. The ores are silver-lead and carry about 4½ oz. of silver for each per cent. of lead.

Nevada United—This company, operating in the White Cloud district, is reported to have one vein 20 ft. wide, carrying 8% blende.

Mines Development Co.—This company, operating at Juniper Mountain, contemplates the installation of machinery with which to sink a shaft to 1000 ft. depth.

Comstock Lode

Ward—A flow of water has been tapped in the south drift, which is reopening old ground on the 2150 level of the Bullion, and the drainage has resulted in lowering the water 5 ft. in the Yellow Jacket incline, joint Crown Point and Belcher incline, and the Overman shaft. The drift has been advanced, its objective point being the old bulkhead constructed years ago to hold back the Gold Hill water. The Starret pump, which was secured to unwater the Ward shaft from the 2200- to the 2475-ft. levels, has been lowered into place.

Belcher—Exploration in the ore streak on the 1400-ft. level is being continued north and south from east crosscut No. 3; the material saved is being stored in the mine, pending repairs to the Yellow Jacket shaft.

Crown Point—Ore taken from the stopes on the 1400 level, is being stored in the mine. Run No. 7 has been completed at the Yellow Jacket mill, and a car of concentrates shipped to the smeltery.

Yellow Jacket—Extensive repairs are being made to the main hoisting shaft. The mill has been shut down while repairs are made to the sills and foundations.

Mexican—Five bars of bullion were shipped from the mill last week worth $17,000. There remain on hand to be shipped, bullion and precipitates worth $11,000.

Douglas County

Pittsburgh-Liberty Mining Co.—A petition has been filed asking that this company be declared an involuntary bankrupt. It is reported that the company owes about $40,000.

Buckskin-National Gold Mining Co.—The winze from one of the tunnel levels is reported to have disclosed gold ore. At a depth of 50 ft. a drift has been driven on the orebody. The vein matter is a highly altered porphyry, impregnated with iron sulphides carrying gold. Development consists of tunnels, opencuts and a winze.

Esmeralda County

Blue Bull—The retimbering and enlarging of the 400-ft. shaft on the Hat claim is progressing about 10 ft. per day.

Pioneer Consolidated—The company recently lost its gallows frame and hoist house by fire, with serious damage to the machinery.

Gold Mountain Mining & Milling Co.—The company is arranging for the construction of a 10-stamp mill on its property of seven claims in the Hornsilver district. The ground has been developed by leasers and four shafts, from 30 to 260 ft. deep, have been sunk.

Loriette—It is reported that the management of this company is surveying for an electric line from a point in Deep Springs Valley by way of Soldier's Pass to the Swab property. Power will be obtained from the Goldfield power line. A depth of 800 ft. has been reached and ore is being found.

HUMBOLDT COUNTY

Sulphur—Operations have been resumed by E. D. Rogers, superintendent. Conditions have been improved by the recent development of new bodies of sulphur.

Comet Placer—Two wheeled scrapers are being employed to scrape off the surface. This material is carted some distance and run through sluice boxes, the black sands being saved on Wilfley tables.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended July 6, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,500	89,919
Tonopah Belmont	1,950	54,576
Montana-Tonopah	1,030	27,622
Tonopah Extension	1,078	26,335
West End	750	19,209
Midway	.....	180
MacNamara	469	10,072
North Star	......	80
Totals	8,777	227,993
Estimated value	$219,425	......

As a consequence of the recent development in the Tonopah Merger mine, work is to be resumed on the Cash Boy, Golden Crown and Sully properties in that vicinity.

Tonopah Midway—The mine shipped to the smelters in the week ended July 12, 40 tons of $50 ore, and 40 tons of $70 ore.

Tonopah Extension—The management states that after the payment of the recent dividends the company had a cash balance of $135,000. In the last three months ore reserves have been increased and the average grade of the ore has improved. The output for June was the largest since the mill was started.

MacNamara—The output of the mill for 15 days ended July 9 was 912 lb. of bullion, worth $10,600, from 1006 tons of ore.

Tonopah-Belmont — There was some delay in starting the new mill but the crushing plant was started on July 9 and is crushing 500 tons per shift. About 2000 tons will be placed in the mill bins before dropping the stamps.

Tonopah Mining—The report for May states that 14,948 dry tons were milled, averaging $18.08 per ton, returning 254,700 oz. of gold and silver bullion worth $206,700, and 100 tons of concentrates worth $34,350. The net profits for the month were $141,152.

WHITE PINE COUNTY

Reports state that Frank C. Armstrong, of New York, has secured control of the Coppermines Co., including 550 acres of mineral lands and 3000 acres of ranch lands, and millsites. The property adjoins the Ruth claim of the Nevada Consolidated.

Giroux—J. B. Cotton, vice-president, is reported to have stated recently that June shipments from the Brooks and Bunker Hill mines totaled more than 23,500 tons and that they have averaged 1000 tons per day so far this month. Part of these shipments were from stock pile and part from the mine. From now on all shipments will be made from underground and will be kept up to the limit of the contract with the Steptoe plant.

New Jersey

It is stated that the recent public sale of the Green Pond iron mines, near Rockaway, a portion of the holdings of the Carteret Steel Co., was not confirmed by the court in consequence of a legal error, and that the property will again be sold, probably in September or October, by W. I. Lewis, Master in Chancery, of Paterson, New Jersey.

New Mexico

GRANT COUNTY

Atwood—This mine, three miles from Lordsburg, is owned and operated by the Atwood Copper Co., A. W. Morningstar, manager. The main working is 310 ft. deep. Three levels, at 75, 148 and 210 ft., were started by the former operators. Two veins carrying gold, silver and copper have been found on the 210-ft. level. Drifting has opened 4 ft. of ore on the south vein, and 12 ft. on the middle vein. Ore from development is shipped to the Copper Queen smeltery at Douglas, Ariz., where it is used for converter lining. The shaft is sinking at about the 300-ft. level and pockets have been installed on the 200-ft. level and will be placed at each level as work progresses. New hoisting machinery has been ordered, loading bins have been arranged on surface with grizzlies and sorting tables, and a 48-ft. headframe is in place. It is the intention to install milling machinery when further development has been done. J. L. Wells, Lordsburg, is consulting engineer.

Oregon

BAKER COUNTY

North Pole—The mine has been closed down and the men discharged, due to failure to open the orebody and the exhaustion of funds.

Dixie Meadows—This mine near Prairie City is closed down and the supplies and equipment are being sold.

Red Boy—A tube mill, recently purchased from the Cougar mine, is being installed.

South Dakota

LAWRENCE COUNTY

Wasp No. 2—The mill capacity has been increased to 520 tons per day. Mill heads have averaged a little under $2 per ton for the last two months. Returns from a recent shipment of high-grade smelting ore were $158 per ton. The orebody is small and it lies under the main low-grade orebody; it is removed as the mill ore is taken out.

Kiemer Gold Mining & Milling Co.—This company was recently organized at Deadwood with H. Kiemer, president; Olaf Seim, vice-president; Mrs. E. R. Kiemer, treasurer and Jesse Simmons, secretary. The company owns 210 acres adjoining the city limits of Deadwood on the southwest. A body of porphyry ore may possibly be cyanided. Development is under way.

Homestake—The work of connecting up individual motors to the rock crushers at the shafts has been completed and the entire crushing and stamping department is being operated by electricity.

Bismarck—Construction work at the cyanide plant, at Flatiron, adjoining the Wasp No. 2, is being pushed, and it is expected that the mill will be in operation in the early autmun.

New Reliance—The recent assessment is intended to take care of indebtedness and provide funds for work. The property has a body of mill ore, and a 30-stamp cyanide plant, in the Bald mountain district.

Trojan—The mill is handling 180 tons per day in the first unit, and preparations are being made to place the second unit in operation. Charles E. Ellis is mill superintendent.

Utah

JUAB COUNTY

Tintic shipments for the week ended July 5 amounted to 138 cars, the output being smaller than usual on account of the Fourth-of-July intermission.

Gold Chain—During the year the company has shipped about 300 cars, which is in excess of the total production of the preceding year. Receipts for June are stated to be about $20,000. The new orebody on the 700 level is opening up well.

Eagle & Blue Bell—There were shipped from the 700-ft. level and winze during June, 221 tons of ore worth $21,731. Ore marketed from the 1300 level during the same time amounted to $14,000, bringing the total reported production for the month to $35,000.

Eureka Hill—There is talk of resuming operations at this mine worked by leasers during the last year.

Opohongo—Work on the 1000-ft. level has been temporarily discontinued to allow for new development on the 600. The company's power is insufficient.

May Day—Three cars of zinc ore amounting to 125 tons have been shipped, bringing in about $3600. Ore of this character is being accumulated, pending the adjustment of freight rates. The Knight Power Co. has contracted to furnish power for the new electric hoist.

Majestic—During June, 16 cars of ore were shipped from the Old Hickory and 10 cars were broken down in the mine, ready for shipment. Returns on two cars gave $8.84 per ton, including all charges except freight, which amounts to $1.75 per ton. July shipments will be increased.

Victoria Consolidated—A crosscut has been driven 15 ft. in ore of shipping grade, on the 1200 level. This is thought to be the same ore as that opened on the 1050 which gives much stoping territory. There are about 700 ft. of ground on the north, and also unprospected territory on this vein south of the shaft.

Salt Lake County

Ohio Copper—At a special meeting in Portland, Maine, July 1, the plans for reorganization were ratified by the stockholders. Statements have been forwarded to stockholders.

Yampa—The aërial tramway is being overhauled preparatory to resumption of work.

Montana-Bingham—The tunnel is in 1100 ft. and progress of about 4 ft. per day is being made. The face is still in Montana-Bingham territory.

Michigan-Utah—A consignment of 131 tons has been marketed, bringing about $40 per ton. Regular shipments are being made. The reconstruction of the old 4½-mile tramway from the City Rocks mine to Tanners Flat is to be started soon.

South Hecla—Working forces have been gradually increased to 16 men. No. 3 drift is following a fissure mineralized with copper and silver. Work has also been started in the Wedge fissure. G. H. Watson is in charge.

Emerald—Work has been started by San Francisco men.

Alta Consolidated—During June, settlements were received on three lots of ore, which are said to have brought in more than $10,000. The last lot sampled as follows: Silver, 75.4 oz.; lead, 11%; copper, 5%; silica, 26%; zinc, 11.02%; sulphur, 24.8%; speiss, 1%; iron 13%. A. O. Jacobson is superintendent.

Columbus Consolidated—A good showing is reported on the upper levels. The lower part of the mine is under water.

Cardiff—Shipments were expected to begin July 8, and will continue throughout the summer. Shipping ore averages from $40 to $50 per ton.

Neva—New directors have been elected for this property near the Cardiff. It will be inspected by them soon with a view to resumption of development.

Tar Baby—A mineralized fissure has been cut in the tunnel, now 330 ft. long.

Silver King Coalition—The annual report for the year ended Apr. 30, 1912, shows that during the year 21,506 dry tons of first-class ore and 86,387 tons of second-class ore were mined, from which concentrates amounting to 14,106 tons were produced. The ratio of concentration was 6.12: 1. The average assay value of the crude ore was 28.35% lead; 50.06 oz. silver; 0.0551 oz. gold. Ore sales brought $1,265,808, and leasers' royalties, $6895, which, with $4933, miscellaneous income, brought total receipts to $1,277,687. Disbursements, including the purchase of the Uintah-Treasure Hill Coalition Mining Co.'s property, amounting to $910,626. There was cash on hand, Apr. 30, $367,011. Electric haulage was installed in the Alliance and on the 900 level, ventilation has been improved and the mill, sampler and tramway are now operated by electric power.

Tooele County

Norma—The company is operating the old Helvetia, or South Daisy mine. This is the property that was unsuccessfully operated by the Daisy Combination Gold Mining Co., two years ago. The mine has a strong shoot of $6 ore on the 600 level, and prospects appear favorable. The company has leased the Daisy mill, and is remodeling it, so as to duplicate practically the Boston-Sunshine installation. The ore will be crushed in a rockbreaker and rolls, and classified into sand and slime with Consolidated Mercur mixer-classifiers and Dorr classifiers. The sand will be sluiced to leaching tanks, leached, and tailing sluiced out. The slime will go to a Dorr thickener, and thence to a Moore filter. Zinc-shaving precipitation will be used. The plant was designed by George W. Wood.

Wisconsin

The district is suffering from a shortage of miners, laborers and teams.

Wisconsin Zinc Co.—The company recently took over the East End lease. A good run of zinc ore was shown by churn drill and shaft. Work of moving the Acme mill to the East End has commenced.

Trego—The mine is in operation again under the management of C. C. Mathey.

Norcross—Mining and milling has been resumed with new pumping equipment.

Vinegar Hill—The company has reopened the Brown mine at Shullsburg.

Federal Lead & Zinc Co.—The company has taken over the Jack-of-Clubs mine at Benton.

Baxter—This former large producer at Cuba City has been purchased from the Janesville owners by men associated with the Frontier company and work will be resumed.

Raisbeck—This old mine at Benton has been taken over by the Vinegar Hill company and a mill has been erected.

Cleveland—This mine at Hazel Green has developed a body of zinc ore from which about 200 tons per week of concentrates are being shipped.

Sally Waters—This mine is being unwatered by the Selivier Mining Company.

Rowley—This mine, at Strawbridge, is shipping regularly under the management of the Vinegar Hill company.

Wyoming

Platinum Mining & Milling Co.—This company, which is now operating the New Rambler mine, has shipped some of the raw ore but is now remodeling the concentrator. It is stated that results from ore shipments have been satisfactory. At present ore is being stockpiled and this will be treated later in the concentrator. It is expected to ship the concentrates to Germany. Julius Thielman is president and general manager, at Holmes, and W. M. Ruggles is mine superintendent.

Beck—One successful trip has been made with a 60-hp. Rumely oil tractor, from Rock Springs, from which point future freighting will be done to the mine at Atlantic City. Custom freighting also will probably be done. The mine is 36 miles from the Chicago & Northwestern Ry. and 90 miles from the Union Pacific railroad.

Canada

Alberta

Keystone Portland Cement Co.—This company which is backed by a syndicate of Belgian men, will construct a cement plant at Blairmore, at a cost of about $400,000. The plant will be one of the largest in Canada with a capacity of 1500 bbl. per day and is to be completed early in 1913.

British Columbia

Le Roi—The concentrator built in 1904 near the mouth of the Black Bear tunnel to concentrate the low-grade ores on the dumps, and used only for a short time, is now being equipped with a 30-ton unit of the Elmore Vacuum Process, Callow screens and Wetherill separator. These machines will be used to concentrate the siliceous ores of Le Roi mine.

Centre Star—The assay office was badly damaged by fire on June 6. The assay office at Le Roi mine is being moved near the Centre Star orebins where a concrete foundation has been laid for it. The assaying for the mines of the Consolidated company in Rossland will be done on the new site. The change will greatly facilitate the work.

Blue Bird—A 3-drill compressor and a 60-hp. boiler are being installed. Shaft sinking will be resumed when the machinery is in place.

Rambler-Cariboo—A shoot of high-grade silver-lead ore has been found on the 1400-ft. level. It is calculated that the main shoot is still about 100 ft. ahead.

Slocan Star—The crosscut being driven at depth is in between 1600 and 1700 ft. Progress is at the rate of about 10 ft. per day. The distance yet to be driven is 500 to 600 feet.

ONTARIO

Explorations for oil and platinum are being conducted south of Chelmsford, near Sudbury. The platinum is supposed to occur in veins with arsenical iron pyrites, in the slate. The oil indications are also in the slate, near the occurrence of so called coal, the anthraxalite of the Canadian Geological Survey. This district was once drilled for coal.

Long Lake—Work at this gold mine, northwest of Sudbury, has been suspended pending the installation of power facilities. Equipment includes a 20-stamp mill and extensive development has been under way for two years. The ore is quartz containing about $9 per ton in gold.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended July 12, and for the year to date, are:

La Rose	....	1,891.57
Coniagas	32.95	1,143.63
O'Brien	......	276.23
Right of Way	......	153.46
Chambers-Ferland		225.50
McKinley-Darragh	106.71	1,457.86
Nipissing	31.25	1,160.60
Hudson Bay	32.54	408.27
Buffalo	26.65	669.07
Crown Reserve	22.99	302.08
Cobalt Townsite	42.00	810.63
City of Cobalt		812.51
Tretheway		283.54
Colonial		41.60
Kerr Lake		424.14
Cobalt Lake	......	341.69
Drummond		330.30
Temiskaming		586.91
Beaver		180.90
Wettlaufer		111.21
Provincial	......	22.22
Casey Cobalt	99.80	212.15
Lost and Found	......	15.00
Totals	394.89	11,504.63

Bullion shipments in ounces

Nipissing	65,822.80	1,976,732.29
O'Brien	13,219.00	112,147.72

Nipissing—The output for June was worth approximately $225,162. The high-grade mill treated 181 tons, bullion shipments amounting to 326,278 oz., worth $198,824. The hydraulic operations have led to the exposure of new veins. An extension to vein 92 has been disclosed carrying from 1 to 2 in. of high-grade ore and two other veins have been found. Vein No. 73 continues to be the principal producer.

Cobalt-Majestic—This company, now in liquidation, is paying all creditors' claims in full, one of its properties having been sold. It is hoped that the proceeds of the remaining claims, one of which is said to be of considerable merit, will enable a dividend to be paid to the shareholders.

Crown Reserve—The construction of a power house will be commenced soon, so as to render the company independent of outside assistance in development work. By Oct. 1 power is expected to be available.

ONTARIO-PORCUPINE

Pearl Lake—Air for mining purposes is being obtained from the Plenaurum, on account of the air-compressor motor having been burned out.

Fisher-Baubion-Bonneau Syndicate—This company's property in Shaw township is being tested with diamond drills. The results are stated to be encouraging.

Dome Lake—The company has decided to erect a 10-stamp mill. Three shafts are being worked and the results of underground development are satisfactory.

Porcupine-Hudson Bay—This property is being examined for New York men.

Krist—This property is being developed by German men. A 50-ft. shaft will be sunk and diamond drilling carried on from a crosscut at the bottom.

Hollinger—The first clean-up of the new mill resulted in a $5000 brick. Gilbert Martin, an electrician's helper at the McIntyre, was killed on July 5, at the transformer house at the Hollinger property, by falling against a high-tension wire.

Hughes—The installation of the new compressor and steam plant on this property has been completed and development work resumed.

ONTARIO-SUDBURY

Mond Nickel Co.—The company is developing a portion of the Froud deposit, purchased from W. McVittie about a year ago, and is sinking a vertical shaft to 1000 ft. depth. The drilling on the Blue Lake property, belonging to McVittie and Cochrane, has been concluded and the option has been relinquished. The new plant at Conniston will not be completed for another year. Extensive equipment is being provided and the ultimate capacity will probably be about 1000 tons per day. This plant will supersede the 300-ton works now in operation at Victoria.

Dominion Nickel-Copper Co.—This company has resumed drilling at the Murray mine.

Moose Mt.—The Gröndal magnetic-separation plant this company is building, will soon be ready to make a test on one unit, which will also include the Jordan impact pulverizer.

Mexico

JALISCO

Mezquital del Oro—This gold mine north of Guadalajara is under option to an American syndicate. It was extensively developed and operated by a British company but has been idle for several years, except for intermittent periods.

MEXICO

El Oro—During June the mill treated 20,030 tons of ore and 15,020 tons of tailings, yielding bullion worth $160,980. Working expenses were $92,350 and $14,860 were expended on development. Permanent mine improvement cost $4640 and total profit, including railway, was $69,040.

SAN LUIS POTOSI

La Bufa—About 30 men are employed at this mine near Charcas, and owned by the Empire Zinc Co. J. S. McKinnon is manager.

Tiro General—The standard-gage railroad from Los Charcos to this mine, a distance of eight miles, is nearly completed and ore shipments over this line will soon be increased. About 1200 men are employed in the mine and on the railroad. S. F. Shaw is superintendent.

SONORA

Muchacho Grande—Work on this property on the Mayo River, north of Alamos, has been suspended for some time owing to the unsettled conditions. It is expected that development will be resumed soon and that a concentrating plant will be installed. W. R. Layne is manager.

Lucky Tiger-Combination Gold Mining Co.—A report for the first four months of 1912 shows that net profits from operation were approximately $45,000 per month. The net profit for May was about $75,000, of which $37,000 came from the operation of the cyanide plant, which is working well. During May 6183 tons of ore were concentrated; tailings cyanided, 7728 tons; estimated value of shipping ore, $30,000; concentrates, $64,200; bullion from cyanide plant, $70,400; total May production, $164,600. Considerable high-grade shipping ore has been discovered on the fourth level of the Sooy vein. The directors have voted to observe a more conservative policy in the future as regards dividend disbursements.

South America

CHILE

Braden—The indications are said to be that the preliminary figure of 23,000,000 tons ore reserves, assaying 2½% copper, may be exceeded in the final estimate. The Teniente orebody is being developed by the Teniente tunnels which are reported to be in ore at present.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, July 17—Coal trade in the West continues rather slow, and it is evident that large consumers have not come around to the point of putting in stocks. Possibly they will not until supplies are less abundant and pressure to sell less strong. Lake trade is in pretty full swing and promises to show a good season.

In the East the Seaboard bituminous trade is exceedingly dull and prices low. Anthracite business is better up to the mark, but is not especially active. The pinch in this trade will come later, when the April and May deficiencies have to be made good.

Coal movement through Sault Ste. Marie Canals, season to July 1, short tons:

	1911	1912	Changes
Anthracite..........	520,000	224,908	D. 295,092
Bituminous........	3,689,282	3,715,397	I. 26,115
Total.............	4,209,282	3,940,305	D. 268,977

The decrease this year was entirely due to the light anthracite shipments in May.

German Coal Trade—Exports and imports of fuel in the German Empire five months ended May 31, metric tons:

	Exports	Imports	Excess
Coal..............	13,022,847	2,997,757	Exp. 10,025,090
Brown coal....	23,124	2,934,312	Imp. 2,911,188
Coke...........	2,208,802	220,702	Exp. 1,988,100
Briquettes	1,096,780	75,381	Exp. 1,021,399
Total	16,351,553	6,228,152	Exp. 10,123,401
Total, 1911...	13,384,462	7,513 176	Exp. 5,871,286

Exports this year included 9583 tons of coke to the United States.

German Coal Production—Production of coal and coke in the German Empire five months ended May 31, metric tons:

	1911	1912	Changes
Coal	66,334,976	70,817,532	I. 4,482,556
Brown coal	30,002,035	33,212,644	I. 3,210,609
Total mined ..	96,337,011	104,030,176	I. 7,693,165
Coke made	10,558,503	11,439,556	I. 881,053
Briquettes made.	8,722,322	9,683,358	I. 961,036

Of the briquettes reported this year 7,615,616 tons were made from brown coal or lignite.

IRON TRADE REVIEW

New York, July 17—The unexpected point in iron and steel markets is an increase in new orders at a time when a falling off was generally expected. In spite of the season demand continues strong, and the only difficulty is in keeping up with deliveries. Production has been decreased by the continuance of extremely hot weather, which much impairs the efficiency of labor.

The labor situation grows weekly more acute, some mills being actually crippled through the shortage, and the tendency to advance wages is becoming more marked. The Jones & Laughlin Steel Co., July 16, announced general advances to all workmen except those paid tonnage rates, making advances of 5 to 10% in rates paid by the hour and day. This follows a number of advances made by smaller mills. As a rule no publicity has been given to these advances, as the mills are competing for men and when the management of one plant makes an advance, it does not care to have the news widely circulated. The recent strike at the Pennsylvania plant, Pittsburgh, of the National Tube Co., was settled by giving the men several important concessions.

The mills have been closing for the shortest possible periods for repairs, but production is materially curtailed from this cause and on account of the extreme heat, the latter, on account of the high humidity, effecting blast-furnace production as well. From this cause the mills will close the month with nearly as large a tonnage on books as at the opening, though specifications are materially reduced as compared with June. The volume of specifying is, however, very good for the season, and better than was expected.

Foundry iron has been quieter, so far as large sales are concerned, though many small orders are coming in. Basic sales have been good and some bessemer iron sales are reported. The coke question is still a disturbing element, while the number of idle merchant furnaces is an argument against higher prices.

The monthly report of the United States Steel Corporation shows that on June 30 the unfilled orders on the books reached a total of 5,807,346 tons of finished material. This is an increase of 56,366 tons over May 30, and of 722,585 tons over Dec. 31, 1911. It is the largest total of unfilled orders reported at any date since Dec. 31, 1909. Deliveries during June were large but they were apparently exceeded by the orders received.

Baltimore

July 15—Exports for the week included 2003 lb. selenium to Hamburg; 420,780 lb. steel plates to Rotterdam; 3,697,300 lb. steel rails and 230,559 lb. rail fastenings to Vera Cruz. Imports included 100 tons ferromanganese from Rotterdam; 4416 tons cupreous pyrites from Huelva, Spain; 24,150 tons iron ore from Cuba.

Birmingham

July 15—There is a little selling of pig iron going on in the Southern territory for delivery during the last quarter of the year. The furnace companies are holding firmly to the new price, $12 per ton, No. 2 foundry. Third-quarter iron can be purchased at $11.50 per ton, but the manufacturers are booking orders with care, to obviate trouble in filling the orders promptly. The make in this section of the country is to be increased during this month by the blowing in of a furnace, while for the next month it is expected two blast furnaces will be ready. At the present quotations Southern iron makers are getting a better profit than for two years and more. The output during July will show an increase over June.

Considerable foreign business has been booked by Southern makers recently, shipments having been started on iron toward Panama, Australia and Italy, while steel billets have been shipped by the Southern Iron & Steel Co. to Liverpool.

There is no end to the cast-iron pipe demand and the plants will be operated through the balance of the year. Additinal small orders for steel rails and shapes are reported and the general steel conditions are favorable. Machine shop and foundry proprietors are complaining of present conditions. The Mississippi floods, the revolution in Mexico and the revolution in Cuba have disturbed the trade.

The petition seeking to throw the Southern Iron & Steel Co. into involuntary bankruptcy has not yet disturbed the operations of that company.

Chicago

July 16—The iron market shows decided strength for a midsummer time. Sales of pig iron are running larger, several having been made in the last week of 500 to 1000 tons and the tendency is to buy more freely for last-half requirements. There is, however, no boom and the change is considered an indication of the real business in sight rather than any speculative turn. A few inquiries have been made for tonnage running over into 1913, but prices quoted have been too high to stimulate business.

Northern No. 2 foundry and malleable iron sell for $15@15.50, and Southern No. 2 brings $11.50@12, Birmingham, or $15.85@16.35, Chicago, on most sales.

There is some sale at slightly higher and lower prices, depending on conditions. The sellers adhere in general to higher prices for the future.

For finished products the demand continues heavy, with local mills crowded and little new business actively sought. Structural material has a widely distributed sale, though individual sales are not large; bars are in very good demand; railroad buying is large, from standard rails to track fastenings and in plates and sheets there is no significant change from the good demand that has existed for several weeks.

Cleveland

July 15—Iron ore movement is active. There is a little belated buying.

Pig Iron—The market is quiet and sales mainly of small lots. The prices are firmly held. Quotations, Cleveland delivery, are $15.15 for bessemer, $13.75 for No. 2 foundry and $13.25 for forge.

Finished Material—Business has quieted down since July 1, and new orders are rather light, except that there is quite a rush for iron bars, and a fair demand for sheets. Jobbers in this district report that business is good.

Philadelphia

July 17—The advance in coke, the oversold condition of many furnaces and the disposition of many buyers to cover future requirements accounts for the strong condition of the pig-iron market. An advance of 25c. can be made and a further advance is said to be possible. Basic iron is moving upward under liberal sales and improving inquiry. Forge is exceptionally strong, and foundry, especially the better grades, is not easily to be had. Low-grade irons are not as easily to be found and large sales have been made for delivery within this district and outside. The feeling among large consumers throughout the East is to look out for the future. The quotations for No. 2 foundry are $15.75; Virginia iron, $16; gray forge, $15; basic, $15.50; and low phosphorus, $20@25 per ton.

Steel Billets—Billets are advanncing and urgent inquiries are coming to hand from points outside of our territory.

Bars—Bars are selling in a moderate way at 1.30c., and inquiries are rather backward, though most of the mills are well filled.

Sheets—The sheet mills are well supplied with business and offers at requested concessions have been held up by mill men, who believe that further advances are to be safely counted on.

Pipes and Tubes—Tubes are again active. The impression prevails that prices will advance.

Plates—The rush for steel plates continues and the mills are crowded to the limit. A great deal of new work, involving steel plate is in sight.

Structural Material—The advancing prices have had a stimulating effect on many buying interests. Some authorities predict that large consumers will soon precipitate orders on the market of exceptional magnitude. Quotations, 1.45@1.50c., tidewater.

Scrap—A great deal of scrap is arriving at the yards and the supply for the present is beyond current requirements. The yard men are making their own terms as to prices and are willing to stock up and hold supplies for autumn distribution.

Pittsburgh

July 16—The American Sheet & Tin Plate Co. this morning announced advances of $2 a ton in uncoated products and $3 a ton in galvanized, making black sheets, 28 gage, 2.05c.; galvanized, 28 gage, 3.15c., and tin-mill black plates, 28 gage, 2.00c. As there is a wide-open market, the new prices do not become the market, which has lately stood at the old prices of the company, as advanced Apr. 11, but the market will probably stiffen to the new rates in a short time. There has been considerable contracting lately, particularly with the automobile and agricultural-implement makers for their respective seasons, at advances from the minimum of the market for early deliveries.

Pig Iron—The market is steadily and more rapidly stiffening, though there is relatively little new buying. The basic market has been helped by the buying of two or three purchasing interests, one large one in particular having picked up 20,000 or 25,000 tons. This buying, with a little by consumers, has cleared off all the $13.25 basic iron and the market is quotable at a minimum of $13.50, Valley. In foundry iron, the $13.25 quotation has quietly disappeared, and this is true also of malleable, so that it may be said in the past week the whole local market outside of bessemer has advanced 25c. Bessemer awaits some active buying. It would not be surprising should some of the large steel works take to buying bessemer within the next 30 days, and this might send the market to $15 ro higher, for there is now no question that the iron and steel market is assured of good conditions at least until nearly the close of the year, and most judges express confidence that the good business will not end there, but will make 1913 a better year than this. We quote: Bessemer, $14.25; basic, malleable and No. 2 foundry, $13.50; forge, $13@13.25, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is quiet, but with occasional buying for late delivery this year. We quote prompt at $50@52, and forward at $48.50, f.o.b. Baltimore.

Steel—Mills have bought limited tonnages of sheet bars at $22, maker's mill, and have bid this price for more, for delivery this side of Sept. 1, without getting the steel. Billets are equally strong, and small billets frequently command higher prices than sheet bars. There is very little tonnage available. The mills are fully sold up for the current quarter and are not ready as yet to name prices for fourth quarter. We quote billets at $21.50 and sheet bars at $22, f.o.b. maker's mill, Pittsburgh, and billets at $21@21.50 and sheet bars at $22, f.o.b. maker's mill, Youngstown. Rods are generally quoted at $25, Pittsburgh, but this price could probably be shaded 50c., as formerly.

Sheets—As noted, the American Sheet & Tin Plate Co. has advanced its prices, effective today, and the market as made by the independents will probably work up to the new basis soon, as the mills have been receiving heavy specifications on old contracts and have been making some new ones, being filled up with actual specifications for from four to eight weeks, and having the major part of their probable output for the balance of the year already under contract. Some of the mills are still willing to do the old prices, and we quote: Black sheets, 28 gage, 1.95@2.05c.; galvanized, 28 gage, 3.00@3.15c.; blue annealed, 10 gage, 1.45c. The advance in flat sheets by the leading interest makes its prices on 28 gage corrugated as follows: Painted, 2.25c.; galvanized, 3.20c. per pound.

Connellsville Coke—Prompt Connellsville furnace coke has been selling in the past week at all the way from $2 to $2.40. It is claimed the prices from $2 to $2.25 were on inferior cokes, purchased by blast furnaces in the hope of breaking the lines of the operators, who are demanding $2.50 on contracts for the balance of the year. It is known, however, that a few of the operators who are asking $2.50 on contract have slightly shaded the figure on prompt. The question of whether the furnaces will have to pay $2.50 on contract remains unsettled, but the developments in the past week seem to be slightly in favor of the furnaces.

St. Louis

July 15—A few contracts for small lots of iron have been closed but the market in general is dull. Prices are steady, though a trifle lower than a month ago. Those who were quoting $11.50 Birmingham a month ago have nearly all dropped back to $11 on business moving in the next 60 days. As a matter of fact there has been $11 iron on the market all the time. The current quotation is $11 Birmingham or $14.75 St. Louis on No. 2 Southern foundry. Northern iron is being quoted at $15.75 St. Louis, though very little is moving.

Good foundry coke is quoted at $5.65 St. Louis.

Iron Ore Trade

Shipments of iron ore from the Lake Superior district in June were 7,567,555 tons, the largest ever reported in June. For the season to July 1 the shipments, as reported by the Cleveland *Iron Trade Review*, were, in long tons:

Port	1911	1912	Changes
Escanaba	1,067,708	1,641,948	I. 574,240
Marquette	533,738	918,890	I. 385,152
Ashland	662,412	1,332,801	I. 670,389
Superior	2,944,954	4,344,331	I. 1,399,377
Duluth	2,050,134	2,845,478	I. 795,344
Two Harbors	1,577,426	2,607,223	I. 1,029,797
Total	8,836,372	13,690,671	I. 4,854,299

Of the June shipments 5,816,493 tons, or 76.9% of the total, went to Lake Erie ports.

United States Foreign Trade

Exports and imports of iron and steel and of machinery in the United States for five months ended May 31, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1911	1912	Changes
Exports	$104,423,821	$118,568,383	I.$14,144,562
Imports	13,150,714	11,021,069	D. 2,129,645
Excess, exp.	$91,273,107	$107,547,314	I.$16,274,207

Increase in exports 13.5%; decrease in imports 16.2%. The leading articles of iron and steel were, in long tons:

	Exports		Imports	
	1911	1912	1911	1912
Pig iron	69,387	104,497	69,889	41,564
Scrap	39,778	42,127	8,762	6,950
Billets, blooms, etc.	117,119	112,155	16,870	7,858
Bars	59,861	77,976	17,265	8,198
Rails	186,609	177,232	.	1,056
Sheets and plates	135,866	212,543	1,073	1,102
Structural steel	84,624	100,477	. .	888
Wire-rods	7,761	27,792	7,115	6,220
Wire	86,332	94,395	.....	......
Nails and spikes	31,703	42,266	.....	......
Tinplates	20,381	36,548	10,389	844
Pipe and fittings	69,465	100,321	.....	......

Imports of wire are not reported in quantities; values were $279,128 in 1911 and $319,310 in 1912. Exports of mining machinery in 1912 were valued at $2,732,265, a decrease of $179,812 from last year.

METAL MARKETS

New York, July 17—Comparative quiet has characterized the metal markets this week, though speculation in copper is still active abroad.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
May 1912	$ 4,450,899	$ 3,346,491	Exp. $1,404,408
" 1911	6,817,149	5,014,741	Exp. 1,802,409
Year 1912	26,225,801	19,653,285	Exp. 6,572,516
" 1911	10,176,807	29,005,312	Imp. 18,828,505
Silver			
May 1912	6,725,781	4,345,032	Exp. 2,380,749
" 1911	5,054,304	3,555,842	Exp. 1,498,462
Year 1912	28,623,028	20,384,764	Exp. 8,238,264
" 1911	28,665,500	18,454,155	Exp. 10,211,345

Exports from the port of New York week ended July 13: Gold, $2,180,925 chiefly to Paris; silver, $927,103, largely to London. Imports: Gold, $624,070; silver, $101,541, from England, Mexico and South America.

Gold—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Nearly all supplies received went to the Bank of England. In New York some more gold went to Paris; on the other hand some was received from London.

Iridium—The current price of this metal is $63 per oz., New York.

Platinum—The market is quiet and prices are still unchanged, dealers asking $45.50 per oz. for refined platinum and $48 per oz. for hard metal. The foreign market is still unsettled and prices rather nominal.

Our Russian correspondent writes, under date of July 4 that the market and prices are generally without change. The demand from abroad is insignificant and therefore in St. Petersburg no business is forward. The offer of platinum by the starateli at Ekaterinburg has increased considerably, work on the placers being active. Crude metal, 83% platinum, is quoted in St. Petersburg—37,500 rubles per pood; at Ekaterinburg 9.80 rubles per zolotnik—equal to $36.75 and $36.85 per oz. The prices are nominal and subject to negotiation.

Silver—The market the past week has been quiet, with lower tendency owing to selling by Chinese banks. Buyers were also holding back on account of overspeculation. The market closes firmer and quiet at 27⅞d. in London.

Shipments of silver from London to the East, Jan. 1 to July 4, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£4,354,700	£3,549,700	D. £ 805,000
China	890,400	933,500	I. 43,100
Total	£5,245,100	£4,483,200	D. £ 761,900

SILVER AND STERLING EXCHANGE

July	11	12	13	15	16	17
New York	60¾	60¼	60¼	60¼	60½	60⅝
London	27 15/16	27¾	27¾	27¾	27⅞	27⅞
Sterling Ex.	4.8730	4.8730	4.8730	4.8735	4.8740	4.8745

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

NEW YORK

July	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
11	16⅞ @17⅛	16.60 @16.75	44⅞	4.75	4.62½ @4.65	7.10 @7.20	6.95 @7.05
12	16⅞ @17⅛	16.70 @16.80	44½	4.75	4.62½ @4.65	7.10 @7.20	6.95 @7.05
13	16⅞ @17⅛	16.75 @16.85	44½	4.75	4.62½ @4.65	7.10 @7.20	6.95 @7.05
15	17 @17⅛	16.95 @17.00	44⅜	4.75	4.62½ @4.65	7.15 @7.20	7.00 @7.05
16	17 @17⅛	16.95 @17.00	44	4.75	4.62½ @4.65	7.15 @7.20	7.00 @7.05
17	17 @17⅛	16.95 @17.00	43½	4.75	4.62½ @4.65	7.15 @7.20	7.00 @7.05

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

July	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
11	73¼	74⅛	79	203¾	198¾	18⅜	26
12	74⅛	74⅞	79	201½	197¾	18⅜	26
13	....	....	....	....	....	....	....
15	75⅛	75⅞	80	201⅜	197½	18⅜	26¼
16	75 3/16	75 13/16	80	200½	196½	18½	26¼
17	75 1/16	76⅛	80½	197	195	18½	26¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper, Tin, Lead and Zinc

Copper—The market is quiet and unsettled. Both the large consumers and the large producers continue to hold aloof, and the business that is being done is passing between the smaller producers and second hands on the one hand and the smaller consumers on the other. It is being transacted at prices considerably below those at which the larger producers are holding. On July 11 arbitrage dealers took great advantage of the disparity between the European and American markets. Being able to purchase electrolytic copper in Europe at 16½c. and less, they were able to sell in this country at great concessions and still realize a handsome profit. In this way some fairly large quantities were placed with American consumers, business being done in round lots at as low as 16¾c., delivered, usual terms, corresponding to about 16.60, cash, New York. Business of this kind continued during July 12 and 13, after consummation of which there was a rally in the market on July 15, when some sales were made at 17⅛c., delivered, usual terms. Of course, sales to Europe have been impossible under the prevailing conditions. The leading agencies continue out of the market being sold ahead in varying degrees and being at the moment unconcerned about marketing additional supplies. On the other hand, consumers seem to have well provided their future requirements and are disinclined to buy except at material concessions. The real test of the market will occur a few weeks hence, when the larger agencies are likely to become desirous of marketing the production that is coming forward all the time. The business in Lake copper during the week of July 11-17 has been of insignificant volume and quotations are but nominal, reflecting only the small amount of business transacted by second hands. At the close Lake copper is quoted 17@17¼c.; electrolytic in cakes wirebars or ingots, 16.95@17c.; while casting copper is quoted nominally at 16½ 16¾c. as an average for the week.

The London standard market has quieted down and has moved within comparatively narrow limits, closing at £75 8s. 9d. for spot and £76 2s. 6d. for three months.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 8502 long tons. Our special correspondent reports the exports from Baltimore at 2648 tons.

Visible stocks of copper in Europe on July 15 are reported as follows: Great Britain, 28,400; France, 6840; Rotterdam, 800; Hamburg, 4950; afloat from Chile, 2300; afloat from Australia, 5800; total, 49,090 long tons, or 109,961,600 lb. This is an increase of 940 tons over the June 30 report.

Tin—The London market has been weak and declining and our market has followed suit. The London dock strike still holds on, but the position over here has been entirely relieved by shipments which have come direct from the East Indies and through European continental ports—so much so that the premium on tin for near-by shipment has now entirely disappeared. During the week, July tin declined from about 44⅞ to about 43½c., and October 43½ to 43 cents.

The London market, which on Thursday, July 11, closed at £203 15s. for spot and £198 15s. for three months, declined on July 12 to £201 10s. and £197 15s., respectively, and on July 16, was £200 10s. for spot and £196 10s. for three months, closing at £197 for spot and £195 for three months.

Shipments of tin from the Straits six months ended July 30 were 25,579 long tons in 1911, and 28,685 in 1912; increase this year 3106 tons.

Tin production of Federated Malay States six months ended June 30, was 20,789 long tons in 1911, and 22,697 tons in 1912; increase this year 1908 tons.

Lead—The market is firm at last prices, 4.75c., New York, and 4.62½@4.65c., St. Louis, at which prices there is a good business doing from day to day.

The London market is firmer, good Spanish lead being quoted £18 10s. and English 2s. 6d. higher.

Spelter—Consumption, both for galvanizing and brass is excellent and the market is very firm at slightly better prices. A moderate tonnage is reported sold during the week of July 11-18, chiefly for July and August delivery, for both of which times a considerable quantity appears to be available. Nobody has been disposed to buy for September or October delivery. At the close we quote 7.15@7.20c., New York, and 7@7.05c., St. Louis.

The foreign market is firmer, good ordinaries being quoted £26 5s. and specials £26 10s. per ton.

Base price of zinc sheets is now $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—Business is quieter than it has been. The quotation is 22½@23c. per lb. for No. 1 ingots, New York.

It is said that the standard price for ingot aluminum is to be fixed at £70 per ton, or 15.22c per lb., by the European syndicate.

Antimony—Business continues active, and the market is firm. Cookson's brings 8.25@8.50c. per lb. and Hallett's 7.87½@8c. For Chinese, Hungarian and other outside brands, 7.30@7.50c. per lb. is paid.

Quicksilver—Business is still rather quiet and there is no change reported in prices. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London price is £8 10s. per flask, with £8 7s. 6d. asked from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Spanish Metal Exports

Exports of metals and minerals from Spain, three months ended Mar. 31, reported by *Revista Minera*, in metric tons:

Metals	1911	1912	Changes	
Pig and manuf. iron	13,967	18,702	D.	4,735
Copper	3,019	5,725	I.	2,706
Copper precipitate	3,394	2,712	D.	682
Lead	37,483	43,695	I.	6,212
Zinc	566	549	D.	17
Quicksilver	413	624	I.	211
Minerals				
Iron ore	2,316,340	2,204,240	D.	112,100
Manganese ore	8,160	10,563	I.	2,403
Copper ore	122,579	37,658	D.	84,921
Lead ore	728	850	I.	122
Zinc ore	40,404	35,321	D.	5,083
Pyrites	377,627	716,326	I.	338,699
Salt	114,066	137,075	I.	23,009

Pyritic ores are not classed as copper ores unless they carry 2.5% or over in copper; below that they are classed as pyrites. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Platteville, Wis., July 13—The base price paid this week for 60% zinc ore was $56@58, the highest ever paid in this district. The base price paid for 80% lead ore was $58@59 per ton.

SHIPMENTS, WEEK ENDED JULY 13

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	839,070	......	....
Shullsburg	600,000	80,000	....
Galena	485,400	....	....
Benton	467,900	....	562,000
Hazel Green	467,000	....	....
Platteville	372,600	.....	191,500
Cuba City	245,890	....	....
Harker	210,940	....	....
Linden	....	.....	80,000
Total	3,688,800	80,000	833,500
Year to date	110,604,130	4,576,470	16,207,570

Shipped during week to separating plants, 2,080,190 lb. zinc ore.

Joplin, Mo., July 13—The high price of zinc sulphide ore this week was $63, the base per ton of 60% zinc was $54@60. Zinc silicate sold at $30@31 per ton of 40% zinc. The average price all grades was $56.32. The high price of lead ore was $61 base per ton of 80% lead, and the average price all grades was $59.28 per ton.

The zinc-ore market took a big jump this week when competition became strong on Friday.

SHIPMENTS, WEEK ENDED JULY 13

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,918,620	....	1,140,260	$148,547
Joplin	2,278,930	...	241,340	73,207
Duenweg	745,000	......	289,990	30,565
Galena	753,600	......	57,600	23,524
Oronogo	443,128	....	356,210	20,728
Cave Springs	636,580	...	......	18,460
Alba-Neck	593,800	....	17,690	17,732
Jackson	183,320	....	113,750	8,544
Spurgeon	105 620	269,850	17,040	7,756
Miami	256,100	....	....	6,400
Wentworth	194,310	......	...	5,412
Carthage	172,210	..	.	4,821
Granby	7,800	132,420	41,220	3,230
Lawton	61,700	....	....	1,789
Sarcoxie	54,470	.....	...	1,496
Aurora	....	....	47,310	1,324
Totals	10,414,180	402,270	2,322,410	$373,535
28 weeks	283,305,810	17,313,960	48,601,130	$8,787,588

Blende val., the week, $298,409; 28 weeks, $7,195,584
Calamine, the week, 6,267; 28 weeks, 258,101
Lead value, the week, 68,859; 28 weeks, 1,333,903

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41 85	$44 90	$40 55	$43 54	$55 68	$58 92
February	40 21	45.75	39 16	43 31	54 46	52.39
March	39 85	51.56	38.45	49.25	54 57	54.64
April	38 88	52.00	37 47	50.36	56 37	54 18
May	38 25	55.30	36 79	53.27	55 21	52.45
June	40.50	55 88	38 18	54 38	56 49	55.01
July	40 75		38 36	....	58 81	.....
August	42 50		41 28	.	60 74	......
September	42 63		41 29		59 33	......
October	42 38	..	40.89	....	54 72	......
November	45 40		43 27		57 19	......
December	44 13	..	40.76	..	62 03	......
Year	$41.45		$39 90		$56.76	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Manganese Ore—The price for domestic ores, as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent., or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess phosphorus and silica.

These prices are put at a high level to encourage exploration for manganese deposits in the United States. Most of the manganese ore used here is imported—from India, Brazil and Russia—and is bought abroad on the open market.

The latest quotations in Great Britain are: Indian or Brazilian ore, 50 per cent. manganese, 19@19½c. per unit; 45 per cent., 17½@18c. Caucasian, 50 per cent., 16@16½c.; 48 per cent., 15½@16c. per unit.

New Caledonia Ores

Exports of ores from New Caledonia four months ended April 30, as reported by the *Bulletin du Commerce* of Noumea, were 10,958 metric tons of nickel ore and 15,994 tons of chrome ore. Exports of metals were 937 tons of nickel matte.

Chemicals

New York, July 17—Midsummer dullness continues to rule in the general market.

Arsenic—Supplies are again rather scarce, and prices have advanced, $4@4.25 per 100 lb. being paid for spot lots. Futures are $3.75 per 100 pounds.

Copper Sulphate—The market is rather quiet. Quotations are unchanged at $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is not active. Quotations for spot are unchanged at 2.45c. per lb., but futures are a trifle easier, 2.42½c. per lb. being asked for September and October.

Petroleum

The monthly statement of the *Oil City Derrick* shows new wells completed in June as follows: Pennsylvania and West Virginia, 491; Lima-Indiana, 54; Kentucky, 15; Illinois, 122; Kansas-Oklahoma, 712; Texas-Louisiana, 120. In all the divisions there were 1514 wells completed, being 193 more than in May. New production was 58,984 bbl., an increase of 5040 bbl. The divisions showing increased production are Lima, Illinois and the Mid-Continent. Dry holes number 235 and gas wells 131, an increase of 15 dry holes and 11 gas wells. The productive oil wells number 1148 as against 981 in May. At the close of June there were 471 rigs and 1431 drilling wells. These figures show a decrease of 42 rigs and an increase of 187 drilling, as compared with the May report. All divisions show an increase in new work with the exception of Kentucky and Texas-Louisiana.

Mining Stocks

New York, July 17—The limiting factor in the market this week has been the condition of the banks and the curtailment of speculative loans.

July 11 the Exchange was rather narrow and prices inclined to weakness. Steel common was off to a lower level. The Curb was quiet and slow and prices irregular. Coppers were firm but other mining stocks were weak.

July 12 the Exchange was dull and weaker. The Curb was irregular, showing activity in spots. Braden was the only active copper stock. Cobalts were dull, but El Paso and Tonopah Extension were active at declines.

July 13 the Exchange and the Curb were both narrow. Coppers were firm, but other mining stocks were neglected.

July 15 prices on the Exchange were stronger but on limited trading. The Curb was quiet and narrow, but copper stocks were inclined to advance a little.

July 16 and 17 the Exchange was again stronger. There were advances in Amalgamated Copper and in Steel common. The Curb was rather scattering in its sales but generally firm in prices, with some advances in copper shares, but rather limited trading in other mining stocks.

At auction in New York, July 11, the following sales were made: 1000 shares Mexican Lead common, $350 for the lot; 15,000 shares Batopilas Mining Co., $20 par, $1.02 per share; 80 shares American Smelting & Refining Co., $100 par, $82 per share; 80 shares Wolverine Copper Co., $25 par, $105 per share.

Boston, July 16—Midsummer dullness has set in upon the metal-share market, and, along with it, uncertain price movements, although all told they maintain a generally strong undertone. Superior Copper has attracted attention during the week by a sharp advance to $48.50, which has been maintained for the most part. Isle Royale also gave a good account of itself by advancing to $35.25, and this rise was pretty much all held. These two stocks seem to be the favorites, marketwise, among the Lake Superior issues.

Butte & Superior shows liquidating sales by a break of $3.87½ to $41.12½. It is said that the promoters of this company took their underwriting bonus in stock and have marketed it all at a good-sized profit to themselves. Ahmeek and Osceola easily respond to buying orders. The former sold at $345 today and the latter at $117. Granby rose $2 to $53.25. It is announced that the Lake company has stopped shipments for a short time in order to make preparations and to get men for an increased tonnage. It is also

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	April	May	June
Alaska shipments.	1,243,911	1,720,391	4,134,569
Anaconda	25,480,000	25,800,000	....
Arizona, Ltd.	3,400,000	3,500,000	3,300,000
Copper Queen......	6,806,425	7,024,087	7,622,733
Calumet & Ariz....	4,104,000	4,424,000	4,160,000
Chino..............	1,150,000	1,275,850	....
Detroit........	2,506,718	2,092,478	1,959,634
East Butte.........	1,400,000	1,445,000	....
Mammoth.........	1,718,450	....	....
Mason Valley......	1,503,056	1,520,000	....
Nevada Con.....	6,115,095	6,063,462	....
Ohio.........	675,000	....	....
Old Dominion....	2,167,000	2,180,000	2,130,000
Ray...............	2,611,920	2,924,913	2,992,500
Shannon.	1,544,000	1,464,000	1,270,000
South Utah........	284,215	236,884	....
United Verde*.....	2,250,000	2,500,000	....
Utah Copper Co...	8,615,775	9,564,919	....
Lake Superior*....	18,250,000	21,250,000	15,600,000
Non-rep. mines*..	7,625,000	8,400,000	8,300,000
Total production	97,400,495	....	....
Imports, bars, etc..	26,842,014	25,836,519	....
Total blister.....	124,242,509	....	... .
Imp. in ore & matte	9,350,972	6,410,226	. .
Total American..	133,593,481	....	..... .
Miami†............	2,554,352	2,565,000	2,584,950
Brit. Col. Cos.:			
British Col. Copper	1,043,173	875,000	996,000
Granby	1,941,797	1,914,460	1,888,400
Mexican Cos.:			
Boleo†.......	2,149,280	2,260,160	1,851 920
Cananea	4,654,000	4,600,000	4,310,000
Moctezuma	2,797,718	2,892,521	3,176,819
Other Foreign:			
Cape Cop., S. Africa	954,240	754,880	.....
Kyshtim, Russia.	1,545,000	....	.....
Spassky, Russia..	649,600	694,400	.....
Famatina, Argen..	....	....	.....
Tilt Cove, Newf'd.	119,869	123,087	....
Exports from:			
Chile	6,496,000	3,696,000	9,856,000
Australia	9,408,000	7,840,000	8,176,000
Arrivals in Europe‡	12,064,640	9,976,860	12,667,200

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VI, 1911........	124,554,312	61,655,561	71,460,519
VII........	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX..	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI.	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year.	1,431,938,338	709,611,605	754,902,233
I, 1912..	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,094,601	67,487,466	58,779,566
IV	125,164,044	69,513,846	53,252,326
V ..	126,737,836	72,702,277	69,485,945
VI ...	122,315,240	66,146,229	61,449,650

VISIBLE STOCKS

	United States	Europe	Total
VII, 1911.......	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX.	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II........ ...	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,380
IV	62,367,557	136,819,200	199,186,754
V	[illegible]	134,176,000	199,242,089
VI ..	49,615,643	117,801,600	167,417,232
VII ..	44,335,004	108,186,000	152,521,047

said that owing to the scarcity of labor at the mines in Michigan, men will be sent from the East.

On the Curb business has been of fair proportions. Davis Daly and Nevada Douglas have shown some strength, while Ohio Copper fell to 30c. today.

Assessments

Company	Delinq	Sale	Amt
Best & Belcher, Nev	June 3	June 27	$0.10
Buffalo, Mont	June 4	July 2	0.002
Challange, Nev	June 8	July 2	0.10
Chollar, Nev	July 7	Aug. 5	0 10
Confidence, Nev	July 15	Aug. 9	0 20½
Con. Imperial, Nev	July 28	Aug. 21	0.01
Crown Point, Nev	June 24	July 17	0.10
Gould & Curry, Nev	July 19	Aug. 12	0 05
Great Falls, Utah	June 26	July 27	0.002½
Hale & Norcross, Nev	July 2	July 29	0 05
Houghton Copper, Mich	May 17		1.00
Julia, Nev	May 15	June 5	0.05
Mineral Farm, Ida	July 15	Aug. 15	0 002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
New Reliance, S. Dak			0 01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida	July 18	Aug. 19	0.001
Overman, Nev	June 29	July 23	0.10
Savage, Nev	June 4	June 26	0 10
Seven Troughs, Nev	June 15	July 2	0.002½
Sierra Nevada, Nev	July 4	July 30	0.10
Silver Mt., Ida	July 15	Aug. 15	0.002
Tintic Central, Utah	June 14	July 6	0.005
Union Consolidated, Nev	July 12	Aug. 7	0.15
Utah Antimony, Utah	June 1		0.03
Utah, Nev	July 12	Aug. 6	0.05
Yankee Con., Utah			0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53 795	56.260	24 154	24.865	25 887
February	51.534	52 222	59 043	23 794	24.081	27 190
March	51.454	52 745	58.375	23.690	24 324	26.875
April	53.221	53.325	59.207	24 483	24.595	27 284
May	53.870	53 308	60 880	24.797	24.583	28 038
June	53.462	53 043	61.290	24.651	24.486	28 215
July	54.150	52 630	......	25.034	24.286	......
August	52.912	52 171	......	24 428	24.082	.....
September	53.295	52 440	......	24 567	24.209	......
October	55 490	53.340	......	25 596	24.594	.....
November	55.635	55 719	......	25.680	25.649	. ..
December	54.428	54 905	......	25.160	25.349	......
Year	53.486	53.304	......	24.670	24.592	......

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55 600	62.760
February	12 256	14 084	12 611	14.329	54.974	62 893
March	12.139	14.698	12 447	14.868	54 704	65.884
April	12.019	15 741	12 275	15.930	54 034	70.294
May	11.989	16 031	12 214	16 245	54.313	72 352
June	12.385	17 234	12.611	17 443	56.365	78.259
July	12.463	.....	12.720	...	56.673	....
August	12 405	.....	12 634	.	56.266	....
September	12 201	....	12.508	...	55.253	.....
October	12.189	.....	12 370	....	55.170	.....
November	12.616	.....	12.769	....	57 253	....
December	13.552	..	13.768	..	62 068	....
Year	12.376	.	12.634	....	55.973	....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	......
February	41 614	42 962	August	43 319	......
March	40 157	42.577	September	39 755	... ..
April	42 185	43 923	October	41.185	......
May	43.115	46.053	November	43 125	......
June	44 606	45 815	December	44.655	. ..
			Av. Year	42.281	... .

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4.435	4 334	4.327	13 009	15.619
February	4 440	4.026	4 266	3 946	13 043	15 738
March	4.394	4.073	4 238	4.046	13 122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4.373	4 194	4.223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13.260	17 588
July	4.499	......	4.397	......	13 530	.....
August	4 500	......	4 406	......	14.260	.....
September	4 485	.....	4 356	......	14 744	......
October	4.265	......	4.139	......	15.332	......
November	4 298	......	4.181	......	15 821	......
December	4.450	......	4.332	......	15.648	.....
Year	4.420	......	4 286	......	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23.887	26 642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5.563	6.626	5.413	6.476	23 016	26.048
April	5 399	6.633	5.249	6 483	23 743	25 644
May	5.348	6.679	5.198	6.529	24.375	25 790
June	5 520	6.877	5 370	6 727	24 612	25.763
July	5 695	......	5 545	......	25.006	......
August	5 953	......	5 803	......	26 801	......
September	5 869	......	5 719	......	27 750	......
October	6.102	......	5.951	......	27.256	......
November	6 380	......	6.223	......	26.795	......
December	6.301	......	6.151	......	26.849	......
Year	5.758	......	5.608	......	25.281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15 90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15 90	15.03	14 50	13.28	14 81	14.01
March	15.90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13 90	15 00	14 15
May	15.90	15.14	14 30	13.90	14 72	14.12
June	15 90	15.15	14 06	14.11	14 56	14.22
July	15 90	......	14 03	......	14 53	......
August	15 90	......	14 00	......	14 47	......
September	15 90	.... .	13 57	......	14 40	......
October	15.43	......	13.44	......	14.34	......
November	14.92	......	13.30	......	14 25	......
December	15.15	......	13.10	......	13.90	......
Year	$15 72	......	$13 94	.....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS July 16

Name of Comp.	Bid.
Acacia	.04¾
Cripple Cr'k Con.	01
C K & N.	.17
Doctor Jack Pot	.05⅜
Elkton Con	.64½
El Paso	.95¾
Findlay	.04¼
Gold Dollar	.18
Gold Sovereign	.02
Isabella	.13
Jack Pot	.04
Jennie Sample	.05½
Lexington	‡ 02
Moon Anchor	01
Old Gold	04
Mary McKinney	.69¼
Pharmacist	.01¼
Portland	92
Vindicator	.80
Work	.01¼

SALT LAKE July 16

Name of Comp.	Bid.
Beck Tunnel	09½
Black Jack	15
Cedar Talisman	02
Colorado Mining	.18
Columbus Con	26½
Crown Point	02¼
Daly-Judge	‡5 60
Grand Central	52
Iron Blossom	1 37½
Little Bell	25
Lower Mammoth	02
Mason Valley	12.50
May Day	13½
Nevada Hills	2 00
New York	‡ 04¾
Prince Con	1 55
Silver King Coal'n	2.65
Sioux Con	.04½
Uncle Sam	.20
Yankee	‡ 12

TORONTO July 16

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 35	Hollinger	12¾
Hudson Bay	†70 00	Imperial	01
Temiskaming	36	Pearl Lake	18
Wettlaufer-Lor.	56	Porcu. Gold.	34
Apex	.03	Porcu. Tisdale	01
Central	‡5 56	Preston E. D.	02
Crown Chartered	10	Rea	24
Doble	‡ 25	Standard	‡ 01¼
Dome Exten	.15	Swastika	09
Foley O'Brien	.15	West Dome	.15

SAN FRANCISCO July 16

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.12	Belmont	8.90
Belcher	.52	Jim Butler	.58
Best & Belcher	.08	MacNamara	.22
Caledonia	1.60	Midway	.49
Challenge Con	.14	Mont.-Tonopah	2.45
Chollar	.12	North Star	.19
Confidence	.65	West End Con	1.60
Con. Virginia	38	Atlanta	.23
Crown Point	.56	Booth	.08
Gould & Curry	01	C.O.D. Con	.10
Hale & Norcross	21	Comb. Frac	.13
Mexican	2 72½	Jumbo Extension	.37
Occidental	50	Pitts.-Silver Peak	1.00
Ophir	.99	Silver Pick	.11
Overman	1 05	St. Ives	.33
Potosi	.04	Tramp Con	‡.01
Savage	11	Argonaut	‡2.00
Sierra Nevada	.23	Bunker Hill	‡4.50
Union Con	.59	Cent. Eureka	.41
Yellow Jacket	.67	So. Eureka	‡2.90

N. Y. EXCH. July 16

Name of Comp.	Clg.
Amalgamated	82⅛
Am. Agri. Chem	61
Am.Sm.&Ref.,com	82⅛
Am. Sm. & Ref., pf.	121
Am. Sm. Sec., pf. B	88
Anaconda	40¾
Batopilas Min	1¼
BethlehemSteelpf	68
Chino	31
Comstock Tunnel	‡ 12
Federal M. & S., pf.	43
Goldfield Con	4
GreatNor.,ore.,ctf.	43
Guggen. Exp	55½
Homestake	96
Inspiration Con	18¾
Miami Copper	28½
Nat'nalLead,com.	57½
National Lead, pf.	109
Nev. Consol	20¼
Pittsburg Coal, pf.	91⅞
Ray Con	20⅝
RepublicI&S,com.	26½
Republic I & S, pf.	85
SlossSheffi'd,com.	54
Sloss Sheffield, pf.	100
Tennessee Copper	42¾
Utah Copper	61¼
U. S. Steel, com	69¼
U. S. Steel, pf.	111⅜
Va. Car. Chem	48½

N. Y. CURB July 16

Name of Comp.	Clg.
Barnes King.	25
Beaver Con	.42
Braden Copper	6⅞
B. C. Copper	5¾
Buffalo Mines	‡1 40
Caledonia	40
Con. Ariz. Sm	9/16
Davis-Daly	2⅜
Diam'field-Daisy	9
Ely Con	7/32
Florence	99
Giroux	4⅝
Gold Hill Con	⅜
Greene Cananea	9¾
Greenwater	05
Internat. S. & R.	124
Kerr Lake	3
Keystone	2⅝
La Rose	3⅛
McKinley-Dar-Sa.	1¾
Min. Co of A. new	3
Motherlode Gold.	1 1/16
Nev. Utah M. & S.	‡ 03½
Nipissing Mines	7⅝
Ohio Copper	5/16
Pacific Sm. & M	[illegible]
South Live Oak	2⅜
South Utah M & S.	¼
Standard Oil (Old)	865
Stand'd Oil of N J	391
Stand'd Oil Subs.	525
Stewart	1 7/16
Tonopah	6 11/16
Tonopah Ex	2⅛
Tri-Bullion	½
Tularosa	‡¼
Union Mines	3/16
United Cop., pfd.	10
Yukon Gold	3¾

LONDON July 17

Name of Com.	Clg.
Camp Bird	£1 8s 3d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 7 6
Mexico Mines	6 17 6
Oroville	0 5 9
Stratton'sInd.	0 3 1½
Tomboy	1 6 3

BOSTON EXCH. July 16

Name of Comp.	Clg.
Adventure	8⅜
Ahmeek	345
Algomah	5¼
Allouez	44
Am. Zinc	30½
Ariz. Com., ctfs.	5¾
Bonanza	.56
Boston & Corbin	7½
Butte & Balak	‡3½
Calumet & Ariz	74
Calumet & Hecla	515
Centennial	‡24
Con. Mercur	‡.05
Copper Range	56¼
Daly West	5
East Butte	‡13¼
Franklin	11
Granby	53
Hancock	30¾
Hedley Gold	17
Helvetia	1¼
Indiana	16⅞
Island Cr'k, com.	‡61
Island Cr'k, pfd.	89¼
Isle Royale	34¾
Keweenaw	‡1¾
Lake	34⅜
La Salle	7
Mass	6¼
Michigan	2⅛
Mohawk	66½
New Arcadian	3
New Idria Quick.	‡6⅞
North Butte	30½
North Lake	5½
Ojibway	‡4½
Old Dominion	56⅛
Osceola	116
Quincy	88½
Shannon	16⅜
Shattuck-Ariz	20½
Superior	47¼
Superior & Bost.	1⅞
Tamarack	40
Trinity	5¾
Tuolumne	‡3⅜
U. S. Smelting	44½
U. S. Smelt'g, pf.	49⅞
Utah Apex	2¼
Utah Con	10⅝
Victoria	3¼
Winona	5½
Wolverine	108
Wyandot	2

BOSTON CURB July 16

Name of Comp.	Last
Bingham Mines	4¼
Boston Ely	1
Boswyocolo	.02½
Butte Central	6 1/16
Cactus	.09
Calaveras	2⅞
Chief Cons	1⅜
Corbin	.97
Cortez	1
Crown Reserve	3⅛
First Nat. Cop.	1 13/16
Majestic	.44
Mazatan	‡⅛
Moneta Porc	‡ 05
Nevada-Douglas.	3⅞
New Baltic	2
Oneco	1½
Raven Copper	.27
Rhode Island Coal	.15
San Antonio	‡3
S. W. Miami	6
South Lake	9½
Trethewey	.45
United Verde Ext.	40
Vulture	‡5.00

‡Last quotation.

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Robt. McKean, Secy.
505 Pearl St., New York.

Monadnock Block, Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94. JULY 27, 1912. No. 4

Copper Statistics

The discrepancy between the refinery and the mine statistics that has excited much discussion during 1912 has caused an expression of hope that the Copper Producers' Association will undertake the publication of the mine statistics as well as of the refinery. This would not, however, be practicable, nor is it necessary. It is impracticable because the copper originating from many small mines, amounting in the aggregate to a good deal, can never be wholly accounted for by any enumeration short of a regular census, and even such is likely to be in error; while statistics furnished by the smelters on the basis of their blister copper, require so much unraveling, in order to avoid duplications that once a year is often enough for such an undertaking.

Anyway, a monthly investigation of this subject is unecessary because sufficiently indicative figures are already available. We hear it deplored sometimes that there is not now the same association of the producers as there was under the leadership of John Stanton, but in fact the principal producers now not only report their production monthly but they do it openly, and everybody can see whether they are reporting correctly or not. Such has been the progress in publicity during the last five years!

Now, by taking the reports of the principal American producers as thus published, excluding those which smelt imported ore or who send their ore to foreign countries, adding the blister copper imported into the United States and the copper in ore (with an allowance for loss in smelting) and we have accounted for upward of 90% of the raw material made available monthly.

The non-reported copper is chiefly that of the American Smelting and Refining Co. We have no doubt that that company would cheerfully contribute its data monthly if such could be done, but the nature of its business is so complex that it could not furnish data that would not involve danger of duplication unless there were an opportunity for leisurely study and comparison of notes. Anyway, the principal part of its copper output is reported by the mining companies who originate it, e.g. the Utah Copper Co., and the quantity of copper made by this and other smelters that remains unaccounted for in one way or another is only about 8,000,000 lb. per month, which may be estimated with the assurance that an error of even 10% would affect the grand total by less than 1%.

In the following table we have made comparison of the refinery and mine statistics for the first six months of 1912, estimating partially the mine outputs in May and June, for which months the returns have not yet been completely received:

PRODUCTION OF COPPER.

Month	Refiners	Mines
Jan.................	119,337,753	139,027,356
Feb	116,035,809	127,885,749
March.............	125,694,601	136,307,674
April	125,464,644	133,593,481
May.... ...	126,737,836	138,107,729
June....	122,315,240	140,000,000
Totals...........	735,585,883	814,921,989

It appears from the above table that the refinery figures are about 80,000,000 lb. behind the mine figures. A small allowance, say about 2,000,000 lb., should be made for smelters who report blister copper rather than the copper content thereof, and a further allowance, say 3,000,000 lb., for the copper recovered by the refiners as bluestone, wherefore the net production of the mines during the first six months of 1912 was about 810,000,000 lb., or 75,000,000 lb. in excess of the production of the refineries. The refinery figures show an advance of about 1,500,000 lb. per month over the average rate of 1910. It was always supposed that the new production of 1912 would amount to an increase of about 150,000,000 lb. during the year. It is in fact running at about that rate. Why the increase has failed to show in the refinery statistics is the point that has been so warmly debated.

We have previously pointed out that the surplus exists in many places, largely in ore rather than as blister copper. Some of the mines report their production as blister copper, but others, including Utah, Ray and Chino, report their output as of copper in concentrated ore, and the Alaska shipments to the United States and the miscellaneous imports of ore are reported in the same way. Undoubtedly there has been an accumulation of ore at several smelteries. In the case of the Hayden plant that will be a permanent lock-up inasmuch as that plant was started with empty bins. However, this represents but a small part of the copper that is unaccounted for. Without doubt the delayed production, wherever it be, is going to come out sooner or later.

Gold Production in Australasia

The returns from the principal states of Australia and from New Zealand are now available for the first half of 1911. They show a continuance of the decrease in gold production, which has now been going on for several years. The accompanying table shows the production for the half year in fine ounces, comparison being made with the first half of 1911. The returns are official except for South Australia and Tasmania, which do not make monthly reports, and for which estimates have been made.

	1911	1912
West Australia	672,860	627,849
Victoria	262,396	245,900
Queensland	184,675	170,400
New South Wales	105,365	94,037
South Australia	3,900	3,500
Tasmania	18,500	17,900
Commonwealth	1,247,676	1,159,586
New Zealand	220,597	199,277
Total	1,468,273	1,358,863
Total value	$30,349,203	$28,087,698

The total decrease this year was 7.3%; it was pretty well distributed, the heavier proportional losses being in New South Wales and Western Australia. No new causes can be assigned for the continued decline in production. In New Zealand it was due in part to the decrease in gold dredging and in part to the smaller output of one or two large mines. In the Commonwealth the older mines are gradually losing in the quantity of ore mined and in the average tenor of the ore. No new mines or districts have been opened, and prospecting seems to be at a low ebb. The prospector, it would seem, has given up the work of hunting for new mines and has gone into other lines of business which promise a better return. The population of Australia increases slowly, and wages in most industries are at a pretty high level. Until conditions change and labor goes into the mining industry instead of leaving it, thus making the working of lower-grade ores commercially profitable, the decline in gold production is likely to continue.

The Properties of Spelter

A subject of investigation that might usefully be undertaken in the physical laboratory of some college is the properties of spelter and what affects them. Spelter is employed for many purposes requiring different properties and we have several broad classes of the commercial metal which are supposed to meet these. Thus, we have high-grade spelter, intermediate, brass specials and ordinary prime western. These classifications are, however, based wholly upon chemical composition, especially the percentages of lead and iron, which are the common, contaminating impurities, although perhaps we should not say "contaminating," inasmuch as a certain percentage of lead is believed to be desirable for certain purposes.

It is found, however, or imagined, that certain spelters of apparently equivalent composition give different results in practice, especially where there is delicacy in their use. Thus, it is said that there is no high-grade spelter that is quite as good as "Horsehead," although some others may analyze as good; we have heard similar differences reported in the case of lower grades of metal.

The expression of these ideas suggests that it ought to be determined if there be truth in them; and, if so, the wherefore and why, which may be due to the presence of small quantities of other metals, not looked for in ordinary analysis, or the physical conditions occurring in the smelting process, or to both. We hope that this matter will be taken up by some physicist and chemist who is interested in the properties of the metals.

Drill Steel

At mines where careful attention is given to the efficiency of the rock drills there is considerable complaint respecting the quality of the steel that is obtainable. It does not stand up satisfactorily to the work. So far as we are aware it is not supposed that the quality of the steel has deteriorated, but rather is it a case of more being required of it to meet the conditions of modern drilling machines, which have been advanced greatly in the intensity of their operation and their mechanical efficiency. The drill builders seem to have outrun the steel makers.

Our suggestion that the American Institute of Mining Engineers ought to concentrate its government in a single body has met with the approval of many members. The present arrangement is absurd. The council is charged with certain duties; the board of directors with others. In certain contingencies the two have to get together in order to act jointly. On the whole, however, the council is a body of no great consequence, and membership in it is an empty honor, although theoretically it is the central and leading factor. There used to be the anomaly of two presidents, one of the council, one of the directors, but common sense has lately corrected that absurdity by electing the same man to both positions. However, the dual control of the Institute is still analogous to the government of Japan under the mikado and the tycoon. Undoubtedly this will have to be changed.

The response to the formation of an Iron and Steel Division of the American Institute of Mining Engineers seems to show that the demand for such a differentiation of the work of the institute existed, as we have always believed. In the short time since the circular of the committee in charge of the new division was issued, over 350 names have been secured, including those of a number of prominent members. A number of papers have been already submitted or are promised for the first meeting. More names are coming in and the new division will have an encouraging start.

Zinc-ore prices in the Joplin market have made a new high record, as much as $66 per ton having been paid last week for a few lots of blende, while the base price for 60% ore was close to $60 per ton.

Recent advances in iron and steel prices seem to be based on legitimate demand. The mills are so full of work that they are finding difficulty in filling orders in time.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

What Is a Stratified Rock?

The question: What is a stratified rock? was raised in the JOURNAL of June 22, 1912. I will endeavor to clear up the fog of misunderstanding.

A stratified structure is one in which there are several layers of the same or different material, one on top of the other, of about the same thickness. The stratification may be horizontal like bedclothes, or again, it may be tilted to an imaginary line.

Stratification is illustrated in physiology by the stratified epithelium; in manufacture, by the stratification tanning, for which purpose an alternate series of layers of bark and hide are laid in a pit; in physics, the bands of interference colors, produced by double refraction, which again occurs in the rainbow, but in both the colored bands grade into one another with no definite line of division.

And so in geology we have strata of rock, which have been laid down, and spread over surfaces by water or other agencies. All beds so laid down are called sedimentary deposits. The most important indication and result of stratification is that the rocks separate more or less easily along the planes separating the beds or strata. Each stratification plane marks a change in the character of the deposit, or a shorter or longer period during which deposition was suspended. Often one stratum is succeeded by another of different character, showing a change in the existing conditions. Sometimes, however, a rock is distinctly stratified, but each stratum separated easily into much thinner layers, closely resembling one another in petrographic character: this is called lamination. In some cases the apparent stratification seems to be of the nature of an imperfect cleavage, there having been a certain amount of rearrangement of the particles of the rock parallel to the planes of deposition.

As to the solidified volcanic ash *in situ*, it is neither stratified nor eruptive. The ash as it came from the volcano was undoubtedly eruptive; but nevertheless, as it fell into the lake, and was consequently deposited by settling through the water continually until the eruption subsided: it is designated at this stage as sedimentary. Again, as all the ash fell contemporaneously, and formed a thick bed of mud, it cannot be stratified. While on the other hand, if the volcano was acive intermittently, and threw out ash at hese intervals, and each of the layers solidified before the next was deposited; then, and then only, would we have a series of layers or stratified rock.

As to the plastic rock in question, it is sedimentary after settling through the water of the lake. If both the ash and débris from the plastic rock are considered together, solidifying in their order of deposition, we would then have a stratum consisting of two distinct layers of rock.

S. S. McNAIR.

Cape Girardeau, Mo., July 15, 1912.

Preparing Furnace Charges and Modern Lead Smelting

An editorial in the JOURNAL of July 13, 1912, gives the impression that careful preparation of furnace charges for lead and copper smelting is comparatively new. This preparation, with the view of getting uniform materials into the furnaces, has, however, been in constant use at all the works with which I have been connected ever since the autumn of 1876, and has gradually been introduced into many other works. The methods of doing this naturally have been improved gradually, mainly in the line of more economical handling of the ores, but there has been no change in the principle.

This preparation comprises:

(1) The physical condition of the ores—suitable average size and average moisture, as well as the best available proportion of raw oxidized and of roasted, preferably sintered, ore.

(2) The chemical composition of the ore beds, which must usually be made up of perhaps 20 or 30 different ores, such as the custom smelter must buy, mostly in small lots, a part of which must first be roasted and sintered. For convenience in subsequent operations these beds are purposely made up in three classes; siliceous, basic and nearly neutral.

(3) The absolute minimum of firm coke of a given analysis, which will accomplish the desired reduction of the various constituents of the ores, and furnish in addition all the heat units necessary for melting the metals, matte, speiss and slag; but no more. Even a small surplus of coke is apt to do as much mischief as a faulty chemical composition of the charge; in fact it may undo a correct chemical composition made for the desired ultimate results.

The paragraph in regard to what the present large furnaces will do, or permit to be done, is also rather misleading. While the large furnaces naturally respond more slowly, in terms of time, to abuses of faulty charges, etc., they, too, show at once by much slower running, bad slags, and various obstructions both in the shaft and in the hearth that something objectionable has been done; and if the proper means are not at once employed to correct matters, even a large furnace may freeze up. At best it will lead a sickly and costly existence for a much longer time than is desirable for a healthy balance sheet.

In an editorial on p. 2 of the JOURNAL of July 6, 1912, after paying a well deserved tribute to the uptodate modern appliances of the smelting works of the International Smelting & Refining Co., it is stated: "And, finally, as an innovation, the time-honored practice of bedding the furnace charges has been discarded in favor of an actual weighing out of each constituent. The last feature results in a perfection of mixture, which is said greatly to promote the running of the blast furnaces, which, of course, is in the line of what ought to be expected."

I cannot see any innovation here, since the correct weighing of furnace charges, including fuel, dates back over 30 years. If the International has very large and very uniform lots of ore to treat, there is of course, no necessity of bedding. But I have found, during a long practice, that even the ores coming from large bodies in the same mines are rarely as uniform chemically and physically as to permit smelting them from a pile, instead of from regular and carefully spread beds. In the latter case, you are sure to get the desired slag and such conditions in the furnace as give the best final results.

It is possible that the writer had in mind the fact that the International roasts and sinters a large amount of ore on the Dwight & Lloyd machine, the different ores being fed to the same simultaneously in certain set proportions. This gives as a result one uniform ore, chemically and physically, and serves the same purpose as bedding. But this manner of handling cannot be advantageously applied where beside the roasting ores a large proportion of coarse oxidized ores must be treated. There the bedding cannot be dispensed with to advantage, as far as I can see, for it would not be economical to weigh into the charges 20 or 30 different ores instead of one bed, the composition of which is known to a nicety.

In other words, what Mr. Mathewson may be doing at the International works, because the kinds of ore he has to treat make his manner of treatment the most advisable and cheapest, cannot necessarily be found as efficient at other works, where ore delivery is entirely different. Generalization in this respect is as yet impossible.

A. Eilers.

New York, July 18, 1912.

Food Supplies for Miners

The lists of food supplies provided for miners in Alaska and at Cobalt, recently published in the Journal, are of especial interest to the managers of those mines so situated as to make it necessary to operate company boarding houses. At many mines the operation of the boarding house is a minor detail. If conveniently situated in regard to markets, standing orders for supplies can be issued and the superintendence of the department delegated to the steward. At other places the boarding house is often the *bête noire* of the manager's existence. Especially is this apt to be true at mines in the tropics remote from markets, and at properties situated in temperate climates, but only accessible by traversing hot lowlands, through which perishable food supplies cannot be transported.

The difficulty in such a situation is not the expense of obtaining food in sufficient quantity, but in being able to obtain sufficient variety. The tendency toward anæmia in the tropics must be combatted by nutritious diet, for unless well nourished the employees are easily susceptible to the many tropical maladies. It is, as a rule, unprofitable to try to operate a mine with men half sick. To keep men healthy they must be well fed, the food must be palatable, and there should be sufficient variations in the menus from day to day, so that the men will not lose their appetites, which will surely follow meals of substantially the same foods day after day.

This is the most difficult problem to solve, because the country cannot be depended upon to furnish a great variety of nutritious food supplies. Wheat, potatoes, peas and beans cannot be grown satisfactorily in the tropics. Rice, yams, plantains and cassava can be easily cultivated, but are too starchy for extensive use.

Starchy foods are all too extensively used in the tropics. It is, therefore, usually necessary to import the more nutritious staples for the foundation of the meals so to speak, and to use green vegetables that can readily be grown in most places to tempt the appetite.

A mistaken idea about eating meat and fruits prevails among the majority of Americans residing in the tropics. Except for the citrus fruits, it is well to eat fruit but sparingly and infrequently; meat is one of the most valuable and necessary foods to prevent anæmia and malnutrition. The trouble is that most Americans object to eating fresh meat and in the tropics meat is usually eaten the day it is killed. Moreover, at small mines the number of men that must be provided for is not great enough to entirely consume a small steer in a day, and the waste is so great that meat is rarely provided.

This waste may be prevented by salting the meat that is not immediately required for the table. An excellent procedure is to place the meat in tubs set in a cool, shady place and cover with brine strong enough to float an egg, and in which ½ oz. of saltpeter has been dissolved for each 100 lb. of meat. Meat kept in this way can be used immediately and if the brine is removed, the beef washed and again covered with fresh brine, it can be kept perfectly for a week or ten days. For the first few days the meat will not be appreciably salty.

The most satisfactory procedure at even a small mine is to install an ice-making machine and build a chill room. A small ice machine sufficient for a mine employing 150 men can be purchased for $1000. The cost of installation and building a chill room is nominal; the cost of operation negligible. With such a plant it is possible greatly to increase the efficiency of the men.

Many are the complaints made about the inefficiency of the natives of the tropics. The cure lies not in complaining, but in providing proper and nutritious food.

C. C. S.

New York, July 15, 1912.

Copper Smelting at Kyshtim

In my notes on the Karabash plant in the Journal of June 22, the statement regarding the relative amounts of air for converting mattes of different grades should read, "the air required to convert matte containing 26% copper costs about half as much as that required for matte containing 16%." A typographical error made the first figure 20 per cent.

Ernest J. Carlyle.

London, Eng., June 22, 1912.

"Airing Off" of a Mine

A Michigan iron-ore mine was recently closed temporarily. Three days later the engineer had occasion to visit some of the recent workings which had been left either timbered (as the ore was soft) or well trimmed. He found that the back of drifts which had held up for months had suddenly come down, so that in one or two cases he had difficulty in crawling through. At the face of one heading where particular care had been taken to leave it well trimmed the ore had bulged or swelled, making a fairly large pile of muck.

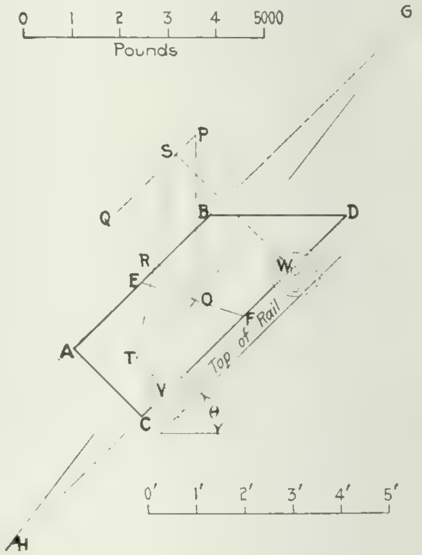
An old miner called the process "airing off" and said that he had often seen it occur when operations ceased in a mine. Is the occurrence caused by stoppage of ventilation or what is the explanation?

Occasional Contributer.

Ishpeming, Mich., July 15, 1912.

Graphic Solution of Skip Loads

I have been reading E. R. Rice's discussion of the above problem in the Journal of July 13, p. 54, and wish to ask about his mathematical assumptions. To find the point *O* (center of mass), he bisects *AB* and *CD* and joins their centers. He prolongs *AB* a distance *CD*, and prolongs *DC* a distance *AB*, joining the points thus found. The intersection of this with the line bisecting *AB* and *CD* is then assumed to be the center of mass of the car. As a matter fact, is it not true that *O* is merely the center of mass of a plane surface *ABDC*? It would appear that *O* cannot be the center of the mass of the skip body, for there is no compensating surface at the front of the skip to make up for the one at *AC*, unless perhaps the bail acts as one.



Graphic Solution of Skip Loads

But the center of mass of the top and bottom of the skip, represented in section by *AB* and *CD*, would not lie upon a line perpendicular to plane *ABDC* through *O*, but below it. There is, moreover, the uncounterbalanced weight of the wheels to lower the point *O*. I cannot suggest the exact solution of the problem of the center of mass in this case, but it seems certain that it lies somewhere toward the point *C*, from where it is located by Mr. Rice.

C. E. Case.

Pittsburgh, Penn., July 15, 1912.

Closing a Gas Well in Hungary

In drilling to explore for deposits of potassium salts in Transylvania, natural gas under 420-lb. pressure was found at Kis Sarmas at depths of less than 1000 ft. After plugging the well, surface disturbances resembling earthquakes occurred, ascribed by some to faulty closing of the well; by others to tectonic movements.

Note—Excerpts from an article by A. Strobl, published in the Journal of the Society of Hungarian Engineers and Architects of America, 29 West Thirty-ninth St., New York, and entitled "Natural Gas in Hungary and the Gas Well at Kis Sarmas."

Hungarian geologists have long been of the opinion that in the eastern parts of Hungary strata containing gas, oil and salts of potassium must exist. The Hungarian government decided to bore extensively in order to find salts of potassium.

The first hole was started near the village of Kis Sármás, in 1907. After drilling to a depth of 2056 ft., where traces of natural gas were found, it became necessary to discontinue on account of the slipping of the sandy strata. On Nov. 26, 1908, the second boring was commenced at a distance of about 1000 ft. from the first. Natural gas appeared at small depths, and the quantity increased with the depth of the well. The drilling was continued, but the gas escaped from the strata under such pressure and in such a quantity as to compel suspension of the drilling at a depth of 991 ft. No salts of potassium were found, but an excessively rich natural-gas region was discovered.

Oil and Gas a State Monopoly

The Hungarian government presented a bill to the parliament, in which it was proposed to make a state monopoly of oil, gas and salts of potassium. The bill passed the legislature in October 1910, although it was opposed by landowners. The government ordered the immediate exploration of the whole Transylvanian valley. The geologists thought that, as in the gas and oil fields of America, the gas would rise to the axes of the anticlines, the oil being found on their flanks and the salt water in the synclines. The result of the researches was that more than 20 anticlines were discovered on an area of 60x100 miles running in a direction approximately north and south. The gas well at Kis Sármás is also situated on the axis of an anticline. The work is proceeding with dispatch, 10 holes now being drilled at Kis Sármás and several others are planned. The budget of the Minister of Finance provides 2,700,000 crowns (about $540,000) to be expended for drilling during the fiscal year.

At the drilling of the well at Kis Sármás, which commenced Nov. 26, 1908, traces of gas were found at a depth of 72 ft. After that several gas strata were struck. The sands at a depth of 374, 525, 629, 680 and from 746 to 990 ft. furnished greater quantities of gas. At a depth of 374 ft. so much gas appeared that the petroleum lamp in the drilling derrick ignited it and caused an explosion. It took 10 hours to extinguish the immense flames.

The gas coming from a depth of 525 ft. threw the water column from the hole to a height of 65 ft. After reaching down 629 ft., the well was shut off, for a short period, and the manometer registered 60 lb. although the closing of the well was imperfect. The pressure of the gas coming from a depth of 680 ft. was found to be 270 lb., the quantity being 134,178 cu.ft. per hour. The strata between 746 and 990 ft. deep developed a pressure of 420 lb. and the amount of the gas delivered by the well increased to 1,270,000 cu.ft. per hour, that is, 30,480,000 cu.ft. per day. The average velocity of the gas was 620 ft. per second. The tremendous force of the gas made it impossible to continue the boring. This well was finished on April 22, 1909. For a long time there was a free escape of gas which could be heard several miles away.

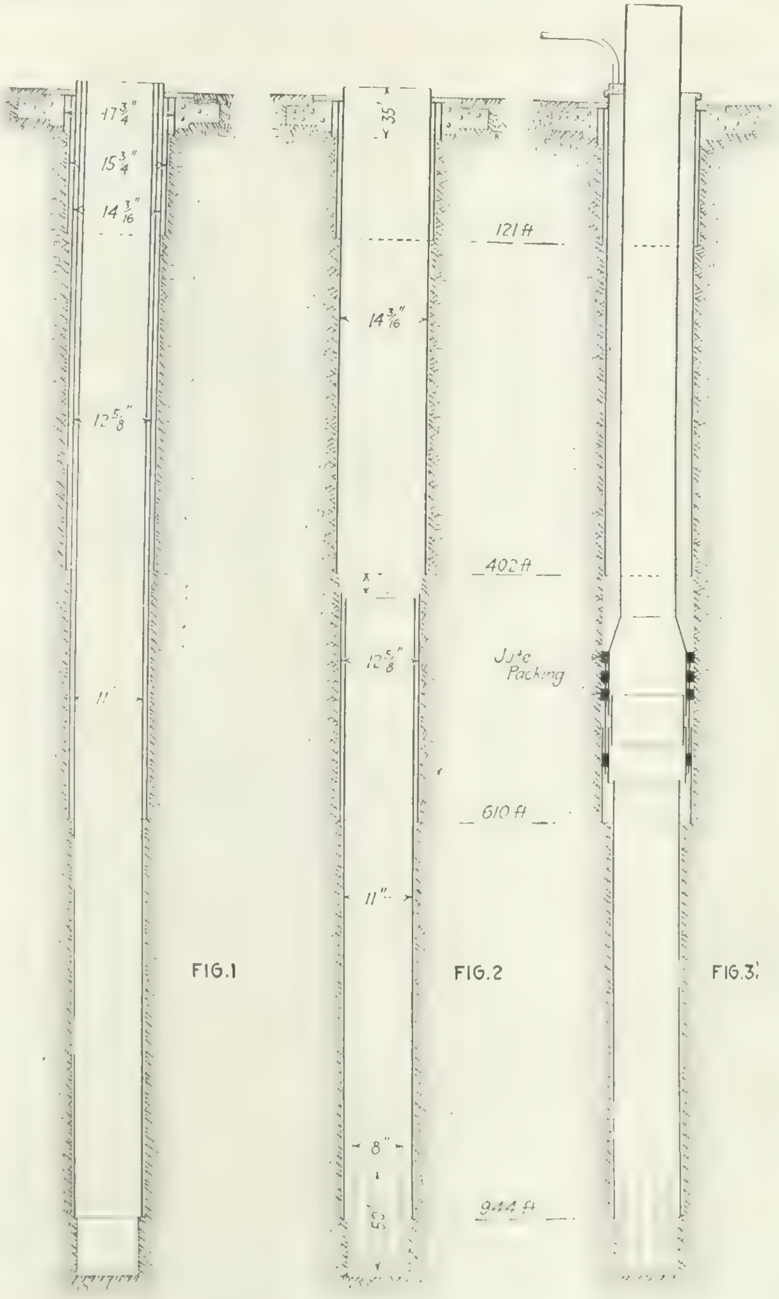


FIG.1 FIG.2 FIG.3

Casing and Packing Used in the Kis Sármás Well

Professor Pfeifer's tests show that the gas contains 99.6% methane (CH_4), which makes it an ideal fuel. Its heating power is 960 B.t.u. per cu.ft. The amount of gas furnished by the well of Kis Sármás represents about 60,000 hp. per day when used to raise steam for steam engines. In order to prevent the large waste of gas, until such time as it could be used for industrial purposes, a method of closing up the well had to be devised. It was hoped that the problem might be solved by setting a valve on the top of the casing. This hope was based on the belief that the clay beds drilled through were closely pressed against the outside of the casing and therefore would not permit the escape of the gas on the outside. This expectation seemed to be justified, moreover, by the fact, that in America the closing of many high-pressure wells has been successfully carried out in this manner.

First Attempts to Close Well Unsuccessful

The closing head consisted of a heavy iron valve weighing several hundred pounds. The first closing experiment was made June 22, 1910. The well remained closed from 5.50 a. m. to 7.30 p. m., during which time the pressure rose progressively to 405 lb. This pressure remained constant for one hour, after which the valves were opened. They were closed again the next day at 6 a. m. and remained so until June 24, at 2 a. m. As early as the morning of June 23, it was observed that gas was escaping some 100 ft. away from the hole, in a ring about 50 ft. wide. The escape of gas increased during the day and in the evening rumblings could be heard in sections of the earth where the gas had not previously escaped. The eruption of the gases grew so strong on the same day at 11 p. m., that the pressure in the well decreased to 75 lb. while the gas emitted through the earth blew the ground water up like springs to a height of six feet.

It became evident that there was no other way to close the well except by packing the outside of the casing. The work of packing was started on May 19, 1911, and was carried out by Thumann, a drilling contractor of Halle (Germany). It was a great handicap in designing the packing that the pipes were strongly pressed against the hole, and therefore the location of the packing could not be chosen; it was determined in advance by conditions. The pipes were of relatively large diameters as they were intended originally to pass salts of potassium and not for natural gas.

The hole, as shown in Fig. 1, was lined with five sets of casing, as follows:—17¾ in. diameter to the depth of 35 ft.; 15¾ in. diameter to the depth of 121 ft.; 14 3/16 in. diameter to the depth of 402 ft.; 12⅝ in. diameter to the depth of 610 ft., and 11 in. diameter to the depth of 944 feet.

The last 46 ft. of the hole was not cased. The gas could be prevented from escaping up the circumference of the drilling by tightening the hole. By this means it would be possible to collect the gas coming from the deepest and richest sand into the innermost pipe, while the gases of the higher strata would rise separately into the space between the respective pipes. But after taking off the closing head and trying to lift the pipes it was discovered that all were so strongly wedged in place that it was impossible to pull them out and they could not be packed for this reason.

No Choice in Position of Packing

After several trials, it was found that the only free position was a pipe 32 ft. long, a part of the 12⅝-in. casing, situated below the end of the 14 3/16-in. pipe at a depth of 402 ft. Under such circumstances it seemed evident that this was the only place where a packer could be applied as the packing of the other pipes was out of the question. The location of the packer would have been selected in any event above the sand at 525 ft., which was furnishing a great quantity of gas, there being no hope of saving the gas coming from the 374-ft. sand. The records of the boring showed a bed of hard clay at the depth of 400 to 416 ft., and this depth was selected for the packing. In order to prevent the slipping of earth in the last unprotected section, a perforated pipe 50 ft. long and 8 in. in diameter was lowered to the bottom of the well. Then the 11-in. pipe was cut at a depth of 421 ft. (Fig. 2) and it was pulled out of the hole. Next the 12⅝-in. pipe was cut at 418 ft. and lifted Consequently the hole between the depths of 402 to 418 ft. was deprived of its casing, and the packer as shown in Fig. 3 was placed here.

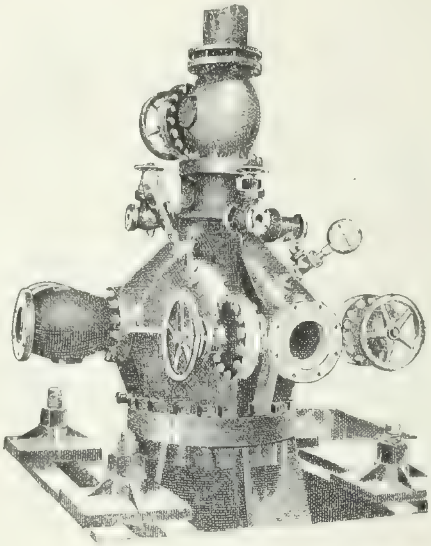


FIG. 4

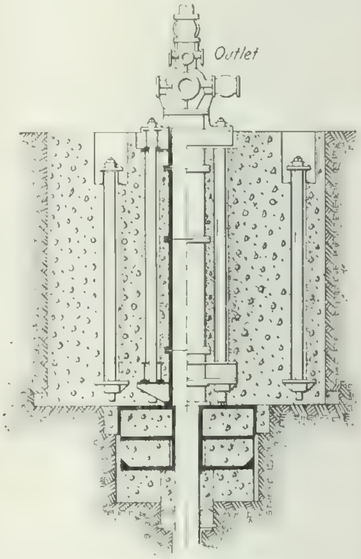


FIG. 5

Closing Valve and Means of Anchoring It to the Casing

The packer is mounted on a pipe of 8-in. diameter and consists of four jute cylinders, of which the three upper tighten the space between the packer pipe and the hole and the lower (fourth) cylinder tightens the space between the packer pipe and the 12⅝-in. pipe. Into the space between the 8- and 14 3/16-in. pipes cement mortar was pumped, thus completely filling out the space between the two pipes and also that between the 8-in. pipe and the circumferential wall of the hole. The spaces between the other pipes of greater diameter were also filled out with cement. Fig. 4 shows a perspective view of the closing head and Fig. 5 a section of the same, showing the method of anchoring.

After the cement became hard the valve head was again mounted, the valves closed and consequently the pressure of the gas reached progressively 420 lb. It has been constant since that time. The work of tightening was finished on July 30, 1911.

Disturbances Follow Closing of the Well

Opinions differ widely concerning the correctness of this method of packing. On Oct. 29, 1911, there was a sudden eruption, like an earthquake, in the vicinity of the gas well of Kis Sármás. The gas burst out with great force at a distance of about 1400 ft. from the well, and within a radius of 1000 ft. it threw the earth to a great distance. From the craters escaped an immense quantity of gas, estimated later at several millions of cubic feet. This was ignited by a lamp burning in a nearby house and it burned with an immense flame. It was difficult to extinguish the fire, and its quenching was accomplished only by throwing wet earth into the fissures in such a manner as to prevent the escape of more gas. No change could be noticed in the condition of the gas well. The pressure remained constant at 420 pounds.

Naturally, the question arose whether there was any relation between the eruption and the well and became the subject of a lively discussion among experts. It is not settled yet. There are two widely different opinions. One party, including Mr. Böhm, the resident engineer in charge of the borings, contends that the eruption was entirely independent of the well and that its cause was purely tectonic. Professor Cholnoky, Professor Pfeifer and others assert that the faulty packing of the well was directly responsible for the outburst.

According to the first-mentioned opinion, the more recent soil layers did move, which would have been the case even if the soil had not been disturbed by boring. Mr. Böhm urges the tectonic theory, stating that the well has shown a constant pressure of 420 lb. after the explosion, which would not have been the case if there had been any relation between the well and the eruption. Before and after the eruption, shakings were felt in the vicinity and the groundwater rose above the soil level, which phenomena usually attend earthquakes. Cholnoky and Pfeifer maintain that the eruption was caused by the insufficient packing of the well. The packer is at a depth of 416 ft. and it shuts off only the higher conducting regions. The gases coming from the deepest and richest layers are not shut off, and they transfuse into the next conducting layer, above which there is a layer of clay. All the layers rise toward the surface. The transfusion was slow on account of the frictional resistance, but at last the pessure grew so strong in the upper conducting region that its force blew up the covering clay layer at a point where it rose nearest the surface. For proof of the existing diffusion, they refer to American wells in which the gas reaches its maximum pressure within a few minutes after the closing of the valves, while at Kis Sármás the maximum was only reached after 37 days.

Mr. Pfeifer believes that the packer should have been placed, as in all American wells, right above the conducting sands and not 95 ft. higher. He suggests the abandonment of the well and the drilling of another, which would be driven with knowledge of what might be expected, and he wants the work done by an American expert.

Several projects to utilize the natural gas have been discussed. For the present the government wants to utilize the gas for industrial developments. Among the enterprises to be undertaken in the near future there is one which will directly use the heat of the gas flames to produce potassium nitrate. This factory will use 7,000,000 cu.ft. daily. Another group of interests, backed by the Solvay Co. of Brussels, intends to invest 4,000,000 crowns, and expects to manufacture chloride of lime, etc., by the electrolytic process.

The Cement Industry in 1911

The statistics of cement production in 1911, prepared by Ernest F. Burchard, of the U. S. Geological Survey, show an increase in quantity, which is the smallest recorded within the last 13 years, and the fact that the total value showed a decrease indicates that trade conditions were not as satisfactory in 1911 as in 1910. The total quantity of portland, natural and puzzolan cements produced in the United States during 1911 was 79,547,958 bbl., valued at $66,705,136. In 1910 the production was 77,785,141 bbl., valued at $68,752,092.

The total production of portland cement in the Unted States in 1911 as reported to the U. S. Geological Survey, was 78,528,637 bbl., valued at $66,248,817, equivalent to 13,321,822 long tons, at $4.97 per ton. The production of portland cement for 1910 was 76,549,951 bbl., valued at $68,205,800. The average price per barrel in 1911 was a trifle less than 84.4c., as compared with 89.1c. in 1910. In the average price for the country is included the value of 135,775 bbl. of white portland cement which sold at an average price of about $2.50 per barrel.

1911 PRODUCTION OF PORTLAND CEMENT BY DISTRICTS

District	Active Plants	Production 1911 Barrels	Change 1911 Per Cent	Average Factory Price Per Bbl.
New Jersey and eastern Pennsylvania (Lehigh District)	24	25,972,108	— 1.30	$0.715
New York	7	3,314,217	+ 1.54	0.805
Ohio and western Pennsylvania	9	6,756,313	+11.25	0.766
Michigan and northeastern Indiana	13	4,519,726	— 0.11	0.827
Kentucky and southern Indiana	3	2,818,820	— 0.21	0.793
Illinois and northwestern Indiana	6	8,617,341	+ 2.88	0.791
Southeastern States (Maryland, Virginia, West Virginia, Tennessee, Georgia and Alabama)	11	4,049,063	+31.85	0.793
Iowa and Missouri	7	6,067,449	+ 6.02	0.862
Great Plains States (Kansas, Oklahoma and central Texas)	17	7,010,396	— 9.23	0.834
Rocky Mountain States (Colorado, Utah, Montana, Arizona and western Texas)	7	2,124,930	— 4.99	1.186
Pacific Coast States (California and Washington)	11	7,278,274	+13.98	1.406
Total	115	78,528,637	+ 2.58	0.844

Production by Commercial Districts

The United States has been divided into 11 subdivisions based on the grouping of plants in direct relation to the trade territory covered by each group. This grouping is also logical when the raw materials are considered. For instance, the plants in northeastern Indiana and northern Kentucky, all of which are near Ohio River and all of which use hard limestone, are grouped together. Plants near Chicago, whether in Illinois or Indiana, are grouped together because of their nearly equal freight rates. The Southeastern States, in which plants use mostly Appalachian limestone, are grouped together, and central Texas is included in the group of Great Plains States. Plants between Missouri River and Mississippi River in Missouri and Iowa are grouped together and the plants in the Rocky Mountain States and western Texas are considered in a group intermediate between the Great Plains and the Pacific Coast. The accompanying tables summarize the statistics for each district.

Lehigh District Produces $18,000,000 Worth

The Lehigh district of eastern Pennsylvania-New Jersey has, with three exceptions, shown a steady increase in production each year from 1890 to the present time. The years in which slight decreases are recorded are 1893, 1908, and 1911. The first two decreases were coincident with years of general business depression, but the decrease in 1911 may, perhaps, be in large part attributed to an over production in 1910. The production for 1911 represented a decrease in quantity of 343,251 bbl., and in value of $619,845, as compared with the production of 1910, an average decrease in price of 1.4c. per barrel.

In 1911, 115 plants reported a production of portland cement as compared with 111 plants in 1910. The total number of rotary kilns in the producing plants was 916 as compared with 902 in 1910. These kilns ranged in length from 40 to 240 ft. The kiln lengths were as follows: 40 to 60 ft., 208 kilns; 60 to 90 ft., 149 kilns; 100 ft., 84 kilns; 110 ft., 140 kilns; 120 ft., 86 kilns; 125 ft., 163 kilns; 125 to 140 ft., 60 kilns; 150 ft. or more, 26 kilns. The gains were all in kilns 100 ft. or more in length, and these gains more than balanced numerically the smaller kilns which were shut down, giving a total of 559 kilns 100 ft. or more in length in 1911, as against 473 kilns in 1910. The 125-ft. kiln is apparently still the most common length for modern kilns.

Nine New Plants Begin Operations

The following nine new plants reported their first commercial output in

1911: Golden State Portland Cement Co., Oro Grande, Calif.; Piedmont Portland Cement Co., Portland, Ga.; Lehigh Portland Cement Co., Mason City, Iowa; Chanute Cement Co., Chanute, Kan.; Tidewater Portland Cement Co., Union Bridge, Md., Michigan Portland Cement Co., Chelsea, Mich.; Knickerbocker Portland Cement Co., Hudson, N. Y.; Clinchfield Portland Cement Corporation, Kingsport, Tenn., and Inland Portland Cement Co., Metaline Falls, Wash. In addition one plant in the Lehigh district, which was idle in 1910, reported a production in 1911. Against these there were 6 plants idle in 1911 that produced cement in 1910, distributed as follows: One each in Arizona and Pennsylvania, two in Michigan and two in New York.

The International Nickel Co.

An agreement has been made for the consolidation of the International Nickel Co. with the Colonial Nickel Co., a corporation recently organized in New Jersey. This agreement is subject to the approval of the stockholders, and a special meeting for that purpose has been called for Sept. 5 next. The International Nickel Co. has now outstanding $11,583,626 common and $8,912,626 preferred stock, with $8,000,000 in bonds; while the authorized capital stock of the Colonial Nickel Co. is $9,000,000. The consolidated company will be known as The International Nickel Co., and will have $12,000,000 in 6% preferred stock and $50,000,000 in common stock; the bonds will be retired.

A statement issued to the stockholders says that $9,000,000 in cash is to be contributed by the shareholders of the Colonial Nickel Co., which is to be used to retire the outstanding bonds of the International Nickel Co. For this money, common stock of the consolidated company is to be issued at par, but by agreement made with stockholders of the Colonial company the stockholders of the International Nickel Co. are to be given an opportunity to purchase this stock at par *pro rata*. The Colonial company has arranged the underwriting of such stock as shall not be taken by the stockholders of the company.

The consolidated company will acquire all the assets of the present International Nickel Co. and will also receive $9,000,000 in cash with which to pay off the outstanding bonds and will have a large amount of stock in the treasury, available as required for the growth of the company's business. Holders of preferred stock of the company will receive in exchange an equal amount of preferred stock of the consolidated company, and this new preferred stock will become a first charge on all the assets and earnings of the company, as the outstanding bonds will be paid off. Holders of the common stock of the International company will receive 2¼ shares of the common stock of the consolidated company in exchange for each share of their present holdings. The capitalization of the consolidated company will be as follows: Preferred stock issued, approximately, $9,000,000; authorized and reserved in treasury, $3,000,000; total preferred stock, $12,000,000; common stock issued, approximately, $38,000,000; authorized and reserved in treasury, $12,000,000; total common stock, $50,000,000. Stockholders of the International company will have the privilege of subscribing at par for the new common stock to the extent of seven-sixteenths of their present holdings.

It is reported that the company has secured some promising claims in the northern part of the Sudbury district; and that these claims will be developed as soon as they are made accessible by the new line of the Canadian Northern R.R., which is now under construction.

The International Nickel Co. at present owns or controls the Canadian Copper Co., Sudbury district, Ontario; the Orford Copper Co. of New Jersey; the Nickel Corporation of Great Britain; and the Société Miniére Caledonienne of New Caledonia.

Another Steel Investigation

Washington Correspondence

The Interstate Commerce Commission has decided to make an investigation into the rates, practices, rules and regulations governing the transportation of cement, iron ore, iron and steel and their products, which will be practically an inquiry into the doings of the United States Steel Corporation. To this end it has issued an order directing such an investigation, in which there is called for "a proceeding of inquiry and investigation instituted by the Commission on its own motion into the rates, practices, rules and regulations of common carriers subject to the act to regulate commerce, as amended, governing the transportation of cement, iron ore, iron and steel and their products, and the material used and consumed in the mining or production thereof, to all points in the United States east of the Mississippi and north of the Ohio and Potomac Rivers, described as Official Classification territory."

It is understood that this investigation is intended to be primarily an inquiry to ascertain whether any "common carrier subject to the Act to regulate commerce, as amended, owns or has any interest in, by means of stock ownership in other corporations or otherwise, any of the above-named articles which it, directly or through other companies which it controls or in which it has an interest, transports over its line as a common carrier, or in any manner owns, controls, or has any interest in mines from which iron ore is taken; whether there is common ownership or control of, or interest in, directly or indirectly, by means of stock ownership in other corporations or otherwise, any common carrier and the mining or production of any of the above-named articles; and whether persons, firms, or corporations having substantial interests in the one, by direct ownership or the holding of stock or securities of common carriers, corporations mining or producing the articles above named or other corporations, or otherwise, occupy, or are represented by persons occupying positions of control in the other."

Turner Emerald Mine in North Carolina

An important feature of the gem-mining industry of the United States during 1911 was the result of prospecting at the Turner emerald mines, near Shelby, N. C., says the U. S. Geological Survey. Gems valued at $100 to $200 per carat have been obtained, and average run of stones is probably as good as the South American.

Up to December, 1911, prospecting consisted of digging several trenches, the largest of which was over 100 ft. long, and two to 14 ft. deep, done by Messrs. Turner and English. The property was taken under option and lease by Lovat Fraser during late 1911, and prospected more thoroughly. It has now been bought by Mr. Fraser and E. P. Earle.

In all about 2700 carats of rough gems have been found, from which about 200 carats of gems have already been cut, and about 700 should be obtained from the entire lot. The average value of the cut stones is about $15 per carat, with a range from $5 to $200.

The theory of the origin of the emeralds at the Turner mine may be summarized thus:

Chromium-bearing basic rock was intruded by granite magma either before or after final solidification of the basic rock. There was a partial absorption of the latter by the granite magma and some of the constituents of the basic rock were taken into solution. Pegmatite veins, in which distinct crystals were only partly developed, formed during the cooling of the rocks. The elements necessary for the formation of beryl were present in the magmatic solutions producing pegmatite, as in some other places in the region. Chromium oxide necessary to impart a color to the emerald was obtained by the action of solutions on the basic rock. A curious coincidence is the fact that the per cent. of Cr_2O_3 in the basic rocks at the Turner mine is about the same as that found in emerald from Colombia.

Should the theory of origin outlined above be essentially correct, prospecting in areas where similar rock associations occur might disclose other deposits of emeralds. Of course, it should not be expected that every pegmatite associated with the rocks mentioned will carry emerald, for beryl has been found with only a small proportion of the large number of pegmatites occurring in the region. Besides chromium-bearing basic rock and pegmatite, the presence of the elements of beryl in the original pegmatite-producing solutions would be necessary.

Buying and Selling Mines

By W. Weston*

With *"Caveat Emptor"* for their text, many able writers in technical journals have, from time to time, discoursed on the advisability, or rather the absolute necessity of the services of a trained and honest engineer being secured by those entertaining the purchase of a mining property, and the result has been that no deals of any magnitude are now made, except in the manner indicated. Time was—say 25 years ago—when the rough and ready "honest miner" in a blue shirt and his trousers tucked into the top of his boots, his mouth full of tobacco, and his pockets filled with specimens, or perchance with a small bag of nuggets or a little vial of placer gold, from the property which he had for sale, could visit an Eastern city and be received at once by the promoter, or the "rich sucker," (as they were politely termed,) but *"nous avons changé tout cela"*—mines are bought and sold now on strictly business principles, and the vendor of a property has to present it accompanied by a report made for him by an engineer of repute and technical training, otherwise it will not be entertained, and then this engineer's report has to be corroborated, or otherwise, by an engineer who examines the property for the buyer, and this is as it should be.

THE OLD WAY STILL BEING TRIED

Of course even now one hears occasionally of a case where a man of polish and education, with good introductions and a fair amount of capital of his own, gets hold of a big property on option, goes to London, and being without scruples or technical knowledge, makes a flashy report, which could not hold water for a minute under expert criticism, but which is accepted by a few wealthy men on the strength of his introduction, or as sometimes happens, on the fact of their all belonging to the same religious sect, the promoter usually closing the business at a private house where, with his feet under "the victim's" mahogany, and a good dinner under their belts, they are mellowed into putting down their names for the money required, the spending of which is also often unfortunately entrusted to the "untutored mind" of the man who has thus adroitly separated them from their "bag of pounds." This has but one result, and fortunately rarely happens now.

But while much has been written about the buyer's end of it, little has been said or written about a seller's end and the necessity of his furnishing a well accredited engineer's report describing his properties.

Two instances have come under my notice lately, almost identical, except in the personality of the two individuals controlling the properties—both wishing to sell on account of advanced age and a desire to clean up—price of each property in the neighborhood of two million dollars, and no engineer's report, plans, maps, or even an intelligently written description of the property, which would induce any capitalist, or syndicate of capitalists, to give the matter five minutes of their time, or five cents of their money, in investigation. A man who owns a property for which he asks two million dollars can certainly afford to pay an engineer 0.1% of that amount to put it in proper shape for presentation to capital, and in such a work $2000 would ordinarily be a very moderate fee. But "No," they say, "there's the property; it's for sale; you can send your engineer to examine it. I don't care to tie it up at present, but if after the examination you want to do business, we will talk about an option." This is the line of talk a purchaser or his agent often gets. The engineer may have to come from New York or London, and it does not occur to the vendor that no purchaser of any sense would dream of going to all that expense unless a report on the property, price, terms of payment and option, giving ample time for examination, preliminary negotiations, and assurance of certain delivery, were first given in writing.

ATTITUDE OF VENDORS BLOCKS SALES

This vendor's plan is exemplified in a coarser way by a miner in the boom days of Cripple Creek, who, swelled up by the ownership of a really rich claim, when approached at his mine by a well known and wealthy operator who desired to purchase, said in answer to a request for time for examination: "Jaw-bone don't go. Come up on the doomp wid yer wad."

But the days of snap action and "stand and deliver" terms of purchase, rich tenderfoot buyers of mines, or sales of claims on picked specimens of ores and pocket-worn gold nuggets, have long since vanished, never to return; mines are bought and sold on scientific lines. The purchasing public has become educated to proper methods.

Not so, however, or not in the same ratio, the owner and vendor, who has yet much to learn. The self-sufficiency and arrogance of the owner of a really good property is too often a bar to a sale, and not until he has been turned down many times, and had many rebuffs from strong people on account of his prohibitive terms, does he realize that it takes two to make a bargain, and that they must meet one another half way.

A point often lost sight of in negotiating for a purchase of a property, is the fact that an option is *de facto* a bond for a deed, and while the option may be drawn up in legal and binding form, unless a valid deed can be given, the option is worthless. The latter, therefore, should be accompanied by an abstract of title, or the certificate of an attorney in good standing that he has examined the title and found it clear and unassailable. This was exemplified the other day in a Western state, in a purchase which involved the expenditure of a million and a half dollars. The president of the company gave an option in perfect good faith, but on examination of the title by the purchaser's consulting engineer it was found that some of the claims which belonged to the company had not been properly deeded to the same by the owners. This made the option valueless and the president had to reorganize his company before he could give an option that was really what it purported to be, i.e., a bond for a deed.

Analysis of Pig Iron Production

The annual report of the American Iron & Steel Association, just published, adds to our previous statistics a complete analysis of the production of pig iron in 1911, according to grades, which is of much interest.

The complete classification of pig iron made for two years past is as follows, in long tons:

	1910		1912	
	Tons	Per ct.	Tons	Per ct.
Foundry iron....	5,144,635	18.8	4,397,729	18.6
Ferrosilicon	115,812	0.4	71,211	0.3
Forge iron .	561,157	2.1	408,841	1.7
Bessemer	10,986,571	40.3	9,126,843	38.6
Bess. malleable	843,123	3.1	612,533	2.6
Low phosphorus	259,071	0.9	282,460	1.2
Basic .	9,084,608	33.3	8,520,020	36.0
Spiegeleisen	153,055	0.6	110,236	0.5
Ferromanganese	71.376	0.2	74.482	0.3
Miscellaneous....	81,159	0.3	45,192	0.2
Total........	27,303,567	100.0	23,649,547	100.0

Miscellaneous includes mottled and white pig, direct castings and some ferro-alloys. Low-phosphorus pig contains less than 0.04% phosphorus; bessemer pig from 0.04 to 0.10%; iron containing 7% or over in silicon is classed as ferrosilicon. Spiegeleisen contains 9 to 22% manganese and ferromanganese 45 to 82%, the standards being 20 and 80%, respectively.

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*Mining engineer, 965 Gas and Electric Bldg., Denver, Colo.

The consumption of iron ore and other materials and of limestone and dolomite flux by the blast furnaces, with the average quantities used per ton of pig iron made, are reported as follows for two years past; figures being in long tons:

	1910		1911	
	Total	Per ton pig	Total	Per ton pig
Iron ore	51,739,000	1.894	13,950,000	1.859
Cinder, etc.	2,800,000	0.103	2,535,000	0.159
Total	54,539,000	1.997	40,515,000	2.018
Limestone	27,303,567	1,191.8lb.	23,649,547	1,144.8lb

The miscellaneous material used in the furnaces includes mill cinder, scale, scrap, slag, zinc residuum and pyrites residues. The averages are calculated on the total make of pig iron. The miscellaneous material was 5.1% of the total in 1910 and 7.9% in 1911. In 1911 the average consumption of flux was 1153.6 lb. per ton of pig made by the anthracite and coke furnaces, and 405.4 lb. by the charcoal furnaces.

The quantity of ferrophosphorus—included in miscellaneous in the table—in 1911 was 6820 tons, an increase of 3349 tons over the previous year.

The number of completed blast furnaces in the United States at the close of the year was 466, eight new furnaces having been built during the year and 20 abandoned; a net decrease of 12 stacks. But the aggregate yearly capacity of the 20 abandoned furnaces was 404,700 tons of pig iron, while that of the eight new stacks was 1,152,500 tons, so that there was a net increase of 747,800 tons in capacity. This statement does not include 15 stacks which were under construction, but not finished at the end of the year. These will have a total yearly capacity of 1,744,500 tons of pig iron.

Industrial Accident Insurance

The Scullin-Gallagher Iron & Steel Co., St. Louis, has developed an accident-insurance system for its employees, which possesses some interesting features says *Iron Trade Review*, July 4, 1912. Each employee pays 1% of his wages for accident insurance. That is, a man receiving $100 per month pays $1 per month to the company for the protection; one receiving $50 a month pays 50c., etc. In return for this the employee is given full medical attention by the company's surgeon without cost in case of any accident. For loss of life the heirs of the employee are paid a full year's salary in cash, this not to exceed $2600. For the loss of both hands or both feet or one hand and one foot, or for the total loss of sight, a similar amount is paid. For the loss of one hand or one foot, half of the foregoing indemnity applies. Similar payments are made for minor accidents. Also, in case an accident sustained by an employee disables him so that he is unable to attend to his duties for a period of more than one week, he is paid an amount equal to half of his weekly wages during the period of his disability.

Largest Electric Mine Hoist in America

In the mine of the Christopher Coal Mining Co., recently organized at Christopher, Franklin County, Ill., will be installed the largest electric mine hoist in America. The mine is to be operated entirely by electric power and about half the capacity of the plant will be required for the hoist. Power for the several operations will be generated at the mine by two 750-kw., three-phase, 60-cycle, 2300-volt Curtis turbo-generators, for which excitation will be furnished by a 15-kw., 125-volt turbo-exciter set. Above ground practically all the machinery, except the hoist, will be operated by alternating current; while all the underground equipment is to be operated by 250- to 275-volt direct current.

The hoist operates on the Ilgner system and is of the double-drum type, having 7-ft. drums designed for an effective load of 9000 lb. in a car and cage, the combined weight of which is 11,000 lb. Wire hoisting rope 1⅜-in. diameter is used. The equipment is being built to make 1000 trips from a 600-ft. depth in seven hours. The cycle arranged calls for 6-sec. acceleration, 9 sec. at full speed, 6 sec. for retardation, and 4 sec. loading and dumping, which corresponds to a maximum rope speed of 2400 ft. per minute.

A 1150-hp., 550-volt, direct-current motor drives the hoist and is direct connected to the drum shaft by a flexible coupling. This motor is designed especially for hoisting service and has large overload capacity. Power will be supplied to the motor by a flywheel motor-generator set, consisting of a 650-hp., 2300-volt induction motor; an 880-kw., 550-volt generator; a 17-kw., 125-volt exciter and a 22,600-lb. flywheel. This unit operates at 600 r.p.m. It is interesting to note that, through the Leonard method of control and the application of the flywheel, it has been possible to decrease the capacities of the hoist motor, generator and induction motor progressively contrary to usual practice.

The speed and direction of rotation of the hoist will be controlled by a controller at the operating platform, by means of which the voltage and polarity of the generator will be governed. Fluctuations of the hoisting load are smoothed out by means of the flywheel and an automatic rheostat in the circuits of the induction motor. The torque of the regulating motor varies with the line current and when this current tends to exceed a predetermined value, the torque of the regulating motor will overcome the weight of the moving parts of the rheostat, introducing resistance into the rotor circuits of the main induction motor, thereby causing the motor to slow down and allowing the flywheel to give up its energy. When the current tends to fall below the predetermined value, the weight of the moving parts of the rheostat will exceed the torque of the motor and the resistance will be cut out automatically. The weight of the moving parts of the rheostat is counterweighted for purposes of adjustment. In the control equipment are also included protective devices to guard against damage from overwinding, failure of alternating-current supply, loss of exciter voltage, loss of air pressure for the brakes, as well as extreme overloads. Both service and emergency air brakes are provided.

The hoist is to be of the Ottumwa Iron Works make, and all the electrical apparatus, including the mine locomotives, is being furnished by the General Electric Company.

Copper Production in Michigan

The following table, compiled from official reports, gives the copper production of Michigan in 1910 and 1911:

COPPER PRODUCTION IN MICHIGAN

Mines	1910	1911
Ahmeek	11,844,954	15,196,127
Allouez	4,655,702	4,780,494
Atlantic	19,018	nil
Baltic	17,549,762	15,370,449
Calumet & Hecla	72,672,469	72,861,925
Centennial	1,572,566	1,493,834
Champion	19,224,124	15,639,426
Gratiot	265,869	14,275
Franklin	966,353	820,203
Isle Royale	7,567,399	7,490,120
La Salle	633,778	280,598
Mass	1,321,885	1,326,898
Michigan	36,682	327,773
Mohawk	11,412,066	12,091,056
Osceola	19,346,566	18,388,193
Quincy	22,517,014	22,252,943
Superior	3,181,041	3,236,233
Tamarack	11,063,606	7,494,077
Trimountain	5,694,868	6,120,417
Wolverine	10,469,253	9,630,639
Victoria	1,164,564	1,303,331
Totals	223,179,539	216,119,011

Accident at German Potash Mine

According to press dispatches a serious accident occurred recently at the Jessenitz potash mine in Mecklenberg, Germany. While men were at work at the bottom of the shaft, about a half-mile underground, a rush of water was heard in the tunnels. By climbing the ladders the men were barely able to save themselves. The shaft is said to have filled to within 120 ft. of the surface. At the same time the level of a near-by lake fell more than a foot, indicating that about 480,000 cu.yd. of water had entered the mine from that source. It is said that the officials have pronounced the mine a total loss. The fact that the lake in question is connected with the River Elbe reduces the possibility of recovering the mine.

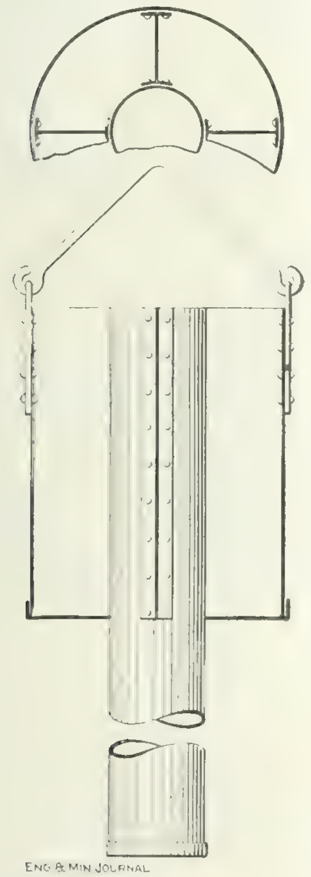
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Can for Lowering Drill Steel

By Evans W. Buskett*

In the practice of underhand stoping in the sheet-ground mines in the Joplin district, long drill bits sometimes reaching a length of 16 ft. are used. To any one who has attempted to send down drill steel in an ordinary can or bucket the accompanying sketch of a special steel can will be appreciated. This same system can readily be adapted to mines using cages.



Bucket for Lowering Drill Steel

The steel can or bucket is about 24 in in diameter and 30 in. deep. In the center is a cylinder about nine inches in diameter passing through the bottom of the can and braced at the top as shown in the sketch. This cylinder can be made to suit the length of steel used. The sketch shows a cylinder for 16-ft. drills.

In use the can is set in a hole in the platform at the collar of the shaft and the steel is placed in it. The longer steel is placed in the cylinder while the short drills are placed in the compartments made by the braces. When the can reaches the bottom of the shaft it is laid on its side and the rope detached.

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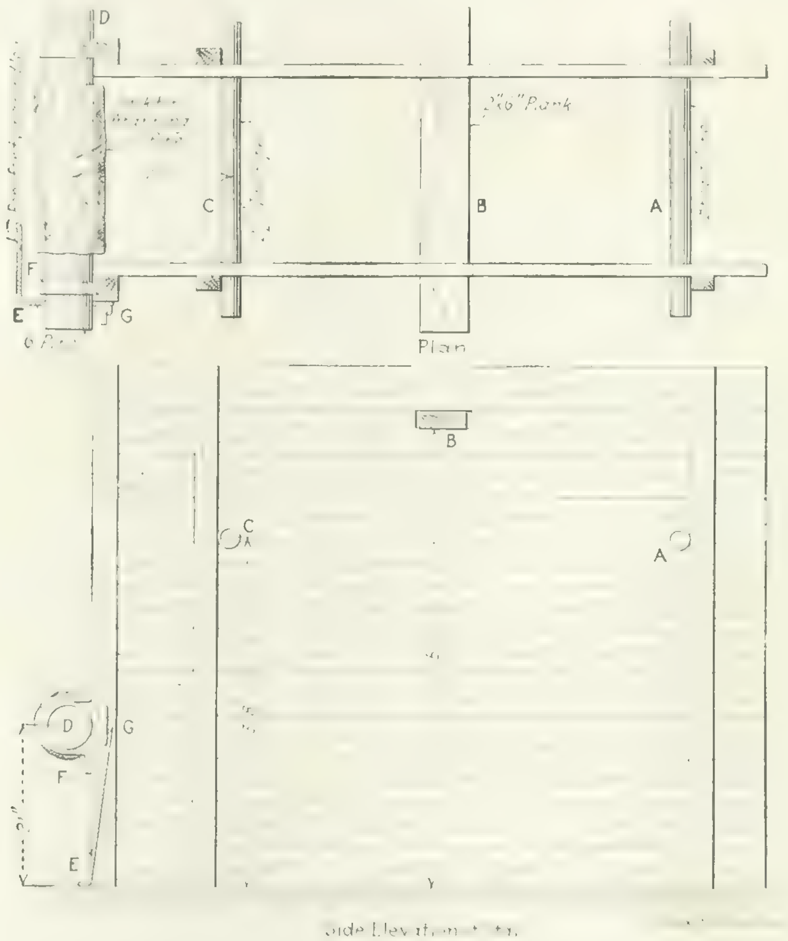
*Metallurgist, Joplin, Mo.

Shoeing Mean Mules

Trouble is often experienced in shoeing mules, especially underground. In the accompanying sketch the general features of a shoeing stall are shown, which has been built at one of the shafts of the St. Louis Smelting & Refining Co., in the Flat River district of southeastern Missouri.



Stall for Shoeing Mean Mules

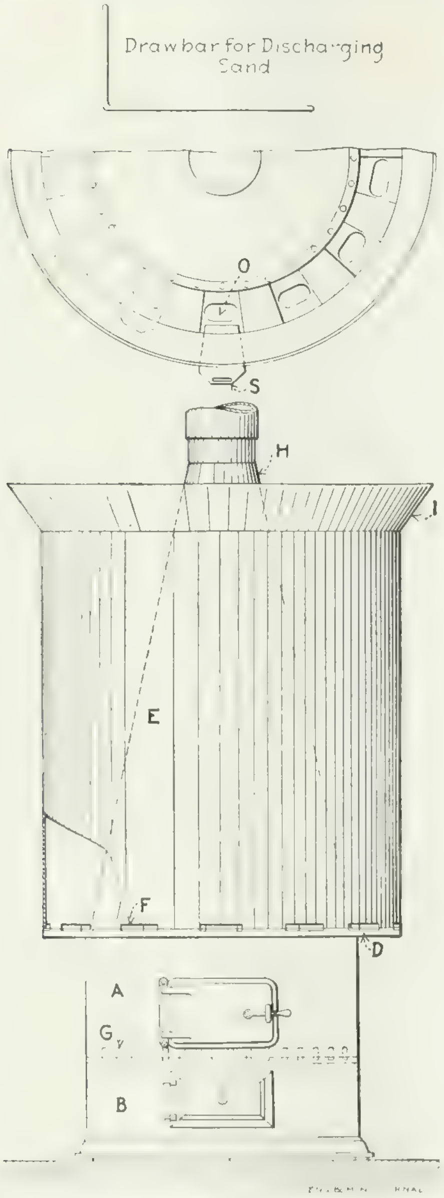
This stall is made narrow so that the mule has not much leeway. There is a pipe *A* at the manger or head end of the stall against which the breast of the mule comes. This is put in after the mule has been forced back against the other pipes and board that are used to restrain him. By this breast pipe he is kept from moving forward; by the board *B* that is put in over his back the mule is kept from rising up so as to be able to kick; by the pipe *C*, which is put in at the same height as the breast pipe, the mule is kept from backing out of the stall; and by the pipe *D*, which is wrapped with old gunny sacks to prevent the mule from injuring himself, he is prevented from kicking.

In shoeing a mule the foot that is to be shod is raised up over the pipe *D*, which is held in iron straps *F*, bolted to the back posts of the stall, and then is tied by the rope *E* that is fastened to the cleat *G*. By this rope the mule is prevented from jerking his foot back out of the shoer's grasp.

The mule can be turned around and his front feet shod in this stall if he causes trouble by not standing still or by trying to strike the man. Some mules give trouble in being shod by laying their weight on the man during the shoeing. This can be remedied by rigging up a swing and putting a band or surcingle around the mule and swinging him so as to take his weight off the shoer.

Driers for Locomotive Sand

Wherever much hauling has to be done either by air or electric locomotives in mines and the track grades are steep, a large quantity of sand has to be used, especially when in the mines there is much dripping of water from the roof. In the lead mines of southeastern Missouri, where the ore occurs irregularly through a flat dipping sedimentary formation, frequent changes in the grade of the tracks are necessary. No matter what the type, whether air, electric or gasoline, much sand is required for the locomotive if a heavy load is to be hauled.



Sand Drier for Locomotive

Hard river sand should be used. Tailings ordinarily are too easily pulverized under the wheels. The ordinary sand driers on the market are made with many tubes, which are expensive to keep in good condition. In the driers devised for the St. Louis Smelting & Refining Co., illustrated in the accompanying sketch, no tubes are used. The drier is somewhat similar to one that was used in railroad construction work in British Columbia, but which was smaller and in which the sand drum was conical, being heated by a large upright stove, such as is used in country railroad stations. The bottom was a screen that held back the wet sand but let the dry sand trickle through. The sand drier used at the St. Louis works has a cylindrical firebox *A*, with a grate *G* and an ashpit *B*, the whole being somewhat similar to those used on some heating furnaces, except for the rim at the top which is perforated at 5-in. centers. These perforations have the shape shown in the details of the method of discharging the sand.

On the top of the firebox is the drum *E* with a notched bottom leaving opening *F*, 5-in. wide and ½-in. deep, when it is placed on top of the firebox. These openings serve to carry the slide gates *S* that slip in on top of the rim *D* and close the openings *O*, that have been cast in it, and through which sand is allowed to discharge as it dries. Inside of the drum *E* is the cone *H*, which comes down on the rim *D* of the firebox, just inside of the discharge opening *O* on a depressed ledge shown in the details of the rim and discharge opening. Between the drum *E* and the cone *H*, which is contracted sufficiently at the top to take an 8-in. stove pipe, is the space for receiving the wet sand. To aid in the charging with wet sand a rim *I* is put on the top of the drum. Owing to the conical shape of the inner faces of the sand receptacle the hot gases impinge against it and the wet sand is quickly dried. While wet the sand will not run, but as soon as it dries it is loosened enough to run down to the opening on the rim, where it is discharged. More wet sand then comes down against the inner face and is dried in a similar manner. A small poker is provided that is turned up about a foot at the end for inserting into the discharge opening and starting the sand to running if it becomes packed at the bottom.

There are no fire tubes in this heater; in fact, about the only things that have to be replaced are the grates which, of course, burn out in time. The man that tends the sand drier, for an attendant is necessary, as from two to four tons are dried per day with this device, also makes up the cartridges of tamping for the mines and does other odd jobs. This work is usually done by some crippled employee.

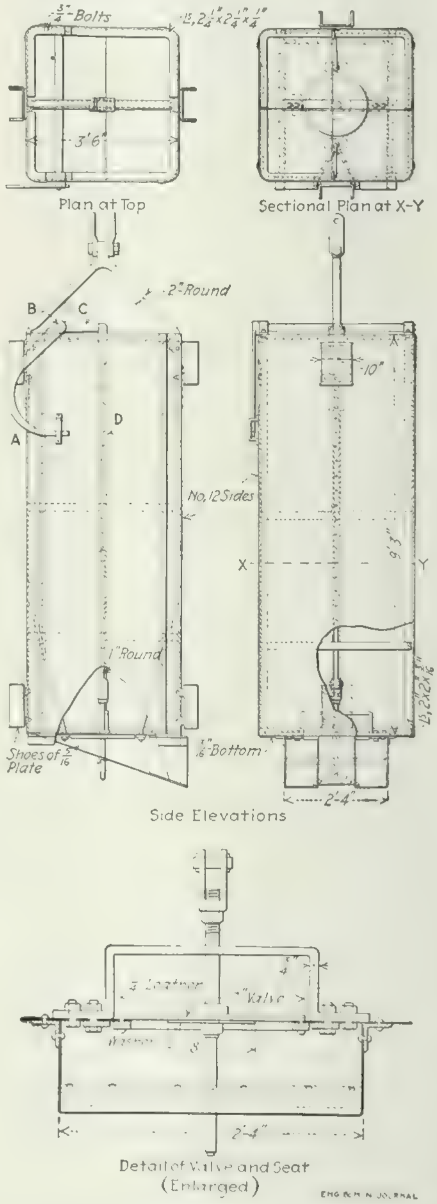
In driving the Laramie tunnel in Colorado the average depth of hole was 7½ was found that with the heavy charges used the powder formed its own tamping. It was therefore possible in case of missfires to explode the charge by pushing a new primer tightly upon the unexploded powder.

Bailer for a Winze Hoist

By S. A. Worcester*

The 800-gal. bailer shown in the accompanying illustration was designed for use in the winze described in the Journal of May 25, 1912, p. 1027. It is arranged to discharge into a tank placed at the south side of the winze in such a manner that two streams flow from the bottom, one on each side of the guide.

The curved arm *A* projecting beyond the upper corner of the bailer is engaged by a stationary lug fixed at the discharge point in the winze. This lug forces the arm *A* inward, rotating the 2-in. shaft *B* and through the link *C* raises the rod *D* which lifts the discharge valve, thus emptying the bailer.



Bailer Used in Camp Bird Mine

The removable guide shoes are bolted to the sides of the bailer and are fitted with liners which can readily be changed in case of there being variations in the distance between guides. The sides of the bailer are made of light sheets well stiffened by ties and angles to prevent bulging. The bottom plate, $\frac{3}{16}$ in. thick, is stiffened by the angles that hold the discharge spout, by the valve-seat ring, and by the two rods from the sides.

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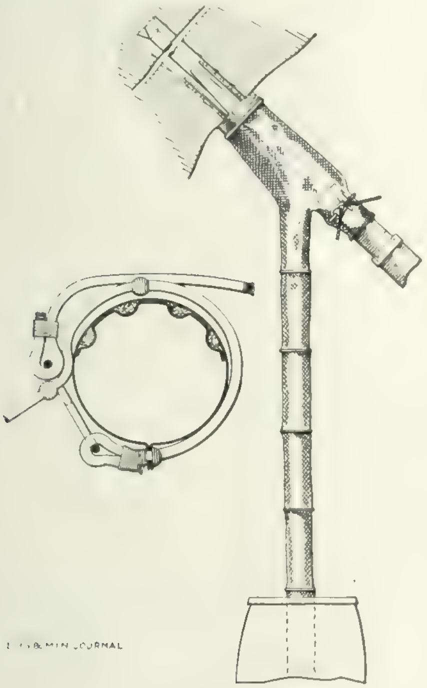
*Mechanical engineer, Victor, Colo

The Mitchell Dust Catcher

The dust catcher shown in the accompanying illustration is used in the Leonard mine, at Butte, Mont., for catching dust from holes drilled above a horizontal position.

As shown in the accompanying figures the device consists of a bag made of canvas or other suitable material. The upper end of this bag is attached to a metal collar to which are riveted four projecting prongs of spring steel. The lower end of the bag is provided with means for attaching to the end of the rock drill. A canvas tube depends from the bottom side of the bag.



DUST CATCHER USED IN SOME BUTTE MINES

After the hole has been drilled into the face to a depth of six inches or more, the spring prongs are thrust into the hole far enough to bring the collar close against the face. The drill steel is then run through the bag so as to extend up into the hole. The lower end of the bag is tied tightly around the drill. As drilling progresses the dust from the hole runs down into the canvas bag thence through the tube into a suitable container.

This device was designed by Thomas E. Mitchell and is patented.

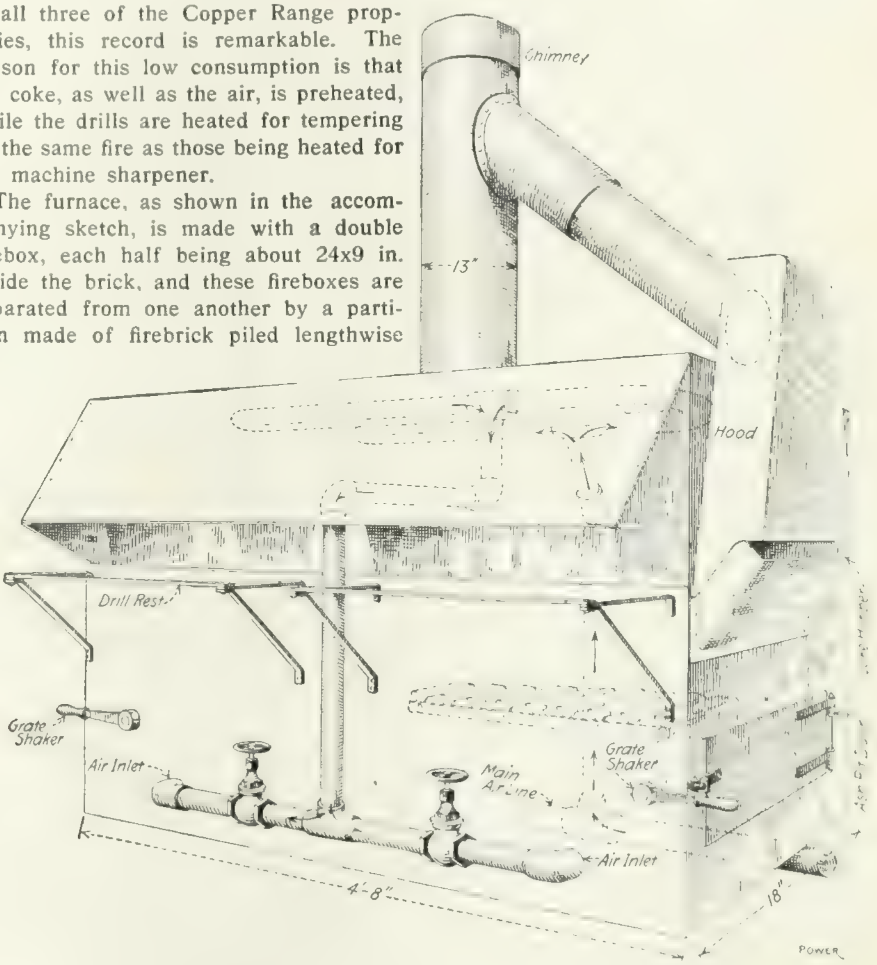
Coke Furnace for Heating Drills

By Claude T. Rice

The coke furnaces used at the Champion mine, at Painesdale, Mich., for heating drills for sharpening and tempering have made the low record for coke consumption of less than half a pound of coke per drill sharpened and tempered. When considering that lots of 750,000 drills are sharpened in a year at the Champion, Trimountain and Baltic mines, for the same type of furnace is used at all three of the Copper Range properties, this record is remarkable. The reason for this low consumption is that the coke, as well as the air, is preheated, while the drills are heated for tempering on the same fire as those being heated for the machine sharpener.

The furnace, as shown in the accompanying sketch, is made with a double firebox, each half being about 24x9 in. inside the brick, and these fireboxes are separated from one another by a partition made of firebrick piled lengthwise across the wall. The firebox is 10 in. deep and fitted with a shaking grate designed somewhat on the principle of the grates in the firebox of a locomotive From time to time the grates are shaken and the clinkers broken up so that there is practically no burning out of the grate bars. The wear on the bricks of the furnace is such that the furnace only has to be relined once in two weeks, 12 firebricks being required for the purpose. This is practically the only maintenance there is on the furnace.

It will be noticed that at each end there is a hopper projecting out from the body of the furnace. These hold the coke and are kept filled so that the coke is thoroughly heated before going down on the fire. This coke feeds down as the fire needs it into the firebox, but, from time to time, the fire has to be poked, and the coke spread out. This is done through the coke hopper, a hood being used to take any gases that may come up the hopper out of the shop through the main chimney of the furnace. This hood is carried by a sleeve that goes over the main chimney pipe so that it can be made to serve the other hopper by swinging it around, there being holes cut in the main pipe to permit this being done. Generally, only one end of the furnace is used at a time, and the heating of the drills for sharpening, is done on one side, while on the other side of the fire the drills are being heated for tempering.



DRILL-HEATING FURNACE USED AT CHAMPION MINE

The path of the air through the furnace is shown in the sketch. The air comes in at the bottom, is taken up through the furnace to a coil of pipe carried on top of the arch of the furnace, so that the hot gases have to play around the coil before going out the chimney, and then comes down to the bottom of the furnace again. In this way any water that may be in the air is converted into steam and the air is preheated before going to the fire. This causes less formation of clinkers than would be the case if wet air were blown under the grate.

In order to throw the heat well out in the furnace, the firebox is made with a low arch, having a spring of only about two inches and a width of approximately 14 in. This arch is carried upon a cast-iron frame hinged at the top so that by an expansive device it is made to grip the bricks of the arch, eight in a row set edgeways, so that they are held tightly in place; ½-in. boiler plate is used for the sides of the furnace.

Using half of the furnace, 1250 drills are often heated for sharpening and tempering in nine hours. It is because the coke is preheated and the air kept always in a dry condition that it is possible to keep the fires uniform so that the heating for tempering can be done on the same fire as the heating for sharpening.

These furnaces have been in use for some time at the Champion mine and have been found much better than the old style of furnace. They do not cost much more to make than do the others, while the operating cost and cost of maintenance are much less than with the ordinary type of coke furnace in common use. The furnace was devised by James Treganza, foreman of the blacksmith shop, and W. J. Richards, master mechanic.

High Cribbings to Support Roofs

It is often possible to mine blanket deposits by leaving part of the ore as pillars. Where the ore is low grade and the pillars may be left far enough apart so that the workings between pillars are not so small as to interfere with the breaking of the ground and the amount of cutting around pillars is not too great, this is often the most profitable way to mine such an orebody. Generally large pillars are left when going through the orebody for the first time, and later are trimmed down as small as better acquaintance with the ground indicates is feasible, doing this retreating from the boundaries. Or when it is not necessary to preserve the roof of the workings, either because the caving will not go to surface owing to the depth of the workings, or because of the surface having little or no value, these pillars are blasted out entirely, and the ore scrammed.

But it should always be remembered before deciding to allow the workings to cave that it will probably be impractical at some future time to go in after any ore that is later discovered underlying the present orebody, at least until several years have passed and the caved ground has become quiet. Failure to prospect the underlying ground or else failure to realize that improvements in mining practice would make profitable ore of what was formerly too poor to mine has tied up considerable ore in certain parts of the southwestern Missouri zinc district.

Often when going through the orebody for the first time it becomes the custom, when sufficient knowledge of the ground has been obtained, to drill the holes for cutting down the pillar as the work advances. These holes should be plugged with wood so that they can easily be found again when months afterward it comes time to load them.

Often in pillar mining, owing to a cross fissure or other unforeseen reasons, the roof between some of the pillars, although the pillars are not left far apart considering the rest of the mine workings, becomes heavy, and perchance a slab may drop out. Then it becomes desirable to build up a crib to support the roof at that place. In such a position with pillars around there cannot be much side swing in a flat, blanket deposit. Therefore the crib does not have to be large to carry a considerable weight especially if filled with rock. But in building it, especially when it is high and heavy blasting is going on in the vicinity, and especially when later ore must be blasted near-by, the small crib needs considerable steadying. In the Providence mine, where a slabby roof has developed in two places between pillars near the shafts, 7x9-ft. cribs have been built up 26 ft. high to support a roof. In each instance these have stood for a year or so and show no signs of failure although they are apparently carrying a large slab of ground.

The timbers of the crib are 7 or 9 ft. long and are 12x12-in. or 10x12-in. timbers. These timbers were overlapped six inches and outward movement was guarded against by nailing 2x6-in. and 2x4-in. planks so as to form an angle at the four outer corners where the crib timbers overlap. The main timbers were also toe-nailed together where they crossed so that outward movement of the timbers, when weight came on them and the rock filling which was carried up as the crib was built, was taken care of, while movement of the crib timbers with respect to one another was also prevented by these angle planks and the rock filling.

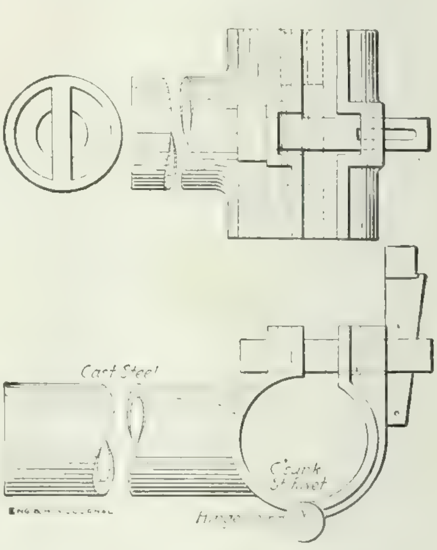
Platforms for carrying up the crib were provided by building old pieces of pipe into the filling as the cribs were carried up. Cross timbers were carried through the middle of the crib in the top two layers, and the whole outer periphery of the crib over the timbers was wedged and blocked down from the roof after the filling had been built tightly up to the roof.

In filling the crib small rock was used as there would be less voids, and the filling was built in between the timbers. The stages were put in about six feet apart vertically, and were left in for a time so that the top of the crib could be inspected to ascertain how it was taking the weight. For the first three or four days after the crib was put in the wedges were tightened each day all around the top so as to take care of any settling that might take place under the force of the concussion and the shake of the ground caused by the heavy blasting near-by, where often one or two boxes of 40% dynamite are loaded into the flat stope holes which are drilled in that mine to a depth of about 18 ft. and have a burden of 10 ft. of ground on them.

Arm for Drill Columns

By R. A. Rule*

The drill column arm generally used in underground drilling is clamped to the column by two bolts. In the arm, for which application for a patent has been made, bolts are not used. The arm is attached to the drill column by a clamp in which a wedge and slotted key are used instead of the usual bolts.



Wedge and Key Drill-column Arm

The wedge fits into a slot in the key, and by striking the wedge a smart blow with a hammer the clamp is drawn tightly about the column. To loosen the clamp the lower end of the wedge is struck with a hammer. It requires but one hand to loosen the wedge so that the other hand may be used to hold the arm when the grip is released.

In the Amur province, or on the eastern side of Lake Baikal, in Siberia, platinum-bearing gravel deposits are prospected by sinking small test pits, states Leon Perret, in a paper on gold and platinum deposits in Russia, recently read at a meeting of the Institution of Mining and Metallurgy. The prospector standing on the bottom of the pit can throw the excavated material from a depth of 14 ft., while some experts can throw from a depth of 20 to 24 ft., and with such precision, that the ejected material will fall in the proper pile at the surface. A separate pile of gravel is made for sampling for each seven inches of depth.

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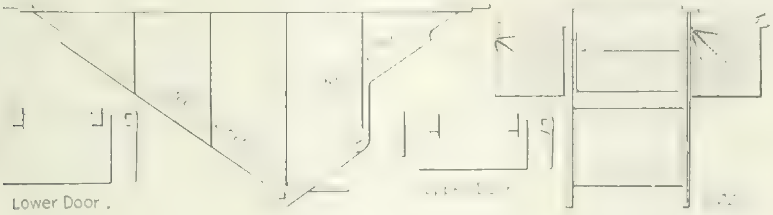
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Calumet Rock Chute

By Claude T. Rice

The type of cast-iron gate chute used on the bins at the rock-houses of the Calumet & Hecla company is shown in the accompanying illustration. The ore that goes to these bins is crushed to four inches, so no large pieces have to be handled through the chute, which is used for drawing the ore off from the bottom of the bin. Within its field of service this ore chute seems to be satisfactory, as chutes of similar design are used in the rock-houses of several of the other Lake Superior companies. Liners are used to save the bottom of the chute. These liners and the gates wear quite thin before they have to be replaced. Replacing can be done at any time easily in the case of the gates, for by closing either one of the two the ore can be held back while the other is being replaced. The bottom door or gate shuts off the ore when lifted up from below, while the other gate, which drops down, is used only to regulate the flow of ore by choking the mouth.



Cast-Iron Chute Used in Calumet & Hecla Rock Houses

Levers fit on the square ends of the gate shafts, and these in the ordinary way in which the gate is used, catch on notched arms that are carried down from the bottom beams of the bin. In this way either gate can be locked shut or at intermediate points of closing so as to regulate the flow of the ore. The chutes are usually put in crossways with the railroad tracks, and then these notched braces have to be used in holding the gates in the different positions. But sometimes these chutes are put in so as to discharge lengthwise with the tracks and are opened by a system of levers that can be operated from a small house or platform on the outside of the car tunnel so that the man loading the cars does not have to go where the dust is flying and climb around on cold cars in cold weather.

Pump Suctions from Cyanide Tanks

By H. T. Durant*

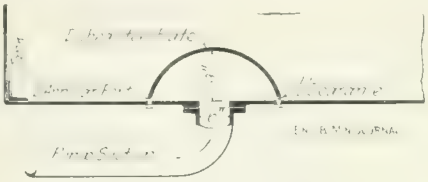
Centrifugal pumps when used to pump from tanks are usually, where possible, arranged to work fully "flooded", thereby entirely avoiding suction lift, the necessity for priming, and the use of foot valves, all of which are a source of delay when endeavoring to run full time. Sometimes the flanged suction connection is made to the bottom of the tank, and at other time to the side, as near the bottom as possible.

Unless some device is used by which the pump can practically empty the tank before it takes enough air to prevent further work, it will be found that, in the case where the suction connection is on the side of the tank, several inches of water still remain in the tank after the pump ceases to draw. Those who have had to clean out a large tank which has no other exit for mud, etc., than a pump with the suction connection on the side of the tank, will appreciate what is meant by this amount which the pump will not take.

This water represents, in a tank of any ordinarily used dimensions, such a tonnage that one is sometimes led to wonder why the suction connection was not made at the bottom of the tank, under which conditions the tank itself could have been built several inches less in depth, or, conversely, with the same depth it would have held more available water.

The accompanying sketch shows a simple and proved arrangement which causes the pump to empty the tank down to the last half inch or less. This, or some other device, may already be ancient history, although I am not aware of its having been illustrated. An obvious modification would make it equally applicable in those cases where the suction connection is to the side of the tank.

The arrangement consists of a dished steel plate of about ⅜ in. thickness, the over-all diameter of which is about four times the diameter of the suction pipe. This plate is placed inside the tank with its concave side downwards over the suction hole, and is distanced off the bottom of the tank about ½ in. by four steel wedges, or by four setscrews tapped through the dished plate.



Method of Attaching Pump Suction to Bottom of a Tank

It is essential to have the dished steel plate heavy enough, or otherwise weighted, so that, when the pump, without first closing the suction or delivery valves, is stopped, the amount of water flowing back from the delivery lines will not be able to shift the plate. This dished plate being arranged by wedges or setscrews to clear the bottom of the tank by about ½ in., will, in the case of a 6-in. pump with a plate two feet in diameter, give as feed to the pump suction an annular port about 72 in.x½ in., consequently partly compensating the friction by excessive port area.

Sampling of Ore

It is not intended, by giving the following data, to enter into a discussion of the errors of sampling. These facts are given to show that it is possible for a wide range between the actual contents of the ore and the estimated contents obtained by the usual sampling methods. The factor that represents this difference is as important in estimating the costs of handling ore as any that represent costs for operation or other charges.

The results of sampling at one of the large gold mines, where the appearance of the ore gave no indication of its value and where an earnest effort was made to get an average sample of the daily production of the mine by hand sampling, were as follows: From over 24,000 samples the estimates based upon the hand sampling were 24.9% higher than the actual contents of the ore. Another record for periods of 10 days each, which does not include any of the 24,000 samples mentioned, and probably represents over 65,000 samples, shows the following results: 19.7%, 4.47% 24.3%, 21.9%, 13.4%, 24.3%, 34%, 29% and 20.5% higher than the actual contents of the ore. These samples were all taken from cars of broken ore representing approximately a ton each, and a general sample of the whole each day checked within 2 to 5% of the separate car samples. Even with this close check the general sample would average about 20% higher than the actual contents of the ore. Numerous records covering a period of several years bear out the correctness of these figures. The records of the face samples which would compare with these records are not at hand but they were invariably higher than the mill returns would indicate after due allowance had been made for all losses in treatment.

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Data obtained during a concentration test where conditions were ideal for sampling also indicate the fact that some error must be counted on. The feed was a fine slime, samples were taken every 15 min. and each cut of the flow accurately timed. An average of 13 separate runs gave an extraction of 40.10% by head and tail assays. By assay of concentrates the extraction was 41.89%, a difference of 1.79%. In taking a sample of the concentrates the entire amount produced during each separate run was dried and quartered on a rubber mat. To prove the accuracy of the sampling of heads and tails the record of flow samples taken in the same manner and by the same men is given herewith.

The tonnage samples checked throughout the entire test in this way.

DATA OF CONCENTRATION TEST

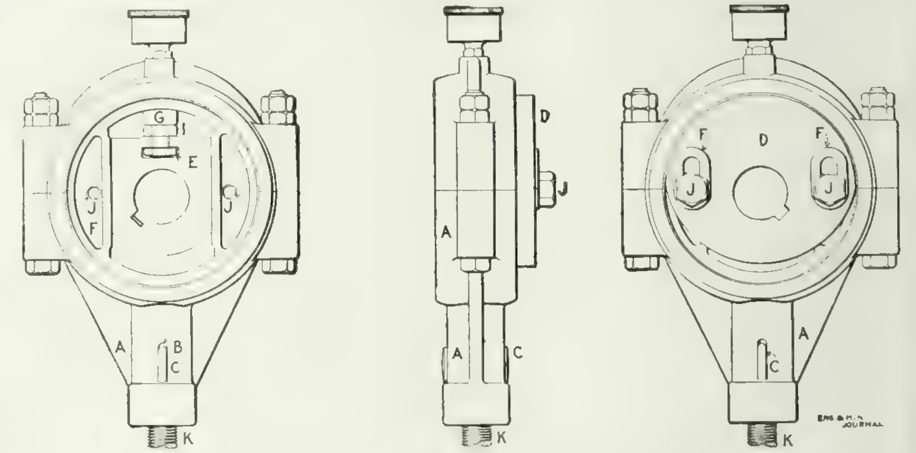
	1 Tons	2 Tons	3 Tons	4 Tons	5 Tons
Dry slime, head flow....	1.224	1.378	2.250	1.386	2.594
Dry slime, tail flow	1.185	1.330	2.187	1.365	2.561
Concentrates by samples.	0.039	0.048	0.063	0.021	0.033
Concentrates by weight...	0.039	0.0475	0.0627	0.0207	0.0327

Overstrom Jig Eccentrics

The details of the jig eccentric designed by G. A. Overstrom, the inventor of the Overstrom classifier and of the Overstrom concentrating table, are shown in the accompanying drawings. These eccentrics are used on the large single-compartment, roughing or bull jigs in the Overstrom section of the mill of the St. Louis Smelting & Refining Co. in southeastern Missouri. The screens of these jigs are three feet wide by five feet long.

The special feature of these eccentrics is their safety, due largely to the fact that the adjusting nut for changing the throw is in the interior of the eccentric and does not stick out where it might strike an attendant while oiling or doing other work about the top of the jig. The cap screws on this eccentric project a little from the hub, but as they are turned towards the driving pulley of the shaft, are not in a position where, under ordinary circumstances, they could catch upon the garment of an attendant.

In case the eccentrics were to be used on a jig with more than one compartment, they could be made perfectly safe by casting the collar of the hub with grooves around the slots, up and down which the gripping bolts would slide as the throw of the eccentric is changed. Then the head of the cap screws would not project beyond the surface of the eccentric and there would be practically no chance for an attendant to be caught. This use of a groove to carry the head of the cap screws below the outer surface of the collar of the hub of course would necessitate the use of socket wrenches in tightening them, but that would be but a small drawback.



The Overstrom Safety Jig Eccentric

The idea of this eccentric, which Mr. Overstrom has improved in several important details, was obtained from the eccentrics designed by Ernst Müller and used at the old Parrot mill at Butte, Mont. There is danger from projecting nuts on the ordinary type of jig eccentric, whenever devices of variable throw are used. Not only would the improved eccentric save many men from injury, but it would permit freer working about the top of the running jig and the work could consequently be done more rapidly.

The Overstrom eccentric is made on the slip type because of the greater ease in adjusting and holding the throw and the greater convenience attending the use of such a slip-eccentric compared to one of the double-eccentric type. But there is no reason why by countersinking the heads of the adjusting nuts, a double eccentric could not be made just as safe. It would only necessitate the use of a little more metal in the castings.

The strap yoke contact with the eccentric was made flat simply because of the tools that were at hand. Where the machinery is available for making ball and socket surfaces, Mr. Overstrom makes the joint between the eccentric and the strap of that type, as there is no possibility of the plunger binding on the sides of the plunger compartment of the jig.

The eccentric yoke is attached to the plunger piston by the key *C*, that passes through the slot *B*. The hub *G*, that passes through the eccentric is made ovoid. This hub, of course, is keyed to the jig shaft. Two slots *F*, are cut through the collar of the hub where the hub proper goes inside the body *K*, of the eccentric and is fastened to it by means of the two cap screws that pass through the slots *F*. In the hub *G*, is a slot *D*, cut out to receive the adjusting nut *I*, it being recessed to grasp the head of the adjusting nut, so that the hub is held securely in position when the clamping nut is brought to bear on the upper face of the hub. The body of the eccentric is cut out in the center so that it will straddle the hub portion of the eccentric. This hub is inserted in the body, the cap screws *J*, are screwed into the body after being inserted in the slot F and then the adjusting screw *I* by the nut on it is screwed out so as to enter the boss *G*, on the body of the eccentric. The adjusting screw *I*, is screwed into the body until the desired eccentricity is obtained. Then the locking nut is screwed home on the hub and the body locked securely into position with respect to the hub. Next the cap screws are tightened to grip the hub and the body together, and the eccentric is set rigidly to give the stroke to the plunger that is desired.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Classification of Bitumens

The following classification of bitumens was worked out by David T. Day in conjunction with the German Society for Testing Materials and Professor Marcusson:

NATURAL BITUMENS

I. Saponifiable (principally wax fats)
Sapropel wax
Algæ wax
Lignite bitumen (raw crude mountain wax).

These waxes, on account of geological considerations as to the origin of bitumens, are to be regarded as the earlier stage in the process of formation of the materials mentioned under the following heading.

II. Not saponifiable (principally hydrocarbons; also lignite and solid bitumens, oxidized and sulphureted hydrocarbons).

Solid or sulphureted and oxidized hydrocarbons, natural asphalt, natural tar, etc., the first containing from 2 to 12% sulphur. (a) Natural gas. (b) Petroleum, liquid and semisolid. Distillates, oils, petroleum benzine (boiling up to 150° C.) Illuminating oils, gas oils, lubricating oils, petroleum paraffin, liquid mineral oils, and semiliquid tar, harder petroleum tar and petroleum coke. (c) Natural wax (ozokerite). By refining processes yields ceresin, or by distillation paraffin wax and oil.

For an elaborate classification of the bitumens, giving their physical and chemical characteristics, see the JOURNAL of Dec. 30, 1911.

Aluminum for Electric Conductors

The advantages of aluminum for electric conductors have been discussed several times. The specific gravities of aluminum and copper are about 2.71 and 8.95, and their conductivities about 61:100, so that only one-half the weight of the copper conductor is required in the aluminum wire. In the United States, however, owing to the duty on aluminum, 7c. per lb., the theoretical saving of aluminum over copper is only about 10%. In Europe and Canada, with low-pressure currents, the saving is about 36%. However, the *Electrical World*, July 6, 1912, calls attention to the fact that in high-pressure lines, the cost of the insulators and towers is so great as to make variations in the cost of the conductor a much smaller factor. The towers are spaced far apart, and their extra height to allow for the greater sag in the lines, and their greater width to take care of the swing of this sag in a wind storm, cuts down the saving to about 4 to 6%. However, corona losses are much less with the larger aluminum conductors.

Locomotive Haulage in Mines

According to *Echo des Mines*, June 24, the costs of haulage in German mines under varying conditions are as follows, amortization charges being included except in the last item: Gasoline locomotives, 4.51c. per ton-mile; continuous current electric-trolley locomotives, 3.95; monophase trolley locomotives, 2.96; storage-battery, 4.79; compressed-air, 3.95c. per ton-mile.

In summing up, the trolley or compressed-air locomotives are said to be particularly indicated in large galleries, the benzine or storage-battery locomotives where the galleries are low or tortuous.

M. de Valbreuze stated that his opinion was that the great field of usefulness is reserved for the trolley locomotive using high-tension currents, i. e., when an underground installation at 2500 to 3000 volts can be perfectly protected, and that this problem appears to him by no means insoluble.

Drying Air for Blast Furnaces

A method proposed by Bruce Walter (*Proc.* Eng. Soc. Western Penn., May, 1912) for drying air for blast-furnace use is to pass the air through screens over which water runs which enters the apparatus at 34° F. and leaves it at about 39°. This reduces the humidity (neglecting entrained vapor) to about 2.75 grains per cu.ft. The air is then run over brine screens, the brine entering the apparatus at temperatures below freezing. The advantages of the method are that no energy is expended freezing moisture in the air, and no time lost defrosting the apparatus.

Selenium Glass

The production of about 11,000 lb. of selenium per annum by the American copper refineries is mainly used in the production of red glass and red-enameled ware (*Journ. Ind. Eng. Chem.*, July, 1912, abstr. from *Sprechsaal*, Nos. 14 and 15, 1912). The dioxide does not give any color, but by reducing the selenium dioxide by arsenic trioxide, by carbon, or by fusion in a reducing atmosphere, the red color is obtained. This, however, is apparently not due to metallic selenium, but to selenides, for when the glass is dissolved in hydrofluosilicic acid, hydrogen selenide is evolved. In general it appears that soda-lime mixes are unsuitable for producing selenium red glass, as are also zinc, boric-acid, phosphoric-acid, stannic-oxide, or calcium-fluoride glasses. This means that the glass must be a potash glass, and preferably highly acid. A good mix was found to be that of Bohemian glass, 1.49 K_2O : CaO : 9.8 SiO_2.

[The statement is made in the original that the production of 11,000 lb. is made by three firms. As there are five firms producing from time to time, the above production estimate is probably under the proper figure.—EDITOR.]

Thermochemistry of Silicates

The heats of formation of various silicates from the metallic oxides and silica have been determined by measuring the heat of solution, in hydrofluoric acid, of the oxides and silica concerned. The results obtained are shown in the accompanying table (*Zeits. anorg. Chem.*, p. 198, 1912; abstr. in *Journ.* Soc. Chem. Ind., June 15, 1912), although the heats of formation of the aluminum silicates are approximate only.

	Cals per gram-molecule	
	Heat of Formation	Heat of Crystallization
Sodium silicate	+ 97.85	
Manganese metasilicate		+ 8.52
Zinc orthosilicate	+ 23.74	+ 9.04
Zinc metasilicate	+ 2.49	
Leucite	+ 101.6	
Microcline	+ 104.2	
Adularia	+ 131.2	+ 55.72
Analcite	+ 85.22	
Natrolite	+ 95.76	
Heulandite	+ 59.40	

Capacity of Filter Presses

The laws of the flow of liquids in filter cakes have been investigated by C. Almy, Jr., and W. K. Lewis (*Journ. Ind. and Eng. Chem.*, July, 1912), who find them capable of mathematical expression thus:

$$R = K\frac{P^m}{V^n}$$

where R is rate of flow in c.c. per min., P is the pressure, V the volume of the filtrate in c.c., and K, m and n are constants readily determinable by experiment. In the author's experiments, using a chromium-hydrate sludge, a 6-in. corner feed press, and 100, 75, 50, 25, 10 and 5 lb. pressures *K* was found equal to about 13,600, *m* to 0.270 and *n* took various values from 0.62 to 0.81, depending on the filtrate. These values will at least serve to give some idea of the magnitude of the constants.

Oil Engines

The committee on prime movers of the National Electric Light Association has recently presented some data on the various types of oil engines, which have been summarized by *Power*. The oil engine differs from the more familiar gas engine only in that the fuel must be prepared for combustion at the engine, or injected at high pressures, and therefore either a carburetor, vaporizer or an injection valve must be provided for vaporizing the liquid-oil fuel, depending upon whether low-, high- or modified-compression type of engines are used. The simple automobile engine comes within the former class (low-pressure). For power purposes the low-pressure engine frequently employs a hot-bulb or "preheating chamber," to enable the engine to burn comparatively low-grade oils. The Diesel engine employs high-combustion pressures (500 lb., approximately) and requires an air-injection pressure of about 1000 lb. It has a cycle peculiar to itself, and the distinguishing feature is that the fuel is injected at constant pressure for about 10% of the working stroke, while the air is hot enough by reason of the high compression to cause combustion on contact.

The guarantees usually given have been about as follows: Diesel, oil consumption not to exceed 0.5 lb. of oil per horsepower-hour; De La Vergne, not to exceed 0.6 lb. per horsepower-hour; Hornsby-Akroyd, not over 1 lb. per horsepower-hour. Oil not to contain under 18,500 B.t.u. per pound. While in fuel economy, the Diesel is superior, reguarding maintenance and attendance, the low-pressure type has much in its favor. This would lead to the opinion that for the larger sizes, exceeding 150 hp., the Diesel motor should be chosen, while in case of small power requirements (under 100 hp.) the low-pressure type would generally be used. In the neighborhood of 100 to 150 hp. the field will be disputed between the two according to existing fuel prices and local conditions. There has been developed a design which may be termed a "compromise" between the low-pressure hot-bulb and the Diesel high-compression engines, for which there is claimed a fuel economy comparative with the Diesel motors, although it employs lower working pressures.

Slagging Type of Gas Producer

The U. S. Bureau of Mines is continuing experiments with the slagging type of gas producer for the utilization of low-grade fuels, and reports encouraging results (Bureau of Mines, *Technical Paper* No. 20). Intermittent runs are not satisfactory, as the slagged ash solidifies in the bottom of the producer, and it is hard to start again on cold air. With preheated blast a four-day intermittent run was made.

On a continuous run of 76 hours, the gas was uniform in value, and good in quality, averaging about 31% CO, and less than 1½ CO_2. Slag was tapped about every hour. About 20 lb. of coke per square foot of producer area was burned per hour, and 15 lb. of limestone was used per 100 lb. of coke. Blast heated to about 440° F. was used, but no steam. However, in other tests 0.75 lb. of steam per pound of fuel was used, with no appreciable effect upon the slagging of the ash.

Dredging in the Seward Peninsula, 1911

The accompanying table was compiled by the U. S. Geological Survey (*Bull. 520-M*), to show the dredges operating on the Seward Peninsula in 1911. It is estimated that from 2,000,000 to 2,800,000 cu.yd. were handled in 1911 by these machines, and that the production was $1,400,000. The entire gold production of the peninsula was $3,100,000, a decrease of about $400,000 from 1910, largely due to a falling off in the winter production, which was about $1,000,000 in the winter of 1909-1910, and dropped to about $200,000 in the winter of 1910-1911. No important new strikes were recorded. An attempt was made to boom the placers in the extreme eastern part of the peninsula, in the Koyuk basin, but the Survey thinks it is good only for one-man camps and dredging.

DREDGES IN OPERATION ON SEWARD PENINSULA IN 1911

Company	Region	Creek	Built	Type of builder	Size of buckets (cu.ft.)	Bucket line	Source of power	Fuel used per day	Remarks
Gold Beach Dredging	Nome	Osborn	1905	I. B. Hammond	5	Open	Crude oil	18 bbl	
Nome Con. Dredging	Nome	Bourbon	1908	E. L. Smith-Lidgerwood	9	Close	Electricity	(?)	Power generated from oil.
Nome Con. Dredging	Nome	Wonder	1908	E. L. Smith-Lidgerwood	7	Close	Electricity	(?)	Power generated from oil.
Plein Mining & Dredging	Nome	Otter	1910	Risdon	3½	Open	Crude oil	13 bbl	
Saunders Dredging	Nome	Saunders	1910	(?)	3½	Close	Distillate	200 gal	
Arctic Gold Dredging	Nome	Saunders	1910	Union Iron Works	2½	Open	Distillate	160 gal.	
Sioux-Alaska Mining	Nome	Moss	1910	Union Iron Works	2½	Open	Distillate	160 gal	
Julien Dredging	Nome	Osborn	1911	Union Construction Co	2¼	Open	Distillate	190 gal	
Nome Con. Dredging.	Nome	Wonder			10		Electricity		Still under construction.
Seward Dredging	Solomon	Solomon	1905	Bucyrus	5	Close	Coal	12-15 tons	Formerly the Three Friends.
Sievertsen	Solomon.	Solomon		(?)	(?) 1	Open	Distillate	(?)	Built before 1906.
Mulligan	Solomon	West.		(?).	(?) 1		Distillate	(?)	Built before 1906; runs on track.
Nome - Montana & New Mexico	Solomon	Solomon	1908	Risdon.	5	Open	Coal	5 tons	Previously at Hope, Alaska.
Solomon Dredging	Solomon.	Solomon	1910	Bucyrus	3½	Close	Coal	7 tons	
Flodin Mining & Dredging	Solomon.	Big Hurrah	1910	Risdon	2½	Open	Coal	3 tons	
Sievertsen & Johnson.	Solomon	Solomon	1910	Risdon	2½	Open	Coal	3 tons	
Kimball	Solomon	Shovel	1911	Sluice-box type.	2½	Open	Distillate	150 gal	Similar to Kimball-Saupe dredge on Melsing Creek
Blue Goose Mining	Council	Ophir		I. B. Hammond.	5	Open	Wood	12 cords	Built before 1905.
Alaska Gold Dredging	Council	Warm.	1909	Byron Jackson	2½	Open	Distillate	160 gal	
Alaska Gold Dredging.	Council	Goldbottom	1909	Byron Jackson	2½	Open	Distillate	160 gal	
Wild Goose Mining & Trading	Council	Ophir	1910	Yuba Construction Co	3½	Close	Distillate	300 gal	
Goose Creek Dredge	Council	Goose	1910						Not in operation.
Alaska Gold Dredging.	Council.	Willow	1910	Union Iron Works	2½	Open	Distillate	160 gal	
Kimball & Saupe	Council	Melsing	1910	Empire Iron Works	2½	Open	Distillate	150 gal	Sluice-box type.
Lubbe	Council	Mystery.	1911	Union Iron Works	2½	Open	Distillate	150 gal	
York Dredging	Port Clarence	Buck	1911	Union Construction Co	2¼	Open	Distillate	190 gal	
Cripple River Dredging	Southwest Seward Peninsula	Cripple		E. L. Smith-Lidgerwood	(?) 5	(?)	Distillate	(?)	Reported under construction.
Kelliher	Kougarok	Taylor		Union Iron Works	2¼	(?).	Distillate	(?)	To be hauled to Taylor Creek during winter of 1911—12.

Treating Clayey Gold Ore

The difficulty of extracting gold from clayey ores is known. According to *Echo des Mines*, Mar. 7, 1912, a recently devised process to treat such ores consists in drying, and then baking such ores to vitrification. They are then stamped or crushed and the gold recovered as usual.

West End Consolidated Mill, Tonopah

By J. P. Hart
and H. L. Williams*

This 100-ton mill was remodeled last year into an all-sliming, non concentrating plant to treat lower grade silver ores. The ore from the 20-stamp battery is slimed by tube mills in closed circuit with Dorr classifiers. The slime is dewatered in Dorr thickeners and given a 60-hr. agitation in Trent agitators after which it is further thickened and treated in a 100-leaf vacuum filter. The zinc-box precipitate is melted in an oil-fired Faber du Faur furnace. An extraction of 90.4% is obtained on $17 ore at a cost of $3.52 per ton.

The mill of the West End Consolidated Mining Co. at Tonopah, Nev., is a 20-stamp, all-sliming, nonconcentrating mill, designed to treat the lower-grade, characteristic silver ore of the district. Construction was started in April, 1911, and milling operations were commenced in September.

Ore Conveyed to Mill by Auto Truck

The ore from the mine is passed through a Crane ore washer, described in the Engineering and Mining Journal, Oct. 14, 1911, and the picked product is loaded from chutes and hauled to the mill railroad bins, a distance of 2000 ft., in a Pierce Arrow auto truck. The truck is provided with a tilting bed having an eye-bolt at the center of the front end, by which it is attached to an overhead 12x48-in. air lift, thus effecting a simple and rapid method of unloading into the crusher bins beneath the car track. The truck has a capacity of 5 tons per load and averages 3½ to 4 loads per hour.

From the bins the ore is passed through a 10x20-in. Blake crusher, elevated to a 32-in. by 6-ft. trommel with 1-in. apertures, the undersize dropping directly to a 14-in. belt conveyor having an inclination of 18½°. The oversize, after passing through a No. 3 Kennedy gyratory crusher, fitted with short head and concaves, joins the undersize from the trommel, all passing a 1¼-in. ring, and is conveyed to the battery bins. The crushing plant handles from 20 to 25 tons of ore per hour. The capacity of the mill is from 100 to 110 tons per day.

The battery bins are made of reinforced concrete with solid concrete ends, and have a capacity of 200 tons. The batteries consist of four units of five stamps each, driven from a common countershaft by friction-clutch pulleys. The battery frames are of steel, originally of the cantilever type, but vertical 12-in. steel I-beams have been placed as posts at the end of each cantilever to take up the vibration. Ten stamps are of 1200 lb. weight each, while the remaining ten weigh 1300 lb. each.

Favor Square-mesh Screens

Both "Ton-Cap" and square-mesh screens have been used on the batteries, but the latter have gained favor from the fact that the "Ton-Cap" screens seem more subject to choking up. Little or no trouble is experienced on this point with the square-mesh screens. It is probable that the coarse-gage wire used in the "Ton-Cap" screens is partially the cause of this trouble. The batteries are equipped with screens of different meshes varying from 6 to 12, the object being to give the tube mills a feed of different grades, as this method gives better results in sliming. The stamps make 101 drops per minute through 6½-in. chrome-steel shoes are used, while the dies are cast iron made by the Tonopah foundry.

Two Dorr duplex classifiers making 12 strokes per minute, follow the stamps The overflow discharge, of which 90% is finer than 200 mesh, passes to four 16x10-ft. Dorr thickeners. The sand is fed to two 5x18-ft. tube mills. The classifiers are placed end to end, parallel to and on the next floor below the batteries; the distance between center lines of the batteries and classifiers is 18 feet.

The tube mills are also placed end to end, a feed and discharge end adjacent, making batteries, classifiers and tube mills parallel to each other. This is a convenient arrangement and requires but a minimum of space. The distance between the batteries and the tube mills is only 25 ft. and all machinery included in stamping, classifying and tube milling is within the vision of the battery man, who, on account of the compactness of the arrangement finds little trouble in tending to these three stages.

Another feature of the end-to-end arrangement is that it permits the driving of both mills from a common pinion shaft, this pinion shaft being connected to each pinion by a 33-in. cut-off friction clutch and driven from its center by a 120-hp. Morse silent-chain drive and 100-hp. Bullock motor. This arrangement of two mills on a common pinion shaft gives a compact drive and allows the use of a motor closely rated to the running horsepower of the two mills; as, with the two clutches, the motor is capable of starting both mills with only a small overload, and of running either independent of the other.

Tube Mills Have Chain Drive

As this was the first attempt in cyanide practice to drive tube mills with a chain, a little detail may be of interest. The advantages claimed for the chain drive over the ordinary belt drives are compactness and saving of power. The power lost due to belt slippage is 6 to 8%, which would be about double in the case of a countershaft with two belt drives. This heavy loss in power is overcome by the use of the direct chain drive, which has a loss of but 2 per cent.

When the mill first started, the rapidity with which the rocker pins broke became alarming. Advices from the manufacturer, however, were to the effect that failure of some of the more highly tempered links and pins was to be expected at the start, as a few links that might not be absolutely accurately bored would be thus receiving the bulk of the strain, after which little trouble would come from this cause. There are at present about 30 broken links in the chain, most of these having failed in the first two weeks' run. As the chain contains 3450 links, the number of links broken throughout the chain has but a slight effect on its usefulness. Four of the rocker pins broke in the first few days while the chain was being tried out on the empty mills, but none have broken since. After 7 months' service the chain has proven itself most satisfactory and has gained preference over the belt drive among all concerned in its operation. One 100-hp. motor furnishes the power for the two mills and also for the bucket elevator which returns the tube-mill discharge to the classifiers. Power readings showed a consumption of exactly 100 hp. The tube mills make 26 revolutions per minute.

Smooth cast-iron chilled liners, cast at the local foundry, are in use. Liners 2 in. thick lasted over seven months, the liners near the discharge end still being good for longer service. The new liners are 2½ in. at the first third, 2¼ in. at the second third, and 2 in. at the last third of the shell, and should last more than eight months. This type of liner has succeeded all other types of liners in the mills in Tonopah. When compared with the Brown or El Oro type of liner it has proved a better slimer; compared with the other type of smooth liner, silex blocks, it gives a longer life and can be more quickly renewed. With this type of liner, the mill can be relined and running in 16 hr. The pebble consumption is 4.8 lb. per ton of ore treated.

From the classifiers the overflow slime flows by gravity to four 16x10-ft. Dorr continuous thickeners. These thickeners make one revolution in six minutes. The

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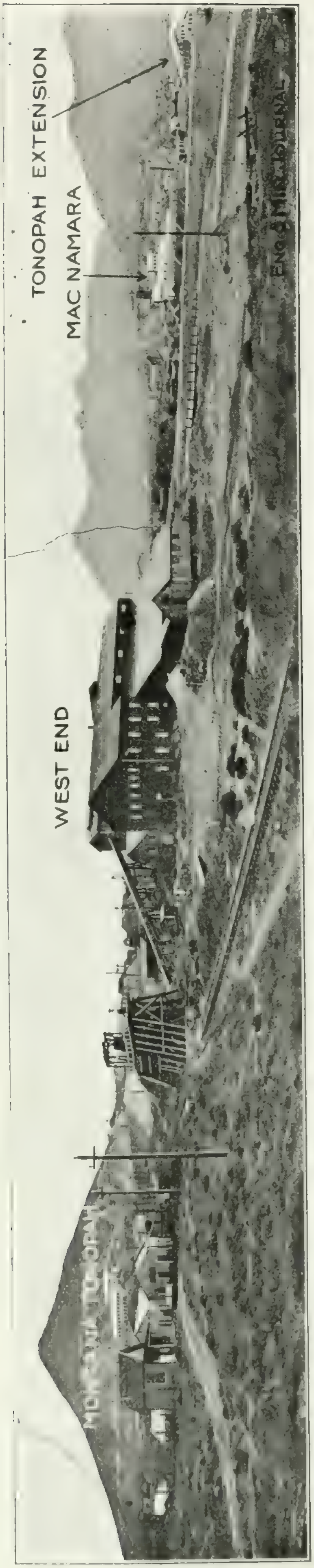
*Care of West End Consolidated Mining Co., Tonopah, Nev.



Some Mills of the Tonopah District. The West End is a 100-ton, Nonconcentrating, All-sliming Mill

four thickeners handle 110 tons of ore and 1000 tons of solution daily, the pulp being thickened to a specific gravity of 1.28 to 1.30. With the solution titrating 1 lb. CaO per ton of solution, or with the addition of 3 lb. CaO per ton of ore, a perfectly clear overflow is obtained. This overflow solution is sent to either the battery sump tank or the silver tank, as desired. The settling capacity of the thickeners is found to be as high as one ton of slime for 6 sq.ft. of settling area; the slime is a granular one containing little flocculent material, 90% of it passing a 200-mesh screen.

From the Dorr thickeners the pulp is drawn to four Trent underfed agitators by means of four No. 3 Gould diaphragm pumps. These are the first of this type of pump to be used in this district and are proving highly satisfactory. Each of the pumps is driven by an adjustable eccentric and eccentric rod from a common shaft 4 ft. above. The speed of the pumps may be varied by three-step cone pulleys, giving 11, 19 or 26 strokes per minute. By varying the stroke between 0 and 3 in., the pulp may be drawn from the thickeners as rapidly as desired.

As these pumps are necessarily suction pumps, they are placed high enough to allow the pulp to flow by gravity into one of the four agitators. This makes the height of suction 20 ft., but as the suction is connected directly to the thickeners the height of suction is decreased nearly 10 ft., the height of the thickeners. This makes the lift about 10 ft. However, the pumps can empty the thickeners if desirable.

The pulp as pumped usually has a specific gravity of 1.26 or approximately two of solution to one of slime. With the pumps set for a 1¾-in. stroke, the four will pump 3.2 tons of dry slime per hour on slow speed, 5 tons per hour on middle speed and 7.4 tons per hour on high speed. When greater than a 2-in stroke is used the wear and tear on the rubber diaphragms is excessive, especially when high speed is used. The only part of the pump requiring renewal is the rubber diaphragm, which has an average life of two months and costs only $1.80. Their reliability, range of adjustment, and little attention needed are strong points in their favor.

Trent Agitators Used

From the diaphragm pumps the pulp flows by gravity through launders to each in turn of four Trent underfeed agitators. Thus each agitator serves as a collector until it has received its full charge. The tanks 24x18 ft. in size, take a charge of about 80 tons of dry slime, and 190 tons of solution each. A 4-in. centrifugal pump is used to run the agitator. The pump discharges through fifteen ¾-in. nozzles, making the area of discharge 6.6 sq.in. as compared to 12.6 sq.in. area of suction.

It has been stated in a description of the Tonopah Extension mill that, with a Trent agitator, the pump works only against a balanced head, that is, the head is the same on both suction and discharge, and for this reason little power is required. This is misleading, as it is evident from the construction of the agitator, that sufficient velocity must be given the pulp issuing from the nozzles to cause enough back pressure to revolve the arms. By actual test this pressure, as measured on the pump discharge, is found to be from 14 to 16 lb. per sq.in., depending on the condition of the runner. The head against which the pump works is, then, really 37 ft. With a back pressure of 16 lb., the agitator revolves at the rate of 3½ revolutions per minute and takes 9 hp. When the speed of one of the agitators was cut down by a broken runner to only one revolution per minute, the back pressure was found to be only 13 lb. per sq.in. and the horsepower used only two or three. This is hardly sufficient for good work, and not enough to start again after an hour's shutdown.

The centrifugal pump is connected to the tank by 6-in. suction and discharge pipes. There are two suctions, one near the bottom of the tank and one near the top. When a tank is full, the bottom suction is closed and the pulp is drawn from the top of the tank. For aëration air is supplied at the pump discharge under a pressure of 20 lb. per square inch.

Special Centrifugal Pumps

The pumps are of a pattern made by Campbell & Kelly, of the local foundry and machine shop. All the centrifugal pumps in the mill are of this type, as they are the result of a long study of centrifugal pumps in mill work and have supplanted pumps of many other makes in this district. They have the following good points: The bearings are separate, babbitted, cast-iron cylinders that can be slipped into place and exact alignment in a few minutes. The thrust of the runner is taken up by a pressed-steel ball race, running in oil, on the end bearing. A nut and lock nut beyond the ball race allows the runner to be slacked off to the suction to maintain efficiency. The runner is of the open-vane type and runs in a hard cast-iron liner within the shell, the liner being fitted with a ground joint to prevent leakage. These agitator pumps ran continuously for six months at a speed of 500 r.p.m. without requiring a repair part of any kind and maintaining the same speed on the agitator. At the end of seven months the shells and runners are still good for two months with the renewal of but one broken runner. A recent cut in speed to 460 r.p.m., reduced the speed of the agitator to 2 r.p.m. with a consumption of 4 to 5 horsepower.

PULP THICKENED BEFORE FILTRATION

After a 60-hr. agitation, the agitator charge is transferred to a 28x22-ft. Dorr thickener by a 6-in. Campbell & Kelly centrifugal pump. The thickened pulp of from 1.30 to 1.40 specific gravity is slowly drawn to a small stock tank, 28x8 ft., or to the filter as desired. This small stock tank will hold enough thickened pulp to fill the filter box when commencing a charge and also serves as a tank to which the stock can be returned after caking. It is fitted with a gear-driven arm agitator which revolves at the rate of 5 r.p.m. and takes 2.1 hp. to operate.

By this means the pulp in the thickener remains undisturbed, allowing from 90 to 120 tons of solution per day to be decanted to the silver tank without being filtered. A cake can be formed much more rapidly with the 1.40 specific gravity pulp than with the ordinary agitator pulp. The thickener revolves once in 6 minutes and requires less than one horse power. This system of a large thickener and a small agitator requiring 3 hp. as a total to operate, and holding three filter charges is an advantageous unit of large size and small power consumption.

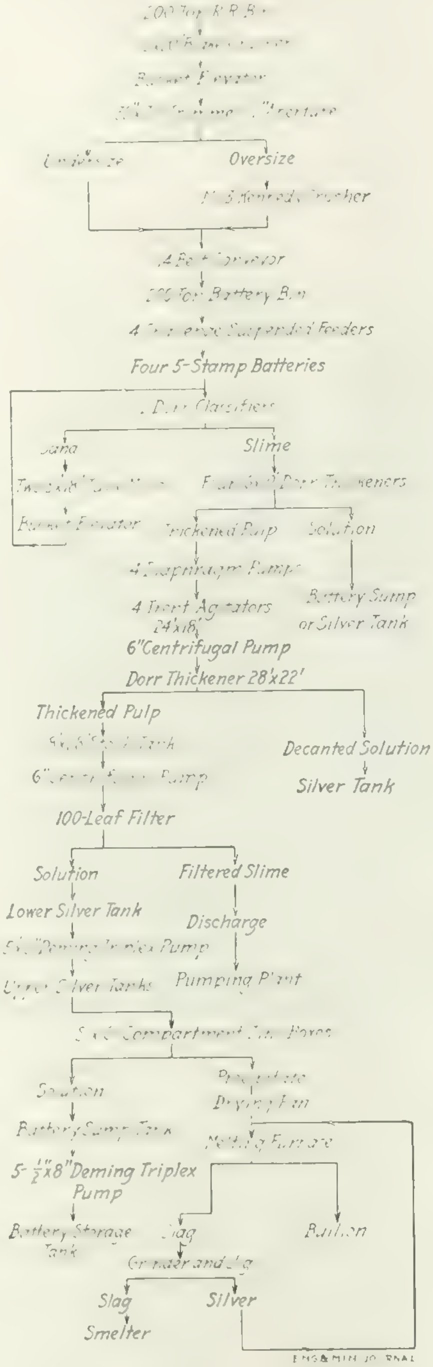
The 100-leaf vacuum filter is operated by a 6-in. Campbell & Kelly centrifugal pump running at 520 r.p.m., a 5¼x8-in. Connersville two-lobe cycloidal vacuum pump running at 550 r.p.m., and a 5x6-Deming triplex pump running at 66 r.p.m. for handling the silver solution.

LOW-COST VACUUM PUMP

The advantage of a Connersville cycloidal vacuum pump lies in its low first cost, small size, small power consumption and few repair parts. The pump has a 2½-in. suction and discharge, a 46¼x19-in. base and stands only 21¼ in. high. The net cost was $175. During the seven months this mill has been in operation, the pump has been repacked but once, while the parts show little or no wear. The power consumption is approximately 3 to 4 hp. and its maximum vacuum on 100 leaves at this altitude of 6000 ft. is about 19 in. A 1½-in. cake can be formed from a 1.40 specific gravity pulp in from 45 to 60 minutes. With the vacuum on for such a short time a spongy, porous cake is formed, making it an easy matter to replace the pregnant solution in the cake.

While caking the pulp is kept in suspension by means of an air lift, which elevates the pulp from the bottom of each of the five hoppers. An air pressure of about 20 lb. is used. A 3-hour solution wash is given the 1½-in. cake. About 80 tons of solution passes through the leaves in this time, making about five displacements of the 15 tons of silver solution originally contained in the cake. This long solution wash was given an additional extraction of from 1 to 2 per cent.

Five leaves per day are treated in from 0.5 to 1% muriatic acid. A special mechanism, patterned after one used at the Belmont mill, was devised for giving the leaves a thorough acid treatment. This device was described in the ENGINEERING AND MINING JOURNAL, Mar. 30, 1912, but was not credited to the Tonopah-Belmont mill at which place it originated. By the use of this apparatus a vigorous circulation of acid is maintained through the canvas, accomplishing more with a weak solution than by soaking in a stronger acid. The life of the leaves should be materially increased by use of the weaker acid also.



FLOW SHEET OF WEST END MILL

ZINC-SHAVINGS PRECIPITATION

The solutions are precipitated by zinc thread in six redwood boxes of a special design, each of six compartments 30x30-in. cross-section and 24 in. deep, with a hopper below the screen. In cleaning up, the precipitate is discharged through 2-in. plug valves at the hopper bottoms into a common system of launders that carries it by gravity to a 5x5-ft. leaching tank, the overflow going to a second similar tank. A 2½x3-in. triplex pump, connected to each tank below the filter cloth, rapidly dries the precipitate, pumping the solution back to the head of the zinc boxes. It takes two men eight hours to clean and repack the boxes.

The precipitate is dried in a 15x5-ft. steam drying pan and after fluxing it is melted in an oil-fired Faber du Faur furnace. The life of the graphite crucibles has been materially lengthened by the experiment of coating them with a thin application of Johns-Manville "Brickline," which effectually prevents the oxidation of the crucible from the outside. Fourteen hundred-ounce bars are poured and cleaned while at a red heat. The slag is poured while still molten into a cement pit filled with water, which granulates the slag for future jigging.

The mill is heated by an oil-fired boiler, the live steam from which is used only to heat the solutions in the Trent agitators, the mill building deriving its heat from the solutions in circulation. The oil is stored 100 ft. from the building in steel tanks which are filled by gravity from oil cars. Oil is fed to the boiler through a 3-in. pipe and an oil pump. The exhaust steam of the pump passes back through the 3-in. supply pipe in a 1½-in. pipe. This keeps the oil warm in the coldest weather.

After impounding the tailings for some time, a pumping plant was installed to pump the slime over a neighboring ridge. The slime cake on the filter leaves is thrown off into the wash water by high-pressure water and, without decanting, the bottom valves of the hoppers are opened until the slime is out and the discharge becomes thin. The slime cakes are all discharged with the force of the water head in the box and, striking in a launder which has a 4% grade with bends and iron riffles, the same is thoroughly mixed before entering a 24-in. No. 14 riveted-iron pipe, which is 700 ft. long and has a 4.8% grade. At the end of this pipe an 8-in. suction pipe connects it directly to a 6-in. Campbell & Kelly centrifugal pump, driven by a 30-hp. motor. The pump discharges through 300 ft. of 6-in. No. 18 riveted-steel pipe on a 12% grade. As the slime is all discharged from the hoppers in four minutes, it almost fills the large pipe and puts a heavy suction head on the pump, aiding materially in pumping out the heavy material that comes first.

It takes 20 minutes to pump out a charge and the power required is 28 hp., with a maximum of 29.5 hp. the first five minutes and a minimum of 26.8 hp. the last five minutes. Ten minutes after the first discharge from the filter each hopper is opened for a few seconds to let out any settled slime and to furnish a water wash for the 24-in. pipe. This is the last material to enter the pump. Consequently after pumping, the drain of the 6-in. pipe back into the 24-in. pipe aids in thinning the first thick slime of the next charge. The total amount of water used to discharge is between 80 and 100% of the weight of the dry slime.

Motor Truck Dumping Over Orebins at West End Mill, Tonopah, Nev.

The use of two types of mortars, of thickeners only 16 ft. in diameter and other like items, is due to the fact that the mill was remodeled from the 20-stamp mill known as the Midway mill, which was operated in 1906 and 1907 by the Tonopah Mining Co., as a concentrating, leaching and slime plant. The Tonopah Mining Co. had in turn remodeled it from a 10-stamp pan-amalgamation mill built in 1902; this was the first mill to operate on Tonopah ores. The changes made in the reconstructions of this mill are of interest as they mark the advancement made in the treatment of silver ores in the last 10 years.

Present Mill a Remodeled Plant

The first mill consisted of ten stamps of the design known as "Boss" batteries with a steel-cantilever battery frame and concrete ore bins; described in the Engineering and Mining Journal, Mar. 10, 1904. It is of interest to state that the battery foundations as championed in that article are still sound, but that the vibration of the steel cantilevers caused the 30-in. concrete supporting wall to start crumbling. The batteries were followed by two Huntington mills, three settling cones and eight regrinding and amalgamating pans. The power was supplied by a 120-hp. Diesel gas engine.

When the mill was remodeled by the Tonopah Mining Co., 10 stamps of Fulton pattern were added on the cantilever battery frame. The Huntington mills, increased to three, were moved down a floor, and the cones brought up ahead of them. The regrinding pans were discarded and four Wilfley tables placed on that floor. A cyanide plant was added, consisting of a double tier of twelve 16-ft. leaching tanks, three combined settlers and agitators of an early Trent agitator design, a Butters filter installation, a zinc room and other necessary tanks. Power was supplied by motors.

As the cost of treatment in this small mill by practicing concentrating, leaching and sliming, was greater than at its 100-stamp mill of similar design at Millers, Nev., all the ore was later given to the larger mill. However, the erection and operation of the Montana Tonopah and Tonopah Extension mills in Tonopah as all-sliming mills, and the operation of the latter on low-grade ore as a nonconcentrating mill, simplified the milling of the Tonopah ores and, in 1911, the West End Consolidated Mining Co., took over the mill. S. H. Brady, the general manager, and J. A. Carpenter, the metallurgical engineer, drew the plans and reconstructed the mill as outlined above.

The batteries were changed from 10-stamp to 5-stamp units, the defective concrete wall was replaced by steel columns and a steel column was placed under the end of each steel cantilever I-beam in order to reduce the intense vibration that had, previously, constantly sheared rivets, loosened bolts and thrown the stamp stems out of plumb. The cone classifiers below the batteries were replaced by Dorr classifiers, the Huntington mills by tube mills, the concentrating tables by Dorr thickeners and the combined leaching and slime plant by a modern slime plant with large Trent agitators and a 100-leaf filter. The smaller tanks of the old mill were used again as auxiliary tanks, their capacity in several cases being increased by raising the sides 3 or 4 ft. by No. 12 sheet iron. Except for a refinery that the old mill did not have, no additions or changes were made to the mill building; yet the daily capacity of the mill was doubled by reconstructing it.

In March, the direct cost of milling was $3.52 per ton of ore, with a recovery of 90.4% on $17 heads. The main items of cost were: Labor, 85.5c.; power, 71.5c.; cyanide, 72.5c.; zinc, 18c. and pebbles 9.8c. The total crew, including the superintendent, numbers sixteen.

After seven-months' operation of the mill with varying grades of ore, the conclusion reached is that with a $10 to $14 ore an extraction can be made without concentration equal to that with concentration, with a lower milling cost and a saving of 3 to 4% in marketing products. With $14 to $18 ore this saving is gradually counterbalanced by lower extraction and solution troubles. When the value of the ore goes above $20 concentration will pay in extraction results above its extra costs. The question of the method used would depend upon the probable grade of the ore reserves. Plans are now being drawn up for a concentrating addition to the present mill.

Hungarian Mineral Production for 1910

The mineral output of Hungary for 1910, is given in the official reports as follows, the items standing in order of decreasing values: Lignite, 7,578,846 metric tons; pig iron, 502,056; bituminous coal, 1,085,132 metric tons; gold, 3041 kg.; coke and briquettes, 264,921 tons; iron ore for export, 645,000 metric tons; silver, 12,547 kg.; pyrites, 92,464 metric tons; lead, 2077; copper, including cement and ore, 6194; bitumen, 4994; mercury, 0.900; antimony, crude and refined, 0.782; litharge, 570 metric tons.

Forbestown District, California

By Lewis H. Eddy*

The Forbestown district, situated in Butte and Yuba Counties, was an active producer of gold and silver for 18 years prior to 1899. The use of inefficient methods of mining and milling was the chief factor causing the abandonment of the quartz mines; modern methods may again make these mines important producers.

The Forbestown mining district in Butte and Yuba Counties, Calif., includes quartz mines and placers that were large producers of gold for a period of 18 years prior to and including 1898. Forbestown is in the center of the district, situated at the head of Forbes Ravine, 22 miles east of Oroville on the Oroville and La Porte stage road. The principal producing mines within a radius of one mile east and west and three miles north and south were the Gold Bank, Golden Queen and Shakespear; the Burlington Gold Mines; and the New York and Ohio Flats placers.

Three Mines Chief Producers

About 75% of the quartz-gold production came from the Gold Bank, Golden Queen and Shakespear, then operated under separate ownership, and at present included with the Miller and other quartz and placer claims in the ownership of the Forbestown Consolidated Gold Mines, M. J. Cooney of Oroville, president and general manager. The Burlington gold mines, including the New Burlington, Mexican, Jo, Annette, and adjoining placers, are owned by the Burlington Gold Mining Co., W. C. Ralston, Royal Insurance Building, San Francisco, president and general manager.

The northerly portion of the district is in Butte County, the southerly portion in Yuba County. The general strike of the formation is northeast. The country rock is generally described as amphibolite. The wall rocks are chiefly greenstone and diorite. There is a massive granite formation about four miles north striking southwest and extending about three miles to the south fork of Feather River. On the south side of the river the rock changes to granodiorite.

The trend of the veins in the Gold Bank and Golden Queen, at the north end of the district is east to west. The dip is irregular, but generally to the northeast. In the Burlington and Shakespear and the Miller the trend is east of north, the dip being more constant to the west. In the Gold Bank and the Shakespear, there are evidences of the dip changing to vertical.

The outcroppings of the Burlington and Shakespear are extensive, varying in width from 10 to 30 ft., and prospect well in the pan. The Gold Bank and the Golden Queen at the north have also extensive croppings on the same vein series, which in places are 30 ft. wide; the larger and more extensive cropping is on the Gold Bank, and is particularly noticeable near the shaft on the west of Forbes Ravine. Pay ore has been mined in the Burlington and Shakespear at from 100 to 250 ft. vertical depth, and judging from the stopes in the upper levels of the Gold Bank and Golden Queen, pay ore has also been taken from near the surface in those mines.

Good Prospects at Depth

The elevation at the apex of the Burlington is 2924 ft. The deepest working is at 2700 ft. elevation. The elevation at the shaft house of the Gold Bank is 2640 ft.; the tunnel plane is at 1870 ft. and a winze 300 ft. deep makes the elevation at the lowest working of the Gold Bank 1570 ft. The dip in the Gold Bank straightens at depth, and the opinion has been expressed by a competent engineer that the dip of the Burlington will change to the east at depth, while another reported the dip in one of the Burlington claims to be 55 to 65° northeast. These conditions confirm the belief that vertical veins having a northeast trend will be disclosed by deep mining.

Placers Yielded Well

The placer mining in the district included Forbes Ravine and other smaller ravines, and New York and Ohio flats, which are situated on the southern end of the district, and east of the Miller and Deadwood claims. These placers yielded rich returns, and were worked persistently until the law demanded the impounding of tailings from hydraulic workings. When the flats had been cleaned to the bedrock, the miners followed the pay toward the quartz croppings and worked up to the Miller, Shakespear and Burlington. The pay dirt of the placers was not gravel of stream origin, as is usual in placer ground, but a formation of red earth, evidently disintegrated from the quartz veins, and was worked by hydraulicking up to but not above the ledges.

The director of the U. S. Mint in 1880 credits the New York and Ohio Flats with a yield of $12,000 to $30,000 per acre, in a depth of 12 to 20 ft. There were, conservatively estimated, 500 acres of this character of ground in these flat and ravine placers, yielding an approximate total of $10,000,000. Adding to this the reported production of $4,000,000 from Forbes Ravine and other ravines and gulches in the vicinity of the Gold Bank vein, and the reported output of the Gold Bank and Golden Queen mines of $1,806,000, the Forbestown district has produced an approximate total of $12,000,000 to $16,000,000.

Gold Bank-Golden Queen Mines

The important history of the development of the Gold Bank and Golden Queen, so far as it directly concerns the present situation of these and adjacent properties at Forbestown, embraces four years from 1894 to 1898. In 1896 the owner of the Gold Bank secured a lease of the Golden Queen, which terminated in October, 1898. Under the operation of the two years' lease the Golden Queen produced $374,000, on which a royalty of 25% was paid to the owner. Prior to the leasing the mine had produced $60,000, making a total of $434,000. The Gold Bank in the life of its operation produced $1,372,000. Thus an aggregate of $1,806,000 resulted from the operation of these properties severally and conjointly up to and including the year 1898.

The closing down of these large producers and the abandonment of development work in other mines in the district may be attributed to various causes which in the concrete are resolved into one: The failure to adopt the best methods of development, extraction and treatment. The immediate cause for the closing of the Gold Bank and Gold Queen was the disagreement between the respective owners as to operating the two properties as one mine, which is the only practical and economical method of making a large mine of either. The mine was not worked out.

In the accompanying table is given a summary of the work done by the Gold Bank Mining Co. on ore from the Golden Queen during the life of the lease. The low average value of the ore indicates that the whole amount extracted was put through the mill, and though the cost of operation was excessive as compared with present-day methods a fair profit of $1.65 per ton was shown. The cost of treatment would in present-day operation be reduced by substituting cyanidation for chlorination.

About 20,000 Ft. of Underground Workings

The underground workings in the Gold Bank and Golden Queen mines include an inclined shaft on the dip of the vein; 10 drifts east and west; five lateral tunnels; a working drainage tunnel intersecting the vein and the winze from the lower tunnel in the Gold Bank; two tunnels and drifts from the Gold Bank workings into the Golden Queen; two tunnels on the Golden Queen proper. Including stopes and raises, the aggregate workings approximate 20,000 feet.

The Gold Bank and the Golden Queen are adjoining claims on the same vein, having a total length east and west of about 3600 ft. The inclined shaft is 8 ft. wide following the footwall 1600 ft. to the place of the working-drainage tunnel. The tunnel is 8x8 ft. and 2500 ft. long, intersecting the ledge at 1250 ft. from the portal, and at 950 ft. vertical depth from the collar of the shaft. The winze in the main tunnel is 300 ft. deep, making the total vertical depth of the ground explored in the practical operation of the mine 1250 ft. from the collar of the shaft, which is the lowest outcrop of the vein.

PARTIAL REPORT OF TWO YEARS' OPERATIONS OF GOLD BANK MINING CO.

Gold, silver and copper	$372,880 55
Gold from mill	138,317 50
Gold from concentrates	208,927 68
Gold from copper cement	6,352 21
Silver	19,283 16
Merchandise sold	1,205 38
Income	374,085 93
Expense	241,751 14
Profits	132,334 29
Average profits monthly	5,513 93
Tons of ore crushed	79,689 00
Average value per ton	$4 68

In November, 1911, the water in many parts of the tunnel was 18 in. deep; this is now drained. In no part of the shaft was the ladder and tram equipment in repair. The only evidence of preservation of equipment was the remnants of an ore chute 3½ ft. wide evidently kept intact by the constant stream of water passing over it and illustrating the method of transportation of ore after the shaft had been opened into the working tunnel.

Evidences of disregard of systematic mining or practical development were numerous; passages gouged out that would scarcely admit the body of a man; chambers large enough to have inclosed the shaft house; so called drifts that formed caves; everywhere disorder and irregularity; nothing to indicate practical work except in the sinking of the shaft, and that was a mere matter of following the footwall.

THE SHAKESPEAR AND MILLER

The Shakespear group is composed of three adjoining claims along the trend of the ledge, having a total length of 4200 ft. In addition there are about 100 acres of ground adjoining. The mine was owned and operated in the prosperous days of Forbestown by Alvinza Hayward. The property is situated south of and adjacent to the south end of the Gold Bank and approximately parallel with the Burlington, the grounds of the two properties abutting at the southerly ends. The vein averages about 7 ft. in width between diorite and syenite and dips west at 50 degrees.

A main shaft was sunk 215 ft., near the center of the claims, and at 200 ft. the vein was drifted on for a length of 600 ft. south where a raise was made to the surface. At the same depth the drift was extended north 350 ft. In each of these drifts an oreshoot was disclosed dipping to the north. Stoping in the main inclined shaft at the bottom opened 20 ft. of vein matter. At 300 ft. north of the shaft a winze was sunk in rich ore. In all these workings high-grade ore was disclosed, and in some instances extraordinary assays were reported. One record shows that 187 tons of unselected ore taken from the winze yielded $2265 on the plates and $545 in concentrates or an average of $15 per ton. But this was considered low grade at that period. Ore that will yield one-half that amount in the present undertaking will be considered sufficient inducement for extensive development.

The Miller property is situated at the southwesterly end of the district and embraces about 70 acres of ground. The vein has a northerly trend and dips west at 60°, generally, but in some parts flattens out to 37°. Some cross veins or feeders dip to the northwest. The property was not developed into a paying mine, for the apparent reason that the operators were in too great a hurry to complete the surface equipment. A 3-compartment working shaft was sunk 240 ft. on the Miller vein, which is intersected by the Shakespear just southeast of this shaft. There is an overburden of red earth on this property that has in numerous places been hydraulicked off exposing the blind quartz croppings. The present owners of the property have exposed these blind croppings for a distance of 2000 ft. which were sampled and gave satisfactory returns.

The adjoining claim on the west known as the Deadwood and the placer grounds on the east were large producers in the early days of the district, and the prospect of making a mine of the Miller is based to some extent on the past history of this section of the district. The character and quality of the ore exposed in the shaft and in the surface prospecting indicate a strong probability that the former owners would have profited by the development that could have been done with the $100,000 expended in surface equipment, which was soon abandoned.

BURLINGTON GOLD MINES

The boundary line between Butte and Yuba Counties divides the Burlington property into halves. The present underground workings are in the south half of the property, and are about one mile southwest of Forbestown. There are four claims having a total length along the ledge of 4500 ft., and three parcels of land at the south end aggregating 50 acres, also on the croppings, making a total length of about 5400 ft. The claims, in their order northward, are the Annette, Jo, Mexican, New Burlington.

In the early life of active mining in the district the Burlington produced pay ore which was treated in a custom mill, but there is no complete record of the quantity or value. The ore was extracted chiefly from the Mexican claim. The results of the early operation of this mine induced renewed prospecting and development which have disclosed a well-defined vein on the Jo claim having a width of 6 to 8 ft. showing from $6.80 to $16.44 per ton of milling ore, and $80 to $100 per ton of sulphurets.

PROSPECTING FROM JO TUNNEL

Evidences of hydraulic mining appear in all the ravines extending to the ledge which crops boldly along the entire length of the claims, and the strength of the ledge is indicated by the deeper prospect shafts and opencuts. In general the croppings show well in pan colors at all points. The reason for undertaking the initial new development by driving the Jo tunnel was that it is about the only favorable place for opening the ledge by tunnel, and it was more economical to follow the ledge or vein exposed near the surface than by sinking on a dip of 60°. The advancing of the tunnel is not to be abandoned, but future prospecting and development will be by vertical shafts from which the vein may be cross-cut and drifted on at much greater depth than can be attained by tunneling.

The Annette claim has been prospected by a tunnel 70 ft. long driven northwest and cross-cutting the vein matter. The results of this work are not definitely known, as the tunnel has long been caved. The New Burlington has been prospected by surface shafts, the deepest of which is 35 ft. The ore exposed contains a large percentage in sulphurets and shows strong colors of free gold in the pan.

JO TUNNEL 305 FT. IN ORE

The portal of the Jo tunnel is on the dividing line between the Jo and Annette a little west of center. The tunnel has been recently advanced to a total length of 400 ft., the last 305 ft. of which is in ore. A raise and four crosscuts are likewise in ore. The plane of the tunnel is at an elevation of 2700 ft. and at 225 ft. vertical depth from the apex of the Mexican which is the highest point of the entire property. The first crosscut is across the east side of the vein at 195 ft. in from the portal; at 240 ft. in the vein is crosscut to the west; and again at 275 ft. it is crosscut to the west; at this point there is a raise on the east side; at the breast of the tunnel there is another crosscut to the west.

The vein is shown at these various crosscuts to be 6, 7 and 8 ft. wide. The course of the vein or ledge as disclosed by the tunnel workings and indicated by the surface croppings along the full length of the four claims is about 20° east of north and west of south. The dip is west 55 to 65 degrees.

The vein matter in the tunnel and in the deeper prospect shafts is white quartz with frequent bands or ribbons of blue quartz highly mineralized with pyrite and galena. The walls are described as diorite and greenstone strong and well defined, with a clay selvage on the footwall, which with the presence of slickensides is taken as evidence that the ledge will prove to be a true fissure.

Systematic Prospecting Planned

The contemplated new prospecting and development includes the sinking of two vertical shafts, one at the northerly end of the New Burlington, the other at about the center of the Mexican. Sinking the shafts each to a depth of 500 ft. would, with the Jo tunnel, give three levels at approximate elevations of 2700 ft., 2425 ft. and 2200 ft. The lowest of these levels would be approximately at 330 ft. higher elevation than the plane of the lowest tunnel of the Gold Bank which is 950 ft. below the collar of the Gold Bank shaft.

The estimated cost of prospecting and development on the plan above described is placed at $75,000. This would provide for two 3-compartment 5x15-ft. shafts each 500 ft. deep, a total of 1000 ft. at $30 per ft., $30,000; 300 ft. (estimated) crosscuts to the ledge, 200 ft. crosscuts on the ledge, 4500 ft. drifts on the ledge, total 5000 ft. at $5 per ft., $25,000; erecting and housing hoist and pump engines, $15,000; total actual cost, $70,000; add $5000 for contingent expense; making a safe total of $75,000 for prospecting to the ledge and permanent development of the ledge.

Good Surface Equipment in District

In the active quartz-mining period in Forbestown district the surface equipment was ample, and with added improvements and the adoption of cyanidation the extraction and treatment of the ores should have continued to and indefinitely beyond the present. A comparatively small amount of dead work was done in the exploration and development of the mines. A total of 110 stamps was installed and operated in the camp; the Gold Bank had 40 in 1894 and added 20 in 1895-6; the Golden Queen, 10; Shakespear 10; Miller 20; and a 10-stamp custom mill.

There is no positive record of the gold and silver content or the percentage of extraction that covers any certain period; but the evidence is clear that much of the ore contained in free gold from $5 to $15 per ton, and that the 1 to 1½% of sulphurets treated by chlorination yielded from $100 to $250 per ton. In 1892-94 the chlorination works at the Gold Bank and the canvas plant at the Golden Queen treated a total of five to six tons of concentrates per day. The cost of treatment including milling and chlorination averaged about $2.75 per ton; miners and other skilled laborers were paid $3 per day; other labor $2.50 to $2.75 per day. Timber cost $13 per 1000 ft.; lagging, 3½c. each. As an example of cost of excavating, the working drain tunnel in the Gold Bank cost an average of $10 per ft.; other tunnel work from $5 to $15 per foot.

Gold Bank Mill the Largest

The surface equipment of the Gold Bank in 1890 included a hoist and pumping plant, one No. 2 Gates crusher, four 5-ft. Huntington mills, eight Victor concentrators; chlorination plant equipped with a reverberatory furnace with three hearths, the revolving barrel was 4x4 ft. holding 1½ tons. The entire surface plant was operated by nine hurdy-gurdy water wheels of varying sizes from 28 in. to eight feet. The pressure at the hoist was 175 ft., at the mill 240 ft., at the chlorination works 265 ft. In 1892, the mill had been remodeled; the rotary mills were removed and a 20-stamp mill installed; the stamps had a 7-in. drop and were operated at 90 to 100 drops per min.; the crushing capacity was 2½ tons per stamp in 24 hr.; the chlorination works handled about three tons per day, making two charges. Two years later 20 more stamps were added to the plant and 16 Frue concentrators installed. Twenty more stamps were subsequently installed making a total of 60 stamps. The exact date of the initial equipment of the Gold Bank is not available.

The Golden Queen was equipped with a 10-stamp mill about 1891. The ore was broken in a No. 2 Gates with a capacity of 200 tons; the broken are passed to Hendy feeders; the stamps weighed 750 lb. each and made ninety 4½-in. drops per min., crushing three tons each per 24 hr.; the stamp shoes were steel working on iron dies; the silver-plate aprons were 1½ ft. long and were cleaned up once a week. The pulp after passing the aprons passed over a 16-ft. sluice plate 16 in. wide, to blankets, then to a series of sluices with occasional cross slats, which took out the coarser pulp; the tailings were worked in a canvas plant. About two tons per day were treated. This mill also was operated by water power.

The Shakespear mill and chlorination works were installed and operated in the busy days of the camp, but when abandoned were left to decay. The Gold Bank, the Golden Queen and the Miller mills still remain intact and considering the 15 years of idleness are in fair repair, and could be put in working order at moderate expenditure.

Miller Plant Was Modern

The Miller plant is of later installation and more modern design; it was operated by Pelton wheels at both mill and hoist. The whole plant could be put in operation and extraction and treatment of ore resumed at small cost and with but little delay. The mill is composed of 20 stamps, with spitzkasten and four Wilfley tables, grinding pan, amalgam washer, and other accessories requiring but little adjustment.

The headgear at the shaft is connected to automatic car-dumping devices. There are ore bins and waste bins; also a Gates crusher that was never used. The hoist and the Pelton wheels are practically new, as are all the parts of the plant, as only a few tons of ore were extracted and treated. The hoist and crusher, and the jackhead for pumping the shaft are equipped to be run by water power delivered through a 14-in. steel pipe 1150 ft. long connected to a penstock at the Forbestown ditch. The stamps and concentration tables are likewise equipped with 14-in. pipe 1600 ft. long connected to the same penstock. There is also a Knowles sinking pump and other machinery; also a complete assay plant equipped with new retort, melting furnace and assay furnace.

In the day of its installation the Miller equipment was a modern and model plant, with one exception. The mill is situated about 600 ft. distant from the working shaft in an excellent topographical position but no better than is afforded immediately adjacent to the shaft; and the tramway was poorly constructed and inefficient.

The ores mined in the Burlington were treated at the custom 10-stamp mill at Forbestown, which was I believe the first mill installed in the district. There is no record of this plant from which the details of its construction can be learned. This mill handled the ores from various mines in the district and was an enterprise of considerable importance in its day.

This history of the mining and milling of ores in the Forbestown district is written from the available records and a visit including the whole surface of the district and a greater part of the underground. There is nowhere any evidence of the mines being worked out. On the contrary the camp is evidently a big producing prospect that required the dropping of a total of 110 stamps for several years and the operation of chlorination works and canvas plants, and the excavation of approximately 30,000 surface feet and extraction of several hundred thousand tons of ore. But it is still an undeveloped prospect in relation to permanent deep mining.

Lime in Cyanidation

By J. W. Hutchinson*

The following notes cover the practice of adding lime at the Goldfield Consolidated mill, Goldfield, Nev. The ore is crushed, concentrated and settled in water, no contact with cyanide solution occurring until the pulp has reached the Pachuca agitators. The bulk of the lime is used not only for neutralization and coagulation, but also for protective alkalinity and is added as a lime emulsion at the main launder leading from the concentrators to the dewatering tanks.

Lime Added as Emulsion

The lime-mixing plant, situated about 200 ft. from the main mill building, contains a storage bin, having a capacity of 120 tons, from which the lime from the railroad cars is dumped. The lime from this bin is slacked in cement buggies for the purpose of breaking down the large lumps, and dumped into two 4-ft. grinding pans. A stream of mill-service water is kept running into the pans (they have no mullers, acting as mixers or emulsifiers only), which overflow a lime emulsion. This product is conveyed in sheet-iron launders to the different departments of the mill and cyanide plants. Wooden launders were not serviceable for this product and required constant repairs. This system requires no extra labor and little power, and has the advantage of absolute control at all times. The only disadvantage is a slight loss of lime from undissolved particles when the accumulations in the pans are cleaned out.

The helper in the cyanide plants attends to the lime and regulates the amount to be used by taking a sample of the overflow from the dewatering tanks every two hours. This is one of the most important departments in the mill and has a great effect on the tonnage, since the maximum settlement takes place within exceedingly narrow limits of lime in solution. Ordinarily this overflow is held at 0.3 to 0.5 lb. CaO per ton of water, and a variation of 0.2 lb. either way from these figures results in decreased tonnage. By adding the lime in an emulsified condition, this regulation is possible. The overflow sample with this method is also an indication that the charge will contain approximately the same amount of protective alkalinity when transferred to the agitators.

At some plants where fine grinding is not required and the sand is leached, a stamp is successfully used for pulverizing the lime, since the coarse particles will be classified out with the sand and maintain a uniform protective alkalinity during leaching. Similarly the overflowing slime will contain no undissolved lime and the slime charge will have the same alkalinity as the overflow from the classifiers. The inadaptability of this method to an all-slime plant is obvious. Occasionally at this plant, when the helpers have been negligent in slacking the lime before dumping into the pans, the overflow sample is no index of what the slime charge will contain, the latter containing 0.5 to 0.8 lb. more CaO than the overflow sample would indicate.

Approximately 12 sq.ft. of settling area is required per ton of ore, in order to dewater to 40% H_2O with no mechanical or continuous device for drawing off the thickened sludge. The manufacturers of the best known continuous thickener recommend 8 sq.ft. with their device, which does not operate well when delivering a product containing less than 50% H_2O. When it is necessary to crush in water, it seems there is nothing in favor of continuous thickening, provided it is possible to regulate closely the alkalinity of the water in which the charge is collected. It was inadvertently demonstrated here recently in trying to crush this ore in solution, that if it were necessary to carry such alkalinity as is required with silver ores (from 1 to 1.5 lb. CaO per ton of solution), it would be impossible, even after 48 hours' settlement, to thicken the pulp to greater density than 1.3. This would reduce the tonnage by approximately 25 per cent.

Better Results Crushing in Water

Though contrary to the experience of others on other ores, it has been demonstrated here conclusively that it is not possible to obtain so high a recovery when crushing this ore in solution, as when crushing in water and giving a preliminary alkaline treatment. This experience is borne out in part by the Alaska-Treadwell company, whose concentrate is subjected to a preliminary treatment with lime before cyanidation; also by the experiments of E. M. Hamilton on concentrates, recently described in the Engineering and Mining Journal. He states that at one property he was able to extract a high percentage of the precious metals from a rich silver-gold concentrate, after a preliminary treatment with lime.

On this ore, with the same period of agitation, the difference in extraction when crushing in solution is 2%. We have demonstrated this, not only in the laboratory, but by actual tests in the mill, lasting three weeks. Further, we have shown that longer time is required to reach the point, after which no gold dissolves, when the ore has been crushed in weak solution; that more lead is required; and though the total cyanide consumption in the plant is lowered, the chemical consumption of cyanide is markedly increased. In the laboratory tests the stock solution was checked with a new solution, in order to determine whether or not the lower extraction in a given time was due to decreased efficiency of the stock solution. However, the two solutions checked repeatedly and in all instances showed that when crushing this ore in a weak solution, nearly 30% more time is required for dissolution of the gold than when the ore is crushed in water and given a preliminary alkaline treatment before any cyanide comes in contact with it. The reason for this is not known definitely, but may be accounted for by the "Physical Effect of Weak Solutions," p. 85, "Cyaniding Gold and Silver Ores," by Julian and Smart.

Crushing in Solution Now

In the past, the ore has been of such grade that it has been more economical to stand the mechanical loss of cyanide (and higher costs), due to crushing in water, and take the higher extraction. At present we are crushing in solution, and by lengthening the time of treatment from 28 to 36 hours, are obtaining a saving within 1% of what can be done with the other method and are avoiding the mechanical loss of cyanide. There is one marked advantage in crushing this ore in water, followed by the alkaline treatment, which has never been appreciated before, viz: The neutralization of the soluble potassium aluminum sulphates, which are abundant. Never since the mill started had the solutions shown any tendency to throw down the gelatinous aluminum precipitate, which is so detrimental to filter cloths and precipitation, until we changed the process.

This was especially noticeable in the solutions coming from the roasted concentrate. This product had always been neutralized with lime slacked in water. The first charge which was neutralized with lime slacked in weak solution threw out so much aluminous precipitate in the gold tanks, that it was impossible to force the solution through the clarifying presses. This was overcome in the subsequent charges by running a fresh-water line to the lime house and slacking the lime for the roasted product in fresh water. In some of the experimental work on the roasted concentrate, caustic soda was used instead of lime. Its use, however, would be precluded by the cost, and the additional disadvantage that it is not a good coagulating agent, but lends itself to the formation of colloidal suspensions, which cannot be settled even with the addition of lime, and that it tends to bring soluble sulphides into the solution.

The Russian customs department has given notice that iron pyrites containing less than 3% copper shall be classed on importation as "iron ore not separately distinguished," says the *Chemical Trade Journal*, but if containing 3% or more of copper shall be classed as copper ore, and pay duty as such.

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Mining Copper at Lake Superior—II

By Claude T. Rice

The Allouez and Ahmeek companies sunk shafts inclined at 80° instead of vertical shafts. When the lode was reached these shafts were flattened to follow it. The only two Whiting hoists in this country are at the Red Jacket vertical shaft, which opens the Calumet & Hecla conglomerate. The conglomerate inclined shafts contain either two or three compartments, and are sunk in the lode. The inclined amygdaloid shafts are either in the lode or parallel to it in the foot wall.

The inclined shafts generally follow the lode at the amygdaloid mines and always do so at the conglomerate mines, for the foot-wall flows under the conglomerate are so weak that a shaft cannot be kept open in them. At the amygdaloid mines, some of the shafts have been sunk with the foot of the lode as the hanging of the shaft, but generally such a shaft is placed at some distance in the foot wall. As considerable trouble has been encountered with some of the shafts within 30 ft. of the vein, it has been decided that a foot-wall shaft should not be less than 60 ft. from the lode. With the shaft at that distance, it has been found in the upper part of the Wolverine mine that the ore can be stoped out over the shaft without any danger and that no shaft pillars are required in the lode to protect the shaft. But the mining of the ore directly over the shaft is not good practice.

The distance at which a shaft should be placed in the foot wall in order to permit cutting of bins and pockets over it in the deeper parts of the amygdaloid mines, is still a problem, and, owing to the experience at the Quincy mine, where the shaft in the foot wall is the one giving the most trouble in the deepest workings, some in the district are inclined to believe that a shaft in the lode is easier to maintain than one in the foot wall; where the hanging is left standing on pillars and a general movement starts, great pressure is thrown on the shaft pillar, and there is a greater tendency for the workings to slab off in the more compact flows of the foot wall than in the more amygdaloidal flows of the lode. In the deeper workings of the Red Jacket shaft, it is found that the foot-wall flows give much trouble through scaling off of the roof and sides and swelling of the foot, even at points 100 ft. or more from the lode in the crosscuts; a lateral drift at a depth of 5000 ft. on the dip of the flows in the Calumet No. 2 workings, gives similar trouble when following flows 200 ft. away in the foot wall of the conglomerate. In these instances, this trouble does not come from oxidation of minerals in the flows, but from pressure.

Shafts in Lode and in Foot Wall

Whether it is best to put the shaft in the foot wall or to follow the lode with it, even in the upper part of the mine, is entirely undecided in the minds of the men operating the flat-dipping mines in the northern part of the district. The principal advantage of the foot-wall shaft, other than that in the upper parts of the mine it requires less timber to keep it open, is that it permits the placing of loading bins directly over the shaft with most of them cut in ore. However, the use of bins over the shaft is not looked upon with favor by many of the most experienced men at these northern mines. Therefore, if bins are not to be used but the skips are to be loaded either by dumping the cars directly into them or from a small measuring pocket cut in the floor of the station, one of the main reasons for sinking the shaft in the foot wall is removed. Another advantage that the foot-wall shaft formerly held, namely the practical immunity from fire, is fast disappearing, owing to the increasing use of reinforced concrete for supporting the ground where the hanging of the shaft is heavy.

The disadvantages are that the shafts in the foot wall cost more to sink than those in the lode, for the partings between the flows, from which to draw the cuts are less prominent than in the case of the lode; there is no ore coming from the shaft to help pay for its sinking; there is the necessity of crosscutting to the lode on each level and of cutting a station in rock. The most important reason, in case of a working shaft being sunk to prospect a lode, as is the general practice in the copper country, is the fact that there is no information concerning the lode coming from the shaft itself. This last objection has less importance at operating mines, and it is questionable whether it is not the wisest policy at new mines to sink a small shaft following the lode and to do all development from it until the grade of the lode is determined. If the ore is rich enough to pay, the working shaft can be raised from several different levels at the same time, placing the shaft either in the lode or in the foot wall, as is thought best, in the light of the information that has been obtained.

Surface Works, Allouez Mine, Michigan

Dead Work Reduced to Minimum

Unless one is accustomed to working mines where a profit must be made from ores yielding only 13 lb. of copper per ton and having payable widths that do not average much over 12 ft., although in some instances swelling out to 20 ft. or more, he is not apt to appreciate the importance of keeping the work in the ore as much as possible and of avoiding dead work. With the shafts placed as close together as they are, 3200 ft. is the maximum interval between shafts, and this is between Osceola Nos. 13 and 14, the average distance being 1600 ft., the tonnage to which dead work can be charged is small compared to that served by a level at low-grade copper mines of other districts, where, in the vein mines, orebodies often have a width of 50 ft. This distance between shafts, however, is being rapidly increased at the newer shafts in this district.

Hand tramming is used entirely in the flat-dipping amygdaloid mines in the vicinity of and north of Calumet, and it is that which has limited the distance between shafts. Experiments are now being tried to concentrate hoisting from several levels at one level, and it is probable that in time the Red Jacket system of subshafts will be tried at some of the amygdaloids, to permit electric or some other variety of mechanical haulage, and the attendant increase in the distance between shafts. Experimenting, however, has to proceed cautiously with the margin of profit as low as it is when copper sells under 13c. per lb. The experience at the Tamarack and the Red Jacket shafts, where long crosscuts are necessary to reach the orebodies from the vertical shafts, has made mining men in the Lake district cautious in adopting any method that entails much dead work. The operators appreciate the fact that the grade of the ore from which copper can be mined at a profit, depends largely upon making every foot of work count; that simple methods must be perfected in which little dead work is necessary in the deeper parts of the properties to be mined. Experimenting has been rendered more cautious since it has been seen that the reason for the failure of the Calumet & Hecla to make profits from the Osceola lode when first opened, was that an experiment in mining was tried in which too much work was done in the foot wall and the principle of clinging as closely as possible to the ore was neglected.

Steep Inclines Instead of Vertical Shafts

Profiting from the experience of the Calumet & Hecla and the Tamarack companies with their vertical shafts, the Ahmeek and the Allouez, which do not own all the outcrop of the Kearsarge lode that can be worked in their properties, sunk inclined shafts having angles of 80° until they reached the lode, when they turned off on arcs of circles to the dip of the lode and followed the ore. At the Allouez shaft, which was the first in the copper country to be sunk with a considerable change in its dip at depth, the curve at the point of flattening was simple and had a radius of only 85 ft., but at the Ahmeek, a compound curve with several hundred feet radius to each part was used. The Centennial company, on account of its owning only a small length of the outcrop on the Kearsarge lode, sank one of its shafts straight down on the dip, while the other shaft, which had to be started within about 50 ft. of the first shaft so as to start it in the lode, had to be given a considerable lateral turn in order to reach the portion of the property below the South Kearsarge workings; the shaft at depth parallels the boundary line which cuts across the lode at an angle of about 45° with its strike.

In making the turn, a compound curve with a small reverse at the end was used, to keep the rope from leaving the rollers. The skip must be slowed up slightly at the curve, but other than that and a somewhat greater wear upon the rollers, little inconvenience is noted in hoisting. While this is probably the only shaft in the world that has purposely been given a side swing and in this instance a large one, the experience gained in it, and at the Allouez and the Ahmeek shafts, where the turn is in the direction of dip, shows what liberties can be taken with shafts if properly planned.

Designs and Methods of Sinking Shafts

In the conglomerate workings, several shafts with one manway and one hoisting compartment are used. These shafts are driven 12x9 ft. with two hoisting compartments. Shafts with two hoisting compartments and a manway are sunk 22x9 ft. in the South Hecla mine, while the subshafts in the Red Jacket lower workings are made 16x9 ft., because cars instead of skips are used in them. The standard size for a shaft with two hoisting compartments and a manway in the amygdaloids, is about 22x9 ft., the manway being 4 ft. wide.

In these flat-dipping shafts, it is an open question whether it is better to place the manway in the center or at one side. With the latter, only one row of dividers is necessary to carry the lining for the manway, while with the other, two rows of divider posts must be placed. Where the two skipways are side by side, a man working between doors in one of the skipways is permitted more leeway in getting out of danger; with the skipways one on each side of the manway, the roller-man can do the oiling of the rollers and inspect the tracks more easily and with less journeying along the tracks, than if the skip-tracks are both on the same side of the manway, in which case the roller-men must go down the tracks to inspect and oil the rollers on the far side. With the manway in the center, a skip, if it leaves the tracks, is less likely to interfere with the one on the other side and in case the shaft gives trouble due to heavy ground, there is less inconvenience in supporting the roof. This is so because more room is left for timbers or concrete bulkheads than if such support had to be squeezed into a restricted free space between the two skip-tracks. The work of putting in such timbering or concrete will also interfere less with hoisting when the manway is in the center.

Drilling in Shafts Done on Day Shift

The drilling in the shafts is almost universally confined to the day shift, while the mucking is done on night shifts. A center cut is generally used, to give a central sump, and as the amount of water in the shaft is small, it is generally handled by bailing. The sinking bucket is carried from the overhead trolley that travels along either a wire rope, hung from an eyebolt in the roof or else along an I-beam suspended by chains from plugs in the hanging. Two machines are used in a shaft and all holes are blasted each shift, so that on the next shift full advantage can be taken of the manner in which the ground is breaking. A rock pentice, 8 to 10 ft. thick and drilled so that it can be blasted out when desired, is left under the skip sump whenever the shaft is being sunk in a mine that is operating.

An advance of from 7 to 9 ft. per round is made according to the size of the shaft and the depth of the holes used. About 34 holes are required to break a 9x22-ft. shaft. The machine men that work in these shafts on day shift use the shaft machine in drifting on the lowest level upon going on night shift, so as to keep the machine busy while the shovelers are cleaning out the shaft. In sinking an advance of 45 to 50 ft. per month is made. The cost of sinking a 10x20-ft. shaft at the Mohawk mine is given in the following table:

AVERAGE SINKING COST FOR A 10x20-FT SHAFT AT MOHAWK MINE IN 1909 AND 1910

	Per Ton of Rock Broken	Per Foot of Advance
Labor		
Machine men	$0.576	$10.05
Drill boys	0.027	
Hoisting and bucket landers	0.210	3.50
Supplies	0.116	1.94
Mucking (approximately) . . .	0.210	3.50
Total, without timbering	$1.139	$18.99

The average number of tons broken per machine per day of two shifts, was 21.5 and the average wage of a machineman was $3.09 per shift.

Timbering the Shafts

In the conglomerate shafts the great weight of the hanging wall has caused the adoption of a novel method of supporting the roof whenever the weight of the hanging commences to come on. In this method, described in a shorter article, the weight of the roof is carried on posts and headboards, while shaft sets are placed merely to carry the lagging and to allow the shaft crew, when easing timbers, to work over the tracks without delay to the hoisting. In the amygdaloid shafts, only posts are required in all but the heavy ground, and generally these posts are carried only between the manway and the hoisting compartments. On account of the ties and the stringers that in the older amygdaloid shafts are of wood, as well as the lagging that is carried along the dividers, the timbers in both the amygdaloid and the conglomerate shafts are sprinkled frequently to guard against fire.

This sprinkling also has a tendency to lengthen the life of the timbers, which, even if good resinous pine, do not last more than seven or eight years at the most, in an upcast shaft. On the other hand, the dampness in the shaft that results from the sprinkling, tends to make the roof slab sooner. For doing the sprinkling, a water pipe is carried down the shaft, broken generally every 500 ft. to ease the pressure. With a 50-ft. hose and by working up and down from a level, it is easy to sprinkle the timbers.

Fire Doors Used

As a further safeguard, in the conglomerate mines, substantial fire doors have been put in for several years on both sides of the shaft at each level, so that a fire can be shut off from the rest of the mine. It is beginning to be the custom also at the amygdaloid mines to put in fire doors on the different levels, as these doors can be used in winter to regulate the draft throughout the mine. The increasing use of concrete in the amygdaloid shafts, however, is rapidly making them more fireproof. Already it is the best practice to use concrete stringers for carrying the rails of the skip tracks in the amygdaloid shafts, while the Ahmeek shaft is timbered with concrete sets and concrete station floors are in use at the Ahmeek, Wolverine, Mohawk and South Kearsarge shafts, and even stations timbered with concrete sets are used at the Wolverine; in the Wolverine and Mohawk shafts, pillars of reinforced concrete are put in to hold up especially heavy parts of the hanging wall and the brows of ground undercut at the stations, because those shafts are sunk in the foot wall. It is almost a universal custom in the district to make the collar of the shaft of reinforced concrete, whether or not it is necessary to sink through quicksand, as the decrease in the pumping expense, due to the surface water that the tight collar keeps out of the shaft when the snow-drifts about the orehouse begin to melt, pays for the extra cost of the construction in a few years.

No. 2 Mohawk Mine, Michigan

Concrete Stringers in Amygdaloid Shafts

The absence of any tendency in the foot wall to swell in the amygdaloid shafts makes it possible to use concrete stringers in them, and when a 60-lb. rail is also used, a permanent skiproad is obtained. Owing to the swelling of the foot wall in the conglomerate shaft, the skip tracks have to be laid with the rails resting directly upon cedar ties, placed about 18 in. apart. To guard against the skip jumping the track, 6x8-in. stringers are carried on the ties alongside the rails. The rail itself cannot be carried on a stringer, as it would be impossible to work on the swelling ground under such a stringer without interfering with hoisting; with the rails carried directly upon the ties, it is an easy matter whenever the swelling of the foot throws the track out a little, to work out the ground from under one of the ties and replace it without interfering with hoisting in the least.

Good, strong shaft pillars are now characteristic of the practice in the mines, although in the past small pillars were left at some of the shafts, especially where the shaft is in the foot wall. In the upper workings of the conglomerate mines, the pillars were only 75 ft. wide on each side of the shaft, but this was increased with depth to 85 ft. and finally below a depth of 5000 ft. on the lode to 100 ft. As the amygdaloid ore is much stronger than the conglomerate in resisting pressure, the pillars at first were not left more than 50 ft. wide in these shafts, but these pillars are now also cut 100 ft. wide on each side of the shaft. Robbing of the shaft pillars has already commenced at some of the conglomerate shafts and no great difficulty is being encountered in getting the ore out, except that the roof is rather heavy. The walls of the lode close in in a few weeks after the ore in the shaft pillars has been taken out.

Hoisting Speed

At the Red Jacket shaft the attraction is the Whiting hoists. There are in existence only two of these hoists in this country, both at the Red Jacket shaft, and another at the DeBeers diamond mine in South Africa. A tail rope is used and of course the system is best adapted to vertical shafts; a mine must be quite deep to make the use of such a hoist profitable. Like other tail-rope systems, it is less flexible than a double-drum hoist working in balance. A recent accident also shows that the strength of the tail rope is almost as important as that of the hoisting rope. If the tail rope breaks, an accident is likely to result owing to the sudden reduction of the load on the side on which the rope breaks, while on the other side a greatly increased strain is suddenly put upon the hoisting rope and engine.

The most popular hoist for hauling from considerable depth on the incline at the amygdaloid mines is a Nordberg with conical ends on the drum. The two ropes are wound on it in opposite directions, using the central cylindrical portion in common. These cones have a small diameter of 12½ ft., and a large diameter of 18½. In the vertical shafts a speed of 2500 ft. per min. and more is used in hoisting rock, while in handling men a speed as great as 1200 ft. per min. is employed. In the inclines a speed of 1000 ft. per min. is used in handling the men, and in hoisting rock the speed depends upon the depth. With a shaft only 3000 ft. deep on the incline, a speed of about 1700 ft. per min. is used, as with that speed the hoisting can be done without any danger of the skips jumping the track. From the deeper inclines on the conglomerate, a speed of 2250 ft. per min. has to be employed in hoisting rock, and at times both at the amygdaloid and the conglomerate shaft a speed of 3500 ft. per min. is attained. While these speeds may seem high to some, they are not dangerous because of the large drums used on the hoisting engines; the larger the drum diameter, the higher the speed at which hoisting can be done safely.

Self-Dumping Skips Used

All hoisting from inclines is done in self-dumping skips. Those at the Calumet & Hecla mines have a capacity of 7½ tons, and most of the other companies use as large a skip, although in some instances one holding only two cars, or from 4½ to 5 tons is used. The signaling is done almost universally by a bell cord, using a lever on the rope that can be locked down by the man under whose control the skip is at the time. At the Ahmeek and a few of the other mines, a solenoid electric signaling system is used, while at the Wolverine the Johnston system of vibrating bell signal is employed. Both systems are well liked at the mines where they are used, and it seems as if it would pay to use electric signals in more of the shafts. One of the curiosities of the copper country is the hoisting of the ore in cars at the Tamarack shafts. Double-decked cages are used, and the cars hold about

2.7 tons of ore as loaded. The men slough these around on the station turnplates with surprising dexterity as long as the car is kept in motion. The turnplates are of cast iron, 1½ in. thick, and rest on stringers.

TYPES OF TRAM CARS

The cars used underground in the northern mines of the Lake district are all low, and characteristically have the front end open, to allow boulders to be lifted into them. The front axle is bolted fast to the car body, while the rear axle is held to the other axle by two distance straps, which give the cars a wheel-base of 24 in. These wheels are placed so that the front axle is only slightly ahead of the center of gravity of the car. This makes the car easy to dump at the shaft, but a drawback is, that with such a long body and short wheel-base, any unequal loading of the car is likely to put it in such balance that only a small obstruction will throw it from the track.

SOUTH KEARSARGE SHAFTS—CENTRAL BOILER PLANT

Another object in making the cars so low, most of them having side sections not more than 30 in. above the track, is to decrease the labor of shoveling. For these reasons the cars are well designed for use in the Lake mines. The cars generally have their wheels held on by keys and only on the cars used at the Tamarack, where the wheels are cast with an oil well in them, and those used at the Red Jacket shaft, where the grease is supplied to the wheel from a screw grease cup that fits on the hollow axle at the ends, is any provision made for automatic oiling. As a result the wheels have to be removed and the axles daubed with grease. For this reason the cars are not well oiled and roll harder than they should, as is shown by the fact that the grade of the drifts has been increased from 6 in. to 8, and finally 10 in. per 100 feet.

The cars used in the Red Jacket workings of the Calumet & Hecla company have solid boxes with the wheels carried on hubs fastened to the sides and bottom of the car. This is necessary in order to permit the car to be brought into the mine and yet hold 2½ tons when loaded. These are dumped at the ore pockets with air plungers and a chain with a hook on it. The cars in the conglomerate mines that are worked through inclines, have swinging doors at both ends. The door on the front, or dumping end, swings up, while the one at the rear end swings down, to allow large boulders to be rolled into the car without trouble. This use of a door on the car seems to be better practice than to have only one end and that closed permanently, for it is important in loading cars where hand tramming is used, that they be kept full if the cost of shoveling and tramming is to be kept low. If the ore is held in the cars by a wall of boulders piled in the front end, it gives the men a good chance to cheat a little in the loading, by building the wall with a good slant to it or by starting the wall a little back from the end of the car.

MOHAWK NOS. 1 AND 2 MINES—ALSO SERVED BY ONE BOILER PLANT

There is no standard gage for tracks in the district. In the Mohawk and Wolverine mines the gage is 3 ft. 1 in.; North and South Kearsarge, Allouez and Ahmeek, 3 ft. 4 in. and in the Calumet & Hecla, 4 ft. A 4-ft. gage is all right for a straight track such as generally obtains in the conglomerate workings and where mechanical haulage is used, but when the track is crooked, it is too wide a gage, as it is hard for a man to push the car around a curve. The present management of the company did not, however, use this 4-ft. gage out of choice, in the Osceola amygdaloid workings; it was necessary to retain this gage on reopening the mine, as the drifts had been driven with that gage and cars with that gage were at hand. The question of gage is simply a problem of railroading; wide gage for straight tracks, and narrow gage for crooked roads. With a wide car, the sides can be made lower and the length shorter to hold a given tonnage, and with the same wheel-base the car will leave the track less easily; however, probably a gage of 3 ft. is wide enough for any car that men are expected to tram.

To facilitate the loading of the skips it is generally the practice in the case of shafts having two hoisting compartments, to use a spur track coming up to the shaft on one side so that one car may be kept standing on the side track waiting to be dumped over the side of the skip; the main track extends across the shaft on the hanging-wall side and has two turntables, one in front of the center of each hoisting compartment, with a short piece of track to take the cars from the table to the edge of the plat so that they can be dumped to full advantage into the skip. The custom is to dump the side cars first, as the ore, having a velocity toward the bottom of the skip, goes clear to the bottom. With shafts having a dip of about 38° this is an important thing in dumping the first car. The second and third cars are dumped in from behind. Two men do the actual dumping, and a third trims the load, assisted by one of the men that aided in the dumping. In the conglomerate workings, where mine requirements approach closely to the hoisting capacities of the shafts, the three cars making the skip load are dumped in 1¼ minutes. Aprons are used to bridge the gap between the plat and the skip, thus preventing any ore from being spilled into the shaft. As a dip of 38° is rather a flat slope for loading skips, an increase of 2 or 3° is obtained in the slope of the skip bottom, where necessary, by placing the front wheels of the skip on an axle bolted to the under side of the skip, to raise the front end as far above the tracks as is practical.

SYSTEM OF LOADING AND DUMPING

The loading of the skips is done in several ways. It is in this part of the tramming that much time is lost at many of the mines. One method is to have the trammers do their own dumping, but this results in loss of time, since the men must wait before they can get a skip at their level. Another way is to have the dumping done only by a special crew of dumpers. This necessitates having a number of extra cars on the level, but this is a small drawback and it is a better and safer method than the first. for anyone can ring the bell when the bell rope is not locked down; this precaution is resorted to when the skip is busy hoisting from a level. In dumping in this way it is necessary for the dumpers to ride on the skips from the bottom of the shaft to the top level, in order to begin the circuit again.

At some mines this practice of riding on the skips is condemned because of the danger, and probably rightly so. These dumpers begin to shovel on the upper level until a sufficient number of cars have been loaded to make two skip loads. Then they dump their own cars and go down from level to level, dumping the cars in turn. After the dumping is finished the men begin tramming again on the bottom level. When six more cars have been loaded, a second crew of three dumpers starts down on the second trip, and then later the third crew starts. By that time it is noon, and the men get on the man car which has been put on the rope in one compartment, and ride back to the top level, to begin to dump again in the same manner in the afternoon. A third system is to have a crew of dumpers, always three in number in all the systems, go through from top to bottom, dumping the cars, and then ride to the top again. However, instead of their having control of the skip, the latter is signaled away from or to the levels by a man centrally situated in the mine. As soon as the skip is ready the dumpers signal to him and he signals the hoisting engineer.

With this system, which requires either the use of a regular telephone or a speaking tube arrangement of some sort, in case a trammer on any level needs the skip he telephones the man in charge of the signaling, and the skip is sent to him as soon as possible. It is possible in this way to avoid long waits that are apt to occur when upsetting of a car delays tramming, or when the men shoveling and tramming from a drift stope get behind in their loading on one of the development levels. This last system of dumping appears to be the best, provided that the saner plan is not followed, of sending the ore from several levels to one of the lower ones, so that tramming can be concentrated sufficiently to pay for mechanical haulage and the use of skip chutes and measuring pockets, or merely measuring pockets in the case of heavy ground.

(To be continued)

Zirconiferous sandstones have been found on numerous farms near Ashland, Va., says a U. S. Geological Survey bulletin.

Adinau Safety Powder

San Francisco Correspondence

The action of Adinau safety powder, called "Adinite," as used in quarry practice was recently demonstrated at Hutchinson macadam quarry in Contra Costa County, near Oakland, Calif. The test was made by the foreman and other employees of the quarry, and neither the inventor of the powder nor others interested had any part in the selection of the rock or the drilling or blasting.

Four 6-ft. holes were drilled in the open face of the quarry about 50 ft. above the floor and 20 ft. below the surface of the deposit. Three unattached boulders were also selected, one of which was drilled with one 3-ft. hole; the two others were bulldozed. Thirty-five sticks of powder were used, distributed at the rate of one stick to each 1-ft. of depth of hole; three sticks to one bulldoze; five sticks to the other. The boulder which contained the 3-ft. hole weighed approximately 7 tons; the others about 3 tons and 5 tons. Ordinary caps and fuse were used.

The seven explosions followed in brief and regular order, beginning with the blasts in the face of the quarry and ending with the largest boulder; the detonations were sharp and short like the crack of a gun. The rock in the face of the quarry was broken small, the exposed fragments slid down gradually, none being carried or shot away upward or outward any appreciable distance. The pitch of the face was about 85°. The bulldozed boulders were well shattered, the fragments being scattered within close range and not lifted. The smaller one was not completely shattered, but was peeled close and left a core about one-fifth the whole rock. The large boulder, which was blasted, gave the most interesting result. The hole was drilled on top in about the center and into a crack or seam. The rock was split by the blast along the line or track of the seam; about six-sevenths of the whole rock falling apart well shattered but not scattered, the remaining one-seventh being moved several inches from its original position and apparently remaining intact. The larger portion of the mass was lifted a few inches above the floor and fell into fragments as though it were mechanically constructed in parts and mechanically unfolded. The area covered by the shattered parts was no greater than would have been occupied had they been placed by hand in an irregular pile. There was no shooting of the rocks into the air. The smaller part of this boulder weighing probably one ton was moved a few inches from its original position, and though apparently remaining intact was in fact well cracked and could be easily broken to required sizes for the gyratory crushers by sharp blows with hand hammers. The general result of the blasting and bulldozing was the breaking of the rock to sizes varying from four to 10 inches.

Various experiments testing the safety of the powder were made with sticks picked at random by some of the visitors prior to loading the holes for blasting. Safety against fire was proven by the use of the red-hot iron rod run through a stick of the powder and further by placing a stick of the powder in a blazing fire. Safety against impact was tested by Professor Adinau hammering the powder drawn from a stick and also hammering the stick powder itself on a blacksmith's anvil. Another stick was struck by a shot from a revolver, without exploding. Evidence that the powder will not explode except in confinement was sufficient. One of the main objects of the company is to provide a product which can be used instead of dynamite by miners, without change in the process of handling the explosive or in the way of drilling holes. Adinite is of the same size and shape as dynamite or the ordinary blasting powder.

The powder used in this demonstration, Professor Adinau explained, was not intended to insure against the particular danger of damp fire. He claims to have for use in mines, a special formula which reduces to a minimum, the danger of explosion by damp fire. It is claimed also by Professor Adinau, that freezing has no effect whatever on this powder because it is made exclusively of ingredients which are solid at the ordinary temperature, so that it can not be disturbed by any lower temperature.

This powder is being introduced and will be manufactured by the Adinau Safety Powder Co. with head office in Mills Building, San Francisco. The company operates a small plant at San Mateo, Calif., for the manufacture of powder for demonstration purposes. The manufacture of commercial powder has not yet been undertaken, but is contemplated when the work of organization is completed.

New Zealand Mineral Production

The official figures for New Zealand's mineral production for 1910 are as follows, arranged in order of descending value: Gold, 478,288 oz.; coal, 2,197,362 tons; kauri gum, 8693 tons; silver, 1,711,235 oz. The value of the above items is estimated at £3,752,696; the value of all unenumerated items is £22,202. From 1853 to 1910, inclusive, New Zealand has produced 19,709,762 oz. of gold, 14,695,797 oz. of silver, and 306,500 tons of kauri gum.

Mining and Metallurgical Patents

A Classified List of New Inventions

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by "The Engineering and Mining Journal" upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COPPER

BRASS SUBSTITUTE. Composition of Matter. Louis Gross, Homestead, Penn., assignor to Car Gross, McKees Rocks, Penn. (U. S. No. 1,023,642, Apr. 16, 1912.)

LEACHING. Method of Treating Copper-Bearing Substances. C. S. Bradley, New York. (Brit. No. 12,304 of 1911.)

PURIFICATION AND DEOXIDATION of Copper by Boron. Ezechiel Weintraub, Lynn, Mass., assignor to General Electric Co. (U. S. No. 1,023,604, Apr. 16, 1912.)

REFINING COPPER. Walter S. Rochey and Hilliary Eldridge, New York, N. Y., assignors to Metallurgical Research Co. (U. S. No. 1,027,769, May 28, 1912.)

GOLD AND SILVER

AMALGAMATOR. William James Gruss and Max R. McColloms, Ramsey, Nev. (U. S. No. 1,032,332, July 9, 1912.)

AMALGAMATOR.—Separator and Amalgamator. John Wick, Council, Alaska. (U. S. No. 1,027,952; May 28, 1912.)

ANTIMONIAL AND ARSENICAL ORES.—Improved Process for the Recovery of Gold and Silver from Antimonial, Arsenical and other Gold Bearing Ores. J. Gitsham, Moonee Ponds, Australia. (Brit. No. 13,621 of 1911.)

CYANIDING—Process of Precipitating and Recovering Metals from Cyanide Solutions Containing Same. C. W. Merrill, Berkeley, Calif. (Brit. No. 7602 of 1911.)

CYANIDING—Pulp-Agitator. William Hammond Iron Works, Warren, Penn. (U. S. No. 1,026,578; May 14, 1912.)

DREDGE. Suction Dredger. Erastus E. Roberson, Le Grand, Cal., assignor of two-thirds to William A. Huelsdonk, Le Grand, Cal. (U. S. No. 1,028,387, June 4, 1912.)

DREDGING. Suction Tube for Hydraulic Dredging Machines. Louis J. Baltz, Buffalo, N. Y. (U. S. No. 1,027,095; May 21, 1912.)

DRY-PLACER SEPARATOR and Concentrator. Newton C. Westerfield, Chicago, Ill., assignor to International Manufacturing & Mining Co. (U. S. No. 1,029,651; June 18, 1912.)

FILTER APPARATUS. Bruce W. Traylor, New York, N. Y. (U. S. No. 1,029,155; June 11, 1912.)

GOLD-SAVING MACHINE. James McDonald Wishart, Pasadena, Cal. (U. S. No. 1,030,499; June 25, 1912.)

LAUNDERS. Improved System of Overflow Launders for Tanks Used in the Process of Gold Recovery or Extraction from Ores. W. Ross, Johannesburg, South Africa. (Brit. No. 13,433 of 1911.)

PLACER MINING. Black-Sand and Gold-Saving Machine and Undercurrent. Charles J. Evans. (U. S. No. 1,032,746, July 16, 1912.)

RECOVERY.—Apparatus for the Recovery of Precious Metals. Henry Noel Potter, Hollywood, Cal. (U. S. No. 1,030,490, June 25, 1912.)

WASH-SOLUTION COLLECTOR. Frank Gardner Peck, Colorado Springs, Colo. (U. S. No. 1,030,918; July 2, 1912.)

IRON AND STEEL

BLAST-FURNACE TOP. George Hampton Smith, Aspinwall, Penn. (U. S. No. 1,031,478, July 2, 1912.)

BLAST FURNACES. Method of Charging Blast Furnaces. H. Aumund, Danzig-Langfuhr, Germany. (Brit. No. 20,375 of 1911.)

CEMENTATION.—Improvements in Cementation Furnaces. Soc. Anon. Italiana Gio. Ansaldo, Armstrong & Co., Genoa, Italy. (Brit. No. 24,635 of 1911.)

CHARGING FURNACES. Frank C. Roberts, Wynnewood, Penn. (U. S. No. 1,033,036; July 16, 1912.)

CONVERTER—Apparatus for the Production of Steel. Henry Johnson, Sheffield, England, assignor to Verdon Cutts & Hoult, Sheffield, England. (U. S. No. 1,032,217; July 9, 1912.)

CRUCIBLE FURNACE. David Reisinger Steele, Curtis Bay, Md., assignor to Harry D. Harvey, Baltimore, Md. (U. S. No. 1,029,090; June 11, 1912.)

CUPOLAS—Breast-Wall Brick for Cupolas. Robert P. Cunningham, Holyoke, Mass. (U. S. No. 1,027,821; May 28, 1912.)

ELECTRIC STEEL—Improvements in the Manufacture of Electric Steel. Victor Stobie, Sheffield, Eng. (Brit. No. 17,179 of 1911.)

FURNACE COVER. Charles S. Robinson, Youngstown, Ohio. (U. S. No. 1,029,319; June 11, 1912.)

FURNACE GAS VALVE. Mark W. Johnson, Jr., Ensley, Ala., assignor of one-half to Karl Landgrebe, Ensley, Ala. (U. S. No. 1,024,785; Apr. 30, 1912.)

FURNACE-TOP. Frank C. Roberts, Wynne; wood, Penn. (U. S. Nos. 1,033,034 and 1,033,035- July 16, 1912.)

GAS CLEANING—Dry Cleaner for Gas. Mark W. Johnson, Jr., Birmingham, Ala. (U. S. No. 1,024, 784; Apr. 30, 1912.)

HEATING FURNACE—Continuous Heating Furnace. Asa W. Griffith, Youngstown, Ohio. (U. S. No. 1,029,605; June 18, 1912.)

HOT-BLAST STOVE for Heating Air, Steam, or Other Gases, and Brick Therefor. Frank C. Roberts, Wynnewood, Penn. (U. S. No. 1,032,505; July 16, 1912.)

MANUFACTURE—Improvements in or Relating to the Production of High-Grade Steel and Slag Rich in Soluble Phosphates. Deutsch-Luxemburgische Bergwerks- und Hutten-Aktiengesellschaft, Bochum, Germany, and Albert Vogler, Dortmund, Germany. (Brit. Nos. 19,640 and 27,400 of 1911.)

MANUFACTURE—Method of Manufacturing Steel. Herman A. Brassert, Braddock, Penn. (U. S. Nos. 1,032,653, and 1,032,655; July 16, 1912.)

ORE REDUCTION—Method of Reducing Iron Ore. Gustaf Grondal, Djursholm, Sweden. (U. S. No. 1,033,051, July 16, 1912.)

REDUCTION OF ORES. Elihu Thomson, Swampscott, Mass., assignor to General Electric Co. (U. S. No. 1,031, 490; July 2, 1912.)

REFINING—Open-Hearth Process of Refining Steel. Gaston Barbanson and Max Lepersonne, Brussels, Belgium. (U. S. No. 1,030,152; June 18, 1912.)

SCRAP—Process of Balling Scrap. Morris Sellers and Hal M. Nicholls, Chicago, Ill. (U. S. No. 1,029,235; June 11, 1912.)

SINTERING—Method of Sintering Fine Ores and Similar Materials. James G. West, Jr., Wilkinsburg, Penn. (U. S. No. 1,031,153; July 2, 1912.)

SMELTING FURANCE. George P. Gibson, Braddock, Penn. (U. S. No. 1,032,599; July 16, 1912.)

STEEL METAL Containing Titanium and Manganese. Auguste J. Rossi, Niagara Falls, N. Y., assignor to Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,029,637; June 18, 1912.)

TREATING ORES. Edward Kerr, Pittsburgh, Penn. (U. S. No. 1,032,007; July 9, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINUM—Compound for Use in Soldering Aluminum and Process of Forming Same. John J. Natzman, Detroit, Mich. (U. S. No. 1,032,494; July 16, 1912.)

ALUMINUM—Process for Direct Nickeling of Aluminum or Alloys Containing Aluminium. Marc Chaude and Joseph Canac, Paris, France. (U. S. No. 1,030,972; July 2, 1912.)

LEAD.—Process for Obtaining Refined Lead from Scrap. Julius Asbeck, Krantscheid-Westerwald, Germany. (U. S. No. 1,025,956; May 14, 1912.)

LEAD PIGMENTS—Apparatus for the Production of Lead Pigments. John W. Bailey, New York, N. Y., assignor to International Lead Co. (U. S. No. 1,031,160; July 2, 1912.)

SULPHIDE ORE TREATMENT. Improvements in the Treatment of Sulphide Ores for the Removal of Sulphur Therefrom and the Production of Sublimed White Lead and Oxide of Zinc. E. E. Banes, Strathfield, N. S. W. (Brit. No. 13,988 of 1911.)

TIN—Apparatus for Smelting Metals, more particularly for the Production of Tin from Tin Ores. H. T. Hoveler, Surrey, Eng. (Brit. No. 23,117 of 1911.)

TIN—Method of Producing Chlorides of Tin. Robert J. McNitt, Niagara Falls, N. Y., assignor to Chlorine Products Co., New York, N. Y. (U. S. No. 1,030, 110; June 18 ,1912.)

TIN-OXIDIZING FURNACE. Konstantin von Olszewski, Dresden, Germany. (U. S. No. 1,028,595; June 4, 1912.)

TITANIUM—Article Composed Essentially of Titanium and Silver and Method of Producing the Same. Auguste J. Rossi, Niagara Falls, N. Y., assignor to The Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,025,426; May 7, 1912.)

ZINC—Improvements in Furnaces for Extracting Volatile Metals from Their Ores. A. Zavelberg, Hohenlohehutte, Germany. (Brit. No. 16,821 of 1911.)

ZINC—Improvements in or Relating to the Metallurgy of Zinc. C. V. Thierry, Paris, France. (Brit. Nos. 20,913 and 21,014 of 1911.)

ZINC—Metallurgy of Zinc. C. V. Thierry, Paris-France. (U. S. Nos. 1,030,349, 1,030,350, and 1,030,351; June 25, 1912.)

ZINC—Process of Treating Zinc-Bearing Ore. James O. Johnstone, Buffalo, N. Y. (U. S. No. 1,029,932; June 18, 1912.)

ZINC ALLOYS—Improvements in or Relating to Alloys of Zinc. T. A. Bayliss, Warwick, and B. G. Clark, London, Eng. (Brit. No. 12,457 of 1911.)

ZINC DISTILLATION. John Collett Moulden and Harold Wolstan Webster, Seaton Carew, England, assignors to Central Zinc Co., Ltd., Seaton Carew, England. (U. S. No. 1,030,676; June 25, 1912.)

NON-METALLIC MINERALS

ASBESTOS—Purification of Asbestos. The British Thomson-Houston Co., Ltd. London, England. (Brit No. 16,960 of 1911.)

ASBESTOS—Purification of Asbestos. Willis R. Whitney, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,031,498; July 2, 1912.)

CLAY—Machine for Cleaning and Sorting Clay or the Like. Michael Bohn, Nagykikinda, Austria-Hungary. (U. S. No. 1,031,823; July 9, 1912.)

CLAY—Preparation of China-Clay. Alfred Gordon Salamon, London, and Charles Jeens Grace, Steyning, England, assignors to The Exploration Co., Ltd., London. (U. S. No. 1,032,862; July 16, 1912.)

FELDSPAR—Process for the Recovery of Silica, Alumina, and Potash from Feldspar. Samuel Peacock, Baltimore, Md., assignor to American Acid Co., Baltimore, Md. (U. S. No. 1,030,122, June 18, 1912.)

MAGNESIA—Manufacture of Magnesia. Emanuel G. Zies, Baltimore, Md., assignor to Standard Lime & Stone Co., Baltimore, Md. (U. S. No. 1,031,502; July 2, 1912.)

PETROLEUM—Utilizing Acid Sludge from Refining Petroleum. John C. Black and Marvin L. Chappell, Richmond, Cal., assignors to Standard Oil Co., Richmond, Cal. (U. S. No. 1,031,413; July 2, 1912.)

MINING—GENERAL

AERIAL TRAMWAYS—Hauling-Rope Grip for Rope Railways. Fritz Dohle, Leipzig, Germany, assignor to Adolf Bleichert & Co., Leipzig-Gohlis, Germany. (U. S. No. 1,031,328; July 2, 1912.)

BELT CONVEYORS—Discharging Apparatus for Belt Conveyors. Thomas A. Edison, Llewellyn Park, Orange, N. J. (U. S. No. 13,434, reissue; June 25, 1912.)

BLASTING—Detonating Composition. Ernest Goodwin, Stamford Hill, London, England, assignor to Eley Brothers Ltd., Edmonton, London, England. (U. S. No. 1,029,287; June 11, 1912.)

BLASTING—Method of and Apparatus for Charging Powder. William H. Plummer and John Tresider, Coleraine, Minn. (U. S. No. 1,029,630; June 18, 1912.)

CAISSON. Ralph H. Chambers, New York, N. Y., assignor to The Foundation Co. (U. S. No. 1,026,656; May 21, 1912.)

CONVEYOR for Use in Mines. Frank Billings, Cleveland, Ohio. (U. S. No. 1,030,226; June 18, 1912.)

DRILL. Rock Drill. David C. Demarest, San Francisco, Cal. (U. S. No. 1,029,855, June 18, 1912.)

DRILL—Rock Drill. James Miners Holman and John Leonard Holman, Camborne, England. (U. S. No. 1,029,294, June 11, 1912.)

DRILL CASINGS—Pulling-Stand for Drill Casings. Albert C. Ludlum, New York, N. Y., assignor to New York Engineering Co. (U. S. No. 1,027,867; May 28, 1912.)

DRILLING. Improvements in and Connected with Rock-Drilling and Like Apparatus. J. Kubat, Kladno, Bohemia. (Brit. No. 24,553 of 1911.)

DRILLING—Improvements in Chucks for Rock-Drilling Apparatus. J. M. and J. L. Holman, Camborne, Cornwall, Eng. (Brit. No. 24,635 of 1911.)

DRILLING—Improvements in Chucks or Tool Holders for Rock-Drilling Machines. J. Ferguson, High Wycombe, Eng. and E. J. Rule, Redruth, Eng. (Brit. No. 15,153 of 1911.)

DRILLING MACHINE—Universal-Joint Coupling for Drilling Machines. John Prue Karns, Boulder, Colo. (U. S. No. 1,030,663; June 25, 1912.)

DRILLS—Automatic Throttle-Valve-Locking Mechanism for Pneumatic Tools. Reinhold A. Norling, Aurora, Ill., assignor to Aurora Automatic Machinery Co., Aurora, Ill. (U. S. No. 1,027,061; May 21, 1912.)

DRILLS—Improvements in and Relating to Rock Drills and the Like. P. Williams, Bedwas, Eng. (Brit. No. 28,385 of 1911.)

DRILLS—Improvements in Valve Motions for Rock Drills. Ingersoll-Rand Co., New York. (Brit. No. 12,440 of 1911.)

DRILLS—Improvements Relating to Pneumatic Supporting and Feeding Apparatus for Rock Drills. G. Rayner and Percy Rayner, Sheffield, Eng. (Brit. No. 26,603 of 1911.)

DUMP CAR. Frank S. Ingoldsby, St. Louis, Mo., assignor to Ingoldsby Automatic Car Co., St. Louis, Mo. (U. S. Nos. 1,027,849; 1,027,850, and 1,027,851; May 28, 1912—No. 1,028, 116; June 4, 1912—No. 1,028,882; June 11, 1912.)

DUMP CAR. Joseph R. Bowling, St. Louis, Mo., assignor to Ingoldsby Automatic Car Co., St. Louis, Mo. (U. S. No. 1,027,809; May 28, 1912.)

DUMP CARS—Door Mechanism for Side-Dump Cars. Karl H. Hansen, Pittsburgh, Penn., assignor to Orenstein-Arthur Koppel Co. (U. S. No. 1,031,067; July 2, 1912.)

EXCAVATING MACHINE. Martin C. Hanson, Brager, Minn. (U. S. No. 1,031,788; July 9, 1912.)

EXCAVATING SCOOP for Wire-Rope Haul. Archibald McGillis, Vancouver, B. C. (U. S. No. 1,027,876; May 28, 1912.)

EXCAVATION—Drag-Bucket. Gurdon H. Williams, Cleveland, Ohio, assignor to G. H. Williams Co., Cleveland, Ohio. (U. S. No. 1,027,301; May 21, 1912.)

EXCAVATION—Rock-Gathering and Excavating Machine. David A. Gilchrist, Belgrade, Mont. (U. S. No. 1,029,359; June 11, 1912.)

EXCAVATOR. Thomas G. Travers, Iron Ridge, Wis. (U. S. No. 1,031,402; July 2, 1912.)

EXCAVATOR—Bucket Mechanism. Charles A. Frayer, Toldeo, Ohio, assignor, by mesne assignments, to Bucyrus Co., South Milwaukee, Wis. (U. S. No. 1,032,358; July 9, 1912.)

FAN. Ernest E. Blackmer and Eric W. Johnson, Monongahela, Penn. (U. S. No. 1,030,561; June 25, 1912.)

FLUME. Charles H. Ramsden, San Francisco, Cal., assignor to Western Pipe Steel Co. of California. (U. S. No. 1,027,627; May 28, 1912.)

FLUME—Metal Flume or Conduit. Harold S. Williams, Caldwell, Ida. (U. S. No. 1,031,407; July 2, 1912.)

FLUME—Trough or Open Flume. William Lennon, Manitou, Colo. (U. S. No. 1,026,957; May 21, 1912.)

HOISTING—Mine or Lift Cage Safety Gripping Apparatus. Louis Sidney Rayner, Caergwrle, England. (U. S. No. 1,031, 819; July 9, 1912.)

HOISTING—Safety Apparatus for Mining Cages, Lifts, and the Like. Charles H. Sivel, Weston, Newark, England. (U. S. No. 1,032,710; July 16, 1912.)

HOISTING—Winding-Engine for Collieries or Like Purposes. Robert James Worth, Stockton-on-Tees, England. (U. S. No. 1,029,410; June 11, 1912.)

HYDRAULIC AIR COMPRESSOR or Pump. Otto H. Mueller, Camberwell, England, assignor to Henry R. Worthington. (U. S. No. 1,031,143; July 2, 1912.)

INSULATOR—Mine Insulator. Frederic A. Warren, Canon City, Colo. (U. S. No. 1,031, 975; July 9, 1912.)

LAMP—Miner's Lamp. Frank L. Flynn, Wilkes-Barre, Penn. (U. S. No. 1,022,130; July 9, 1912.)

LAMP—Miner's Lamp. Nelson Plount, New York, N. Y. (U. S. No. ,1026,622; May 14, 1912.)

LAMPS—An Improved Igniting Device for Miners' and Like Safety Lamps. A. Pasierbski, Mikultschutz, Germany. (Brit. No. 19,785 of 1911.)

LAMPS—Apparatus for Igniting Miners' Lamps. Ernest Arthur Hailwood, Morley, near Leeds, England (U. S. No. 1,030,297; June 25, 1912.)

MUCK SHOVEL. Norman Ebbley, Wallace, Ida. (U. S. No. 1,029,799; June 18, 1912.)

PICK Specially Adapted for Miners' Use. W. E. Jones, Abersycham, Eng. (Brit. No. 2966 of 1912.)

PUMPING—Method of Operating Internal-Combustion Pumps. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,026,639; May 14, 1912.)

PUMPING—Method of Operating Reciprocating Pumps. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,026,638; May 14, 1912.)

PUMPING—Method for Pumping Liquids. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,032,114; July 9, 1912.)

PUMPS—Method of Regulating Pumps of Certain Types for the Pumping of Liquids. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,032,113; July 9, 1912.)

SLUICE GATE. William van den Heuvel, Los Angeles, Cal. (U. S. No. 1,028,640; June 4, 1912.)

SURVEYING INSTRUMENT. George H. Stone, Colorado Springs, Colo. (U. S. No. 1,032,437; July 16, 1912.)

TIMBER PRESERVATION—Process of Preserving Wood. Carleton Ellis, Montclair, N. J., assignor to Copper Oil Products Co., New York. (U. S. No. 1,028,201; June 4, 1912.)

TUNNELING—Method of Boring Tunnels. Norman Ebbley, Wallace, Ida. (U. S. No. 1,032,049; July 9, 1912.)

TUNNELING MACHINE. Richard T. Stone, Deming, N. M. (U. S. No. 1,026,412; May 14, 1912.)

WIRE-ROPE CLAMP. Wallace E. Belcher, Chicago, Ill. (U. S. Nol 1,027,234; May 21, 1912.)

ORE DRESSING—GENERAL

CONCENTRATOR. Walter L. Hawley, Cartersville, Mont. (U. S. No. 1,032,281; July 9, 1912.)

CONCENTRATOR—Belt Concentrator. Joseph W. Pinder, Oakland, Cal. (U. S. No. 1,030,427; June 25, 1912.)

CONCENTRATOR—Mineral Concentrator. Charles O. Michaelsen, Omaha, Neb. (U. S. No. 1,027,349; May 21, 1912.)

CONCENTRATOR—Ore Concentrator. Carl J. Witt, Needles, Cal. (U. S. No. 1,023,909; Apr. 23, 1912.)

CONCENTRATOR—Ore-Concentrator. Laban E. Jones, Anaconda, Mont. (U. S. No. 1,029,933; June 18, 1912.)

CRUSHER. Ray C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,031, 083; July 2, 1912.)

CRUSHER. William H. Lieber, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,030,194; June 18, 1912.)

CRUSHER—Gyratory Crusher. Thomas W. Capen, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,029,742; June 18, 1912.)

CRUSHER—Jaw Crusher. Albert B. Black, Concord, Mass., and James H. McKee, Harvey, Ill., assignors to Austin Manufacturing Co., Chicago, Ill. (U. S. No. 1,032,808; July 16, 1912.)

CRUSHER or Pulverizer. Milton J. Williams, Chicago, Ill. (U. S. No. 1,030,956; July 2, 1912.)

CRUSHING—Chilian Mill. Stephen H. Pitkin and James H. Stratton, Cleveland, Ohio, assignors to Wellman-Seaver,-Morgan Co., Cleveland, Ohio. (U. S. No. 1,031,730; July 9, 1912.)

CRUSHING—Crusher Head for Grinding Mills. Edward S. Black, Chicago, Ill., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,028,530; June 4, 1912.)

CRUSHING—Grinding Mill. William R. Cunningham, Bucyrus, Ohio, assignor to American Clay Machinery Co., Bucyrus, Ohio. (U. S. No. 1,028,550, June 4, 1912.)

CRUSHING—Lifting Mechanism for Mullers of Ore-Grinding Pans. Gustave A. Gelien, San Francisco, Cal. (U. S. No. 1,029, 863; June 18, 1912.)

CRUSHING MILL. Thomas Leggett Sturtevant, Quincy, and Thomas Joseph Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,027,294; May 21, 1912.)

HYDRAULIC CONCENTRATOR. Ulysses A. Garred, Anaconda, Mont. (U. S. No. 1,031,113; July 2, 1912.)

MAGNETIC SEPARATOR. Frank C. Heinen, Chicago, Ill. (U. S. No. 1,026,673; May 21, 1912.)

ORE-FEEDER. Walter E. Wahlin, Garfield, Utah. (U. S. No. 1,032, 256; July 9, 1912.)

ORE SEPARATOR. Frank C. O'Brien, Denver, Colo., and Frederick C. O'Brien, Prescott, Ariz. (U. S. No. 1,031,285; July 2, 1912.)

PULP SCREEN. Edward J. Pope, Holyoke, Mass., and John W. Mullen, St. Joseph, Mich. (U. S. No. 1,032,701; July 16, 1912.)

SCREENING—Improvements Relating to Processes and Apparatus for Screening Ore and the Like. G. H. Stanley, Johannesburg, S. A. (Brit. No. 22,683 of 1911.)

STORAGE—Storage of Coal, Ores, Etc. William F. Hunt, New Brighton, N. Y., assignor to C. W. Hunt Co., West New Brighton, N. Y. (U. S. No. 1,026,444; May 14, 1912.)

METALLURGY—GENERAL

CASTING—Process for Casting Molten Metals under Pressure. Franz de Buigne, Magdeburg, Germany. (U. S. No. 1,026,733; May 21, 1912.)

CASTING APPARATUS. John Wilson Brown, Jr., Philadelphia, Penn., assignor to Enterprise Manufacturing Co., of Pennsylvania, Philadelphia, Penn. (U. S. No. 1,027,316; May 21, 1912.)

CONVERTER. Srol Boruchow Frumkin, Minsk Russia. (U. S. No. 1,025,260; May 7, 1912.)

CONVERTER for the Separation of the Fixed and Volatile Metals in Complex Ores. Marcel Collin, Paris, France. (U. S. No. 1,033,062; July 16, 1912.)

CONVEYING APPARATUS. Arthur S. Dwight, New York, N. Y., assignor to Dwight & Lloyd Metallurgical Co. (U. S. No. 1,027,111; May 21, 1912.)

CRUCIBLE COVER. Thomas McGrath, Springfield, Mass. (U. S. No. 1,029,815; June 18, 1912.)

DISCHARGING APPARATUS—Improvements in Apparatus for Discharging Metallurgical Furnaces. E. Gottlieb, Frankfort, Germany. (Brit. No. 883 of 1912.)

ELECTRIC FURNACE for Smelting and Reduction of Ore. Hans Bie Lorentzen, Notodden, Norway. (U. S. No. 1,030,904; July 2, 1912.)

ELECTRIC FURNACES — Improvements in Electric Furnaces. H. Plauson, W. Zsvetaeff, G. Tistchenko, St. Petersburg, Russia. (Brit. No. 10,858 of 1911.)

ELECTRIC FURNACES—Improvements in or Relating to Electric Furnaces. M. Ruthenburg, London, Eng. (Brit. No. 28,126 of 1910.)

EXTRACTION—Processes and Apparatus for Extracting Metals from their Ores. H. S. Mackay, Riverside, Cal. (Brit. No. 13,499 of 1911.)

FUME—Collection of Fume, Flue-Dust, and other Matter Suspended in Gas. Richard Francis Pearce, Liverpool, England. (U. S. No. 1,028,487; June 4, 1912.)

FUME ARRESTER. Lorenzo D. Royce, Oakland, and Louis Wallerstein, San Francisco, Cal. (U. S. No. 1,031,089; July 2, 1912.)

GAS OR SMOKE WASHER. Oliver M. Foster, Elkhart, Ind., assignor, by mesne assignments, of one-fifth to S. K. Dickerson, one-fifth to D. R. MacBain, and one-fifth to DeWitt C. Moore, Cleveland, Ohio, and one-fifth to Charles E. Schaff, Chicago, Ill. (U. S. No. 1,026,666; May 21, 1912.)

ORE-SAMPLING DEVICE. Leslie M. Sheridan, Anaconda, Mont. (U. S. No. 1,031,385; July 2, 1912.)

POWDERED-FUEL-FEEDING APPARATUS. William R. Dunn, Easton, Penn. (U. S. No. 1,028,997; June 11, 1912.)

REDUCTION OF REFRACTORY ORES in the Electric Furnace. Frank J. Tone, Niagara Falls, N. Y. (U. S. No. 1,028,151; June 4, 1912.)

REFINING—Process and Apparatus for Extracting and Refining Metals and Alloys. Albert E. Greene, Chicago, Ill. (U. S. No. 1,031,257; July 2, 1912.)

RESIDUES—Means for Handling Smelting-Furnace Residues. Emile Dor-Delattre, Liege, Belgium. (U. S. No. 1,031,918; July 9, 1912.)

RETORT FURNACES—Improvements in or Relating to Retort Furnaces and the Like. Stettiner Chamotte-Fabrik Actien-Gesellshcaft vormals Didier, Stettin, Germany. (Brit. No. 1608 of 1912.)

ROASTING—A Process of Roasting Ore and Apparatus Therefor. R. Scherfenberg, Berlin, Germany (Brit. No. 25,443 of 1911.)

ROASTING—Helixoidal Combined Ore-Roasting Furnace and Cooling-Hearth. Ellsworth A. Clark and William H. Davis, Boulder, Colo. (U. S. No. 1,029,667; June 18, 1912.)

ROASTING—Improvements in or Relating to Mechanical Ore-Roasting and Like Furnaces. J. Harris, Sheffield, Eng. (Brit. No. 25,142 of 1911.)

ROASTING AND SINTERING—Apparatus for Roasting and Sintering Ores. Arthur S. Dwight, New York, N. Y., assignor, by direct and mesne assignments to Dwight & Lloyd Metallurgical Co., Jersey City, N. J. (U. S. No. 13,423, reissue; May 28, 1912.)

ROASTING AND SINTERING—Process of Roasting and Sintering Ores and Product Resulting Therefrom. Arthur S. Dwight, New York, N. Y., assignor, by direct and mesne assignments, to Dwight & Lloyd Metallurgical Co., Jersey City, N. J. (U. S. No. 1,3424, reissue; May 28, 1912.)

SMELTER. Allan R. Partridge, Denver, Colo., assignor to Partridge Smelting & Refining Co., Denver, Colo. (U. S. No. 1,025,922; May 7, 1912.)

SMELTER FUMES—Bag House. Albert J. Meier, Glendale, Mo. (U. S. No. 1,030,477; June 25, 1912.)

SMELTER FUMES—Condenser for Smelter-Furnace Fumes. Constantine E. M. Tambacopolo, New York, N. Y. (U. S. No. 1,023,600; Apr. 15, 1912.)

SMELTER FUMES—Purification of Gases. Willis R. Whitney, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,022,012; Apr. 2, 1912.)

SMELTER FURNACE. Watson Marshall Nesbit and Edward Pike, Eureka, Utah. (U. S. No. 1,027,882; May 28, 1912.)

WELDING or Cutting Apparatus. John Walter Whitford, Jersey City, N. J., assignor to Davis-Bournonville Acetylene Development Co., (U. S. No 1,028,166; June 4, 1912.)

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Experience in mining is an essential qualification.

Kirby Thomas, of New York, is in Ontario on professional business.

Charles Butters has been visiting the Nipissing high-grade plant at Cobalt, Ontario.

Edwin J. Collins, has returned to Duluth, Minn., from a two weeks examination trip in Wyoming.

R. S. Botsford has left London for the Ural Mountains. His address is Bogoslovsk, Government of Perm, Russia.

Richard B. Stanford is again at his office in New Orleans, after a stay of two months in Honduras, Central America.

G. L. Sheldon sails from Seattle, Wash., for Katalla, Alaska, July 27. He will return about the middle of September.

Dr. C. D. Walcott is conducting paleontological investigations in the Yellowhead pass, Rocky Mountains, B. C., for the Geological Survey of Canada.

G. C. Bateman has been appointed representative for the Canadian Mining & Exploration Co., with headquarters at the Dome mine, South Porcupine, Ontario.

B. F. Noehl, of the W.-O.-N. Engineering Co., Los Angeles, Calif., is in Arizona on professional business. He will return to Los Angeles early in August.

George Jacob Davis, for some time past at the University of Wisconsin, has been appointed dean of the College of Engineering at the University of Alabama.

Thomas H. Leggett, of Leggett & Hellmann, New York, has been appointed consulting engineer of the mining department of the American Smelting & Refining Company.

Ernest McCullough, of Chicago, has been engaged by the University of Kansas to lecture on mining methods at the summer school to be held in Weir City, Kan., commencing July 22, and continuing for six weeks.

George Irving Adams, until recently of the United States Geological Survey at Washington, sailed from San Francisco for China July 12 to take charge of the mining and geological departments of the Pei Yang University at Tientsin.

Prof. Ross C. Purdy, one of the foremost authorities on ceramics in America, has resigned as professor of ceramic engineering at Ohio State University, Columbus, Ohio, and has taken charge of the research laboratories of the Norton Co., Worcester, Mass. Professor Purdy was formerly president of the American Ceramic Society.

James M. Swank, vice-president and general manager of the American Iron & Steel Association, on his eightieth birthday, July 12, received a large number of letters and telegrams of congratulation. These came from many men prominent in the iron and steel industry, from men in government service and from foreign engineers and statisticians. Herr Schoedter, general manager of the Verein Deutscher Eisen-Huttenleute, wrote: "In unison with the whole American iron industry, we take this opportunity to thankfully acknowledge the unparalleled service that you have rendered, not for the United States only, but also for the iron industry of the whole world, through your exemplary labors in the collection of statistics of iron production. Your name will be linked for all time with this unparalleled collection of statistics."

OBITUARY

C. V. Stewart died at Kansas City, Mo., July 12. He had been for a number of years engaged with the Daly interests of New York, and had done much work at Silver City, and in the Burro Mountains in New Mexico.

F. O. Pellham died at Callabacillos, Chihuahua, Mexico, June 3, after a long illness. He was for a number of years in Colorado, but went to Mexico 15 years ago, and since then had been in charge of mills at Lluvia de Oro, Topia and Callabacillos. He had a high reputation as a mining man and was much liked and respected both by Mexicans and Americans.

Thomas W. Phillips died at New Castle, Penn., July 21, aged 77 years. He was born in Beaver County, Penn., and had lived at New Castle for many years. He engaged in the oil business at an early date and was a large operator, being president of the T. W. Phillips Oil & Gas Co., which controls over 500 wells. He served several terms in Congress and in 1898 was a member of the Industrial Commission.

M. E. McCarthy, superintendent of the Live Oak mine of the Inspiration Consolidated Co., died very suddenly of heart disease on July 16, as he was coming from the mine to Globe, Arizona, in his automobile. Mr. McCarthy was manager of the Hovland & Smith properties for the last six years and developed the Live Oak from a prospect to a proven mine. He was one of the best known and best liked mine managers of the district.

George W. Botsford died at Houghton, Mich., July 17, aged 65 years. He was born in Michigan, and settled in the copper country 40 years ago. He was for a number of years connected with the Franklin and other mines as manager of the commercial department. He married in 1875 Miss Elizabeth McKernan of L'Anse, daughter of the late John Q. McKernan.

John H. Bartow, 66 years old, president of the Lake Erie Ore Co., and a director in several iron and steamship companies, died early last week at his residence in Cleveland. Mr. Bartow went to Cleveland 35 years ago from Buffalo, and started as a vessel broker. Later he became interested in several ore mines and steamship companies. He was a director in the Carter Steamship Co., Cleveland Steamship Co., Salem Iron Co., Salem, Ohio; Erie Steamship Co., Valley Steamship Co., and the Valley Transit Co., in addition to being president of the Lake Erie Ore Co. At one time, he was vice-president of the MacDonald Ore Co., the Young Exploration Co. and the Groveland Mining Co., three Michigan concerns.

Capt. William A. Nevills died, at San Francisco, on July 10. He was born in England and was about 82 years old. He was taken to Canada when a child by his parents and when a young man served in the British army both in Canada and in England. He went to California about 25 years ago and became a prominent factor in the early development of deep quartz mines on the Mother Lode. He was the owner of the Moore mine and the Mammoth mine, in Amador County, and later acquired the Rawhide and the App and Heslep mines, in Tuolumne County. The Rawhide, the Moore and the Mammoth had not been in operation for some years, but the App was closed down only within the past month. Litigation has disturbed the operation, and the failure to sell the App recently was partially the cause of closing it down. This mine and other properties of Captain Nevills were advertised to be sold under a trust deed on July 16, at Fresno. Captain Nevills's mother, now 105 years old, survives him.

Societies and Technical Schools

Northern California & Southern Oregon Mining Congress—A meeting of this body was held at Yreka, Calif., on July 19 and 20. Special invitations were sent to mining men in Shasta, Trinity and Del Norte counties.

California State Miners' Association—This society will issue a call for a convention of mining men, to be held in San Francisco, for the purpose of preparing for the participation of the Western states in the mining exhibits to be made at the Panama-Pacific exposition, in 1915. At a meeting of the association, July 15, at San Francisco, W. C. Ralston, E. B. Braden and Charles G. Yale were appointed a committee to communicate with the governors of the several mining states, asking them to send representatives to San Francisco for a conference on the subject and to devise a plan for an exhibit of minerals, metals and methods of mining.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco.

July 18—The California Supreme Court has handed down a decision in the injunction proceedings against the Selby Smelting & Lead Co., affirming the lower court. The question of whether the farm crops of Solano County have been damaged by the fumes from the Selby plant has not yet been tried in the lower court. To facilitate the trial the board of supervisors of Solano County has appointed T. T. C. Gregory as an expert to assist the district attorney in securing evidence as to the effect of the fumes. These injunction suits originated in 1906. Since their origin there have been many improvements and changes in the operation of the smeltery, and appliances and devices installed to prevent the escape of damaging fumes. Expert chemists have shown there is no damage being done. The hay crop, which is the chief crop in the vicinity, orchards, flowers and other vegetation are healthy and show no damage from fumes. There is no complaint from the farmers in Contra Costa County, whose farms are within closer range of the smeltery, and not separated by a body of water. These facts will doubtless be brought out in the trial of the injunction suits, which will probably settle the matter.

The Anderson & Bella Vista R.R., in Shasta County, has been purchased by the California, Shasta & Eastern Ry. Co., and will be extended from Bella Vista to the Afterthought mines at Ingot. It is the purpose also to extend the road beyond the mines and into the timber sections of Montgomery Creek, where there are large tracts of timber held by the Walker interests, the Terry Lumber Co., the Benton Lumber Co. and other lumber interests. It is understood that the Southern Pacific R.R. contemplates the construction of a road either down South Cow Creek or down Deer Creek. These two railroads will open up a vast territory of timber and give better transportation facilities to the mining districts of the northeastern part of the state. The initial work preparatory to the construction of the line from Bella Vista to Ingot is in progress, and work is in progress at the Afterthought mines. As the company now has large bodies of ore developed and blocked out it is the present policy to devote energy and capital chiefly to the extension of the railroad to the mines and to install a suitable reduction plant for the recovery of the zinc.

Denver

July 19—The Tomboy company, which owns the Argentine and Cincinnati mines in Savage Basin and which has more recently acquired the Montana in the Smuggler Basin above Telluride, crushed 8400 tons in June, worth $81,500, giving profits of $40,500. In the same period Stratton's Independence netted $14,500. With these two producers, and Camp Bird, Ltd., also owned in London, it would seem that Colorado as a field for mining, would offer attraction to foreign interests.

As a further indication of the immense business the railroads of the West expect to do this year, may be cited the fact that in addition to the large steel orders already given to the Minnequa plant at Pueblo, by four lines, the Denver & Rio Grande R.R. recently awarded contracts for 350 all-steel coal cars, 700 box cars, 100 stock cars and 50 cabooses, at a cost of $1,100,000. The coal cars will be all steel with drop doors so that the entire load of coal may be automatically dumped. Thirty freight locomotives have also been ordered from the American Locomotive Co., at Schenectady, New York, and the Baldwin works at Philadelphia. The Mikado type of locomotive, of which 14 have just been ordered, will be a part of the new equipment. These will be the first large engines of this type to be operated in this territory, and will develop about 20% more power than the largest freight engines now operated by the Rio Grande. Early delivery was made a part of the contract in order to meet the demand for fruit delivery on the western slope.

Butte

July 17—Since the phenomenal rise of the Butte & Superior from a copper prospect to one of the richest zinc mines in the country, a rush has been made to secure claims in the vicinity. Options have been taken on nearly all of the claims north of the Butte & Superior mine by various interests and it appears likely that in the future Butte will be exploited, to a considerable extent, for its zinc mines. A. B. Wolvin, president of the Butte & Superior, is a prominent figure in the new field, and in company with John M. Hayes, of Salt Lake City, a Guggenheim representative, he is said to have secured options to buy interests in four claims, the Lone Star, Wedge, Hidden Treasure and Sarah, adjoining the Butte-Milwaukee property on the east. Mr. Wolvin also has an 18 months' option on the Brundy claims, consisting of the Macarona, Montgomery, a one-half interest in the Altoona, and an interest in the Colleen, Bawn and Amazon lode claims, situated southeast of the Pittsmont property. Three important claims, the Third Sphinx, Michigander and Alma, lying between the Butte & Superior and North Butte Extension properties, have been bonded to E. B. Milburn, of Butte. The Butte & Superior company owns a controlling interest in the property of the Butte-Milwaukee and North Butte Extension companies. The former holdings have been prospected with good results. There is talk of the Butte & Bacorn mine resuming operations, as well as the Butte & London, Colusa-Leonard Extension, Bullwhacker and Amazon-Butte companies.

Dwight Chaffee, a well driller of Great Falls, recently struck a strong flow of gas while drilling a well on the farm of Henry Hurd, near Big Sandy, 45 miles northeast of Great Falls. The gas was encountered at 500 ft. and issued from the hole at an estimated pressure of 300 lb. The drill was in shale rock when the flow started and the gas is passing through 200 ft. of water. The find immediately caused a rush to the place and options are being taken on land in the vicinity.

Kingman, Ariz.

July 17—It is likely that Mohave County will soon receive greater recognition as a metal producer than heretofore, not only on account of constantly increasing production but also because of the better facilities for outsiders to inspect the mines and prospects. One familiar with the resources of the county finds it difficult, at times, to understand the reasons for its past slowness of development when compared with other districts less favored by natural conditions. The perseverance of a few men has made possible the present output of the Gold Road and Tom Reed mines and the records of these two, while giving a better understanding of conditions encountered in that particular vicinity, have added impetus to the development of numerous properties in the county.

There is an agitation for better roads, as a result of which the supervisors have lately spent some time in the preliminary survey of a road across the county which is expected to become a part of the National Automobile Highway. This road has been mapped out from the Colorado River on the western side of the county, passing through Oatman, where the Tom Reed mine is situated, Gold Road, Kingman and thence following closely the line of the Santa Fé R.R. to the county's eastern boundary. It is understood that E. F. Thompson has interviewed Washington authorities in regard to diverting a portion of the surplus funds of the Indian School at Truxton, to building a branch road into Diamond Cañon on the Colorado River and that there is a reasonable assurance of its being carried out. Work has been commenced on the road between Kingman and Gold Road in Kingman Cañon, this being the most important road in the county, as all supplies for the Gold Road, Tom Reed and other mines are received at Kingman and thence freighted to their destination.

The taxation of the mines is a pertinent subject of discussion at present, due to the recent visit of the State Board of Tax Commissioners, that met with the county board of equalization last week. Several prominent mining men of the county appeared before the board to furnish data. According to a recent ruling of the state board, all producing mines must be listed according to their gross production and the assessment levied on that basis. While this method will undoubtedly give more easily ascertainable data from which to calculate the assessable value, it will also levy an apparently disproportionate burden of taxation upon properties where unfavorable conditions increase the cost of production.

Negaunee, Mich.

July 20—Over 7,500,000 tons of iron ore were shipped in June from the upper lake ports. This compares favorably with the record year of 1910 when 7,316,592 tons were shipped during the same month. The above production for June, this year, was sent out from six ports, Superior leading with 2,348,606 tons; Duluth, 1,551,214; Two Harbors, 1,445,669; Marquette, 561,976 tons. Escanaba and Ashland each shipped about 100,000 tons. The heavy shipments from Superior were caused by the contracts which the Great Northern Ry. has with the Steel Corporation in connection with the Hill ore lands. A few years ago Duluth shipped nearly twice as much ore as Superior but the conditions are now reversed.

Governor Osborn has ordered a rehearing of the iron-mine taxation cases which were acted upon in Houghton a few weeks ago. At that meeting of the State Tax Commission, at which Prof. C. K. Leith, iron-ore expert, was present, the valuations of several mines on the Gogebic and Menominee Ranges were lowered, owing to the evidence presented by the mining companies. Oglebay, Norton & Co., Corrigan, McKinney & Co., and Pickands, Mather & Co. were the beneficiaries by the reductions, and it is claimed by individual taxpayers that no notice of the meeting had been given them so that but one side of the cases, that of the mining companies, was presented.

Toronto

July 20—The attention of the officials of the Ontario Bureau of Mines is being directed to the large increase in the number of fatal mining accidents due to the increased employment of electricity as a motive power in mining. While accidents from other causes show a marked decrease, owing to the stricter enforcement of the regulations, fatalities caused by electricity are of more frequent occurrence. Owing to the exhaustion of the supply of wood for fuel in the mining regions and the expense of bringing in coal, there has lately been a remarkable development in the use of electric power. This new factor has considerably cheapened the cost of production. The cost of horsepower has been reduced from between $150 and $175 per hp. per year, to about $50 by the introduction of electricity, which has enabled the mining of ore that would have been found unprofitable with the use of steam power. Its introduction on a general scale brings with it a new peril to the safety of the workers, particularly at the outset, when a large proportion of the men are inexperienced in its use.

Sudbury, Ont.

July 20—Some recent discoveries of nickel ore on the western end of the nickel formation, made by Foster Shields and associates, are considered of importance and of interest as indicating the possibilities of the district, notwithstanding the prospecting which has been going on for several years. These discoveries are apparently on an "off-set" but in a general way are in the determined formation and have been heretofore overlooked because of the drift-covered character of the country. Other new discoveries have been made in Trill Township, south of the Shields locations. Last lear some new deposits were opened in Falconbridge Township on the southeastern corner of the nickel-bearing formation and drilling has developed commercial orebodies there. Probably not one-third of the known nickel-bearing formation in this district has been explored beyond a depth of 10 feet.

New nickel districts are announced from time to time but so far none have proven of commercial grade. A few years ago some rich phyrrotite from the Alexo mine, near Porcupine, attracted attention but explorations did not disclose sizeable deposits. This ore occurred with serpentine and the possibility of important deposits being found in the large serpentine areas of eastern Ontario and in Quebec, has been suggested. Last winter some phyrrotite from Burwash Lake, north of Sudbury, was investigated but the ore did not run high enough to be of present interest. Another large phyrrotite body west of Kenora, in western Ontario, has been investigated by Boston interests but this is reported to be below commercial grade. More recently a new nickel-bearing formation near Sault Ste. Marie is being investigated. The ore is reported to run more than 2½% nickel. The formation is similar to that at Sudbury. It is an interesting fact that all of the phyrrotite deposits of Ontario carry some nickel, often as much as 1% but so far it is only in the Sudbury district that commercial bodies of ore have been found, that is 3%, or better.

Cobalt

July 19—Prospectors are returning to Cobalt and other points in Northern Ontario from Lake Kienawisik and the Bell River district, to which there was a rush this spring. Little staking was done because of the generally unpromising character of the field. It is claimed by them that the geological maps published, regarding the Bell River district, are misleading, large areas marked as green schist being covered with drift, with only occasional outcroppings of rock. There appear to be better indications at Lake Kienawisik, but most of the locations there were made in the winter. Many prospectors are reported to have gone north by water routes to James Bay, on their way to Ungava.

Porcupine

July 18—The mine managers of the Pearl Lake section have agreed to conform to a common wage scale. This scale is approximately the same as is paid by the Dome and Hollinger mines. It is probable that this agreement will lead to the formation of a mine-managers association, along the same lines as the Cobalt organization. This will greatly strengthen the hands of the mine operators and will permit of concerted action in any matters which come up for their consideration.

The Miller-Middleton and Dixon mines are being developed by the Timmins-McMartin Syndicate and are opening extensive orebodies. The shafts are being sunk to conform to the levels on the Hollinger, so that the three properties can be worked from one main shaft should an amalgamation be decided upon. It is probable that a small mill will be erected at the No. 9 shaft of the Dixon.

The Mining News

The Current History of Mining

Alaska

Great Northern—This company, operating on Copper Mountain, has 35 men blocking out ore. There is some talk of erecting a 500-ton leaching plant to treat the product, of which there seems to be a quantity. The vein is 120 ft. wide, consisting of sulphides running about 4% copper. Electric drills are used, with a gasoline power plant. The extension of the Copper River R.R. up the Knokulana River will stimulate mining operations in that district. The Great Northern company is controlled by James Phillips, Jr., of the Nevada Consolidated, and E. F. Gray is manager. This company also has large interests on Iron Mountain, where 10 men are doing development, and also on the Kotsina River, where a similar force is working. The company is reported to have spent $1,500,000 in opening these properties and a large tonnage is in sight.

Regal Mines Co.—This company, which is a subsidiary of the Great Northern, is operating a property near Kennicott, with 15 men. A shaft is down 115 ft. on a contact between limestone and greenstone and sinking is progressing about 5 ft. per day. The ore is copper glance and rich enough to ship.

Arizona

COCHISE COUNTY

Arizona United—The company has recently found a body of 6% copper-sulphide ore on the seventh level of the Republic mine. The ore has been penetrated for 150 ft. Work has been resumed upon the Mammoth mine and good ore is being taken out from the second and third levels. Regular shipments will be made to the El Paso smeltery. The first three cars are said to have run over 6% copper.

GILA COUNTY

The working time of churn-drillers and their helpers at the mines of the Miami district has been reduced from 12 to 8 hr. per day. Drillers will receive $5 and helpers $4 per day. The new scale went into effect July 15.

Miami—The production for June was 2,683,310 lb. During the month 4964 ft. of development work were done. The development of the Captain orebody, a tongue from the main orebody, will begin soon. Equipment will be erected at the Captain shaft, which will be connected with the main shaft by a drift from the main orebody on the 420-ft. level. It is estimated that the Captain orebody contains about 3,000,000 tons of ore. A second churn-drill will be put to work on the northeastern part of the property where there is another large body of ore, assaying from 1% to 1¼% copper. Exploration of the ground below the 570-ft. level continues.

South Live Oak—Churn-drill hole No. 2 is over 400 ft. deep in granite.

Superior & Boston—The company has begun to ship ore from the Limestone vein and shipments from the Great Eastern vein continue.

Copper Reef—It is reported that the drift on the California vein has passed through the fault recently encountered and entered vein matter carrying copper, gold and silver.

Iron Cap—F. A. Woodward, general manager, has received instructions to begin the operation of the mine on the plans that he outlined in a recent report. The hoisting and compressing machinery at the Williams shaft is being overhauled and active development work will be started soon. The Williams shaft is 800 ft. deep. It is proposed to drift westerly on the vein. The property lies between the Copper Hill and Eureka shafts of the Arizona Commercial.

McMorris—At this mine in Richmond Basin, eight miles northeast of Globe, the 800-ft., 2-compartment shaft has been retimbered to the 200-ft. level and the exploration of that level will soon be started. The mine is being operated by the White Metal Development Co., and George Wilson is superintendent.

GRAHAM COUNTY

Arizona Copper Co.—The results of operations for the six months ended Mar. 31, show total profits of £176,447. Total dividends amounted to £12,266, leaving £164,181. It has been decided to pay an interim dividend of £94,994, leaving £69,187 to be carried forward.

MOHAVE COUNTY

Williams—This tungsten mine, owned by E. Williams, is situated in the Aquarius Mountains, about 60 miles southeast of Kingman. A bond and lease has been given to men represented by Seeley W. Mudd, for whom Mr. Williams has recently done some development work. Tungsten ore was recovered during the course of the work.

Reco—E. S. Osborne has taken a short option on this property with the intention of interesting Los Angeles men in its development. Samples recently exhibited showed free gold. The mine is in the Wallapai district, in C. O. D. cañon, near the old C. O. D. mine.

Frisco—Manager E. H. Barton brought a $7000 bar of bullion in from the mine last week, the result of two weeks operation of the mill.

Mineral Park—H. E. Bierce, of Denver, has bonded this copper mine belonging to Thomas McNeely. A crosscut is being driven to explore several veins.

Mitchell—A crosscut is being driven at the 400-ft. level to cut the orebody. At all points where the vein has been cut so far, good orebodies have been found.

Tom Reed—Last week a $79,000 bar of bullion was brought in from the mine, the result of the monthly cleanup.

Gold Road—Recently a $20,000 bar of bullion was sent into Kingman from the mine. This was from a week's operation of the plant. It is understood that additions and improvements to the milling equipment will be made within the next six months, which will practically double the production.

Mocking Bird—This mine is being operated by W. H. Hall. Considerable work has been done lately and the ore now in sight is estimated at about $80,000, its value being from $15 to $80 per ton.

PINAL COUNTY

Lake Superior & Arizona Mining & Smelting Co.—The company has given an option on its property to the American Smelting & Refining Co. The property consists of 17 claims adjoining the Magma Copper Co., at Superior, 30 miles west of Globe. The A. S. & R. Co. is given until Oct. 20, 1912, to unwater and examine the mine, after which, should it so elect, it is given two years in which to develop the mine, and make the payments. The purchasing company has the choice of making total payments of $400,000 cash and two-fifths of the authorized capital stock of the company which it shall organize to operate the mine, or, under an alternate plan, of $800,000 cash if it elects to purchase the property at the end of one year or $1,000,000 cash at the end of two years. F. W. Hoar, of Globe, represents the L. S. & A. Co. and J. Kruttschnitt, Jr., representing the A. S.

& R. Co. has gone to Superior to make preparations for unwatering the mine. The mine is opened by an inclined shaft 1300 ft. deep and about four miles of drifts. Some oxidized ore is exposed, averaging about 4% copper, and $50,000 worth of higher-grade ore was shipped from one stope, but it is upon the possibility of opening up sulphide ores at depth that the future of the mine depends. Sulphides were beginning to appear at the bottom of the shaft when the mine was closed down.

California

AMADOR COUNTY

Argonaut—John Libby, a shift boss, and James Nancarrow, foreman, were badly injured at the head of a raise in a stope in this mine, at the 3400-ft. level. A wedge of ore, weighing about 100 tons, dropped suddenly, the fall compressing the air and causing a rush down the raise. Libby was knocked 50 ft., landing on a pile of ore. Nancarrow was thrown across the rails of the car track.

Zeila—A winze is being sunk below the 1500-ft. level, to explore the lower ground. The mill will be run on ores from the upper levels.

South Jackson—The 100-ft. shaft will be deepened to 500 ft. before prospecting the vein. The shaft is a 3-compartment vertical one. The mine is equipped with modern machinery. The shots are fired by electricity. No shots are fired underground, nor while the men are underground. About $14,000 has been expended for construction and equipment since Apr. 1, by the present owner, the South Jackson Mining Company.

BUTTE COUNTY

New dredging ground is reported to have been discovered east of the town of Honcut. The ground is being prospected.

Robinson—Sixteen men are employed at this mine, in Granite basin, at sinking and other exploration work. Prospecting is in progress on neighboring claims.

CALAVERAS COUNTY

Tanner—Good ore is being disclosed in the shaft and sinking is in progress. The tunnel is also being advanced with two shifts.

Penn—The mine force has been increased by 25 men. It is expected that the blast furnace will be placed in commission again soon.

Ford—A strike of high-grade ore is reported at this mine, at San Andreas, at a depth of 40 ft. Whether it is a pocket or a continuous vein will be determined by further exploration. The formation is similar to that in the Gwinn mine.

INYO COUNTY

Christmas Gift—The second car of ore taken from this mine, in the Darwin district, by the present owners, was shipped about the first of July. This mine was located on Dec. 25, 1874. William Skinner and brother leased the property last December and disclosed the vein within 6 ft. of their initial work.

Custer—Seventy feet of new work have been done recently. A drift has been driven under the old workings, and favorable results attained in the uncovering of vein matter. John Thorndike, of Darwin, is the leaser.

Lucky Jim—This mine, in the Darwin district, is now down 900 ft., and other mines in the district will be sunk deeper, as this one has made a good showing. The vein matter between walls in the stopes is 50 ft. wide.

SAN BERNARDINO COUNTY

The Needles district has been attracting attention recently. R. E. Zuber and James Carter, of the Gold Roads region, went to Los Angeles recently to secure a cyanide plant for handling the tailings of several of the mines. The Gold Chief mine, near Barnwell, is reported to be in good condition and development work is steadily progressing. The Lead Mountain Mining Co., owning properties south of Bagdad, has installed a motor-truck service between Bagdad and the mines. A concentrating plant is being installed for the handling of tailings which were left by former operators.

Four-Ace Mining Co.—This company has secured a lease on the Santa Ana mine and recently disclosed high-grade ore. A small shipment was sent to the Red Dog mill.

MODOC COUNTY

Hess—A gold brick, weighing 8 lb., was shipped about July 15. The mill is working on ore from an 8-ft. vein, containing some medium-grade ore. James Harvey is the leaser.

Gold Shore—Development and prospecting have indicated that this claim is on the mineralized zone embracing the Sunshine and the Yellow Jacket mines, which are the best developed properties in the Highgrade district.

Sunshine—A car of ore has been shipped from the Schauers & Laughlin lease to Selby. The company has canceled the lease and will work the mine on its own account.

Buttes—Good ore is reported to have been disclosed in the Merrifield Smith lease on this mine, at Windy Hollow. The installation of a stamp mill is contemplated.

NEVADA COUNTY

Excelsior—The shaft has been unwatered. The directors of the owning company are expected from Colorado Springs, Colo., to make an examination.

Campion—Work will be resumed on this group, in the Meadow Lake district. Z. Campion, of San Francisco, is owner.

Buckeye—Work has been resumed at this mine, in Willow Valley. A 25-ft. shaft has been sunk to tap the extension of the old Harmony channel. The Cold Spring Mining Co. is the owner. W. G. Motley, an Eastern man, is president.

Oustomah—A purchase bond has been taken for a term of three years by E. C. Klinker, of Reno, Nev. The Eddy holdings below the 200-ft. level embrace about 500 acres of unexplored ground.

PLACER COUNTY

Pacific Portland Cement Co.—This company has purchased the railroad constructed from Auburn to the quarries, and which crosses the middle fork of American River over a concrete bridge, completed this year. It is reported that the cement company has also purchased the quarries and will develop the limestone deposits.

Great Western—Extensive development work is planned in the opening of properties near Westville, on the Forest Hill divide. Walker & Lass, of Auburn, are directing the work.

Colorado

BOULDER COUNTY

Colorado Chemical & Metals Co.—The Bailey mill, at Eldora, operated by this company, has temporarily suspended work while a roaster is added to the equipment. B. W. Johnson is manager.

Carmine Tungsten Co.—The company has received its electrical equipment, which is being installed rapidly. A. N. Zwetow and M. J. Mayer are the managers.

Burlington-Boulder Mining Co.—This company, operating the Burlington group of claims on Left Hand Creek, near Glendale, is driving a new crosscut to develop the vein at a greater depth. J. G. Boundy is manager.

Primos Mining & Milling Co.—The company shipped two cars of tungsten concentrates recently from the Lakewood mill. C. F. Lake is manager. A 6-ton auto truck is used to transport ore from the mines to the mill, at Newmire.

CLEAR CREEK COUNTY

Phoenix—This mine will soon be unwatered through a diamond-drill hole connecting with the 14th level of the Phœnix mine. The hole will be 1½ in. in diameter, 350 ft. long and will have an upward inclination of 70°. The water will be tapped at a depth of 600 ft. The volume of water to be drained through the hole is estimated at 18,000,000 gal.

After the mine is unwatered the property will be operated through the Newhouse tunnel. A Bullock & Sullivan diamond drill will be used. The contract for the drilling has been let to Messrs. Shank & Ahearn, of Denver. Walter A. Funk is the engineer directing the work. R. H. Sayre is manager of the Phœnix-Ophir Mining Company.

Big Five—The 4-ton, storage-battery motor hauls a train of 40 cars, or about 130 tons, from the breast of the tunnel to the custom mill at Idaho Springs.

Newhouse—Work has commenced on the sampling works and mill. Twenty men are employed on the excavations for the foundations and contracts have been let for some of the machinery. The sampling works will have a capacity of 350 tons and the first unit of the mill a capacity of 100 tons. It is estimated that a recovery of 85 to 95% will be made. The situation of the mill at the portal of the tunnel will result in an important saving of freight and haulage charges on all ore mined by interests operating through the tunnel.

Lake County—Leadville

Many electric hoists are being installed in the district, a new gallows frame is being placed over No. 3 shaft of the Colonel Sellers, another has been ordered by Hawkins & Co. for the La Plata shaft and a 37-hp. hoist is to be installed at the Tip Top shaft on Fryer Hill. Another is to be put on the Old Elk shaft by the lessees of the Hibschle.

Mount Champion Co.—This company, whose mine is at 12,000 ft. elevation in Lackawanna Gulch, is employing 50 men in development work by tunnels and raises, and in completing the mill and aërial tramway.

Miller Mining & Tunnel Co.—This company's properties are situated above Twin Lakes and Everetts and 35 men are employed. The orebodies are in fissure veins in the granite and about 1000 tons per month of smelting and milling ores are being produced, the grade ranging from $5 to $65 in gold, and 5 to 25 oz. silver per ton. The surface plant consists of five boilers, 60 to 250 hp., 12x12-in. steam hoist, 125-hp. turbine wheel, five drill compressors, a 5-hp. motor, amalgamating and concentrating mill and a 3400-ft. aërial tram; the head office is at Twin Lakes.

San Miguel County

Butterfly-Terrible—This mine, which is being operated by D. J. Sayer as manager and lessee, is again in full operation, after a shutdown of 2½ months, caused by landslides taking out the power flume.

Suffolk—This mine, now owned by the Ophir Mines Mining & Milling Co., is installing a cyanide plant under the direction of George Pickett. It is anticipated that with the additional equipment there will be a good saving made in the milling. This addition to the mill will probably be finished within two months.

Crown Point—E. E. Bassett has returned to Ophir; he has taken a lease on this property and has begun active operations.

Teller County—Cripple Creek

Doctor-Jack Pot—The lessees are doing well and one of the best strikes in the district for some time has been made by Jerome Beard, in a drift from the bottom of the Davenport shaft. The first car of 32 tons shipped out returned $48 per ton. The shoot has been opened for 30 ft. in length and is 18 in. wide. Wilson Bros., lessees, are shipping three cars per week that will average about 1 oz. gold per ton, and Bailey & Gates took a car from the Lucky Corner which ran $44 per ton, while Carl Evans has sent out a car estimated at about 2 oz. per ton.

El Paso Consolidated—With a view to building a mill for the treatment of the product of the El Paso mine on Beacon Hill, the character of the ores and the average grade through the mine are being ascertained by extensive sampling under the general direction of T. R. Countryman, engineer for the deep drainage tunnel, who has three parties of samplers going through the mine. This work has been going on for three weeks and will take a month more for completion.

Idaho

Blaine County

Greyhound—Operations have been suspended pending litigation and because of dissensions among stockholders.

Elkhorn—Gold ore has recently been developed in these properties in Parker Gulch, near Ketchum. One car was recently shipped and two more will soon be forwarded to the General Engineering Works, Salt Lake City, for testing purposes, preliminary to the designing and installation of a mill. The property is controlled by New York men.

Illinois

Reports state that a combination of coal-mining interests is about to be effected in the central part of the state. The plans include a merger of coal companies in central Illinois, erection of a large power plant at Kincaid, from which current will be taken to operate the Commonwealth Electric properties, including those in Chicago. Francis S. Peabody, of Chicago, is said to be largely interested. A merger of many large power plants in that part of the state is said to be under consideration.

Michigan

Copper

Osceola Consolidated—At No. 4 shaft of the North Kearsarge branch, water broke through at the eighth level on July 19, causing a suspension of operations for about one-half day. The water came through a cavein from surface, but clogged itself within a few hours. It is now being held and a concrete dam is being built. When the water broke through it was deemed advisable to take all the men to surface, but all the shafts with the exception of No. 4 have resumed operation.

Calumet & Hecla—No. 21 shaft, the only one that this company is operating on the Kearsarge lode, is down to the 20th level and is opening excellent ground in the lower drifts, particularly at the 16th and 17th levels south and the 18th level north at points considerably distant from the shaft.

Indiana—The shaft is sinking below 950 ft., and should reach the felsite formation within the next 50 feet.

Houghton—The company has added additional drills and has replaced the temporary bucket with a skip of much larger capacity, so that development can be carried on more advantageously. Openings on the main lode are encouraging and further opening of the West lode will be watched with interest.

Isle Royale—The new hoisting equipment at No. 5 shaft has gone into commission. This equipment was bought from the Tamarack company, and is of ample capacity to meet the future needs of this shaft. Rock shipments from this shaft will gradually be increased. The shaft is now sending about 200 tons per day to the mill. Underground conditions at this point are satisfactory. The shaft is sinking below the ninth level.

Superior—Sinking is to be resumed at No. 2 shaft, below the 13th level. The shaft will be sunk considerably deeper and a search made for the West vein.

Tamarack—A tube mill has been installed at the mill and an extended test will be made on the regrinding of the tailings.

Iron

American—Machinery for the concentrator being erected by the Denver Engineering Works Co., has been received.

Imperial—The stockpile at this Cleveland-Cliffs mine, at Michigamme, is being rapidly cleaned up. A new crusher will be erected soon and the shaft widened to permit balanced hoisting.

Mitchell—Two diamond drills are in operation at this Jones & Laughlin mine. Thirty-five men are employed and some ore is being produced for shipment. The mine has been operated and explored in a small way for several years. Two diamond drills are also being operated near Iron Mountain Lake, south of Ishpeming.

Nevada Land Co.—This company, in which the E. J. Longyear Co. is interested, recently opened an orebody, with diamond drills, in Sections 13 and 14, T.42N.-R. 33 W., east of Buck Lake and near the old Mastodon mine. The property is said to be for sale.

Caspian—The steam shovel, formerly at this mine, at Iron River, has been moved to the Vivian mine, at Quinnesec, also controlled by Pickands, Mather & Co. The foundation for a new office has been laid at the Caspian. This company, like the Cleveland-Cliffs, is offering inducements to its house-dwellers to maintain well-kept gardens and lawns.

Minnesota

The fee-owners of the Norman mine, on the Mesabi Range, are reported to have filed suit against the Oliver Iron Mining Co. for $1,012,250, claiming that careless mining methods have ruined the property and have caused large loss of life in the past. Notice of the cancellation of the lease has already been given.

Montana

BUTTE DISTRICT

Anaconda—The Tramway mine, which has been closed down for the last two months, has begun operations again with about 500 men. The mine was closed to permit changing the hoisting engine from steam to compressed air, which necessitated enlarging the cylinders to over twice their former size, as well as realigning the engine. Both the main and auxiliary hoist have been remodeled to use air. The mines now being operated under the air system, in the order of installation, are: Mountain View, High Ore, Diamond, West Grayrock, Leonard and Tramway. The Pennsylvania will be the next and work will start there soon.

Pilot-Butte—A new hoist has been ordered and it is expected to arrive in about a week. The shaft has nearly reached the 1300-ft. point, where a station will be cut; sinking will then be continued to the 1800-ft. level before further development work is done. It seems probable that good copper ore will be opened at depth, as on the 1500-ft. level of the Elm Orlu mine, adjoining, a vein has been developed to within 30 ft. of the Pilot end line, the ore averaging 4% copper. This vein contained principally zinc ore on the levels above, and in this respect it is similar to the Badger State mine, of the Anaconda company. T. G. Murray, of St. Paul, a director and one of the principal stockholders, is in Butte at present to inspect the mine.

DEER LODGE COUNTY

Hidden Lake—Extensive development work with good results is being done on the Cecelia May No. 1 claim. Ore assaying $12 per ton was found within a few feet of the outcrop of the vein, and as the work extends downward the grade is found to increase. The latest report is that the inclined shaft, being sunk on the vein, is in ore averaging $16 per ton, principally in gold.

Nevada

COMSTOCK LODE

Ophir—Work has been started on the new cyanide plant, and the machinery will be housed under a corrugated-iron building, 106x117 ft. The equipment will consist of a tube mill, a Dorr thickener, three Trent agitators, large storage tank, and Butters filters. The capacity will be 100 tons per day, and the plant will be driven by electric motors, aggregating 100 hp. The company has impounded 21,000 tons of tailings, valued at $126,000, and taking out the cost of the erection of the plant, $36,000, will leave a substantial margin of profit. The plant will also be connected directly with the Kinkead mill, and tailings hereafter will be sluiced directly to the cyanide works, forming a continuous process. The new works are being constructed under the direction of Walter Techow, mining engineer.

C. & C.—Connections have been made with the new high-tension cable from the substation of the Truckee River General Electric Co. This line in the future will carry the entire pump load of the north-end mines. The substation is to be connected with the new 60,000-volt line of the power company, extending to the new smeltery, at Thompson, in Lyon County, and will give to the Comstock district, continuous and uninterrupted service. There is now passing through the substation approximately 3500 hp., used for the pumps and mining operations.

EUREKA COUNTY

The Eureka-Nevada Ry., formerly the Eureka & Palisade Ry., has recently purchased two new locomotives. These are now in commission and are hauling ore from this district and adjacent territory to Palisade. There are now 800 tons of sacked ore on cars in Eureka, awaiting shipment.

Credo-Eureka Mines Co.—This company has temporarily suspended operations and is preparing to remodel and enlarge its hoisting facilities.

Nevada Central Copper Co.—Two cars of high-grade ore were recently shipped to Salt Lake City. Extensive development is planned.

Windfall—The alterations and improvements being made in the mill are well under way and a new compressor has been installed. With resumption of operations it is expected that costs will be reduced materially and production increased.

HUMBOLDT COUNTY

A cloudburst on July 18, is reported to have damaged badly the camp of Seven Troughs and to have destroyed the nearby town of Mazuma. Reports state that the loss of life was 13, the known dead being: John Trenchard, merchant, formerly of Victor, Colo., and his wife; Mrs. McLean, Mrs. Reese, Mike Qualen, miner; a son of Superintendent Gillespie, and four boys of the Keogh family, all of Mazuma. The wall of water swept down the cañon, carrying buildings before it and overturning the Mazuma Hotel. No loss of life is reported at Seven Troughs.

National—The suit with the Charleston Hill company, in progress at Carson City before Circuit Judge Farrington, is being bitterly fought. Some of the men representing the National are: H. V. Winchell, N. H. Winchell, H. L. Hollis and W. H. Wiley. The Charleston Hill company is retaining Albert Burch and A. C. Lawson.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended July 11, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,100	93,019
Tonopah Belmont	2,500	57,076
Montana-Tonopah	888	28,510
Tonopah Extension	912	27,247
West End	590	19,799
Midway	80	260
MacNamara	405	10,477
North Star	......	80
Totals	8,475	236,468
Estimated value	$211,875	......

Montana-Tonopah—The company has made the final payment of $59,375 on the Commonwealth mine, at Pearce, Ariz., on which it will immediately install a 300-ton mill of 30 stamps, with two Hardinge and two tube mills and a complete cyanide plant, at an estimated cost of $200,000. This will be paid for by an issue of bonds for $250,000, running for five years and bearing 7% interest, the latter guaranteed by the Montana-Tonopah Mines Co. According to the report of Llewelyn Humphreys, the mine shows ore reserves of 314,545 tons of a gross value of $1,969,730 and a net profit of $955,667.

Tonopah Mining—During June, 14,551 tons were milled, of an average grade of $18.95 per ton. The net profit was $151,389.

Tonopah-Belmont—The report for June states that 7370 tons were milled, of a net value of $204,602. The net profits were $125,525. Development work has been resumed on the Lillie Belle and Del Monte veins. The main shaft will be sunk to the 14th level.

Tonopah-Cash Boy Mining Co.—This company, owning the Cash Boy claim, adjoining the Tonopah Merger on the west, has granted to the Tonopah Leasing & Mining Co., of which W. S. McCornick, banker of Salt Lake City, is president, a three-year lease on the property. The shaft is down 500 ft. and sinking will be resumed.

Tonopah Extension—The cleanup at the 30-stamp mill for June shows that 4476 tons of ore were treated, an average of over 149 tons per day, resulting in 48 bars of bullion worth about $61,144, the extraction averaging 93% of the assays. In the mine, the main orebody on the 500-ft. level has widened and in the east stope is 45 ft. wide of milling grade.

New Mexico

Deadwood—On July 5, the shafthouse and gallows frame were destroyed by fire and the machinery considerably damaged. Work on a new structure was started at once and underground work will be resumed soon. A 50-hp. gasoline engine is being added to the mill power plant. The last cleanup in June produced 4000 oz. of bullion and 1½ tons of concentrates.

Socorro—Special orebins are being erected for custom ore that will be delivered from adjacent claims. The mill is operating regularly with a capacity of about 175 tons per day.

New York

Press dispatches state that a large gas well was struck recently on the Andrew Orvis farm, in Orchard Park Valley, by a company in which Buffalo men are interested.

Oregon

A railroad to cost $1,000,000 and to extend 52 miles up the Applegate River from Grant's Pass, has been financed and authorized by the owners of the copper mines in the Blue Ledge district. The contract for the rails has been let, the final survey is to be made soon and the contract for the construction is to be let.

Poller—E. O. Poller and associates, owning this mine near Blue River postoffice, recently installed a 2-stamp Nissen mill. It is not operating satisfactorily as the gold is in the sulphides. The ore is too low grade to ship.

Lucky Boy—This mine, owned by Portland men, is reported to have been sold to Twohy Brothers, railroad contractors, who will develop it. The mill and electric plant are in good condition.

South Dakota

Evans Consolidated—The reports of officers, given at the annual meeting, showed that during the year $12,000 were spent on development and that the mine is nearly ready for a mill.

Wasp No. 2—At the annual meeting, held recently, the board reappointed John Gray general manager. The property operated steadily during the year, excepting 40 days in January and February, lost on account of severe weather. During the six months ended July 1, the mine produced 66,020 tons of ore, from which $141,163 were recovered. Dividends amounting to $60,000 were paid during that period.

Victoria—The company announces that it is about ready to start milling. The officials state that there is a supply of good milling ore, sufficient to keep the plant busy for some time. The ore yields a high recovery by cyaniding after coarse crushing. The mill is equipped with Gates crushers and rolls, and has a leaching capacity of 200 tons per day. O. N. Brown, Deadwood, S. D., is superintendent.

Utah

Beaver County

June shipments amounted to 47 cars, of an estimated value of about $28,000. This does not include shipments from the South Utah and the Horn Silver.

Red Warrior—Good lead-silver ore is being shipped from below the 550-ft. level.

Moscow—Four cars of ore were shipped recently and the reserves are being increased.

Majestic—June shipments from the Old Hickory amounted to 16 cars, with 10 to 12 more cars ready for shipment at the end of the month. Shipments were kept back by haulage difficulties. Arrangements are being made to reduce the wagon haul to the railroad from about four miles to half a mile. Two shifts are being worked, and a third is to be added soon. A new compressor is being installed and electricity will be furnished by the Beaver River Power Co., replacing gasoline power. At the Harrington-Hickory, a west drift on the 550 level is 290 ft. long, and the fissure is still strong. Development work only was done in June, and no shipments were made.

Rob Roy—A shipment of good ore is being prepared for the market.

Juab County

Tintic shipments for the week ended July 12 amounted to 170 cars.

Gold Chain—The payment of the recent dividend will leave more than $50,000 in the treasury. The present output is 100 tons per day.

Swansea—This company has been shipping steadily since January, beginning then with a weekly average of three-fourths of a car. The output for the week ended July 12 was eight cars. Most of the ore is coming from the 940-ft. level. The 800 is also producing, and the ore there is of a better grade than that on the 940. A new electric compressor has been installed.

Iron Blossom—Foundations for the new hoisting equipment for the No. 1 workings have been completed, and lumber for the new shafthouse, etc., has been delivered. Most of the equipment is on the ground. Drifting has been started on the 700-ft. level of the No. 1 workings to reach the body of copper ore opened recently on the 600. The face of the drift is mineralized with copper. The output for the week ended July 12 was 25 cars.

Opohongo—The drift to the south on the 600-ft. level, being driven for the ore opened from higher workings, is thought to be within 100 ft. of its objective point. Shipments for the week ended July 12 amounted to four cars.

Beck Tunnel—Two cars were shipped during the week ended July 12, and the company is making expenses. A drift is being driven south on the 175-ft. level to connect with a stope above, and indications are encouraging.

Uncle Sam—A special stockholders' meeting is called for Aug. 7, to consider increasing the capitalization from $500,000 to $750,000. It is understood that the 250,000 additional shares will be used in acquiring mining property.

Canada

Alberta

Western Canada Natural Gas—This company's pipeline from Bow Island to Calgary has been completed. It is 181 miles long. The contractors, Corcoran & Co., of Pittsburgh, commenced work three months ago. The expenditure was approximately $3,000,000. The company, which includes local and English capitalists, will supply natural gas to Calgary.

British Columbia

Red Cliff—This company, in the Portland Canal district, has commenced shipping copper-gold ore to the Tyee Copper Co.'s smeltery, at Ladysmith, Vancouver Island. About 700 tons of ore are being shipped. This is the first crude ore to be shipped in quantity from that district.

Motherlode-Sheep Creek—The company, with William Watson, New York, as manager, has commenced crushing ore at its new mill, in Sheep Creek camp, Nelson mining division. The mill equipment was put in under the supervision of C. W. Merrill.

Richmond—This group is under bond to Joseph L. Warner for $50,000. He has organized a syndicate of Vancouver men. Work has been resumed in the shaft. It is the intention to install a power plant consisting of an air compressor, hoist and pump, to be driven with electric power from the West Kootenay Power & Light Company.

Phoenix—Matt Trewhella has leased this property, which has been idle for many years, and has uncovered a small vein carrying gold and copper. A shipment of 15 tons was sent to the Trail smeltery recently.

ONTARIO

Fidelity Copper Co.—W. G. Colwell, of Buffalo, is planning to resume work on this property, 12 miles north of Sturgeon Falls.

Macgowan—The mine at Parry Sound, from which considerable rich copper ore was shipped several years ago, has been sold for taxes.

Shakespeare—This low-grade gold mine at Webb, west of Sudbury, which has been under option to a French syndicate for some time, has reverted to the local company. Considerable development has been done.

ONTARIO-COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended July 19, and for the year to date, are:

La Rose....	62 63	1,954 20
Coniagas...		1,143 63
O'Brien		276 23
Right of Way	26 55	180 01
Chambers-Ferland	31 55	257 05
McKinley-Darragh..........	61 36	1,519.22
Nipissing	75 03	1,235 63
Hudson Bay................	...	408 27
Buffalo	28 18	697 25
Crown Reserve		302 08
Cobalt Townsite	43 00	853 68
City of Cobalt..............	......	812 51
Tretheway.		283 54
Colonial.		41 60
Kerr Lake..................	......	424 14
Cobalt Lake................	57.55	399 24
Drummond		330 30
Timiskaming	32 55	619 46
Beaver.....................	......	180 90
Wettlaufer..................	......	111.21
Provincial..................	......	22 22
Casey Cobalt...............	......	212.15
Lost and Found.............	......	15.00
Totals....................	418 40	11,923.03

Wettlaufer-Lorrain—During the quarter ended June 30, the mill treated 4166 tons of ore, yielding $120,787. Costs were $49,050 and profit, $71,737. No new orebodies were found in the Silver Eagle claim. A Huntington mill for regrinding jig tailings has been installed and is doing well.

Gould Consolidated—This company has entered into a contract with the Porcupine Syndicate, Ltd., under which the latter will work the property of 120 acres held by the Gould under lease from the Peterson Lake. The Porcupine Syndicate will continue development at the 100-ft. level and will open on a lower level the veins encountered in the present workings, which are believed to be continuations of some of the Nipissing veins.

McKinley-Darragh—The output for the first six months of 1912 was 1,530,000 oz. of silver. Work will be started immediately on the aërial tramway, 5000 ft. long, over which ore will be brought from the Savage mine to the McKinley mill, which will reduce operating costs.

Timiskaming—The financial statement, as of June 30, showed: Cash in bank, ore on hand and money due from the smelters, $459,426.

Rochester — The shareholders have ratified a bylaw for the formation of a holding company. It is proposed to organize a new company with a capitalization of $1,000,000, stock being allotted to present shareholders in the proportion of one new share to four of old stock. The new corporation will assume the debts and endeavor to raise funds by selling stock.

ONTARIO-PORCUPINE

McEnaney—The erection of a 5-stamp mill has been definitely decided upon.

McIntyre—This company has ordered a 100-ton cyanide plant, to treat the ore from No. 5 shaft, which is not amenable to amalgamation and concentration. The second payment of $50,000 has been made on the property.

Alexo—This company will commence shipping nickel ore to the Mond smeltery. Shipments at first will consist of three cars per week and will be gradually increased to one car per day. The ore will probably average about 5% nickel and 0.5% copper.

Goldfields Limited — A development fund of $40,000 has been raised to carry on work at this Larder Lake mine.

Hollinger Reserve—Three veins have been cut on the 100-ft. level and the company is considering the erection of a small mill.

Dane—The two shafts at this copper mine are now down over 100 ft. Some ore running as high as 18% copper has been encountered.

Silver Lake—Five veins of calcite and niccolite have been uncovered at this Elk Lake mine. On one of these, five testpits were put down, all showing silver ore.

ONTARIO—SUDBURY

North Star—The nickel mine, in Snider Township, near the Creighton mine, owned by the Mond Nickel Co., will be reopened and operated to supply the new smeltery at Conniston. The ore runs higher in nickel than the average of the south range ores.

Murray—Drilling will be resumed on this property, near Sudbury, by Smith & Travers, for the Dominion Nickel-Copper Co., as soon as the title papers are signed. The smelting plant at the mine has been dismantled. The property was sold for $125,000.

Canadian Copper Co.—This company has taken an exploration option on Lot W. D. 38, in Bowell Township, and Clear Lake, in Capreol Township, from W. McVittie, of Sudbury. The company has recently indicated a policy of expansion in the matter of acquiring new properties in the district.

Mexico

CHIHUAHUA

Dolores—Rebels recently are reported to have commandeered 80 of the company's pack mules.

MEXICO

Esperanza—During June the mill crushed 8682 tons of ore and 3191 tons of tailings. Total receipts were $89,123; expenses, $14,374; estimated profit, $13,097. No ore was mined from the San Carlos vein, pending a connection between shafts. Development work totaled 512 feet.

SAN LUIS POTOSI

W. H. Simpson is working his claim, situated near the San Diego mine.

San Sebastian—This mine is being worked on a small scale, producing ore containing about 3½% copper and 350 grams of silver.

SONORA

Greene-Cananea—The company is reported to have readjusted its wage scale by doing away with the premium system and reducing the working hours from 9½ to 9 hours, without change of pay. Hereafter all employees will receive 3.50 pesos per day.

Lucky Tiger - Combination — During June the mills crushed 5676 tons of ore and the cyanide plant treated 5439 tons of tailings from the two mills and 2081 tons from the old tailings dumps, an average of about 250 tons per day. The bullion produced was worth $64,877; concentrates, $57,932 and 110 tons of shipping ore, $27,010; total, with sundry profits, $153,336. Expenses were: Mining, including development, $20,469; milling, $33,468; other expenses, $31,656 Estimated profit for the month was $64,597; development work amounted to 267 feet.

Africa

TRANSVAAL

It is reported that gold-bearing quartz has been found in a reef under the city docks, at Cape Town. The man who discovered it is said to have worked on the docks more than 18 years ago.

Gold production from the Witwatersrand in June was 722,588 oz., and from the outside districts 31,348 oz.; a total of 753,936 oz., being 25,726 oz. less than in May. For the six months ended June 30, the total output was 3,896,147 oz. in 1911, and 4,544,907 oz.—or $93,943,228—in 1912; an increase of 648,760 oz. this year. The companies holding reserves report 8983 oz. at the end of June. The number of negro laborers employed on June 1 was 212,573, a decrease of 4254 men from the May report.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, July 24—The coal markets generally show little change. In the West business seems to be improving, and consumers are beginning to consider the putting in of stocks more freely. The Lake trade is suffering from the usual congestion at the upper ports.

The seaboard bituminous trade is still slow, but supplies are not as excessive as they have been.

The anthracite trade is rushing and the companies are behind in deliveries. They have not yet made up the shortage caused by the April and May suspension, and many orders are pressing.

Coal and coke carried on Pennsylvania R.R. lines east of Pittsburgh and Erie, six months ended June 30, short tons:

	1911	1912	Changes
Anthracite......	6,035,900	4,572,269	D. 1,463,631
Bituminous.....	19,748,713	22,519,781	I. 2,771,068
Coke........	5,248,549	6,374,293	I. 1,125,744
Total........	31,033,162	33,466,353	I. 2,433,181

Total increase this year, 7.8%. The decrease in anthracite was due to the stoppage of mining in April and May.

Coastwise shipments of coal from chief Atlantic ports, six months ended May 31, long tons:

	Anthracite	Bituminous	Total
New York	5,763,455	4,928,499	10,691,954
Philadelphia.......	664,305	1,917,032	2,581,337
Baltimore	69,758	1,534,639	1,604,397
Newport News......	....	1,245,180	1,245,180
Norfolk............	....	2,133,754	2,133,754
Total....	6,497,518	11,759,104	18,256,622
Total, 1911........	7,919,353	10,807,863	18,727,216

Total decrease this year, 470,594 tons, the loss being wholly in anthracite. New York covers all the harbor shipping ports.

The Southwestern Interstate Coal Operators' Association reports shipments as follows for the four months ended Apr. 30, in short tons:

	1911	1912	Changes
Missouri.	822,259	1,142,277	I. 320,018
Kansas.	1,579,236	1,928,482	I. 349,246
Arkansas	431,465	614,884	I. 183,419
Oklahoma........	757,786	1,092,575	I. 334,789
Total....	3,590,746	4,778,218	I. 1,187,472

Total increase this year was 36.4%. These shipments cover over 90% of the coal mined in the states named.

IRON TRADE REVIEW

New York, July 24—Very little change is evident in the position of the iron and steel markets. Business continues active for a midsummer month, and prices hold up to the recent advances, with a firming up in several minor lines. There is beginning to be some complaint about slowness in deliveries, and some mills have trouble in keeping up to the dates specified.

Railroad business is good, a number of orders being reported for new cars, locomotives and bridges. Small orders for rails are still coming in. There is a demand for plates and sheets, and structural steel is also called for in new orders. Steel billets are in demand.

The volume of specifications for steel products has increased somewhat since last report, and the average of the month thus far is practically up to that of the same period in June, which is a great deal more than producers expected. The market is strong and shows signs of stiffening too rapidly. Mills have been falling behind in deliveries, and this prompts buyers to place specifications farther ahead, so that the situation begins to take on the aspect which prevailed in the summer of 1909. That movement went too far, and became topheavy, and predictions are now being made in some quarters that there will be a runaway market again. While the movement thus far has been legitimate, there is always the danger of speculative buying when prices advance steadily and rapidly, as there is danger of their continuing to do. Already there are rumors that an advance may occur in bars, plates and shapes within a fortnight, and there has been some contracting for fourth quarter, prompted by the fear of such an advance. On the whole, however, contracting has been light in July.

Inquiries are reported for some large lots of pig iron, and there is a steady run of small sales. Some furnaces in the East have advanced prices 25c. per ton, and Southern iron is firmer than it has been. Pig-iron stocks are now pretty well down to a normal level.

Baltimore

July 22—Exports for the week included 2,001,040 lb. steel billets to Liverpool; 383,140 lb. steel plates to Rotterdam. Imports included 11,174 lb. bar iron from Sweden; 6314 tons iron pyrites from Huelva, Spain; 10,500 tons iron ore from Cuba.

Birmingham

July 22—Southern pig-iron market conditions are satisfactory despite the fact that the active buying movement expected is lagging a little. There are some sales being made right along and quotations are firm at $11.50@12 per ton for No. 2 foundry, delivery during the third and fourth quarters of the year. There is inquiry in hand for a large quantity of iron for delivery during the latter part of the year but the manufacturers are holding firmly to $12 per ton. The cast-iron pipe companies will have need for much iron through the balance of the year. The Central Foundry Co. will be at pipe making again shortly while the North Birmingham Dimmick plant is nearing completion.

In steel there is more business on the books at the rail mill at Ensley than ever before at this time of the year. There is a fairly good demand for steel wire goods and the announcement is made that there will be repairing done at the plant of the Southern Iron & Steel Company at Gadsden only where it is found imperative.

The pig-iron production has been improved a little this month by the blowing in of one furnace. Two others are being put in shape but will hardly start up until next month. Accumulated stocks are going down rapidly. The Sloss-Sheffield Co. holds more iron in its yards than all the other companies in the South combined, but is moving out its product by degrees and at the same time rushing the work of repairs on two of its blast furnaces.

Charcoal iron holds its own. The make is small and the price above $22 per ton.

Chicago

July 23—The iron market continues strong as regards both pig iron and finished products. Northern No. 2 foundry iron is held firmly at $15 furnace, as a minimum for general last-half requirements; Southern No. 2 foundry is held at $12 Birmingham or $16.35 Chicago. At these prices Northern has the advantage and is more in demand, but furnace agents manifest no anxiety to sell. The anxiety is being manifested by the melters, sales and inquiries being more numerous. Though the greater part of the business is in small lots, some sales of over 1000 tons have been made in the last week and there are many inquiries for larger tonnage. Contracts are being made for deliveries up to the end of the year and there is some inquiry about 1913 supplies, but the prices quoted are high and there is no disposition yet on either side to go beyond the calendar year. Charcoal iron, though having a fair sale, has not shared the rising movement and continues to be firm at $15.75, Chicago.

Advancing prices have checked but slightly the demand for iron and steel products. Structural material continues to show a large number of contracts for the week, both local and western requirements being heavy. Railroad supplies are steadily in demand, and some large needs are being figured on in addition to a big aggregate of smaller orders; the mills are filled with business on standard rails. The bar market is strong as regards steel and iron bars. Plates and sheets have a very good sale; there is no evidence of dullness anywhere.

Cleveland

July 22—Shipments of iron ore have been delayed a little by bad weather and slow movement of boats.

Pig Iron—There is a steady run of small sales. Prices are firmer. Quotations, Cleveland delivery, are $15.15@15.25 for bessemer, $13.75@14 for No. 2 foundry, $17.50@18 for Jackson County silvery.

Finished Material—Demand is active on almost all lines and the recent advances in quotations are well maintained. Complaints are made that mills are falling behind in deliveries on contracts.

Philadelphia

July 24—Prices are nominally higher than a week ago. An early adjustment of the coke dispute is looked for but only trifling reductions are expected. This hope explains partly the falling off in business and inquiries for late deliveries. Makers are not trying to secure contracts and are serenely satisfied with the drift of things. The melting of pig is increasing in all channels of consumption and the disposition to buy for forward requirements is manifest, though held in check by an upward tendency which is not regarded as warranted. Considerable business has been closed in this market within a few days. Most of it has been hanging fire for two or three weeks. Foundry No. 2 X is strong. Low grade irons are under inquiry from large cast-iron concerns which have recently booked additional orders. Forge is $15; No. 2, $15.50@16; basic $16, which can be shaded.

Billets—Small orders for both open-hearth and forging billets are coming along and another advance is pending.

Bars—The pressure for early deliveries on the part of small buyers and jobbers is felt at most mills for refined.

Sheet—The advanced price is easily held and the mills are full of work.

Pipes and Tubes—Tubes have been in very good demand all this month at top prices. Pipe is strong.

Plates—Congested conditions exist. Manufacturers are unable to comply with all the conditions asked as to delivery. In several instances premiums have been paid and it looks as though premium prices for early delivery would be the rule soon. The volume of prospective business threatens to swamp the mills for a while.

Structural Material—An improvement is reported on late delivery work, extending to the end of the year. The flow of inquiries is constant.

Scrap—Sales are large and all good lines of scrap are disappearing. In some cases consumers have given instruction to dealers to gather up certain kinds of scrap for fourth-quarter delivery.

Pittsburgh

July 23—Under date of July 20 the American Steel & Wire Co. advanced its prices $1 a ton, making plain wire 1.45c., wire nails $1.65, painted barb wire 1.65c., galvanized barb wire 1.95c. and galvanized smooth wire 1.75c. The advance was promptly followed by the independent producers. It will doubtless have the effect of eliminating shipments on old contracts carrying a base price of $1.50 for nails, and throw shipments into the $1.55 and $1.60 prices. Demand is light, but is regarded as good for the time of year.

Pig Iron—The local pig-iron market is firm but quiet. It appears that the furnaces now operating have little iron to sell for the next few months, and are not interested in putting up prices in the circumstances, when advances might tempt other furnaces to get into blast. We quote: Bessemer, $14.25@14.50; basic, malleable and No. 2 foundry, $13.50; forge, $13@13.25, all at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Interest is beginning to develop in ferromanganese for first-half delivery, and several inquiries are out from steel mills for round tonnages. Prompt metal is not in particular demand, and does not bring any higher price than forward. We quote 80% at $48.50, Baltimore.

Steel—The steel situation has become a trifle stronger. Most of the mills are entirely out of the market for this quarter, and do not care to name prices for fourth quarters. Some of the mills are ready to sell small tonnages for early delivery, as they can spare the material. Prices are not materially changed and we quote: Billets, $21.50@22; sheet bars, $22@22.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are $25, Pittsburgh.

Sheets—The market has been stiffening since the advance by the leading interest a week ago. The lowest prices made by independents have disappeared, and the market has moved about half way toward covering the advances made by the leading interest, $2 in black sheets and $3 in galvanized. Specifications are good and some new contracts are being entered. The leading interest is operating about 85% of its sheet mills, having a few mills off here and there for repairs. The independents are doing more repair work, and are operating at between 65 and 75% of full capacity. In another fortnight the mills will probably be through with repair work and will be running full again. We quote: Blue annealed, 10-gage, 1.45c.; black sheets, 28-gage, 2@2.05c.; galvanized, 28-gage, 3.05@3.15c.; painted corrugated, 2.20@2.25c.; galvanized corrugated, 3.10@3.20c. per lb., Pittsburgh.

Connellsville Coke—A split has occurred in the ranks of the Connellsville coke interests who were asking a uniform price of $2.50 for furnace coke, either prompt delivery or on contracts through the half year. A party of operators is offering coke through a Uniontown brokerage house to furnaces, and it is understood its ideas are $2.50 for prompt and $2.35 for contract. A Pittsburgh firm which was greatly interested in the movement and controls a large tonnage of coke is offering prompt at $2.25 and would probably close a few contracts at the same figure. The differences arose from a variety of causes, including dissatisfaction on the part of some experienced sellers with the flat price of $2.50 when there are differences in the value of different brands of Connellsville coke, even though regarded as standard. The market is quiet at the moment, the break having come very suddenly at the beginning of this week. Prompt coke has sold in a limited way at $2.20, at ovens.

St. Louis

July 22—The pig-iron market is dull at present with very few contracts being closed. Buyers do not seem inclined to purchase heavily, though the price of $11.25@11.50 Birmingham is still being held. This price will probably be shaded 50c. on a fairly large contract. The current quotation is $11.25 Birmingham or $15 St. Louis for No. 2 foundry. The market is also dull for Northern iron and the price of $15.75 St. Louis, prevails.

Good foundry coke is quoted at $5.65 St. Louis.

Iron Ore Trade

A 25-ft. vein of iron ore has been discovered in sections 34 and 33, township 27 north, range 6 west, in the southeast corner of Eau Claire County, Wis. The vein now discovered is in the southern part of Seymour township, north of the Eau Claire River, and between Hay River and Muskrat Creek. Four shafts are now being dug to a depth of 50 ft. The ground is north of that which was explored and abandoned by the Augusta Mining Co. many years ago.

British Imports—Imports of iron ore in Great Britain six months ended June 30, were 3,513,214 long tons in 1911, and 2,916,538 in 1912; decrease, 596,676 tons.

Imports of manganese ore, 181,550 tons in 1911, and 145,493 in 1912; decrease, 36,057 tons.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie Canals in June was 10,747,159 short tons, being 1,810,466 tons over May. For the season up to July 1 the total freight was, in short tons:

	1911	1912	Changes
East-bound......	9,624,131	15,329,385	I. 5,705,254
West-bound.....	4,769,561	4,521,385	D. 248,176
Total...	14,393,692	19,850,770	I. 5,457,078

The number of vessel passages this year was 6783, showing an average cargo of 2927 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal................	4,209,282	3,940,305	D. 268,977
Iron ore............	8,250,823	12,928,232	I. 4,677,409
Pig and mfd. iron.	128,148	197,811	I. 69,663
Copper	38,181	30,689	D. 7,472
Building stone.....	1,352	2,282	I. 930
Salt, bbl............	236,477	295,687	I. 59,210

Iron ore was 65.1% of the total freight, and coal 19.8% this year.

Foreign Iron Trade

German Production—The German Iron Trade Union reports the make of pig iron in the German Empire in May at 1,463,610 metric tons, 36,051 tons more than in April. For the five months ended May 31 the total was, in metric tons:

	1911	1912	Changes
Foundry iron	1,293,451	1,290,193	D. 3,258
Forge iron........	233,307	229,773	D. 3,534
Steel pig	706,176	848,682	I. 142,506
Bessemer pig.....	142,878	163,274	I. 20,396
Thomas(basic)pig	4,043,830	4,474,198	I. 430,368
Total......... ...	6,419,642	7,006,120	I. 586,478

Total increase this year 9.1%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

METAL MARKETS

New York, July 24—The metal markets have been fairly active and prices are firmer in several lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
June 1912..	$ 7,149,035	$ 5,611,057	Exp. $1,537,978
" 1911..	3,074,755	4,767,714	Imp. 1,692,959
Year 1912..	33,374,536	25,264,042	Exp. 8,110,494
" 1911..	13,251,562	33,773,026	Imp. 20,521,464
Silver			
June 1912..	5,045,944	4,879,485	Exp. 166,459
" 1911..	5,777,703	3,506,446	Exp. 2,271,257
Year 1912..	33,668,972	25,264,249	Exp. 8,404,723
" 1911..	34,443,203	21,960,601	Exp. 12,482,602

Exports from the port of New York, week ended July 20: Gold, $62,600; silver, $1,248,909, chiefly to London. Imports: Gold, $371,998; silver, $136,561, principally from Mexico and South America.

Gold—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Outside of India there was no special demand.

Iridium—The current price on this metal continues at $63 per oz., New York.

Platinum—The market is rather quiet, as is usual at this season. Prices are unchanged, dealers asking $45.50 per oz. for refined platinum and $48 per oz. for hard metal. The foreign market is reported firmer.

Silver—The market has ruled quiet and steady, fluctuating between 27 13/16 and 27 15/16d. in London. The Chinese loan negotiations continue at a deadlock, but the Monsoon reports are favorable, and the Indian currency reserves reveal a decrease of 10 lakhs in the total of silver rupees and an increase of 19 lakhs in that of gold. The market is likely to remain steady for the present.

SILVER AND STERLING EXCHANGE

July	18	19	20	22	23	24
New York....	60⅝	60⅜	60½	60¾	60¾	60⅝
London	27⅞	27 13/16	27⅞	27 15/16	27 15/16	27⅞
Sterling Ex..	4.8735	4.8740	4.8750	4.8750	4.8765	4.8765

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to July 11, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India...	£4,487,000	£3,677,200	D. £ 809,800
China.... ...	890,400	933,500	I. 43,100
Total......	£5,377,400	£4,610,700	D. £ 766,700

Messrs. Samuel Montagu & Co. write from London: "The net import of gold into India for the month of June was £2,868,333, approximately. This makes a total for the first six months of the year of £19,500,000. The figures are striking when compared with £20,909,000, the net import during the whole of 1911, exactly double the period. Of this £19,500,000, over £9,000,000 swells the total of gold held by the Indian Treasury against the note issue, leaving £10,500,000 to be accounted for. At least £4,800,000 of this residue was received in the form of bar gold."

Total imports of gold in Great Britain five months ended May 31 were £20,316,524 in 1911, and £21,122,640 in 1912; exports, £13,319,365 in 1911, and £16,182,160 in 1912; excess of imports, £6,997,159 in 1911 and £4,939,962 this year.

Total imports of silver in Great Britain five months ended May 31 were £6,244,061 in 1911, and £6,146,914 in 1912; exports, £7,604,627 in 1911, and £6,146,844 in 1912; excess of exports in 1911 was £1,360,566 in 1911; excess of imports in 1912 was £101,070. Of the imports this year £4,938.979 came from the United States.

Imports of gold into France four months ended April 30, were 112,753,000 fr.; exports, 18,489,000 fr.; net imports, 94,364,000 fr., an increase of 87,824,000 fr. over last year.

Foreign trade of the United States, six months ended June 30, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise	1911	1912
Exports..................	$987,820,540	$1,099,515,882
Imports..........	763,745,950	884,812,966
Excess, exports	$224,074,590	$214,702,916
Add excess of exports, silver..........		8,404,723
Add excess of exports, gold...........		8,110,494
Total export balance................		$231,218,133

The gold and silver movement in detail is given in the table above.

Copper, Tin, Lead and Zinc

NEW YORK

July	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
18	17 @17⅛	17.00 @17.10	43⅝	4.75	4.60 @4.62½	7.15 @7.20	7.00 @7.05
19	17⅛ @17¼	17.10 @17.20	43½	4.70 @4.75	4.60 @4.62½	7.15 @7.20	7.00 @7.05
20	17⅛ @17¼	17.10 @17.20	43½	4.70 @4.75	4.60 @4.62½	7.15 @7.20	7.00 @7.05
22	17⅜ @17½	17.30 @17.40	43⅞	4.70 @4.75	4.60 @4.62½	7.15 @7.20	7.00 @7.05
23	17½ @17⅝	17.45 @17.50	43⅞	4.70 @4.75	4.60 @4.62½	7.15 @7.20	7.00 @7.05
24	17½ @17⅝	17.45 @17.50	43¾	4.70 @4.75	4.60 @4.62½	7.15 @7.20	7.00 @7.05

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

July	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
18	76⅜	77	81¼	199¾	197¼	18 9/16	26¼
19	77 7/16	77 11/16	82½	198½	195¼	18½	26¼
20	....	....	....	.....	.....	....	....
22	78 11/16	78⅞	83¾	199⅜	197	18½	26¼
23	79	78⅞	84	199¼	196¾	18½	26¼
24	78⅛	78⅛	83¾	199	196¼	18 9/16	26¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper—There has been a better demand for copper both in this country and in Europe, and it appears that refined copper in the hands of speculators and dealers has been pretty well cleared out; and that further supplies will have to be obtained from the larger producers who did not follow the decline, but right along held at 17¾c., usual terms. With the advance in London the opportunity for profitable arbitrage transactions disappeared. Under these circumstances the market here advanced rapidly upon relatively small transactions. There has been talk in the newspapers of large business at 17¾c., but we have had no authentic reports of such, and copper has been liberally offered and sold by first hands at 17⅝c. delivered, usual terms, during the latter part of the week. The business in Lake copper that has been reported has been relatively small in volume and the quotations are more or less nominal. At the close Lake is quoted at 17½@17⅝c.; electrolytic in cakes, wirebars or ingots at 17.45@17.50c. Casting copper is quoted nominally at 17@17¼c. as an average for the week.

The market for standard copper was up to £77 13s. 9d. for three months, on Friday, July 19, but since then has been reactionary again, and it has been reported that short selling for account of renewed bear operators is the cause of this.

It is furthermore noteworthy that the usual contango between spot and three months' copper has entirely disappeared, both spot and three months being quoted £78 2s. 6d. at the close. Our London cables explain that this seems to be due to the fact that the buyers on the previous account have been covering their near-by dates, while the new bears are selling three months.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 5874 long tons. Our special correspondent reports the exports from Baltimore at 1701 tons.

Tin—The market is without special feature and has fluctuated within narrow limits. Abroad there was some pressure on the London market, evidently due to the Banka sale. Tin for most deliveries has ruled between about 43½@43⅞, and closes at 43¾ cents.

The London market, which opened on July 18 at £199 5s. for spot and £197 5s. for three months, closed on July 19 at £198 10s. for spot and £195 15s. for three months. On July 22, 23 and 24 it held around £199 7s. 6d. for spot and £196 15s. for three months, closing today at £199 for spot and £196 5s. for three months.

Lead—There is a fair business doing at slightly lower prices, 4.60@4.62½c. St. Louis and 4.70@4.75c. New York.

The London market is firmer, good Spanish lead being quoted £18 11s. 3d. and English lead 2s. 6d. higher.

Spelter—The demand for metal for immediate delivery has disappeared and consequently the premium. The business of the week has been in August-September contracts. Some of the principal buyers have been in the market and have taken a fair tonnage of metal at 7@7.05c., St. Louis. We quote, New York, 7.15@7.20c. and St. Louis, 7@7.05 cents.

The London market is firm at £26 5s. for good ordinaries and £26 10s. for specials.

Base price of zinc sheets is now $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—Business has been active and sales good. Prices have advanced and No. 1 ingots are now quoted at 24@24½c. per lb., New York. The foreign market is also higher.

Antimony—Business continues active and sales are good. Stocks are now small and those of outside brands which have been held in second hands are pretty well cleaned out. The market is in a strong position and further advances are expected. Cookson's is firm at 8.25@8.50c. per lb. and Hallett's 7.87½@8c. For Chinese, Hungarian and other outside brands, 7.50@7.65c. per lb. is paid.

Quicksilver—Business is still rather quiet and there is no change reported in prices. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London price is £8 10s. per flask, with £8 7s. 6d. asked from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, six months ended June 30, figures in long tons, except quicksilver, which is in pounds:

Metals	Imports	Exports	Excess	
Copper, long tons	61,130	26,981	Imp.	34,149
Copper, 1911....	74,309	40,704	Imp.	33,605
Tin, long tons ...	21,571	22,044	Exp.	474
Tin, 1911 .	20,901	20,988	Exp.	87
Lead long tons	107,445	25,703	Imp.	81,742
Lead 1911 .	106,922	33,761	Imp.	73,161
Spelter, l'g tons	70,881	4,378	Imp.	66,503
Spelter, 1911....	67,623	5,247	Imp.	62,376
Quicksilver, lb...	3,199,124	1,003,798	Imp.	2,195,326
Quicksilver '11	3,969,263	1,352,789	Imp.	2,616,474
Minor met's, tons	3,660	13,257	Exp.	9,597
Minor 1911.	2,750	10,829	Exp.	8,079
Ores				
Tin ore and con.	15,233	....	Imp	15,233
Tin ore, 1911.	14,929	....	Imp	14,929
Pyrites	455,502	....	Imp.	455,502
Pyrites, 1911.	487,763	....	Imp.	487,763

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Minor metals include nickel, aluminum and the minor metals and alloys.

Spanish Metal Exports

Exports of metals and minerals from Spain, four months ended Apr. 30, as reported by *Revista Minera*, in metric tons:

Metals	1911	1912	Changes	
Pig and manuf. iron	17,428	20,444	I.	3,016
Copper..............	3,770	6,971	I.	3,201
Copper precipitate..	4,898	3,689	D.	1,209
Lead................	46,925	58,169	I.	11,244
Zinc................	581	815	I.	234
Quicksilver.........	623	1,037	I.	414
Minerals				
Iron ore............	2,978,486	2,882,106	D.	96,380
Manganese ore.....	11,573	10,063	D.	1,510
Copper ore..........	159,848	53,645	D.	106,203
Lead ore............	917	1,127	I.	210
Zinc ore............	50,275	43,524	D.	6,751
Pyrites.............	607,644	948,588	I.	340,940
Salt................	179,745	193,484	I.	13,739

Pyritic ores are now classed as pyrites unless they carry 2.5% or over in copper. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Joplin, Mo., July 20—The high price of zinc-sulphide ore this week was $66; the base per ton of 60% zinc was $56@62.50. Zinc silicate sold at $30@32 per ton of 40% zinc. The average price, all

SHIPMENTS, WEEK ENDED JULY 20

	Blende	Calamine	Lead Ore	Value
Webb City Carterville	4,405,730	......	939,840	$158,162
Joplin........	1,924,690	.....	219,070	64,312
Galena.....	817,110	. ....	314,880	32,825
Duenweg....	706,940	. ....	35,990	21,916
Alba-Neck....	675,480	......	......	20,264
Granby	227,610	572,770	11,750	15,140
Miami......	327,840	......	210,640	14,304
Cave Springs.	361,750	.. ...	......	10,490
Carl Junction	307,740	......	......	9,540
Oronogo... .	310,840	. . .	.....	7,403
Jackson...	232,930	. ..	.... .	6,754
Carthage..	227,000	....	......	6,583
Spurgeon . .	. ....	192,110	100,930	6,100
Springfield....	86,000	.. ..	......	2,500
Badger...	74,680	..	......	2,090
Wentworth...	62,310	.	......	1,806
Quapaw....	63,410	.....	. ..	1,711
Aurora.	. ... .	81,190	.	1,217
Totals	10,812,060	846,070	1,833,100	$383,117
29 weeks...	294,117,870	18,160,030	50,434,230	$9,170,705

Blende val., the week, $315,344; 29 weeks, $7,510,928
Calamine, the week, 13,310; 29 weeks, 271,411
Lead value, the week, 54,463; 29 weeks, 1,388,366

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January.	$41 85	$44 90	$40 55	$43 54	$55 68	$58.92
February .	40 21	45 75	39 16	43 31	54 46	52 39
March.....	39.85	51.56	38.45	49.25	54 57	54.64
April.	38 88	52 00	37 47	50 36	56 37	54 18
May ..	38.25	55 30	36 79	53.27	55 21	52.45
June . ..	40.50	55 88	38.18	54 38	56 49	55.01
July........	40 75		38 36	.....	58 81	. .
August	42 50		41 28	....	60 74	.
September .	42 63		41 29	. .	59 33	.. ..
October .	42.38	..	40 89	. .	54.72	. ..
November..	45.40		43 25	.	57 19	. ..
December..	44 13	..	40 76	..	62 03	. ..
Year. .	$41 45		$39.90		$56.76	......

NOTE Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold Lead ore prices are the average for all ores sold grades, was $56.38. The high price of lead ore was $61, and the average price, all grades, was $58.86 per ton.

The zinc-ore market was on another rampage this week and the strong competition between four or five of the heaviest buyers brought the base up to $62.50 on Friday, a price that few operators ever dreamed they would be able to sell zinc ore for a few months ago. The market is in a peculiar condition, and even higher prices are looked for next week.

Platteville, Wis., July 20—The base price paid this week for 60% zinc ore was $57@58. The base price paid for 80% lead ore was $58@59 per ton.

SHIPMENTS, WEEK ENDED JULY 20

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point........	689,500	. .	....
Galena	561,050	167,000	....
Platteville	552,690	....	192,900
Shullsburg...... .	545,500	112,830	....
Hazel Green. .	460,000	60,000	....
Benton.....	443,000	.. ....	396,800
Linden	223,650	63,490	80,000
Cuba City . .	158,920	50,000	.....
Harker.........	144,870	151,500	. ....
Rewey	82,000	....	....
Total...... . .	3,861,180	604,820	669,700
Year to date..........	114,465,310	5,181,290	16,877,270

Shipped during week to separating plants, 2,324,120 lb. zinc ore.

Other Ore Markets

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price, delivered at smelting works in Kansas and Oklahoma, is for the zinc contents, less eight units at the St. Louis price for spelter; with a deduction of $16 to $18 per 2000 lb. of ore.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less. These prices are delivered.

Vanadium Ore—A recent quotation for vanadinite, containing at least 10%, is 75c. per lb. for the V_2O_5 in the ore.

Molybdenum Ore—Recent prices offered for molybdenite, carrying 25% MoS_2, are $25 per ton; for wulfenite, at least 25% MoO_3, $100 per ton, f.o.b. railroad.

Chemicals

New York, July 24—The general market remains quiet, but there is a fair amount of business for the season.

Arsenic—Prices are unchanged for spot white arsenic, $4@4.25 per 100 lb. being asked for early delivery. Futures are a shade lower, at $3.50 per 100 lb. Supplies are coming in more freely.

Copper Sulphate—Sales have been fair and the market is still quiet. Quotations are unchanged at $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is quiet but firm, and prices are a shade better, 2.45@2.50c. per lb. being asked for both spot and future positions.

Mining Stocks

New York, July 24—On July 18, there was some activity on the Exchange, and prices advanced. The Curb was quiet and rather irregular, Cobalts were steady and other mining stocks firm, but slow. Copper stocks were fairly active.

July 19 the Exchange was active, with more advances. The Curb was again irregular but more active. Braden Copper advanced, but British Columbia was off a fraction. Motherlode and Tonopah Extension sold freely at advances. Lehigh Valley Coal Sales also gained several points.

July 20 the Exchange was quiet. The Curb was more active, but copper stocks were inclined to be weaker. Diamond Black Butte, Tonopah Extension and West End Extension sold freely at advances.

July 22 the Exchange was rather slow, but firm. On the Curb mining stocks were rather quiet, except the coppers, which were strong and active. A feature of the dealings was the sale of 85,000 shares of Greenwater at 5c. per share.

July 23 and 24 the Exchange was rather unsettled and prices were weaker. Mining stocks on the Curb were quiet for the most part, but some coppers—notably Braden and Greene Cananea—advanced.

Sales of securities at auction in New York, July 18, included the following: Ontario Mining & Smelting Co., 4441 shares, $55 for the lot; New Central Coal Co., 15 shares, 37½% of par value; Comstock Tunnel Co., 200 shares, 10½c. per share, and $100 income bond scrip, $12; Columbus & Hocking Valley Coal & Iron Co., 3 shares, $1 for the lot; West End Furnace Co., Roanoke, Va., $100,000 first-mortgage bonds, $500 for the lot.

Boston, July 23—Although mining shares maintain a firm undertone midsummer inertia is manifest. Osceola took a $3 drop to $115 upon the announcement that the mine had to close down on account of the inflow of water, but quickly recovered when it was found that the damage was not as serious as first thought. Shannon and Arizona Commercial are conspicuously strong and active. Arizona Commercial has risen almost $1 during the week as a result of the successful reorganization of the company. The 6% bonds have risen 11 points to 86. Isle Royale sold up over $3 to $36.37½, which is its best price since 1907. U. S. Smelting has been particularly active and rose $2.50 to $46.50. Both Ahmeek and Calumet & Hecla show substantial advances.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	April	May	June
Alaska shipments.	1,243,911	1,720,391	4,134,569
Anaconda	25,480,000	25,800,000	. . ....
Arizona, Ltd.....	3,400,000	3,500,000	3,300,000
Copper Queen......	6,806,425	7,024,087	7,622,733
Calumet & Ariz....	4,104,000	4,424,000	4,160,000
Chino...............	1,150,000	1,275,850	1,463,000
Detroit...	2,506,718	2,092,478	1,959,634
East Butte..........	1,400,000	1,445,000	. ....
Mammoth........	1,718,450	. .	... .
Mason Valley......	1,503,056	1,520,000	. . .. .
Nevada Con.... ..	6,115,095	6,063,462	5,913,832
Ohio...............	675,000	. . ..	. . .. ..
Old Dominion ...	2,167,000	2,180,000	2,130,000
Ray...............	2,611,920	2,924,913	2,992,500
Shannon	1,544,000	1,464,000	1,270,000
South Utah.........	284,215	236,884	....
United Verde*	2,250,000	2,500,000	....
Utah Copper Co....	8,615,775	9,564,919	8,772,742
Lake Superior*....	18,250,000	21,250,000	15,600,000
Non-rep. mines*..	7,625,000	8,400,000	8,300,000
Total production	97,400,495	....	....
Imports, bars, etc..	26,842,014	25,836,519	....
Total blister	124,242,509	... .	....
Imp. in ore & matte	9,350,972	6,410,226	....
Total American..	133,593,481	... .	....
Miami†	2,554,352	2,565,000	2,584,950
Brit. Col. Cos.:			
British Col. Copper	1,043,173	875,000	996,000
Granby	1,941,797	1,914,460	1,888,400
Mexican Cos.:			
Boleo†	2,149,280	2,260,160	1,851 920
Cananea	4,654,000	4,600,000	4,310,000
Moctezuma	2,797,718	2,892,521	3,176,819
Other Foreign:			
Cape Cop., S Africa	954,240	754,880	.....
Kyshtim, Russia...	1,545,000	.... .	.. ...
Spassky, Russia..	649,600	694 400	... . .
Famatina, Argen..	.	. ...	. ....
Tilt Cove, Newf'd..	119,869	123,087	.. ..
Exports from:			
Chile...	6,496,000	3,696,000	9,856,000
Australia	9,408,000	7,840,000	8,176,000
Arrivals in Europe‡	12,064,640	9,976,860	12,667,200

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VI, 1911........	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII.............	122,896,697	65,988,474	79,238,716
Year.......	1,431,938,338	709,611,605	754,902,233
I, 1912..........	119,337,753	62,343,901	80,167.904
II.............	116,035,809	56,228,368	63,148,096
III..........	125,694,601	67,487,466	58,779,566
IV..........	125,464,644	69,513,846	53,252,326
V..............	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650

VISIBLE STOCKS

Month	United States	Europe	Total
VII, 1911 . .	157,434,164	195,932,800	353,366,964
VIII...........	137,738,858	191,891,840	329,630,698
IX.....	133,441,501	191,228,800	324,670,301
X..............	[illegible]	[illegible]	332,840,456
XI..............	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912..........	89,454,695	158,323,200	247,777,895
II....... ...	66,280,643	154,851,200	221,131,843
III.............	62,939,988	141,142,400	[illegible]
IV	[illegible]	136,819,200	199,186,751
V	65,066,029	134,176,000	[illegible]
VI	49,615,643	117,801,600	167,417,232
VII.............	[illegible]	108,186,600	152,521,047

Curb trading has been of fair volume with a firm list of prices. Nevada-Douglas is being quietly picked up around $3.50. Houghton touched $10 again, while there is a fair demand for First National and Davis-Daly.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0 10
Buffalo, Mont	June 4	July 2	0 002
Challange, Nev	June 8	July 2	0.10
Chollar, Nev	July 7	Aug. 5	0 10
Confidence, Nev	July 15	Aug. 9	0.20½
Con. Imperial, Nev	July 28	Aug. 21	0 01
Con. Virginia, Nev	Aug. 11	Sept. 5	0 20
Crown Point, Nev	June 24	July 17	0 10
Gould & Curry, Nev	July 19	Aug. 12	0.05
Great Falls, Utah	June 26	July 27	0 002½
Hale & Norcross, Nev	July 2	July 29	0 05
Houghton Copper, Mich	May 17	....	1 00
Mineral Farm, Ida	July 15	Aug. 15	0 002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
New Reliance, S. Dak	....	....	0 01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida	July 18	Aug. 19	0.001
Overman, Nev	June 29	July 23	0 10
Savage, Nev	June 4	June 26	0.10
Seven Troughs, Nev	June 15	July 2	0.002½
Sierra Nevada, Nev	July 4	July 30	0.10
Silver Mt., Ida	July 15	Aug. 15	0.002
Tintic Central, Utah	June 14	July 6	0.005
Union Consolidated, Nev	July 12	Aug. 7	0.15
Utah Antimony, Utah	June 1	....	0.03
Utah, Nev	July 12	Aug. 6	0.05
Yankee Con., Utah	....	....	0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53 795	56.260	24 154	24.865	25 887
February	51 534	52 222	59 043	23 794	24 081	27.190
March	51.454	52 745	58.375	23.690	24 324	26.875
April	53.221	53 325	59.207	24.483	24 595	27 284
May	53.870	53 308	60 880	24.797	24.583	28 038
June	53.462	53 043	61.290	24.651	24.486	28 215
July	54.150	52 630	.....	25.034	24.286	......
August	52.912	52 171	.....	24.428	24.082	......
September	53.295	52 440	.....	24.567	24.209	......
October	55 490	53 340	.....	25.596	24.594	......
November	55.635	55 719	...	25.680	25 649	......
December	54.428	54.905	....	25.160	25 349	......
Year	53 486	53.304	......	24.670	24.592	......

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12 680	14 337	55 600	62.760
February	12 256	14.084	12.611	14.329	54.974	62 893
March	12 139	14.698	12 447	14.868	54 704	65.884
April	12.019	15 741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16 245	54.313	72.352
June	12.385	17 234	12.611	17 443	56 365	78.259
July	12.463	...	12.720	......	56.673	......
August	12 405	...	12.634	..	56 266	......
September	12.201	...	12 508	..	55 253	......
October	12.189	....	12.370	...	55.170	....
November	12.616	.	12 769	..	57.253	....
December	13.552	.	13 768	..	62 068	.
Year	12.376		12.634	.	55 973	...

New York, cents per pound, London pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	...
February	41 614	42 962	August	43 319	....
March	40 157	42.577	September	39 755	...
April	42 185	43 923	October	41 185	...
May	43.115	46 053	November	43 125	...
June	44 606	45 815	December	44 655	.
			Av. Year	42 281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4.435	4 334	4.327	13.009	15.619
February	4 440	4.026	4 266	3 946	13.043	15 738
March	4.394	4.073	4 238	4.046	13.122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4.373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13.260	17 588
July	4 499	.....	4.397	......	13 530	....
August	4 500	......	4 406	......	14.260	.
September	4 485	.....	4 356	......	14 744	.....
October	4 265	....	4 139	......	15.332	.....
November	4.298	.....	4.181	......	15.821	....
December	4.450	....	4.332	......	15.648	...
Year	4.420	......	4 286	......	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6 292	23.887	26 642
February	5.518	6.499	5 368	6.349	23 276	26 661
March	5.563	6.626	5.413	6.476	23 016	26.048
April	5 399	6.633	5 249	6 483	23 743	25 644
May	5 348	6.679	5 198	6.529	24.375	25.790
June	5 520	6.877	5 370	6 727	24.612	25.763
July	5 695	......	5 545	.....	25.006	......
August	5 953	......	5 803	......	26 801	......
September	5 869	......	5 719	....	27 750	....
October	6.102	......	5.951	......	27 256	.....
November	6.380	......	6.223	......	26 795	.....
December	6.301	......	6.151	......	26 849	......
Year	5.758	......	5.608	......	25 281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15 90	$15.12	$14 40	$13.32	$14 75	$14.00
February	15 90	15.03	14 50	13.28	14 81	14.01
March	15.90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13.90	15 00	14 15
May	15.90	15.14	14 30	13.90	14 72	14 12
June	15 90	15.15	14 06	14.11	14 56	14.22
July	15 90	....	14 03	.....	14 53	......
August	15 90	..	14 00	......	14 47	.....
September	15 90	..	13 57	......	14 40	....
October	15.43	......	13.44	.....	14.34	......
November	14.92	.....	13.30	.....	14 25	......
December	15.15	.....	13.10	.....	13.90	......
Year	$15 72	....	$13 94	.....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS July 23

Name of Comp.	Bid.
Acacia	.04¾
Cripple Cr'k Con.	01½
C. K. & N.	18¾
Doctor Jack Pot	.05⅛
Elkton Con	.65
El Paso	.96½
Findlay	.04⅛
Gold Dollar	.18
Gold Sovereign	.02
Isabella	.13¾
Jack Pot	.04
Jennie Sample	.05¼
Lexington	‡ 02
Moon Anchor	.0085
Old Gold	.03¾
Mary McKinney	.69
Pharmacist	.01¼
Portland	.91¾
Vindicator	.80
Work	.01¼

SALT LAKE July 23

Name of Comp.	Bid.
Beck Tunnel	10
Black Jack	15
Cedar Talisman	02
Colorado Mining	.18
Columbus Con	25
Crown Point	02¼
Daly-Judge	5.85
Grand Central	55
Iron Blossom	1 20
Little Bell	‡ 25
Lower Mammoth	03
Mason Valley	13 00
May Day	12
Nevada Hills	2 15
New York	02¼
Prince Con	1 57½
Silver King Coal'n	2 50
Sioux Con	.04¼
Uncle Sam	.19
Yankee	‡ 12

TORONTO July 23

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	†7 35	Hollinger	12 25
Hudson Bay	†70 00	Imperial	01
Temiskaming	37	Pearl Lake	17
Wettlaufer-Lor.	‡ 56	Porcu. Gold	31
Apex	03	Porcu. Tisdale	01
Central	†5 56	Preston E. D.	01
Crown Chartered	09	Rea	25
Doble	‡ 25	Standard	‡ 01¼
Dome Exten	13	Swastika	09
Foley O'Brien	.15	West Dome	10

SAN FRANCISCO July 23

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.10	Belmont	9.32½
Belcher	.50	Jim Butler	.69
Best & Belcher	.09	MacNamara	.22
Caledonia	1.60	Midway	.63
Challenge Con	.17	Mont.-Tonopah	2.50
Chollar	.11	North Star	.23
Confidence	.80	West End Con	1.70
Con. Virginia	.48	Atlanta	.31
Crown Point	.52	Booth	.09
Gould & Curry	07	C.O.D. Con	.11
Hale & Norcross	18	Comb. Frac	.18
Mexican	2 95	Jumbo Extension	.41
Occidental	50	Pitts.-Silver Peak	1.05
Ophir	1.12½	Silver Pick	.12
Overman	.90	St. Ives	.33
Potosi	.03	Tramp Con	‡.01
Savage	10	Argonaut	‡2.00
Sierra Nevada	.24	Bunker Hill	‡4 50
Union Con	.66	Cent. Eureka	.42
Yellow Jacket	.54	So. Eureka	‡2 90

N. Y. EXCH. July 23

Name of Comp.	Clg.
Amalgamated	83¾
Am. Agri. Chem	61
Am.Sm.&Ref.,com	82¾
Am. Sm. & Ref., pf.	107¾
Am. Sm. Sec., pf. B	87
Anaconda	41½
Batopilas Min	1⅝
BethlehemSteelpf	67½
Chino	31¾
Comstock Tunnel	‡ 12
Federal M. & S., pf.	46½
Goldfield Con	4
GreatNor.,ore.,ctf.	42
Guggen. Exp	55½
Homestake	96½
Inspiration Con	19
Miami Copper	29½
Nat'nalLead,com.	58¾
National Lead, pf.	108
Nev. Consol	20¾
Pittsburg Coal, pf.	91½
Ray Con	20⅞
RepublicI&S,com.	25½
Republic I & S, pf.	84¼
SlossSheffi'd,com.	55
Sloss Sheffield, pf.	97
Tennessee Copper	43½
Utah Copper	61⅞
U. S. Steel, com	69⅝
U. S. Steel, pf.	112¼
Va. Car. Chem	49¼

N. Y. CURB July 23

Name of Comp.	Clg.
Barnes King	25
Beaver Con	44
Braden Copper	7⅛
B. C. Copper	5⅝
Buffalo Mines	‡1 40
Caledonia	40
Con. Ariz. Sm	$\frac{11}{16}$
Davis-Daly	2½
Diam'field-Daisy	7½
Ely Con	22
Florence	1⅛
Giroux	5
Gold Hill Con	⅜
Greene Cananea	9⅞
Greenwater	06
Internat. S. & R.	124
Kerr Lake	2⅞
Keystone	2⅛
La Rose	3¼
McKinley-Dar-Sa.	$1\frac{11}{16}$
Min. Co. of A. new	2⅞
Motherlode Gold	$\frac{15}{16}$
Nev. Utah M. & S.	‡ 03½
Nipissing Mines	7⅝
Ohio Copper	⅜
Pacific Sm. & M	¼
South Live Oak	‡2⅜
South Utah M. & S.	¾
Standard Oil (Old)	980
Stand'd Oil of N.J	389
Stand'd Oil Subs	525
Stewart	$1\frac{7}{16}$
Tonopah	6⅞
Tonopah Ex	2½
Tri-Bullion	½
Tularosa	‡$\frac{11}{16}$
Union Mines	$\frac{3}{16}$
United Cop., pfd.	10
Yukon Gold	3¾

LONDON July 24

Name of Com.	Clg.
Camp Bird	£1 7s 9d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 9 6
Mexico Mines	6 17 6
Oroville	0 5 6
Stratton'sInd.	0 3 1½
Tomboy	1 6 3

BOSTON EXCH. July 23

Name of Comp.	Clg.
Adventure	8¼
Ahmeek	350
Algomah	5½
Allouez	46½
Am. Zinc	31½
Ariz. Com., ctfs.	6⅜
Bonanza	40
Boston & Corbin	‡7½
Butte & Balak	‡3½
Calumet & Ariz	75½
Calumet & Hecla	520
Centennial	25
Con. Mercur	01
Copper Range	58
Daly West	5¼
East Butte	13⅝
Franklin	11½
Granby	53
Hancock	32
Hedley Gold	16
Helvetia	‡1¼
Indiana	17½
Island Cr'k, com.	56
Island Cr'k, pfd.	88¾
Isle Royale	35
Keweenaw	‡1¾
Lake	36
La Salle	7
Mass	7
Michigan	2¼
Mohawk	69
New Arcadian	‡3
New Idria Quick.	‡6⅞
North Butte	30¾
North Lake	5¼
Ojibway	4½
Old Dominion	57
Osceola	116⅛
Quincy	90½
Shannon	16⅞
Shattuck-Ariz.	20
Superior	47½
Superior & Bost.	1¾
Tamarack	40½
Trinity	5½
Tuolumne	3¼
U. S. Smelting	45½
U. S. Smelt'g, pf.	49⅞
Utah Apex	2¼
Utah Con	13
Victoria	3¼
Winona	5½
Wolverine	110
Wyandot	2

BOSTON CURB July 23

Name of Comp.	Last
Bingham Mines	4
Boston Ely	1
Boswyocolo	.03
Butte Central	6¼
Cactus	08
Calaveras	2¼
Chief Cons	1¼
Corbin	1
Cortez	1
Crown Reserve	3½
First Nat. Cop.	2
Majestic	43
Mazatan	1½
Moneta Porc	‡ 07
Nevada-Douglas.	$3\frac{1}{16}$
New Baltic	2
Oneco	1⅞
Raven Copper	.26
Rhode Island Coal	20
San Antonio	‡3
S. W. Miami	6¼
South Lake	9
Trethewey	.45
United Verde Ext.	.40
Vulture	‡5.00

‡Last quotation.

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Sec'y.
505 Pearl St., New York

Monadnock Bldg., Chicago
6 Bouverie Street, London, E.C.
Unter den Linden 71, Berlin N.W. 7

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94. AUGUST 3, 1912 No. 5

Spelter Statistics

The report of the U. S. Geological Survey shows a production of 166,496 tons of spelter during the first semester of 1912 against 146,330 in the second and 140,196 in the first of 1911. The deliveries are estimated at 159,046, against 145,157 and 134,902. At first glance the marvellous increases both in production and in consumption that are indicated by these figures are likely to be viewed with amazement, but before seeking for an explanation it is useful to examine the statistics of other metals in order to discover whether the spelter statistics are in or out of tune with them.

Assuming that the rate of consumption during the second half of 1912 is going to continue at the same rate as in the first half and comparing with the consumption during the 12 months of 1911, it appears that iron increased to 1.12 times the rate of 1911, copper to 1.11 and spelter to 1.13½. These figures are sufficiently in harmony to lull any suspicions of manipulation or abnormality, however we may marvel at the extraordinary percentage of increase, which will be even greater if industry continues to wax during the remainder of 1912.

How then is the difference in the behavior of the markets to be accounted for? As between iron and spelter this is simple. In the iron business there was, and still is, a surplus of producing capacity, which has been utilized as required. Consequently, the advance in the iron market has been orderly and moderate. In the spelter business, on the other hand, there was no surplus to speak of and new capacity has had to be provided. This has put the producers under a severe strain and the market naturally has advanced to a high level and has been feverish.

With respect to copper the case is not so simple. An adequate explanation of the delay in smelting and refining the excess production of 75,000,000 lb. is necessary before any broad deduction may safely be drawn as to the market for this metal. It may be said, however, that the domestic deliveries of the refined metal probably measure the actual consumption in this country.

The Park City Report

The Park City report is one of the publications of the U. S. Geological Survey of major character, such as have done most to establish the reputation of the Survey. Its author, Mr. Boutwell, is a distinguished mining geologist (who is no longer a member of the Survey) and his reputation insures excellence in his work. We shall review it from the geologic standpoint in a subsequent issue.

It is highly unfortunate that the publication of the Park City report has been so long delayed. This has previously been the subject of criticism in the JOURNAL and elsewhere. The field work was begun in 1902. The full report is issued after the lapse of 10 years.

Mr. Boutwell, in his preface, offers an apology for the tardiness, saying, "Delay in digesting this large mass of facts and in preparing the final report, which is regretted by none more deeply than by the writer, has been caused mainly by the interference of other work. This includes the completion of previous work, occupying two office seasons after the Park City field work was started, the organization of statistical work on the production of lead, zinc and quicksilver, both in field and office, and two outside examinations undertaken with the consent of the proper Survey officers. Fortunately the resulting loss has not been as serious as it would have been in most districts, owing to a lull in mining operations in this camp which leaves the examination practically up to date."

This apology is in reality a serious indictment of the former administration of the U. S. Geological Survey. No elaborate argument is necessary to demonstrate that one important piece of work of this kind ought not to be inaugurated before previous work had been completed, that members of the Survey ought not to be given leave of absence in order to conduct outside examinations, and that distinguished geologists ought not to have been detailed to mere statistical investigations. We have criticized the administration of the Survey for such errors of judgment during a long time. We have reason to believe that some of these faults will not be permitted to continue under the present direction.

The World's Production of Pig Iron and Steel

The pig-iron production of the world in 1911 showed a small decrease from 1910, the total loss being 1,609,043 tons, or 2.4%. This decline was entirely due to the smaller production of the United States, nearly all the European iron-making countries having enlarged their production. The three leading countries are the United States, Germany and Great Britain, which produced in 1911, respectively 37.4, 23.8 and 15.4%—in all 76.6% of the total make, against 23.4% by all other countries. The accompanying table shows the production in 1910 and 1911, all being reduced to metric tons for purposes of comparison:

PIG IRON PRODUCTION OF THE WORLD

	1910	1911
United States	27,636,687	24,027,733
Germany	14,794,029	15,280,527
Great Britain	10,380,212	9,894,136
Total	52,810,948	49,182,396
All other countries	13,049,312	15,068,821
Total	65,860,260	64,251,217

While there was a small loss in production, there was probably no decrease in consumption, as both the United States and Great Britain carried over heavy stocks from 1910, and these were practically used up last year.

Unlike pig iron steel showed an increase in 1911, though the gain was small, being only 134,574 tons, or 0.2%. In most countries the proportion of steel to pig iron showed an increase; and this was the case even in Great Britain, which has always been comparatively a small steel producer, and has continued the use of wrought or puddled iron more than any other country, except Belgium. The second table shows the steel production, in metric tons, for the last two years.

STEEL PRODUCTION OF THE WORLD

	1910	1911
United States	26,512,437	24,054,309
Germany	13,698,638	15,019,333
Great Britain	6,106,856	6,564,998
Total	46,371,921	45,638,640
Other countries	11,934,426	12,748,281
Total	58,252,347	58,386,921

Of the steel in 1911 the United States, Germany and Great Britain together made 78.2%, the proportions of the three countries being 41.2, 25.7 and 11.3%, respectively. No other country approaches any one of these three in its production of iron and steel. The leaders among the other countries are France, Austria-Hungary, Belgium and Russia.

In the 10 years from 1902 to 1912 the world has shown increases in production of 19,908,648 tons, or 44.9%, in pig iron, and of 26,936,779 tons, or 85.6%, in steel. The very much greater proportional growth of the steel is substantial evidence of the general adoption of the various steel-making processes. Much of this growth is due to the openhearth and basic converter methods, making available a wide range of raw material formerly thought unfitted for the manufacture of steel.

Pig Copper

The official report of the Nevada Consolidated Copper Co. for the quarter ended June 30, 1912, throws some light upon the much discussed discrepancy in the copper statistics. "Labor troubles at refineries delayed the marketing of copper and during the quarter there was also a considerable increase in copper on hand at the Steptoe plant. The quantity and value of copper in transit to the market (with the higher price for copper) has also materially increased. In total we have $702,611 more values in metals on hand than at the end of the preceding quarter."

Reckoning this copper at 16c. per lb. and allowing for the gold and silver, it appears that Nevada Consolidated was carrying at the mid-year something like 4,000,000 lb. of copper more than it was on March 31, 1912. Consequently here is one bit of official evidence respecting the stock of pig copper at the smelteries and in transit. Perhaps some of the other smelters find themselves similarly situated. It may be mentioned also that some of the refiners are no longer quite so positive about the absence of pig copper in their yards as they were a little while ago.

Tonopah Milling Practice

When a knowledge of the present trend in the cyanidation of silver ores is desired one naturally turns to the practice in Mexico and Nevada as furnishing the best indicator. The ores of Tonopah are essentially silver ores, for the silver occurs in the approximate ratio of 100:1 of gold by weight. It is of double interest therefore to follow the development of the metallurgical practice in this district, for we obtain an idea of the progress in the cyanidation of silver ores in general, as well as of the advance in Tonopah milling methods in particular.

The first mill to treat Tonopah ores, a 10-stamp, pan-amalgamation mill, was followed by others in which the cyanide process was adapted to treat the characteristic arsenical, antimonial sulphide ores by preliminary concentration, the sand and slime tailing being separately cyanided. The next step was the adoption of all-sliming, which was followed by the use of direct cyaniding in addition to all-sliming at two of the mills, whereby the lower-grade ores were successfully treated.

At the West End Consolidated, an all-sliming, nonconcentrating mill, described in detail in a recent issue, an extraction of 90.85% on $17 heads is obtained at a cost of $3.52 per ton. The limit at which direct cyaniding can be profitably adopted is given as $20, preliminary concentration being essential for ores of higher grade. That direct cyaniding is the more profitable method for the lower-grade ores was demonstrated at the Tonopah Extension, where concentration was abandoned after one year's operations. At the latter mill the ore averages $13 and a total extraction of 90.85% is obtained at a cost of $3.19 per ton by direct cyaniding.

A survey of the present practice in the Tonopah district shows that all-sliming is general in the new mills, that the tendency is toward heavier stamps, 1250- to 1500-lb. stamps displacing the 1050-lb., that a combination concentration-cyanidation system is used for high-grade ore and direct cyaniding for lower grade, that both zinc-shavings and zinc-dust precipitation are used, that heating of solutions is common and that lead acetate is the reagent generally used to prevent the precipitation of silver as the sulphide.

By the Way

The Boston *News Bureau* recalls the 25th anniversary of its first publication by reprinting a stock exchange sheet of June 1, 1888. Only five mining stocks are quoted and they are Boston & Montana, $47; Calumet & Hecla, $245; Franklin, $15; Osceola, $20; Quincy, $69.25 per share.

A "Cousin Jack" story, which has been going the rounds of the Michigan iron ranges, has to do with the directions given a Cornish mining captain by a young mine engineer concerning the starting of a crosscut from the main drift. Upon returning several days later the engineer found that nothing had been done. He questioned the captain and was asked with much dignity: " 'Ow th' bluddy 'ell couldde turn a right angle to the left!"

A dispatch states that gold, silver and other metals to the value of $62,000 have been cleaned up in the last 13 months, from the old smeltery dump at Argentine, Kan. The site is now occupied by a structural-steel company, which is reported to have paid $45,000 for the property. The officials of the steel company expect to recover about $25,000 more and consider that they made a good bargain in the purchase of this property. The smelter suspended operations about fifteen years ago.

Like Banquo's ghost the spectre of "hidden stocks" of copper rises every now and then to disturb the 17c. copper feast of the American producers, says the *Wall Street Journal.* The phantom will not down, although each producer in turn rises to roll up his sleeves, turn his pockets inside out to show he has none of the elusive metal hidden about his person, and laying his hand upon his heart solemnly avows that the only hidden stocks he knows about are those concealed in the bosom of mother earth.

The long fight of the labor unions against improved machinery and processes in the Government Printing Office is fittingly supplemented by Senator Poindexter's bill abolishing all scientific shop-management systems in Government establishments says the *Evening Post.* The bill has been favorably reported. It is said for it that it would end the stop-watch and all other devices fo "speeding up" workmen. The great principle that one man must not be allowed to do what can be divided between two or more is obviously violated by the scientific management idea.

Colonel Goethals, engineer in charge of construction of the Panama Canal, in a recent report, states that over $15,000,000 worth of machinery has already been purchased in connection with the work. Some of the principal items are: Steam shovels, 102; cars, 4181; locomotives, 189; rock drills, 725; cranes, 79; dredges, 14; barges, 44. After the canal is placed in operation, many of the locomotives and cars will be continued in use, but the remainder of the equipment, together with a vast amount of scrap material, will probably be put up for sale. Secretary of the Interior Fisher has suggested that much of the Panama Canal machinery be transferred to Alaska for use in constructing a government railroad to the interior of that territory. The execution of this plan, of course, depends on the action of Congress.

One curious and unexpected result of the Standard Oil dissolution has been an accumulation of Standard Oil securities in the hands of Wall Street speculators, says the *Evening Post.* Old Standard Oil of New Jersey was, perhaps, better distributed among small investors than any other industrial security. Transactions in it were made on the Curb, and 40 or 50 shares in a day would cause it to be called active. After the dissolution, many small holders were unable to abide the confusion and annoyance of sorting, keeping, and understanding fractional shares. It was harder on the small stockholder than on the others. True, he could put all of his fractions into one envelope and be sure that he had the same property as he owned before, but then came the dividend checks, one for 1c., another for 6c., and so on. He found that there was a market for the stuff in Wall Street. Speculators were willing to take his fragments and piece them together or swap them around into full shares, and, rather than to be bothered, he often sold. The speculators had tips, first on one stock and then on another, and the tips were good, and their willingness to collect and integrate the fractions accordingly increased. The result is that speculators have a larger interest in Standard Oil securities today than was ever the case before. It is worthy of note that Standard Oil Co. of New Jersey recently sold on the Curb at $1000 per share, a record price for this stock.

Few but editors appreciate the difficulty of obtaining and holding good correspondents. Like the tropics, the desert also has a peculiar effect on the nerves of certain men and an otherwise good correspondent will suddenly violate all the ethics and start to "syndicating his stuff." Editors like doctors and other professional men have to stand together and one of the Salt Lake dailies has forwarded to us the latest attempt of a desert Agamemnon G. Jones, to catch the editors going and coming. Of course, we cannot print correspondence that has been syndicated in this way, but by changing names and giving the writer and hero the Henry Wallace Phillips' sobriquet, no confidence will be violated, and any advertising will be impartially bestowed. Elko County is booming, and the only thing that can retard it is the loss to the state through the theft of Mr. Jones' most modern scientific instruments. This great loss is fully depicted in Mr. Jones' letter below:

———, Nev.
July 22, 1912.

Mining Editor. S. L. Tribune. Being a Specl Corespondent, Engineering & Mining Journal of N. Y. City, I send you also an Item. On ———, Nevada. Elko County is Booming—aspecialy the Linn District Bullion District In Fact The whole County, of Elko. Nearly Evry Train Brings in Bonders and Prospective Purchasers of Mining Properties. The True Fissure Mining Co. Headed By The Well Know opperator Mr. Jones. Is on the ground. There is Reported a Great Gold Strike about a mile From Linn Camp. These new Finds are no Fake Prospects. as you will note By the Prominent visitors to the many Camps, Surronding ——— in Bothe and all Directions. There is also as usual an Epidemic of Thieves that Infest these Rich Mining Camps. In Broad Day light yesterday they Celebrated the Sabath. By wholesale Burgleries Robing 2 Rooming Houses and made a Fine Clean up on the Mining Men and a Resturant Keeper Taking His Days Reciepts as Part of the loot. They also appropiated, one of the Most Modern Scientific Mining Engineers outfits of Great Value and a Gift Given To Mr. Agememnon G. Jones, M. E., By Alaska Friends valued at a large sum of Apreciation. For Reports on Copper River Properties From valdese to Many Miles up the River. They also stole Many valuable Federal Corespondents and Divested His Room of all Wearing appearl. The Federal People and local officers Have all Been sent Notice. But as yet no Clew Has Been Sighted. But there is little Doubt But they will offer this Magnificent outfit of Scientific Instruments to Some Engineers. It Consisted of Range Taking. Instrument. Baromaters. Compasses angle measurment Instrument, and at least 6 other Devises of Instruments used By Metelurgical Men such as Mr. Jones. In Evry Branch and line of Reports on Mines and Ther ore Measurments. Being So Modern it is not only a loss to Mr. Jones But to the Whole State of Nevada, Jones Being one of the Mining Men who was Educated In virginia City a Graduate of Conrad Wegans Class Chief assayer In the Con virginia and a Report From Him Goes in the Greatest Mining Journals in the World—Engineering & Mining Journal, 505 Pearl Street N. Y. Now Mr. Editor C. C. Goodwin Knows Me well. ask Him, Send Me Copy of the Paper With this Report. I will also send it to The New York office of the Engineering Journal. loose no time attending to it.

AGEMEMNON G. JONES, M. E.

P. S.—I am Doing Business With Standard Oil Co.

Mining Bills

WASHINGTON CORRESPONDENCE

The Alaska placer-mining bill the main features of which were published in the JOURNAL of Jan. 27, 1912, has passed both houses of Congress and requires only the President's signature to become a law. Briefly, the features of the law are the following:

No association placer-mining claim shall exceed forty acres, and on each 20 acres or fraction, $100 worth of labor must be performed each year including the year of location, until a patent has been issued. No person may locate any placer-mining claim in Alaska as attorney for another unless he holds power of attorney in writing acknowledged and recorded in any recorders office in the judicial division where the location is made. Such authorized person may locate claims for not more than two individuals or one association, and no agent may locate more than two claims for any one principal or association during any calendar month. No placer-mining claim may be patented in Alaska which is longer than three times its greatest width.

The Senate has passed a bill for the establishment of a mining experiment station in the State of Wyoming. This bill is the same that was offered by Senator Warren some time ago.

U. S. Petroleum Production

Petroleum production in the United States in 1911 surpassed its own record made in 1910 by an increase of nearly 11,000,000 bbl., according to the U. S. Geological Survey. In 1910 the output was 209,557,248 bbl. The total production of the world also surpassed all previous records, amounting to over 345,000,000 bbl., and of this the United States produced more than 63%. The value of this enormous output of oil in the United States for 1911 was $134,044,752, the average price being 60.8c. per barrel. The increase for the year was caused principally by the gain in California, which was by far the largest producer, its output being over 81,000,000 bbl. Another factor in the increase was the discovery of oil at Vinton, La., and the comparatively new Caddo field in Louisiana also grew in importance. A find of high-grade oil at Electra, in northern Texas, was another noteworthy event of the year.

U. S. PETROLEUM PRODUCTION

	Bbl.
1901	69 389 194
1903	100 461 337
1905	134 717 580
1907	166 095,335
1909	183 170 874
1911	220 449 391

Oklahoma, with a production of more than 56,000,000 bbl., extended its field well into Osage and Pawnee Counties, and oil was discovered still farther west, in Kay County, considerably increasing the Mid-continent yield. All these gains in the Mid-continent field, however, were offset by the declines in Illinois and states farther east; in short, all fuel oils increased and refinery oils declined. Another feature, the influence of which is being felt in 1912, was the increase in transporting and refining capacity, which in spite of the general increased yield of the country led to a drain on stocks in the Mid-continent field and the result has been a general increase in the price of crude oils for refining.

In the production for 1911 California led with 81,134,391 bbl.; Oklahoma took second place, with 56,069,637 bbl.; Illinois was third, with 31,317,038 bbl.; and Louisiana was fourth, with 10,720,420 bbl. The greatest increase in production in 1911 were in California, 8,123,831 bbl.; in Oklahoma, 4,040,919 bbl.; and in Louisiana, 3,879,025 bbl. The principal decreases were in Illinois, 1,826,324 bbl.; and in Ohio, 1,099,258 bbl.

Important Iron Lease Decision

NEGAUNEE CORRESPONDENCE

An important mining decision has been handed down in the Michigan iron region in the suit of Andrew Young, of Stambaugh, Mich., against the Verona Mining Co., to cancel the lease which the company holds on his homestead. Young was dissatisfied with the manner in which development was being carried on. Judge Flannigan decided that the company is in the right and the case was dismissed.

Young is the owner of an 80-acre homestead at Palatka, Iron County, and gave the Verona Mining Co., a subsidiary of Pickands, Mather & Co., an option to explore and conduct mining operations in case ore was discovered. Several options were given, the last one in 1901; the lease attached was to run for 50 years and the royalty to be paid was 10c. per ton on all ore mined with a minimum royalty or ground rental of $1000 per year.

An exploratory shaft was attempted in 1901-2 and was sunk to a depth of 200 ft., of which 80 ft. was surface and 120 ft. was "paint rock" and black slate, and about 125 ft. of drifting was also done, at a total cost of $15,000, without finding any definite orebody. This form of exploration proved so expensive that permission was obtained from Young to drill from the underground workings of the adjacent Baltic mine of the company, which was granted, upon payment of $50 per month until July 1, 1903. A drill hole was driven a distance of 520 ft. from a point 150 ft. underground in the Baltic mine, and cost about $1700, without disclosing ore.

After the execution of the lease, which the mining company finally accepted, its activities were confined to developments in the adjacent Baltic and Fogarty mines. In 1909, the company bored two drill holes horizontally on the complainant's land from the underground workings of the Fogarty at a depth of 330 ft. One hole was barren of results, but the other cut 100 ft. of ore, although the other dimensions of the ore lense are not known. This was the first discovery of commercial ore on the property. The cores indicated that the drill had proceeded with the formation, and it was not possible at that time to point a drill hole from the Fogarty that would crosscut the formation, nor was the find considered sufficiently valuable to sink a shaft to it. The most feasible manner of exploring the find was to drive a drift from the Fogarty along the drill hole and then crosscut; permission was asked of the complainant to do this, which was refused, and shortly afterward the complainant started suit. Judge Flannigan says:

> The discovery made by the drill was so far beneath the surface and so small as not to warrant sinking a shaft thereon from the surface. No sufficient reason was presented by the complainant for such refusal. Here was an effort on the part of the defendant which offered the only real chance for the discovery of a workable deposit of ore and to permit the plaintiff to complain of the lack of development of the property when he stood directly in the way of development would not be equity.

During the years that the Verona company has held the lease it has paid $1000 per year minimum royalty. Since the time the lease was granted, there has been a great development of lands on all sides of the property, whereas at that time the Baltic was the only mine in the locality. The leases made since then have, as a rule, carried higher royalty than the figure on the Young's tract.

Judge Flannigan's conclusion says in part:

> He (Young) testified that the form of lease did not suit him, nevertheless, after careful consideration of the whole subject, he accepted it, as, no doubt, being the best he felt he could do with his property, in view of its doubtful prospects and under iron-ore conditions existing at that time. It appears he made practically the same contract a number of his neighbors made. Recent mining events in the Iron River district may serve to show his and his neighbors' foresight was at fault. If his and his neighbors' contracts were being written today, no doubt they would be different, but, if they were being written today under the circumstances and conditions of their respective dates, there is no reason to apprehend they would be substantially different.

If the decision had been in favor of Young, it is certain that other similar suits would have been commenced, as there are a number of persons who are dissatisfied with the leases they now have with mining companies. The case will probably be carried to the Supreme Court.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

The Ton

On account of absence from the city I did not until today observe the communication in the JOURNAL of July 6 signed "American," who takes exception to the use in the Geological Survey publications of the long ton. "American" certainly has not traveled far beyond the boundary lines of Cook County or he would know that the long ton is the accepted unit in many branches of the mining industry. Iron ore and pig iron are invariably sold by the long ton. In the anthracite industry of Pennsylvania the long ton is practically the only unit. The use of the long ton in Maryland is fixed by statute, and all of the bituminous coal shipped to the Atlantic Seaboard north of and including the Chesapeake Bay is measured by the long ton. When the measurement gets beyond pounds in the copper industry the long ton or long cwt. is used.

The officials of the Geological Survey prefer the use of the short ton, but as long as there is a double unit used in the industry the Survey reports are made to conform thereto. The "Mineral Resources of the United States" is not a publication intended primarily for European consumption, and consequently no attempt has been made to adopt the use of the metric ton, which, if divided into pounds would be more fractional than the long ton. The customs officials invariably report the imports and exports in long tons where the weight is the basis of measurement. In many instances in the reports of the Geological Survey these are converted into short tons for convenience in the making of comparisons.

E. W. PARKER,
Statistician in charge,
Division of Mineral Resources.
Washington, D. C., July 23, 1912.

Underground Positions for Engineering Graduates

At the Tiro General mine of the Cia. Metalurgica Nacional, in the state of San Luis Potosi, Mex., it has recently been decided to put into practice the plan of starting recent graduates from schools of mines at work in the mines as carmen, shovelers, miners, etc., and at periods of about six months to advance them through the positions of level boss, assayer, assistant in the engineering office, night-shift boss, day-shift boss, foreman and chief engineer.

If this plan has already been tried by other companies and definite results were obtained, it would be of interest and value to many readers to learn how successfully it worked for both employer and the young engineer.

S. F. SHAW.

Charcas, San Luis Potosi, Mex., July 16, 1912.

L. E. I.

Supplies for Mining Camps

In the accompanying table is given a list of groceries and provisions consumed at Iron Mountain, Idaho, by 20 men (average) including cooks, during four winter months in 1909 and 1910. In addition to the list, lard was tried out of the two hogs listed as fresh pork. There were not enough fresh vegetables to last through the period and owing to the winter season and snow-blocked roads, the camp was snowbound practically all of the period, no more could be obtained and their place was taken by canned goods. Double the amount of cabbage, turnips, parsnips, and one-half more onions and carrots should have been provided. In addition to the list were used sundry small amounts of spices.

FOUR MONTHS' SUPPLIES FOR 20 MEN

Fresh beef	2383 lb	Canned pears	1 case
Fresh pork	581 lb.	Canned pumpkin	1 case.
Fresh mutton	167 lb	Canned oysters	1 case
Fresh fish	100 lb	Maple syrup	3 cases
Fresh chickens	112 lb	Crackers	4 cases
Fresh eggs	69 doz	Macaroni	3 cases
Case eggs	6 cases.	Cheese	77 lb.
Ham	472 lb.	Sugar	9 sacks.
Bacon	258 lb	Oatmeal	3 sacks.
Butter	330 lb	Beans	1½ sacks
Flour	29 sacks.	Molasses	2 gal.
Graham flour	50 lb.	Jelly	3 buckets.
Corn meal	2½ sacks	Vinegar	6 gal.
Coffee	322 lb.	Baking powder	8 (large) cans.
Potatoes	40 sacks		
Carrots	200 lb.	Pickles	1 keg.
Turnips	100 lb.	Lard	25 lb
Cabbage	200 lb	Catsup	1 gal
Onions	248 lb	Tea	30 lb
Parsnips	100 lb.	Chocolate	5 lb.
Apples	600 lb.	Cocoanut	6 lb.
Salt	105 lb	Soda	2 lb
Dried peaches	30 lb	Yeast foam	10 pkg
Dried apples	65 lb	Cornstarch	6 pkg
Dried apricots	50 lb	Chowchow	8 qt
Dried prunes	100 lb.	Pepper sauce	2 bot.
Raisins	150 lb.	Currants	9 pkg.
Condensed milk	23 cases.	Hominy	20 lb.
Canned corn	3 cases	Matches	½ case
Canned tomatoes	5 cases	G. S. soap	1 case
Canned peas	5 cases	Tar soap	1 case
Canned peaches	1 case.	Ivory soap	1 case.

The isolation of the camp made the cost of these supplies high and the 30-mile wagon haul was expensive. The total payroll deductions for board were $2318 ($1 per man per day) and just about equaled the cost of running the boarding house, paying for all supplies and the cook's wages.

PERCY E. BARBOUR.
Candor, N. C., July 13, 1912.

Mine Hoisting Systems Compared

In the article entitled "Mine Hoisting Systems Compared," published in the JOURNAL of May 25, 1912, B. V. Nordberg quotes from a paper that I read before the American Institute of Mining Engineers, in March, 1910, making several misstatements which show careless reading. As stated in my paper, the Winona hoists were installed "to centralize power plants and secure central-station economies," and not with the idea that the Ilgner hoist would show any great theoretical heat efficiency. I have even advanced this opinion personally to Mr. Nordberg.

Although Mr. Nordberg makes several statements to which I must take exception, I hasten to agree with him on the proposition that each hoisting problem has its own solution which may differ radically from that for another mine. Where steam is the necessary power and the hoisting can be made regular enough to get a good load factor, there is ample room for discussion as to the advisability of generating electricity or compressing air for driving a hoisting drum with the hope of making a fuel saving. The steam engine, as in the case of the Copper Queen, is quite likely to be the proper solution.

Fuel economy, as figured by Mr. Nordberg in his paper, frequently has but little bearing on the problem of saving dollars and cents by change in a hoisting system. Successive months' operation at Winona No. 4 shaft and at King Philip No. 1 shaft, by steam and by electricity, respectively, have brought out this fact clearly.

When using steam, the coal actually burned at Winona No. 4 shaft, was 54 tons per month, which is at the rate of 108 tons for two hoists, each operated by a separate steam plant. The following month, using electricity for both hoists, the kilowatt-hours used totaled 46,590. If we assume the convenient ratio of four pounds of coal per kilowatt-hour, these figures would indicate a theoretical coal consumption of about 93 tons, or not much less than the coal consumption when using steam on each of the two hoists. The quantity of coal, however, that was actually burned at the central plant was only four tons greater when the hoists were electrically driven than when they were operated by separate steam plants, or an actual saving to the mine of 104 tons for the month when using the electric hoists. In addition, the wages of four firemen and the cost of delivering the coal were saved. The additional expense chargeable to the electric hoist was two oilers at $1 per day each. Oil and repair expense was greater on the steam hoist than on the electric hoist.

ADDITIONAL EXPENSE

Electric Hoists	
52 days oilers @ $1	$52 00
Steam Hoists	
104 days firemen @ $2.20	$228.80
100 tons coal @ 3.30	330 00
16 days teaming @ 7.00	112.00
	$670 80
Less Oilers.	52 00
Net Saving for month by using the electric Hoist	$618.00

This statement will perhaps satisfy Mr. Nordberg, who wonders what the object was to apply electric motors to these hoists. The 25% saving of fuel, which he quotes from my paper, refers to a certain class of steam engines, as can be seen by reference to the paper. The apparent fuel saving of the electric over the steam method deduced from the rock to coal ratios given (124:1 for the Winona steam hoist and 279:1 for the electric hoist) is over 50%. The steam hoist replaced by electric hoists at Winona may be, as Mr. Nordberg intimates, "of an uneconomical type, designed for preliminary operations in opening a mine," nevertheless, they are the steam hoists recommended and sold by Mr. Nordberg and other manufacturers for the purpose for which they are now in use. Some of the drums have a capacity of 1500 ft. of rope; the next drum purchased will have a capacity of at least 3000 ft. of rope. These drums will have to hoist all the rock left above the 1600-ft. level at that time, even if they are not built for the shallower depth. This is what happened when the Nordberg 3000-ft. hoist was installed at the D shaft of the Champion mine. The larger hoist had to be purchased for the greater depth, but had to work for some years hoisting from an average depth of from 600 to 1200 ft. The little hoist which is replaced would show a much better coal-to-rock ratio.

I am unable to check Mr. Nordberg's figures for the D shaft of Atlantic mine in April, 1903. He does not give the total coal burned. This hoist actually hoisted 18,180 tons of rock from an average depth of 2492 ft. on an average dip of 52°. The coal burned was 238½ tons. The rock-to-coal ratio is 76.2:1. At 600 ft. depth this is equivalent to a ratio of 316.46:1. Multiplying by 0.788 to reduce to vertical gives a ratio of 249.4:1. At this same hoist in March, 1906, a banner month, the product was 20,638 tons from an average depth of 2830 ft. The coal burned was 342 tons; the rock-to-coal ratio was 60.34:1, equivalent to 284.62 at 600 ft. depth; referred to vertical, it is 224.26:1. The B hoist at the Atlantic mine with a skip load of 1.536 tons, in February, 1906, hoisted 9448 tons of rock from an average depth of 2234 ft. The coal burned was 198 tons; rock-to-coal ratio, 47.72:1, at 600 ft., 156.04:1; referred to vertical, 140.2:1. This hoist has a separate boiler plant, while the D plant also serves a compressor and the rockhouse engine.

The comparable rock-to-coal ratio in my paper would be 279 × 0.94 = 262. Mr. Nordberg has used, to his apparent advantage, my conservative figures of four pounds coal per kilowatt-hour. It might be well to state that three pounds is not an uncommon figure. The Houghton County Electric Light Co., at its Houghton plant, gets monthly figure of 2.5 lb. coal per kilowatt-hour on the switchboard. The output will probably average about 1000 hp., with a high lighting peak. The Winona figure of 262 becomes 350 at 3 lb. per kilowatt-hour.

Mr. Nordberg appears to be inconsistent in his use of the word "efficiency." Efficiency is output divided by input. He charges for the full input, but gives no credit on the output side for windage in the hoisting shaft, handling of men and timber, for friction of skips, etc., or for the fact that King Philip No. 1 shaft was hoisting unbalanced. Using 1.54 kilowatt-hours per net ton from 600 ft. depth, which is the only figure he gives indicating results on the Butte hoists, we get, in a similar manner, an efficiency of $\frac{1.79}{1.54} = \frac{27.6}{23.7}$, 27.6% for the Butte hoists and, from his manner of statement, I would assume that the cost of reheating was still to be added. Does he mean that at Butte the result is the same as if we had a hoisting engine, the friction of which was 72.4%, with the cost of the reheating still to be added? If the Anaconda Copper Mining Co. would allow some of its officials to publish actual results from the Butte air hoists, the contribution would be of great value to operators everywhere. Mr. Nordberg gives no description of the Butte hoists and no figures of actual results obtained.

R. R. SEEBER.

Winona, Mich., July 17, 1912.

Sampling of Ore

The first section of the article under the above title in the JOURNAL of July 27, 1912, p. 159, does not seem to prove much. Reduced to lowest terms it seems to be a bald statement that carefully taken hand samples showed about 20% higher than the "actual contents" of the ore. How were the "actual contents" determined, by resampling or by recoveries? If the latter, might not the metallurgical losses in the process have been greater than suspected, or might not some of the employees been holding a private clean up?

That hand sampling can be made to give fairly reliable results was pretty well shown in C. T. Rice's article, "Grab Sampling in Stopes," (ENG. AND MIN. JOURN., Oct. 14, 1911).

It is one of the commonest of metallurgical practices to blame any differences between samples and recovery on the sampling. In the first place it saves any mental work on the part of the superintendent, and in the second it lets him out of any responsibility, leaving him free to talk of the economies of his administration.

SAMPLER.

Perth Amboy, N. J., July 29, 1912

Crystals and Optical Activity

I think that H. C. Jones, in his article on "Solution and its Importance," (ENG. AND MIN. JOURN., Apr. 6, 1912, p. 698), has made a few mistakes in his crystallography. He states that sodium-ammonium racemate forms two kinds of crystals, of which some contained only right-handed and others only left-handed faces. As a matter of fact most of the faces present are identical in both forms. The only one showing the enantiomorphous symmetry being a comparatively small and insignificant form (hkl) thus showing very few faces on the crystals.

Again he states, "From his work as a whole, Pasteur was able to see not only that asymmetry in crystalline structure was necessary for optical activity, but ——" etc. Not having a reference library here I cannot say whether Pasteur made this statement, though I do not remember seeing it when reading his works. Asymmetry in crystalline structure is not necessary for optical activity—take Mr. Jones' own instance dextro- and laevo-tartaric acids (not laevo-racemic—such a thing does not exist) when mixed in equal amounts and crystallized at the ordinary temperature, they come out as racemic acid in only one form showing no enantiomorphous faces. Pasteur himself investigated this, and finding it to be so, and therefore being unable to separate and dextro- and laevo-tartaric acids as such, transformed them into their sodium-ammonium salts, which do show the enantiomorphous symmetry referred to. Instances of bodies showing optical activity in solution and no enantiomorphous forms in their crystals might be multiplied indefinitely. There are also many bodies showing these forms which yet possess symmetry in the molecule—any crystal without a center or a plane of symmetry may do so. Two common instances are cuprite CuO and quartz SiO_2—both of which have fairly symmetrical molecules. Of course there is no known exception to the law that optical activity implies the existence of enantimorphous form in the molecule.

D. F. SANDYS WUNSCH

Naraguta, Northern Nigeria, May 21

The Importance of Observation

By Rensselaer H. Toll*

Attention to details and the cultivation of the faculty of close observation are essential to the success of the mining engineer for in his, far more than in other engineering professions, results often depend upon his ability to interpret nature's language, an ability acquired only by persistent study of the significance of all natural phenomena.

One of the most important qualifications of the successful engineer and one which the young members of the profession should strive assiduously to develop is the habit of close observation. It is the framework to which we apply the covering of technical knowledge by the nails of logical deduction. If the frame or the fasteners are weak or carelessly placed the result will be a faulty structure.

The prime requisites of a mining engineer are: (1) the ability to see things as they exist, (2) to understand what he sees; (3) to make profitable use of what he sees and understands. Other things being equal, his usefulness will be measured by his power of seeing, understanding and making practical application of the results of his observation; and of two men of about equal education and ingenuity the one who possesses the greater powers of observation will be much the more efficient.

A Faculty Acquired by Habit

The faculty of close observation is acquired by habit, rather than "bred in the bone." It results unconsciously from long familiarity with a subject, but one who has acquired the habit will be a close observer under all conditions. Among laymen a great difference in this regard is to be expected, but it is surprising how great a difference exists among engineers, in whom the faculty should be developed to a high degree. How many important factors are overlooked through lack of close attention to details!

The miner who breaks the most ground is not necessarily the quickest or the one who can strike the hardest blow. Such may be greatly outclassed by the slowly-moving plodder who carefully studies his working place and takes advantage of the lines of weakness or other characteristics of the rock, pointing his holes so as to obtain the maximum results with the minimum expenditure of powder and effort.

Likewise, the best engineer is not always he who makes a mine examination in the least possible time and bases decision upon the absolute value of ore in sight; for he may be found wanting by another, who, by closer observation and judicious application of his knowledge of geology or metallurgy, makes capital of details which the other fellow overlooked.

The appraisal of a mine is not entirely a matter of sampling and assaying combined with the use of simple arithmetical formulas—especially the appraisal of prospects or partly-developed mines, with which we have principally to deal. Each fault, slip and fracture should be studied as carefully as if the value of the property depended upon its relation to the ore occurrence; for, in mining geology, "every little movement has a meaning all its own,"—a meaning which all too often is overlooked.

The Significance of Surface Indications

Surface indications are of great importance, and a careful study of the surrounding surface may save much time in the underground work, often affording important clues to the situation of orebodies and the possibilities of extension. In the present imcomplete stage of our knowledge of ore formation it is not advisable to place too much reliance upon surface indications; but, nevertheless, they sometimes offer hints which are of great value.

It is quite amazing, when one stops to consider it, how much information regarding the character and position of the underlying rocks may be obtained by observing the character of the vegetation. Many trees and small plants have strong preference for certain kinds of soil and indicate by their presence or absence some of the constituents of the rocks which, by their decomposition, formed the soil sustaining the plant life.

In desert regions, where vegetation is sparse, this selective action of plants is most marked, but in almost any mining region a close observation of the flora will disclose the nature of some of the rocks beneath.

Often when the vegetation does not seem to indicate the chief constituents of the soil it may show quite plainly the possibilities for mineralization. For instance, a heavy growth of aspens or other trees or plants requiring much moisture may denote a fissured area, which would favor mineralization; while an even growth of vegetable matter requiring but little moisture may indicate a barren area. This condition exists in many districts.

Fissure Veins Sometimes Indicated by Vegetation

Fissure veins may often be traced by the character, color, absence or profusion of vegetable growth. If the vein filling is harder than the enclosing rock it will stand out above the latter, often devoid of vegetation; but when softer, and wet, the outcrop will often be plainly marked by the luxuriance of the vegetation, and sometimes by a plant which does not flourish in the soil at either side of the vein.

In the deserts of the Southwest the changes in the formation are apparent to even to a casual observer by the difference in the character of the plant life; and the line of division of two dissimilar rocks may often be seen for miles, though the rocks may be covered by several feet of soil or débris. Such plants as the yucca, cactus, cedar, piñon, ocotilla and many varieties popularly known as sage brush will be found to select certain lines or areas for their growth, indicating whether the soil is chiefly limey, siliceous, or clayey. Many plants show even the presence of certain metals which are favorable to their growth.

The important point of this discussion, however, is the examination of the rocks themselves, which is often carelessly done. It was close observation that led to the discovery of a peculiar piece of rock on the Gertrude dump which gave Thomas F. Walsh and Camp Bird, Ltd., their millions from this famous mine; and the discovery of most mines is the result of continuous application of the powers of sight and thought.

Discoveries of many of the rich mines have been called "accidents," but they were accidents only in that some man happened upon the ground with his eyes open. Prospectors have the faculty of observation developed to a high degree and, being always on the lookout for indications of ore, failure to notice those indications is really more of an accident than is an occasional discovery, as may readily be seen from a casual examination of any district which has been prospected to any extent.

The Results of Taking Things as They Appear

In this regard it seems that the average prospector is more careful than many mine managers and engineers, for there are numberless intances of workings being carried forward for years alongside bodies of good ore; an especially striking instance is the recent discovery of calamine of good grade in a number of the old mines at Leadville, large bodies of this ore having been exposed to view for several decades, unrecognized, though the mines had been visited time and again by engineers and metallurgists of international reputation. This only shows how easy it is to accept things for what they appear, without proper investigation, and how prone we are to overlook things which seem to have but little value.

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When the fever of speculation was at its height in Cripple Creek an ambitious Kentuckian came west to mine and sold a good farm which his father had left him, to invest in the booming stocks. Fortune has not yet smiled upon him, though he has not given up hope of some day regaining the farm. It seems that life on the farm was made doubly unattractive by the presence of extremely heavy boulders which cropped up at every plowing and had to be carted off and piled up out of the way; and the land itself was not prolific.

A few years after the sale of the farm zinc was discovered in the vicinity in commercial quantities and the purchaser of the farm soon found that his boulders were high-grade zinc ore, and what he has realized from the metallic products from his land have compensated many times over for the lack of fertility of the soil and the difficulty of cultivating it.

What Surface Features May Indicate

Some time ago I was called upon to examine an old mine which was being reopened, and before visiting the workings was informed by the superintendent that the country was entirely volcanic, the orebodies being in fissures in the "porphyry." However, a cursory examination on arrival at the mine proved that the vein was a fault-fissure following the contact of eruptives and sedimentaries. The difference in the character of the rocks was not easily distinguishable by candle light, but the identification of the foot wall as a mass of porphyry was indisputable, while any doubt as to the sedimentary character of the hanging was dispelled by the discovery of a considerable exposure on the surface, made by a recent cave-in, where the stratification of the rocks could be seen from a long distance.

Whether these physical features are any more favorable than if all the rock were porphyry is immaterial. The point is that, had the superintendent been more observing he might have recognized the different characters of the rocks and when he found a good-sized but low-grade vein on the contact he would probably have drifted on it and opened the rich orebody which lay within a few feet, instead of driving 150 ft. in the barren porphyry, at a loss of two months' time and $1500 of the company's money.

Another case to the point which was recently observed was a drift of several hundred feet on a portion of a vein which was highly impregnated with sulphides of iron and copper, and hence spectacular, though of unprofitable grade. The really valuable portion of the vein was unattractive to the eye and its worth was unsuspected until it was suggested to the manager that he break into it and sample it at different places, when it was found to be of profitable grade.

Another instance is of a promising prospect which was recently turned down by a mining man through lack of careful examination. A vein of good width and grade crosses a tunnel at what appeared to be about a right angle, and a drift was started in the foot wall and driven along the supposed strike of the vein. The latter, however, instead of being at right angles to the tunnel, really makes an angle of 50 or 60 deg., and the drift soon crossed the vein and was well into the hanging before the error was discovered. A bend was then made toward the vein, but before the breast had reached the ore, the contractor quit work and the drift was left in that condition, with the pay streak showing only where the drift crossed.

Mud and powder smoke obscured the identity of the vein and country rock; giving everything much the same appearance, and instead of making fresh exposures to determine the character of the rocks all along, the aforesaid expert took it for granted that the ore in sight where the vein was crossed was merely a "bunch," and that the vein lacked continuity,—an opinion which was deepened to conviction by the assay results from two samples of country rock which had been taken at the breast.

The Case of a Cripple Creek Lease

A few years ago a group of miners in the Cripple Creek district obtained a lease on a block of ground which had little to recommend it excepting its situation. However, they were confident that the area contained ore somewhere within its limits and they commenced development on a vein which in places was so obscure that the trail was lost a number of times, and but for the trained eye of one of the party which is characterized by the miners as a "nose for ore," they would scarcely have been able to follow the streak at all.

Several times their funds became exhausted and they were obliged to work elsewhere for wages until the necessary "grubstake" was at hand, when they would resume operations. After three or four disappointing resumptions they decided to sell the lease, but could find no buyers. Finally succeeding in unloading a three-fourths interest on a wealthy speculator who did not need the small sum with which he parted or the large one which he acquired, they advanced their drift a few feet and were rewarded by the glitter of sylvanite in an orebody which, during the last eleven months of their lease, produced nearly a million dollars.

The last case may be classed by some as of pure luck; but, no matter what part that indefinable element may have played in the final result, its accomplishment was due to dogged perseverance and the application of a well-trained faculty of observation. To carelessness or carefulness in the use of this faculty many failures and successes may be traced; and it probably is of greater importance in the business of mining than in any other line of endeavor.

U. S. 1911 Coal Production

The United States has become a half-billion ton coal country. During the last two years the total production has averaged just a trifle short of the 500,000,000 mark, exceeding that figure in 1910 and almost reaching it in 1911. The final figures compiled by Edward W. Parker, of the U. S. Geological Survey, show a total production in 1911 or 496,188,308 tons, valued at the mines at $625,910,113. Of this production Pennsylvania anthracite amounted to 90,464,067 tons, valued at $174,952,415, and bituminous coal and lignite to 405,724,241 tons valued at $450,957,608.

COAL PRODUCTION IN UNITED STATES IN 1910 AND 1911

State or Territory	1910 Tons	1911 Tons
Alabama	16,111,462	15,021,421
Arkansas	1,905,958	2,106,789
California and Alaska	12,164	11,647
Colorado	11,973,736	10,157,383
Georgia	177,245	165,330
Idaho	4,448	1,821
Illinois	45,900,246	53,679,118
Indiana	18,389,815	14,201,355
Iowa	7,928,120	7,331,648
Kansas	4,921,451	6,254,228
Kentucky	14,623,319	13,706,839
Maryland	5,217,125	4,685,795
Michigan	1,534,967	1,476,074
Missouri	2,982,433	3,760,607
Montana	2,920,970	2,976,358
New Mexico	3,508,321	3,148,158
North Dakota	399,041	502,628
Ohio	34,209,668	30,759,986
Oklahoma	2,646,226	3,074,242
Oregon	67,533	46,661
Pennsylvania bituminous	150,521,526	144,721,303
Tennessee	7,121,380	6,433,156
Texas	1,892,176	1,974,593
Utah	2,517,809	2,513,175
Virginia	6,567,997	6,864,667
Washington	3,911,899	3,572,815
West Virginia	61,671,019	59,831,580
Wyoming	7,533,088	6,744,864
Total bituminous	417,111,142	405,724,241
Pennsylvania anthracite	84,485,236	90,464,067
Grand total	501,596,378	496,188,308

The decrease in production in 1911 was 5,408,070 tons, or a little over 1%. The decrease is attributed by Mr. Parker wholly to the depressed condition of the iron and steel trade in 1911, which was reflected in the decreased production of coke. The three leading coke-producing States alone showed an aggregate decrease of nearly 9,000,000 tons of coal.

The decrease in the production of bituminous coal compared with 1910 was 11,386,901 tons, but this loss was largely made up by the increase in the production of anthracite, which was 5,978,831 tons greater than in 1910.

The average price for bituminous coal was one cent per ton lower in 1911 than in 1910 and that of anthracite was three cents higher. The total number of men employed in the coal mines of the United States in 1911 was 722,322, of which 172,585 worked in the anthracite mines of Pennsylvania. The average number of days worked in the anthracite mines was 246 and in the other mines 211. The average production per man was 3½ tons per day in the bituminous and lignite mines and 2.13 tons per day in the anthracite. The time lost by strikes in 1911 was insignificant.

The production of coal by States in 1910 and 1911 is shown in the accompanying table.

Pig Iron Production

The production of pig iron in the United States in the first half of 1912 as collected and reported by the American Iron & Steel Association reached a total of 14,072,274 long tons. This is an increase of 2,405,278 tons, or 20.6%, as compared with the first half of 1911, and of 2,089,723 tons, or 17.4%, in the second half. This production has been exceeded in two previous years, in the second half of 1909, when the total was 14,773,125 tons, and in the first half of 1910, when it was 14,978,738 tons.

The production for the half-year, classified according to the kind of iron made, is given below; comparison being made with the first half of 1911:

	1911		1912	
	Tons	%	Tons	%
Foundry & forge	2,788,355	23.9	2,835,016	20.1
Bessemer.	4,704,424	40.3	5,572,355	39.6
Basic	3,935,487	33.7	5,405,376	38.4
Charcoal	161,135	1.4	166,366	1.2
Spiegeleisen....	43,429	0.4	36,145	0.3
Ferromanganese	34,166	0.3	57,016	0.4
Total.	11,666,996	100.0	14,072,274	100.0

The bessemer production this year includes 124,162 tons of special low-phosphorus iron. Charcoal iron includes a few tons of pig iron and of ferro-alloys made in the electric furnace. The largest increase was in basic iron which gained 1,469,889 tons, or 37.3%; while there was an increase of 867,931 tons, or 18.5%, in bessemer.

PRODUCTION BY FUELS USED

The classification by fuels used is as follows:

	1911	1912	Changes
Coke and bit.	11,356,634	13,840,251	I. 2,483,617
Anthracite	149,227	65,657	D. 83,570
Charcoal......	161,135	166,366	I. 5,231
Total	11,666,996	14,072,274	I. 2,405,278

The small quantity made with electricity is included under coke. Only two or three furnaces use raw bituminous coal, and nearly all the anthracite furnaces use some proportion of coke mixed with the coal, so that practically 97% of the iron is made with coke as fuel.

PRODUCTION BY STATES

The production by States was as follows, in long tons, in the first half of 1912:

	Furnaces in Blast	Tons made	%
Mass. & Conn.	4	8,793	0.1
New York	17	880,581	6.3
New Jersey	1	2,773	
Pennsylvania..........	108	6,035,773	42.8
Maryland...	2	107,027	0.8
Virginia	6	129,127	0.9
Alabama	19	887,512	6.3
West Va.	2	129,155	0.9
Kentucky	1	21,017	0.2
Tennessee	9	147,076	1.0
Ohio	49	3,285,752	23.3
Illinois..........	20	1,304,227	9.3
Indiana & Mich.	20	788,252	5.6
Wis. & Minn.	4	153,420	1.1
West of Mo. River	5	199,789	1.4
Total	267	14,072,274	100.0

Producing furnaces west of the Missouri are found in Missouri, Colorado, Oregon and Washington, with one electric furnace in California. No furnaces were in blast in Oregon and Washington this year. The number of furnaces given in the table is that in blast at the close of the half-year.

CONDITION OF FURNACES

The whole number of furnaces in blast on June 30, 1912, was 267, against 231 on Dec. 31, 1911, and 212 on June 30, 1911. The number of furnaces idle, including furnaces being rebuilt, on June 30, 1912, was 200, against 235 on Dec. 31, 1911, and 201 on June 30, 1911. During the first six months of 1912 the number of furnaces actually in blast during a part or the whole of the time was 302, against 275 in the last half of 1911 and 297 in the first half of that year.

On June 30, 1912, there were seven new furnaces under construction, of which six will use coke and one charcoal; five furnaces were being rebuilt. During the half-year eight new furnaces were completed and seven were abandoned. The yearly capacity of the new stacks was 1,039,500 tons; that of the abandoned stacks was 215,000 tons, so that there was a net gain of 824,500 tons in capacity.

Stripping Hill Mines

DULUTH CORRESPONDENCE

Since the announcement several weeks ago of the letting of the contract for stripping the Adams mine of the Hill interests at Chisholm, Minn., it is reported that the contracts for stripping two other holdings of the same company will also be let. One tract is situated three miles northeast of Buhl, consisting of four forties in Sec. 15, 58-19; the other consists of one forty immediately west of the Mahoning mine at Hibbing in Sec. 2, 57-21. It is estimated that thirty million cubic yards will be removed from the former, and five hundred thousand from the latter. Neither of these properties has been given a name as yet, but it is expected that the Adams mine at Chisholm will be renamed "St. Louis" from the county in which it is situated; the fact that there is another Adams mine at Eveleth, also on the Mesabi range, necessitated a change.

It is planned that the Hill properties will be in shape to ship ore in 1915. The lands which have already been released by the Steel Corporation comprise all those on which no developments had been started, and it is understood that by releasing these now, instead of in 1915 when the balance will be given up, the corporation gained certain concessions from the Hill interests.

Swansea Consolidated

SPECIAL CORRESPONDENCE

The Swansea Consolidated Gold and Copper Mining Company has been organized to succeed the old Clara Consolidated Gold and Copper Mining Co., of Swansea, Yuma Co., Ariz. The new company has been organized by strong financial houses of France and Holland, and is entirely separate and distinct from the old company which formerly operated the property. The new board of directors represents the European interests and it proposes to develop and exploit the property in a businesslike way.

Camille Clerc a well known French engineer, has been placed in charge of the work as general manager. L. C. Mott is in charge of the smeltery and H. T. Hughes directs the underground operations.

During the last two months, under the new management, the condition of the mine has been much improved, and it is now producing 200 tons daily of 3% copper ore. The ore runs high in iron and from 6% to 12% SiO_2. The smeltery has just been blown in and is expected, in the near future, to handle 400 tons of mine run as well as 200 tons of outside ore. There are now about 225 employees on the property.

Asphalt in Utah

SALT LAKE CORRESPONDENCE

Among the little developed resources of Utah, that are beginning to attract attention, are the rock-asphalt deposits near Sunnyside, in Carbon County. The asphalt occurs as an impregnation of certain beds of sandstone, of which there are four principal ones. The largest is 200 ft. thick, and the three others average about 100 ft. each. The total tonnage available has been estimated at many million tons. The impregnation is said to be uniform, the deposit carrying between 10 and 12% pure bitumen. It is interesting to note that, when broken, the material is especially suitable for paving in its present condition; it is practically ready for use, without artificial mixing, after being crushed and heated. It has been tried in Salt Lake City with good results. The initial cost of installation is relatively low, and material which has been in use since 1893 is still in good condition. The cost of upkeep compared to that of other streets paved with California asphalt is relatively small. The deposit is in Whitmore Cañon five miles from Sunnyside, and is owned in part by the Pittsburgh-Salt Lake Oil Co., which holds 480 acres of ground, in which the deposits occur. The rock asphalt so far taken out, has been mined by opencut.

The Steel Committee Report

WASHINGTON CORRESPONDENCE

After months of unexpected delay the Stanley Steel Investigating Committee has finally made public its report concerning the work which has been in progress for a good deal more than a year past. The Stanley report besides going over the alleged facts which were ascertained in the investigation, also makes recommendations for legislation. This had not been expected, as it was supposed that the Stanley Committee was merely an investigating body and would, if it recommended anything whatever, confine its attention to the steel industry as such. Instead of that it has now branched out and made suggestions, putting them, moreover, in the form of regular bills, that would have reference not only to the steel industry but to every other. It in fact undertakes to recommend a general anti-trust program.

The Stanley report contains much old material practically accepting the work of the Bureau of Corporations in regard to many of the subjects connected with the steel industry which were studied by the Bureau. In particular it goes over the details concerning the organization of the different steel companies, with much minuteness.

The principal distinguishing characteristic of the report is the stress that is places upon the possession by the Steel Corporation of a very large power over ore reserves as well as over coal and other mineral materials that are needed in the manufacture of steel and iron. All this had been treated by Commissioner Smith in his report on the steel industry, but Mr. Smith had assigned considerably less importance to the subject than the Stanley Committee is inclined to do. Mr. Stanley and his associates moreover, seek to make out a case against the Steel Corporation for a general hostility to the public that was not detected by the Commissioner of Corporations. Particular stress is placed upon the absorption of the Tennessee Coal, Iron & R.R. Co. and the stock market deals connected with that episode.

Mr. Stanley's remedies for the evils he has pointed out in connection with the steel industry include a good many of the general "anti-trust" variety, but they are all tolerably familiar. It would seem that the recommendation which the Stanley group is disposed to push most strenuously is that which bears upon so-called "interlocking directorates.". These directorates are regarded as chiefly conclusive to close control of industry and their abolition is recommended. It would appear that the Stanley suggestions are not likely to receive attention at this session of Congress and in all probability will not be considered next winter either. This will throw the question over to a new Congress, which may take a different view.

Zinc Production in 1912

The United States Geological Survey has issued a bulletin, prepared by C. E. Siebenthal, giving the production and approximate consumption of zinc in the United States for the half-year ended June 30, comparisons being made with the first half and the second half of 1911. The figures for consumption are as follows, in short tons:

	1911		1912
	1st half	2nd half	1st half
Stocks on hand	23,232	17,788	9,081
Production	140,196	146,330	166,496
Imports	146	463	3,053
Total supply	163,574	164,581	178,630
Exports	10,884	10,343	13,170
Stocks at close	17,788	9,081	6,414
Total deductions	28,672	19,424	19,584
Apparent consumption	134,902	145,157	159,046

Of the exports this year 7331 tons are classed as "foreign exports" and 5839 tons as "domestic exports," presumably meaning zinc smelted from foreign and domestic ores. For the second half of 1911 the division was 6452 tons foreign and 3891 tons domestic; for the first half, 7903 and 2981 tons, respectively.

The production statement for the half year is as follows, in short tons:

	1911		1912
Made in	1st half	2nd half	1st half
Illinois	41,255	41,875	44,224
Kansas	50,574	47,839	52,485
Oklahoma	19,997	26,318	36,010
All other states	28,370	30,298	33,777
Total	140,196	146,330	166,496
From domestic ores	135,061	136,360	159,952
From foreign ores	5,135	9,970	6,544
Total	140,196	146,330	166,496

The production for the first half of 1912 shows an increase of 26,300 tons, or 18.8%, over the first half of 1911; and of 20,166 tons, or 13.8%, over the second half.

The statement of foreign ores and of ore exports is as follows:

	1911		1912
	1st half	2nd half	1st half
Zinc ore imported	27,885	38,097	27,049
Zinc contents	15,028	17,112	12,228
Zinc ore exported	9,625	8,656	13,709

Of the imports of zinc ore in 1912 about 95% came from Mexico, and 5% from British Columbia and other countries. These figures do not include some lead ores from South America containing less than 13% zinc.

Nevada Consolidated Copper Co.

The Nevada Consolidated Copper Co. produced 18,092,439 lb. of copper in the quarter ended June 30, 1912, divided as follows: April, 6,115,095 lb.; May, 6,063,462; June, 5,913,882 lb. There were milled during the quarter, 813,141 tons of Nevada Consolidated ore, averaging 1.66% Cu, of which 731,299 tons were from the pits, and 81,842 tons from the Veteran mine. In June the Steptoe plant milled 26,924 tons of Giroux Consolidated ore, the copper production from this ore not being included in the copper-production figures above. In the quarter previous, 17,578,450 lb. of copper were produced.

The metals on hand and in transit have increased by $702,611, and now amount to $3,936,680. Earnings were $1,628,859, from which dividends of $749,784 were paid, leaving net surplus for the quarter, $879,075. From this were allowed $141,161 for depreciation on the Steptoe plant and $134,603 for ore extinguishment, giving a net credit to undivided profits of $603,311. Expenditures for stripping amounted to $302,253, of which $131,294 was charged to operating, the balance to deferred charges, which now stand at $2,499,016.

In August and September it is purposed to determine the possibility of ore in depth at the Eureka pit. By that time the work will have been carried further westward, and will give a larger area for drilling below the bottom of the development holes.

Eastern States Copper in 1911

The Eastern States produced 19,605,386 lb. of copper in 1911, of which 18,850,276 lb. came from Tennessee, where the Tennessee and Ducktown companies operate; 665,110 lb. from Maryland and Pennsylvania, and 90,000 lb. from Virginia. The deepest shaft of the Tennessee company was 797 ft. in 1911, according to the U. S. Geological Survey, and the deepest of the Ducktown shafts, 900 ft. About one quarter of the Tennessee copper is shipped to Europe without refining, the remainder is refined in the United States.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

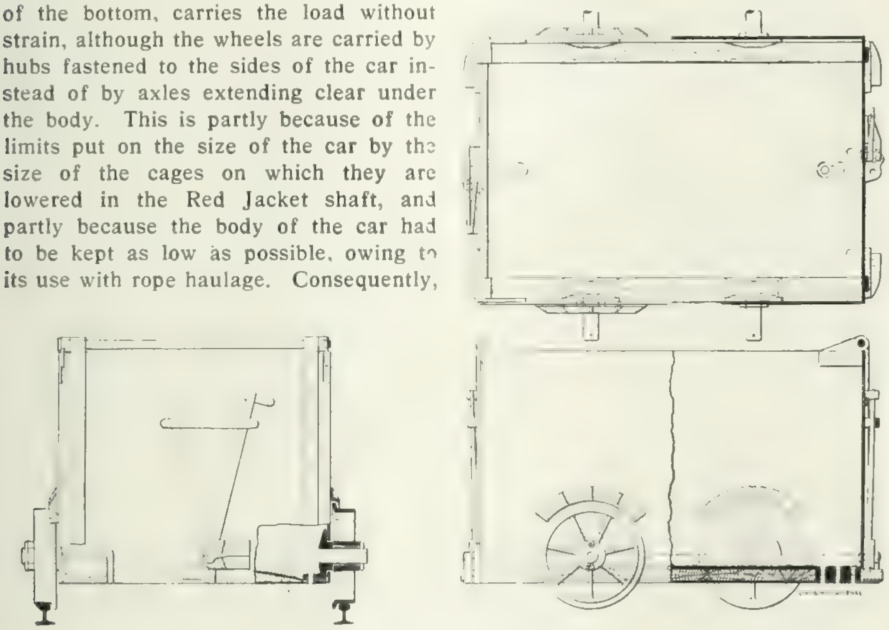
The Red Jacket Car

The car shown in the accompanying drawings is used at the Red Jacket shaft of the Calumet & Hecla company. The most interesting feature of the car is the manner of reinforcing the bottom. Two plates are used, bolted together to form a beam, with a filling of wood to give stiffness. The top plate is ⅜ in. thick while the bottom plate is ¼ in. thick, with wood filling two inches thick at the center. The gage of the track is 48 in. and the car has a capacity of 2½ tons of conglomerate ore.

This car, owing to the construction of the bottom, carries the load without strain, although the wheels are carried by hubs fastened to the sides of the car instead of by axles extending clear under the body. This is partly because of the limits put on the size of the car by the size of the cages on which they are lowered in the Red Jacket shaft, and partly because the body of the car had to be kept as low as possible, owing to its use with rope haulage. Consequently, axles could not be used, for it was desired to make the capacity of the cars 2½ tons.

The car is fitted with doors at each end to aid in loading boulders from the floors of the drifts when cutting-out stoping is being done, although most of the ore after stoping proper begins is loaded from slide chutes. As the car is used on the rope haulage levels, buffers are provided at the corners. The car is dumped by a chain coming down from an air cylinder over the measuring pockets at the shaft. The axles are greased by screwing a grease cup on the end of the hollow axle.

These cars stand up to the work well and no trouble comes from bowing of the bottom under the strain. The same design of bottom is used in the 7½-ton cars used to serve the underground bins at Osceola No. 13 shaft, where the track on which the car runs has a gage of 5 ft. 9 in. to enable the car to be kept low and short for dumping.



Car Used at Red Jacket Shaft of Calumet & Hecla Company

Joplin Method of Dumping Buckets

The following method of dumping buckets is practiced in the Joplin district when tramming the ore at surface to a bin near-by, as when the ore is being hand jigged, or for dumping buckets of waste as in shaft sinking. The shaft is straddled by the tub-truck tracks which are laid at a wide enough gage so that the bucket will come up between the rails without any likelihood of its hitting. Consequently the truck has a wider deck than the underground bucket cars, which run on a 14- or 16-in. track. On the truck is nailed a 2-in. cleat against which the front side of the bucket rests when it is landed on the car, while at the back end is a 4x6-in. timber also nailed to the deck. On top of this back piece the rear end of the bucket rests in a tilted-forward position.

The track when tramming to a near-by mill generally has a considerable grade so that the trammer can ride the truck out to the dump. He gets up considerable speed to the load so that when it strikes the cribbing of the dump the momentum causes the bucket to tilt forward. During this tilting the bucket is generally guided by the man, while at the same time he gives the bucket a slight push forward just as it strikes the dump so as to aid in unsetting in case the momentum of the load is not enough. The buckets on which these dumps are worked generally are not larger than about 22x30 in. A tall can, of course, works better than one with breadth equal to height, as in dumping such a can the center of gravity has to be raised relatively higher than in dumping by momentum.

The dump is a crib built up on the bin or the tracks to approximately the height of the top of the bucket car, which is about 15 in. This crib is securely tied in place so that the shock of the constant bumping will not move it and the crib timbers are securely spiked together so as to stand the work. This crib is made about the same width as the track, or several inches wider than the bucket, so that provision is made for side swing during the tipping of the bucket. In depth, speaking of the direction in which the bucket dumps, the crib is somewhat greater than the width of the bucket, yet considerably less than the diagonal of the longitudinal section of the bucket. Consequently, in dumping the top of the rim of the bucket strikes on the far side of the crib while the lower part of the side of the bucket is resting upon the near side of the crib. This throws the bucket into an inclined position so that the rock or ore slides out aided by its momentum. Owing to the roughness of the crib walls it is impossible for the bucket to go down through, although the section of the dump crib is greater than the bottom section of the bucket.

In some instances these dumps are rigged so as to allow side dumping of the car. The cribbing is then built alongside the track, with a bumping block fixed across the track to stop the car even with the dump crib. But in this form no aid comes from the momentum of the load and the blocks on the top part of the car truck have to be made so as to throw the bucket into practically a balanced position with the top pointing to the side on which the can is to be dumped; then with a slight push the trammer can dump the bucket.

The back block gives the pitch to the bucket necessary to put it in an unstable position, while the front cleat prevents sliding forward on the deck when the dumping impulse is given.

This dumping system is surprisingly simple and effective. Flying dumps are generally made as that is easiest on the man, and seldom, if ever, does the bucket fail to take the dump properly. In getting the bucket back on the car, all that is necessary is to tip the bucket straight back the way it came over and slide it back a few inches so that its front side is behind the forward cleat. The tilted position on the truck makes it possible to run the truck back up the track to the shaft without danger of the empty bucket slipping on the car.

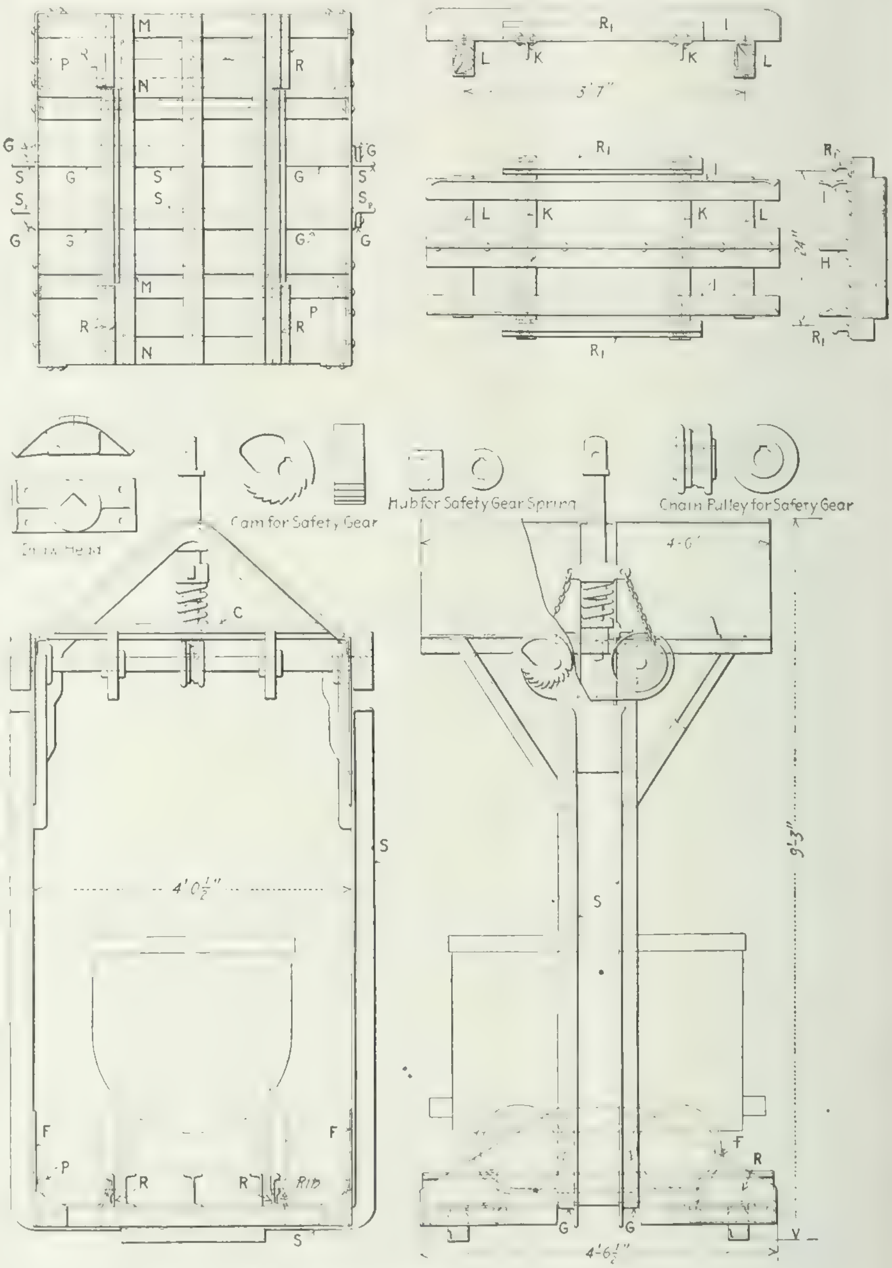
A Drop Bottom Cage

In the accompanying drawing are shown the details of the drop-bottom cages used at the mines of the St. Louis Smelting & Refining Co., in southeastern Missouri. The notable feature of the cage is that the car is locked in position on the deck by dropping the central part of the deck track. This track is carried on a framework that rests upon the bottom deck of the cage and under which are cross-beams that come down far enough so that the car and the central portion of the track are raised up level with the outer rails before the crossbars of the deck of the cage come in contact with the landing chairs. These outer fixed rails are given a slight slant toward the center of the car so that, if the car has not been put on properly, the jar of lifting the cage off the chairs will cause it to run to the center of the cage and drop down into the recess in the rails formed by the dropping of the central portion of the deck. Only its weight holds this movable portion of the deck in position so that in case of repairs the central portion can be easily lifted out to work on it.

Pans marked *P* in the drawing are riveted to the bottom of the deck so as to come up alongside the rails and keep anyone riding on the cage from getting his toe under the rails of the drop portion. In this way possibility of injury from that source during the hoisting of a deck load of men is prevented. Until these pans were put on, some trouble was experienced from a man getting his toes caught under the drop bottom when the cage was lifted off the chairs.

This seems to be a good way of locking the cars on the deck of the cage. It is quick and certain in its action, and forgetfulness of the men is guarded against. The lifting of a locking bail and dropping it again to lock the car in position on the cage, both at surface and at the different levels, are avoided, and so the men are able to cage quickly. The main advantage is that the possibility of a car getting loose in the shaft and causing a wreck is almost completely eliminated. A disadvantage is that the use of chairs in the shaft is entailed. In some districts, as at Butte, Mont., it is preferred not to use chairs, for the cars can be caged more rapidly without them and there is less danger from accident.

The bail is a 1x6-in. wrought-iron plate bent up into a short curve at the point and punched to allow the drawbar to go through. Plates are put in between the bail and the side plates to reinforce them and distribute the shear of the rivets used in fastening the bail over a larger area of the side plates.



Drop-bottom Cage Used in Southeastern Missouri

The cage is equipped with the ordinary type of cam safety catches operated by coil springs and chains from a collar on the drawbar of the cage. The side plate is punched to receive these dog shafts, while it also extends down the side of the cage to take the guide shoes *S*, which are angle irons riveted to the side plates. These shoe angles extend clear down under the deck of the cage so as to tie the deck securely to the sides. Also to the bottom where the angles are bent around to take the weight of the bottom, reinforcing plates *G* are riveted.

The deck of the cage is made up of the outer angle cross-braces *M*, the inner center braces *N*, and the shoe angles *S* that extend clear across to help form the bottom deck. The braces *M* and *N* are far enough apart so that the cross-braces *K* of the drop bottom can come down between them. These cross-braces *K* are timbers shod at top and bottom with channels. To the cross angles *M* and *N* of the main deck are bolted the rail castings *R*, which serve as rails to carry the car over to the drop bottom. These castings do not extend clear over the inner braces, but a ledge is left for the rails R_1 of the drop bottom to come down on so as to justify at the proper height with the rails *R*.

The drop-bottom frame is made up of the cross-braces *K*, the angle irons *I*, the longitudinal angles *H* bolted together, back to back, so as to stiffen the drop bottom, and the cross-braces *K* which carry the rails R_1 of the drop bottom.

In landing the cage the chair shoes come out and catch the cross-braces *L* of the drop bottom and raise the drop bottom even with the rest of the deck. By that time the shoes of the chairs have engaged with the outer angle braces *M* of the cage proper. It is by these cross-braces *M* that the weight of the cage is carried.

Joplin Type of Horse Whim

From the nature of the ore occurrence in the Joplin district, where many of the deposits are mined at shallow depths, the mining must be done by individuals rather than by companies, and this has led to the development of many excellent types of prospecting machinery, of which the horse whim is an example. It is probably the best type of horse whim in use today, being much better than the type of whim used in Western camps in which the drive is of the capstan instead of the geared type. In the Western type of horse whim the topman is stationed at the drive, as that is where the drum and brakes are placed. This is done with the idea of having the driver near the fractious western mustang. Missouri horse whims are built on the saner idea of placing the drum and brakes at the collar of the shaft, leaving the control of the better-trained Missouri horse to word of mouth and transmitting the power by a tumbling rod to the drum. This entails no danger from the horse or mule becoming unmanageable, as the driving shaft can be thrown easily out of gear with the drum and the bucket be held in the shaft by the brake lever, which lever is the same one that is used in throwing the drum out of gear.

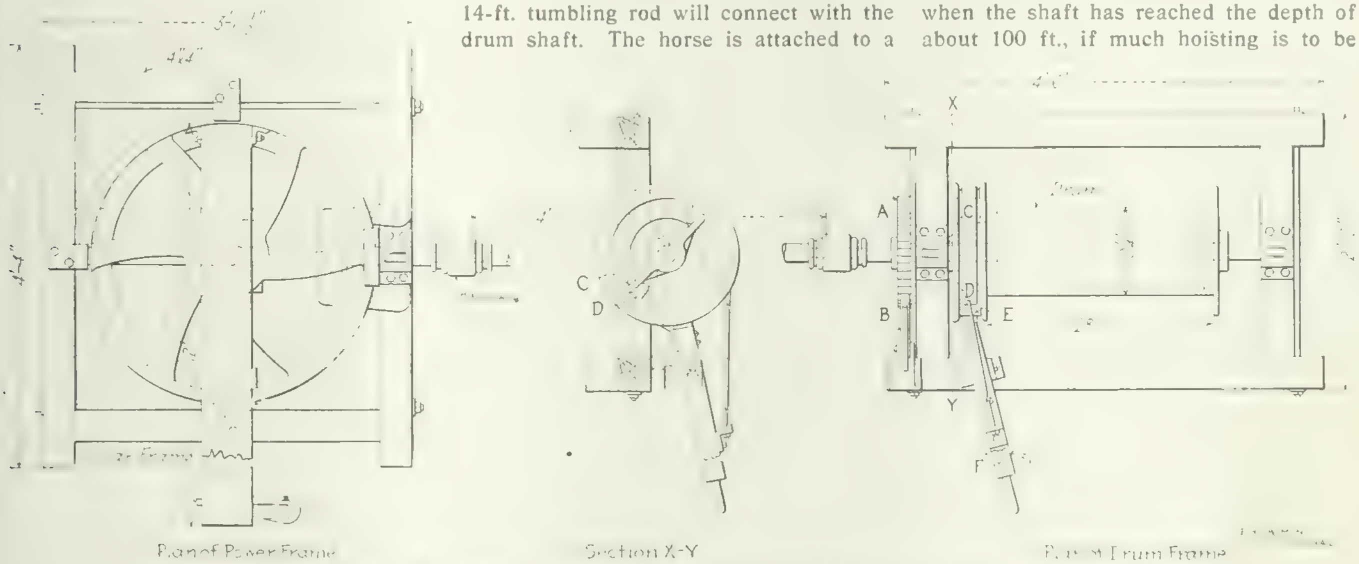
The headframe used with these hoists is of the derrick type, made chiefly of 2x6-in. planks. This headframe is made high so that where the ground is flat an upper floor may be built, which is necessary in order to get dumping room. On that account the brake lever, which is a piece of 3x3-in. timber, is made long enough for the driver to control the hoist from the upper floor while landing the bucket.

The bucket used in hoisting with these whims is made by cutting a 50-gal. oil barrel in half and binding and tying it together with suitable irons. This bucket will hold about 350 lb. of ore or rock. Small buckets are used in order that hoisting may be fairly constant; while one bucket is being filled the second is raised to the surface, dumped, and lowered so as to arrive at the bottom of the shaft just as the filling of the first bucket is completed.

The design of this Joplin horse whim is shown in the accompanying drawing. The horsepower gear is so placed that a 14-ft. tumbling rod will connect with the drum shaft. The horse is attached to a sweep, 12 to 14 ft. long, and as there are 77 teeth on the driving gear and 12 on the pinion, and as the drum is a little more than 10 in. diameter, the bucket is raised about 17 ft. to one journey of the horse around the ring. A knuckle is used to connect the tumbling rod to the shaft of the power pinion as well as to the shaft of the hoisting drum.

The drum is carried on a 4x4-in. oak frame as is also the driving gear. The frame is securely fastened to the frame of the derrick in an upright position. The rope, which is generally an old ⅝-in. rope that has been used until too worn to be safe on one of the steam hoists with its larger loads, reels directly on the drum from the top sheave. To prevent the bucket from running back when the drum is in clutch, a ratchet and dog are provided. These are shown in the illustration and are marked *A* and *B*. The drum is loosely mounted on the drum shaft, while keyed to the driving shaft is a double-arm dog *C*, that engages with the two plugs marked *D*, which form part of the end casting of the drum. An outer groove is made in this casting for the brake strap *E*, which is lined with leather as wood is too bulky for brake lining on such a hoist. Pieces of old belt are used for this lining; it lasts well, and gives a good grip on the drum. The brake lever is fulcrumed either from the top cross brace of the drum frame or else from a 2x6-in. cross piece nailed to the headframe about 18 in. from its lower end. This is a loose fastening permitting side swing to the lever, as it is by the side throw of the brake lever that the drum is thrown into or out of clutch with the dogs on the driving shaft.

These hoists can be obtained at any time for about $50, f.o.b. Joplin, Mo., or may be made cheaply at any local foundry. Their great advantage is that the driver is stationed at the shaft where he can watch the bucket as it comes up. The horse hoist is usually abandoned when the shaft has reached the depth of about 100 ft., if much hoisting is to be done, and a steam hoist is substituted as horse hoisting is too slow to be economical at greater depths.



Horse Whim and Hoisting Drum Used in the Joplin District

Concrete stringers for supporting the skip rails in inclined shafts were first used in the Lake Superior copper countyr by the Ahmeek Mining Co., and later by the Mohawk Mining Co. The rigidly constructed skip running at high speed on a rigidly supported track resulted in doubling the cost of skip repairs, because the skip axles rapidly became "crystallized" and the rivets worked loose. The repair bill was reduced to normal by molding 2-in. pine strips into the stringers at 3-ft. intervals in such a way that the strips projected ½ in. above the stringer. The rails were then relaid upon these strips. The strips were treated with a wood preservative before using and after four years' service are sill in good condition, none having been replaced

Exploring the Sudbury Orebodies

By Hamilton Maxwell

Under the conditions of ore occurrence in the Sudbury nickel-copper district in Ontario, exploration for the ore and "proving" the tonnage and grade of the ore when found can be satisfactorily done by diamond drilling. The drilling is done usually by contract at about $3.50 per foot.

The location of the holes and general direction of the work is usually under the charge of the company's own engineer, who lays out a general program based on a consideration of the geology and any available data from previous explorations.

The engineer should be in close touch with the work to correlate the new holes with the results obtained in holes already drilled. A "corechopper" checks the cores and prepares them for sampling. Usually it is advisable to have surface, topographic and magnetic surveys made prior to the drilling.

The first drill holes are necessarily tentative. These "scout" holes ordinarily need not be very deep. Other holes are placed to "prove" the orebody. Holes are drilled usually at right angles to the plane of the contact but vertical and "fan" holes are sometimes advisable.

The core is sampled in 3-ft. sections or according to the changes noted. It is broken up and the whole material assayed. The barren core is of value only in interpreting the geology and is usually not saved after inspection by the responsible engineer.

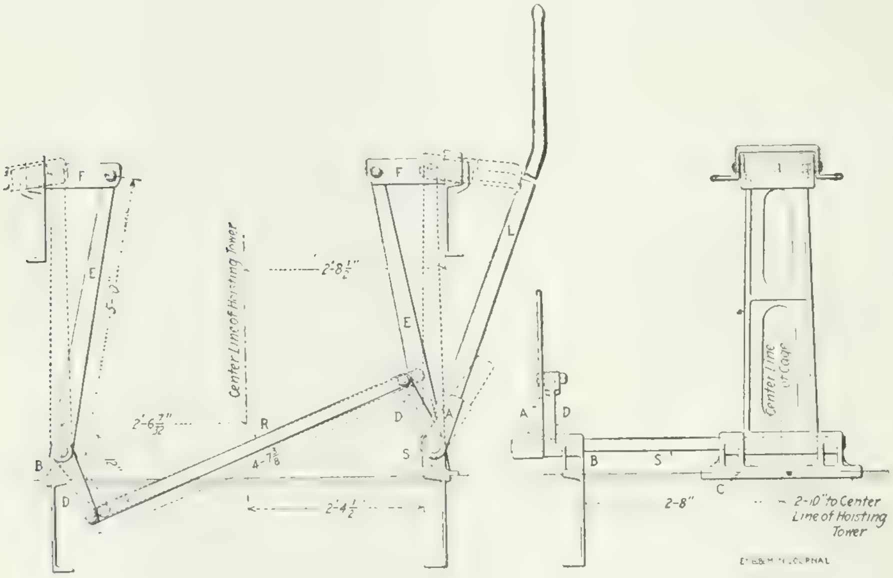
Obviously the costs of proving ore by drilling vary greatly. They may range from 5c. to 20c. per ton on an extensive drilling campaign. If a large orebody is encountered without much preliminary drilling they may be only a fraction of the smaller figure. In any case the expense should be charged against the cost of the ore as the drilling is an aid to the economical extraction of the ore.

In exceptional cases, exploration by shaft is desirable but this is more expensive than drilling and slower. A drill hole advances from 10 to 25 ft. daily in this district and several drills are often used.

Chairs for Drop Bottom Cages

The details of construction of the chairs for the drop-bottom cages that are used at the shafts of the St. Louis Smelting & Refining Company in the lead district of southeastern Missouri, are shown in the accompanying drawing.

The chairs are made to come out and catch the cage under the center of each side so as to lift the drop part of the cage deck on which the car is resting, level with the outer rails of the deck before the weight of the whole cage comes on this chair.


F
E
L
R
D
S
A
B
C
Center Line of Hoisting Tower
2'-8½"
2'-6"
2'-4½"
2'-8"
2'-10" to Center Line of Hoisting Tower
Center Line of Cage
E.&M. JOURNAL

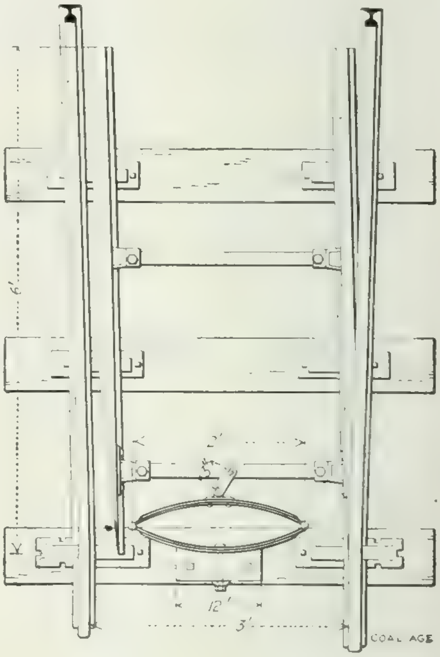
Details of Chairs for Drop-bottom Cages

The bearings *B* and *C* are carried from a member of the headframe to which they are securely bolted. In these bearings are carried the chair shafts *S* to which are keyed three arms: the lever arm *A* to which the lever is bolted; the link arms *D* and the chair arms *E*. A rod *R* connects the link arms of the two chair shafts together. The chair arm is a heavy steel casting about four feet long. To the upper end of the chair arms are bolted the chair shoes *F* that are moved out over channels riveted to the headframe at the proper height for landing the cages. On the inside end of the chair shoe is a hook that engages with the channel on which it slides and limits the inward throw of the chairs.

Locking Switch for Inclined Plane

Every mine superintendent who has operated or is operating a mine where the ore is lowered by gravity, will probably be glad to hear of any scheme that will automatically lock the switch points on an incline with three rails above and two below the parting.

It often happens that the parting point cannot be seen by the man at the drum, and he must trust almost entirely to good luck to properly land his trip. To know that he has a device that will positively lock the switch points relieves the drum man of unnecessary worry, and makes his position more secure. It has been my lot, states A. W. Evans, in *Coal Age*, for the last 18 years to be in charge of mining operations where gravity planes were used, and in the history of each plane, where the arrangement of three rails above the parting and two below was used, a number of wrecks occurred at the switch points.



Switch-locking Device

In the accompanying illustration, a device for locking a switch on an inclined plane, is shown. It is simple in construction and positive in its action. The device consists essentially of an elliptical spring —usualy an old buggy spring—bolted to a block of wood and then made secure to a track tie, as shown, with its upper side fastened to the switch bar. Its action is to hold the switch point close to the rail, no matter which way the switch may be set. Each down-coming car automatically sets the switch for its own track and the spring practically locks the points in position, insuring a safe delivery of this car over the proper track to the head of the incline.

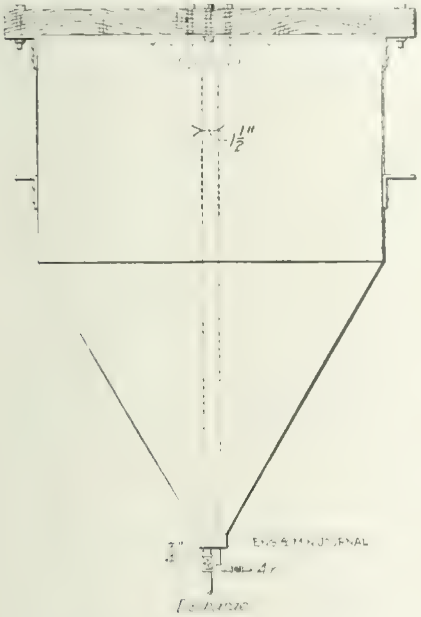
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Laboratory Pulp Agitator

By Evans W. Buskett*

The accompanying engraving shows a cheap and convenient agitator for cyanide experiments. There being no heavy sheet iron in camp the agitator was made from the heaviest galvanized iron obtainable. It was riveted and soldered on the outside, no solder being put on the inside. The machinist made an iron plug with provision for an air inlet and tailings discharge. The plug was soldered into the bottom of the cone, which may sound queer to some, as it did to the tinner who made the agitator, but clean iron can be soldered with common solder almost as easily as tin. The tailing discharge was fitted with a ¾-in. pipe and stopcock. Brackets were riveted to the sides to support the tank and at the top for anchoring the wooden bar which supports the umbrella.



Laboratory Pulp Agitator

The material being galvanized, it was, of course, necessary to remove the zinc to prevent the precipitation of the gold and silver. This was done by swabbing the interior with commercial hydrochloric acid and washing thoroughly with water. When dry, it was painted with asphalt paint, which was poured on.

The umbrella was supported by a bolt in the center, while the pipe was supported by two bolts passing loosely through the umbrella. The central pipe was 1½ in., with an ordinary 1½-in. flange coupling at the upper end. By these supporting bolts the umbrella or the pipe could be raised or lowered independently or the whole arrangement could be lifted out by raising the wooden bar supporting it.

The agitator was 18 in. in diameter and 30 in. high overall, and was used in the cyanidation of silver tailings, a 25-lb. sample being used in each test, although the tank has a capacity of 50 pounds.

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*Metallurgical engineer, Joplin, Mo.

A Taylor automatic stoker is to be tried in connection with one of the reverberatory furnaces of the Michigan Smelting Co., at Houghton.

Canvas Tables of the Combination Mill

Canvas tables were more in vogue in this country before the perfection of the cyanide process and before the early types of bumping tables came into favor. Still at several gold mills in the United States, canvas tables are now used. More extensive use of canvas tables was made in the earliest days of stamp milling in Australia. There it was the custom at the mills to stamp custom ore in small lots, carefully cleaning up amalgamation and canvas tables upon completing the stamping of a lot of ore supplied by one man, before starting a lot supplied by another. It was then customary for

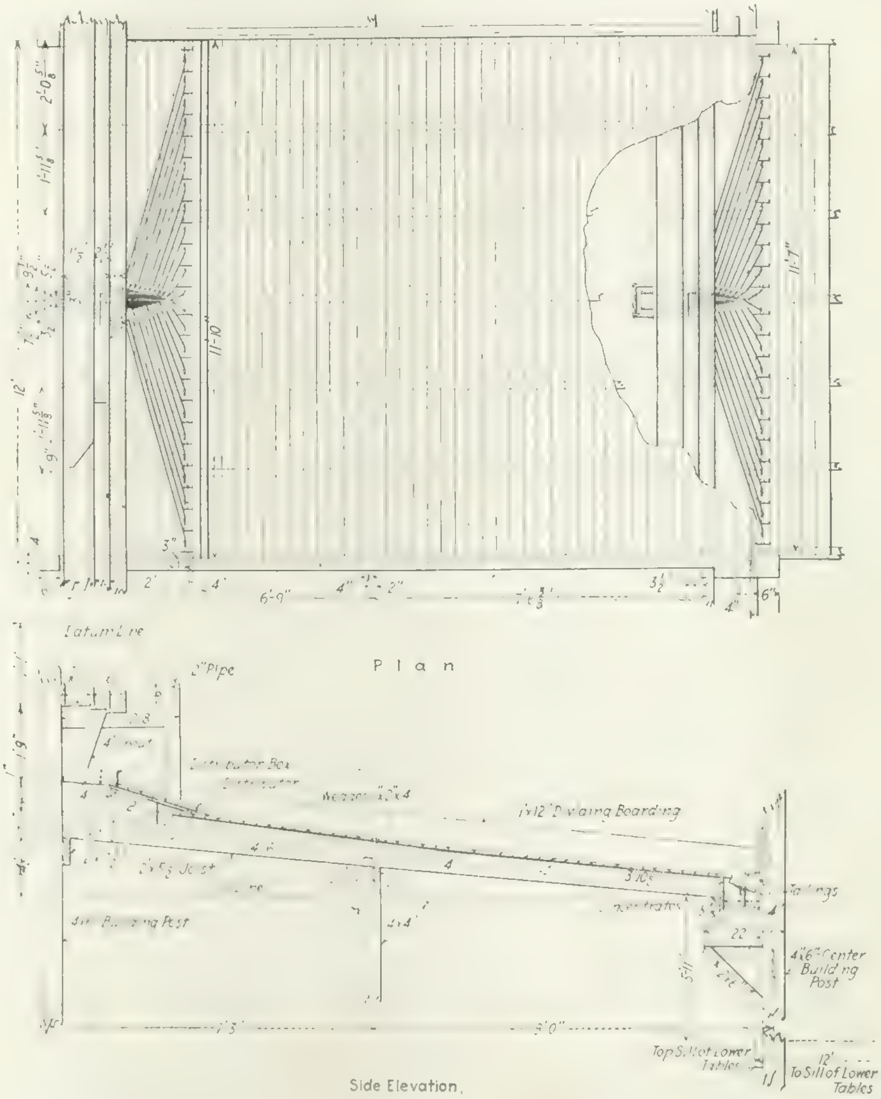
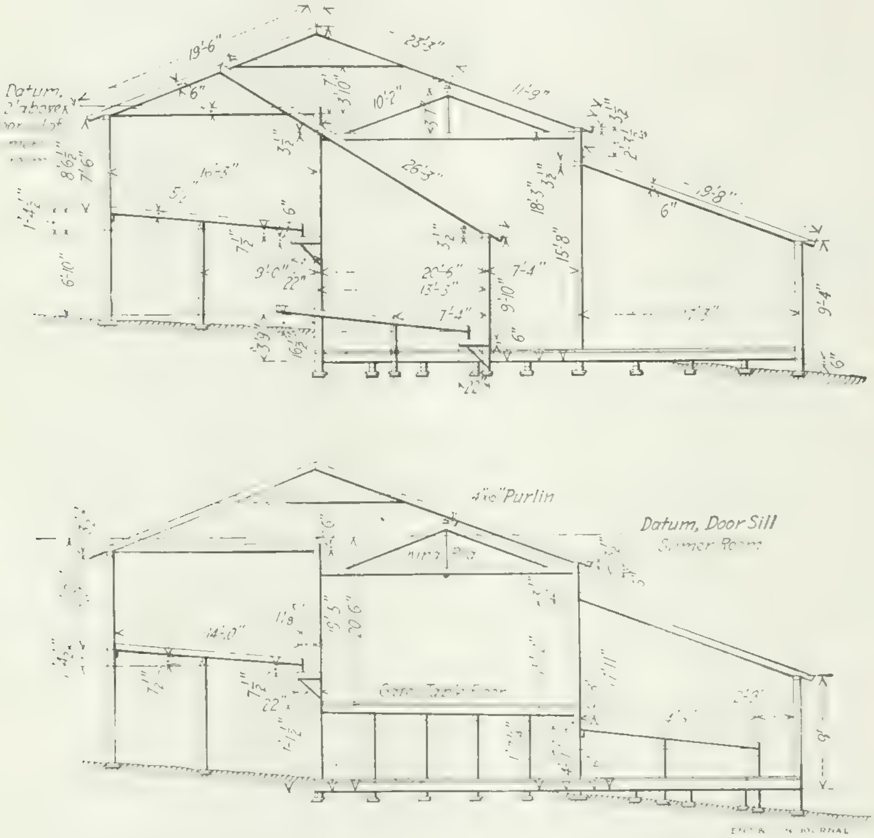


Fig. 1. Details of Canvas Tables Used in Old Combination Mill, at Goldfield, Nev.

the owner of the ore being stamped to attend to and clean up the canvas tables. Bullock's skins were often used instead of canvas—the particles of gold becoming entangled in the hair.

A canvas table is an extremely simple device to construct. It is simply necessary to build a substantial support for the canvas covering. The slope or grade of the table and the amount of water required must be determined by experiments upon the crushed ore that is to be treated. Sticky ores, those containing much clay, and ores containing heavy minerals, must be treated on a table, the grade of which is steep, compared with the grade of a table treating granular ores or those containing few heavy minerals.

The greatest ingenuity required in the building of a canvas table is in the manner of distributing the pulp at the head end, and in arranging some device by which the concentrate caught by the canvas cover, can be readily removed at frequent intervals.



No. 2. Cross Section of Canvas-table Plant

In the accompanying illustration is shown the canvas table, designed by A. G. Kirby, and used at the old Combination mill, at Goldfield, Nev. The notable features of this table are the distributing trough at the head end and the manner of deflecting the concentrate into a collecting launder at the end of the table when the supply of feed is shut off and the concentrate is to be gathered. The manner of collecting the concentrate and distributing the feed, is clearly shown in the accompanying drawings. The canvas tables were arranged in the Combination mill, as is shown in one of the sketches. The tailings from the lower end of the first table were sent to the feed trough of a second set of tables placed below and extending out from the tail end of the first series. Later the tailings from the first set of tables were sent to Gates vanners, and tailings from the vanners were then caused to flow over the second set of canvas tables. Still later the second set of canvas tables was abandoned.

After a canvas table has been in use for some time, especially where, as in the case of the Combination mill, lime was fed to the dry ore in the bins before crushing, the canvas covering soon becomes coated and the interstices of the threads filled with a deposit of lime salts. At the Combination mill it was the custom to remove this lime deposit from time to time by treating the canvas with dilute acid. In some mills where the gold is in an exceedingly fine state, this deposition of lime salts on the surface of the canvas might not prove a disadvantage, for it often is the case that the fine flakes of gold will adhere strongly to a very smooth surface; an example being the cement tables now used in some of the Mexican gold mills. This fine gold is often efficaciously recovered by the canvas table after the pulp has passed over amalgamation tables of the usual type.

Where the amount of material caught is small, and consists largely of fine, clean, or even dirty gold, it is the practice in some mills to treat the canvas-table concentrate in a tube mill or grinding pan, or in a Berdan pan, mercury being added and this fine or dirty gold being amalgamated. In other plants, the concentrate is cyanided, in others reconcentrated and shipped; depending on local conditions and the nature of the concentrate itself.

The amount of water that must be used to transport the finely crushed ore over the canvas surface, depends largely on the nature of the ore and grade at which the table is set. The amount of water used in cleaning is entirely dependent on the skill of the operators; some men will use three or four times the quantity of water that will be amply sufficient for another. At the Combination mill, 54% of the total ore milled, or an average of 1400 tons of slime per month, was treated in the canvas plant. The percentage of the total recovery made by concentration on vanners and canvas tables ranged from 17 to 28%; by the canvas tables alone, 7 to 13%. The average weight of concentrate recovered per month after passing over Gates vanners was 21.4 tons. The sizing test of the feed is shown in Table I. The costs of operation were as follows: Labor, 18.5c.; repairs, 3.0c.; power for vanners, pumps and lights, 3.0c.; acid, 0.5c.; sundry supplies, 5.0c.; total, 30.0c., per ton of pulp treated, not including superintendence and general expense.

TABLE I. SIZING ANALYSIS OF CANVAS TABLE FEED

Mesh	Heads Percentage Held	Tails Percentage Held	Extraction
+100	1.5	1.3	0.300
+150	12.2	9.8	0.600
+200	0.07	0.7	0.792
—200	13.3	9.6	
—200(slimes)	72.5	78.4	11.310
	100.2	99.8	13.002

An Adjustable Drafting Board

In the article published under the above caption in the Journal of June 8, 1912, there are several typographic errors that make the description of the drafting board somewhat obscure. They are as follows: The first sentence of the third paragraph should read: "The legs *H*, were also made of ¾-in. pipe, 2 ft. 8 in. long"—not "2 to 8 in. long." The last sentence in the first column should read: "The rest of these hinges are merely two short pieces of light strap iron." The last word in the paragraph at the top of the second or middle column should be "rod," not "iron." The second sentence of the last paragraph should be—"Setscrews are put in the coupling *L* and *L'''*—not "Such screws, etc." and the "of," the third word from the last in the article should be omitted. In the illustration one side of the endless cord should be shown as passing in front of *A A'* the supports.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Crosscutting in Caved Ground

In running a 600-ft. crosscut through soft porphyry and partly through a caved area in a Nevada mine, the last 179 ft. of the crosscut cost $13.13 per ft. Included in this cost were 7341 B. ft. of sawed and 14 ft. of round timber; $265\,^{6}/_{8}$ eight-hour shifts of labor was required to break the ground, tram the rock and put this amount of timber in place. The timber consumption was equal to about 41 b. ft. per ft. of crosscut and labor for mining, mucking, tramming and timbering was equivalent to 1.48 eight-hour shifts per ft. A total of 419 holes was drilled; 880 lb. of dynamite and 2414 ft. of fuse were consumed, equivalent to a little less than 5 lb. of dynamite per foot of crosscut and about 5.76 ft. of fuse per hole drilled. The candle consumption amounted to 1063 candles or a little over four per man per shift. The accompanying table gives the totals that make up the $13.13 per foot.

CROSSCUTTING COSTS IN A NEVADA MINE

Miners, muckers, trammers and timbermen	$1052.94
Dynamite	120.87
Caps	3.26
Fuse	10.86
Candles	24.80
Timber	285.86
Superintendence, shift bosses and surveying	170.62
Hoisting	215.82
Air and tools	139.72
General expenses	296.13
Assaying	38.70
Total for 179 ft.	$2359.58

The cost of driving 171 ft. of crosscut before reaching the caved area was only $8.90 per ft., indicating that it costs about 47.4% more to drive through caved ground than it does through virgin territory. Labor was figured at $4 per shift for miners, $3.75 for muckers, $4.50 for timbermen and $4 for timbermen helpers.

Concentration Costs, Bluebell Mine

The following costs were incurred at the Bluebell mine, Riondel, B. C., in concentrating an ore consisting of 35% quartz, 35% pyrrhotite, 20% marmatite, and 10% galena. The object was to recover the galena, of which 85% probably was found in sizes of from two to 10 mm., usually associated with the pyrrhotite. The greatest difficulty was found in the presence of a large amount of lead-bearing pyrrhotite middling, which requires recrushing, reports S. S. Fowler, in the *Bulletin* of the Canadian Mining Institute, February, 1912.

There were three shifts, each consisting of boss, jigman and tableman, while on the day shift were three more men, used in dumping, weighing and crushing. Water power is supplied by five 24-in. impulse wheels. No amortization charges are included in the power costs.

BLUEBELL CONCENTRATION COSTS

	Per Ton
Bosses, jigmen and tablemen	$0.186
Weights, crusher, miscell.	0.057
Heat, light, and power	0.022
Repairs, labor	0.085
Supplies for breaking and rolling	0.031
Supplies, conveying, pumps, launders	0.042
Supplies, sizing, jigging, tabling	0.026
Miscellaneous supplies	0.036
Loading concentrates	0.013
Total.	$0.498

In the time covered by these costs, there were 43,069 tons milled in 5494 hours of running; 994 hours were lost on repairs, and 88 by holidays.

Costs in the Iron River District, Michigan

The Iron River district is situated in Iron County, Michigan, in the vicinity of the towns of Ironwood and Stambaugh on the Chicago & Northwestern R.R. Dr. C. K. Leith describes the district as follows: "The ores are in closely folded, upper Huronian slates. The iron-formation lenses are uniformly steep dipping. In a large way they have a distinct linear trend, but almost every property shows major and minor buckles and considerable narrowing or widening of the formation. The walls of the orebody may be all slate, all jasper or any combination of the two. The larger orebodies occur in places where formation has been thickened by folding. The axes of these folds are favorable places for the concentration of ore. They have steep pitches and should have great persistence in depth. The underground developments are yet shallow, the deepest mine being 690 ft. deep and the average about 450 ft. Drilling, however, has shown the ore down to a depth of 1712 feet."

The important mines of the district are expected, in the future, to produce about 2,000,000 tons of iron ore per year. The Caspian mine is the largest in the district, having a probable ore reserve of 10,000,000 tons, which is one of the largest orebodies in the Lake Superior region. Its bottom level is about 290 ft. deep with a cross section of 377,000 sq.ft. and drill holes have shown ore on the north at more than 1300 ft. in depth. It is operated by the Verona Mining Co., which also operates the Baltic, Fogarty, and the Houlihan, a new property. The Osana is probably the next in importance to the Houlihan and is owned by the Mineral Mining Co., together with the Wauseca and the Nanaimo. Other mines in the district are: The Chatham of the Brule Mining Co., the Hiawatha and Chicagon of the Munro Iron Co., Tully and Baker belonging to the Corrigan, McKinney & Co., and other small properties and explorations, operated by the Oliver Iron Mining Co., Davidson Ore Co., Niagara Iron Mining Co., and the Huron Iron Co.

A summary of a 5-year period, 1906-1910, shows that the average cost of the ore produced during that period was 103.75%, with the average value of the ore based at 100%. This is partly accounted for by the large amount of exploration and development work during the period mentioned. The items that make up the total cost as stated show the following ratio to the value of the ore: Mining, 39%; exploration and development, 19%; construction, shafts, machinery, etc., 7.5%; general expenses, including administration, 2.6%; royalties, 6.3%; taxes, 0.55%; rail freights, 11.5%; lake freights, 15.3%, and commissions, 2%. While this means that the expenditures have averaged 3.75% more than the value of the ore, if construction, exploration and development are figured at the average for all other districts in the state the profit should eventually be about 19% of the average value of the ore.

Meyer & Charlton Costs

As stated in the 1911 annual report of the Meyer & Charlton Gold Mining Co., Transvaal, South Africa, 123,043 tons of ore were mined from which 6289 tons or 5.11% of waste were discarded by hand sorting, 1190 tons being sorted out underground and the remainder after hoisting the ore to the surface. The mill crushed 117,154 tons in 247.7 days with an average of 75 stamps which is equal to a stamp duty of 6.30 tons per day. The cyanide department treated 113,727 tons of sand and slime consisting of 83,541 tons of sand and 30,186 tons of slime which was equal to 71.3 and 25.7% respectively of the mill pulp. The plant for treating accumulated slime treated

36,369 tons averaging 2.649 dwt. gold per ton and made a theoretical extraction of 82.95%. The total cost of production was $4.61 per ton made up of $2.01 for mining, 15c. for sorting, crushing and transportation; 56c. for milling; 84c. for cyaniding; 46c. for general mine expenses; 30c. for mine development and 29c. for head office expenses. The average value of the yield per ton was $8.55 which indicates a profit of $3.94 per ton of ore including recovery from accumulated slimes.

Tons per Man

Several articles published under this heading have given the tons of ore secured per man per year as figured from data obtained from annual reports. So far figures thus given have shown a wide range according to the class of men employed, indicating that where intelligent white men are employed the tonnage rate per man is higher. It is interesting to note what H. C. Hoover says in his book "Principles of Mining."

After stating that the actual outlay for labor represents from 60 to 70% of the total underground expenses and a general discussion on the relation of efficiency to general results, he says: "Much observation and experience in working Asiatics and negroes as well as Americans and Australians in mines, leads the writer to the conclusion that, averaging the actual results, one white man equals from two to three of the colored races, even in the simplest forms of mine work, such as shoveling and tramming." In reasoning this out Mr. Hoover attributes this fact, among other things, to the necessity of a greater amount of direction, waste of supplies, more accidents, more ground to keep open for increased numbers, and increased expense in handling men in and out of mine.

These opinions have only been arrived at after a careful study of the whole situation as indicated by the data given in his book which is substantially quoted herewith.

Four groups of gold mines were taken from India, West Australia, South Africa and Western America, all of which were working in depth and using every labor-saving device available. The conditions at all the mines were practically the same, stoping width from four to five feet, except that at those working white men conditions were less favorable owing to heavy supports required in stoping.

At four Kolar (India) mines where the average wages were about 20c. per day for native labor, 963,950 tons were secured with 13,611 colored men, and 302 white men engaged wholly in superintendence, 69.3 tons were secured per man per annum at a cost of $3.85 per ton. Six Australian mines paying about $3 per day for white labor and employing 1534 men produced 1,027,718 tons or 669.9 tons per year per man at an average cost of $2.47 per ton.

At three South African mines in Witwatersrand, where two-fifths of the colored men employed were negroes and three-fifths Chinamen; 2,962,640 tons were mined with 13,560 colored men and 1595 white men at the rate of 195.5 tons per man per annum and at a cost of $2.68 per ton. The negroes receive about 60c. per day and the Chinamen 40c. including board. The white men were almost wholly engaged in superintendence of some form.

At the five American mines selected to compare with these properties 1,089,500 tons were mined with 1524 white men at the rate of 713 tons per annum, and at a cost of $1.92 per ton. The average wage was approximately $3.50 per day. Attention is called to these facts to refute the statement so often heard about the advantage of cheap labor. Mr. Hoover is of the opinion that "no engineer or investor in valuing mines is justified in anticipating lower costs in regions where cheap labor exists."

Alaska Mining and Milling Notes

During 1911, at the Alaska-Mexican mill, one pound of chrome steel in the shoes crushed 2.61 tons of ore and one pound of iron in the dies, made at the Treadwell foundry crushed 5.71 tons of ore at a total cost of 2.61c. per ton of ore crushed for iron and steel consumed. Stamp duty was 5.27 tons per day.

The cyanide plant, operated jointly by the Alaska-Treadwell, Alaska-Mexican, and Alaska United companies treated 17,751 tons of concentrates from May 15 to Dec. 31, 1911, at an estimated extraction of 96.5% on an average grade of $60.43 per ton.

The cost of concentrate treatment was $2.8115 per ton of which $1.1349 was for labor, 10.76c. for electric power, 30.90c. for pebbles, 47.25c. for cyanide, 6.69c. for lime, 21.47c. for zinc dust, and 50.59c. for sundry supplies. Some of the unit costs per ton were: 20.36 lb. of pebbles in grinding, 2.28 lb. of cyanide and 7.37 lb. of lime in cyaniding, 2.79 lb. of zinc dust in precipitation, and 27.98 kilowatt-hours of electric power, per ton of concentrates treated.

At the mine a record from 1909 to 1911, inclusive, as given in the annual reports shows that in mining 667,017 tons of ore and performing 13,925 ft. of development work, the average consumption of dynamite was about 1.1 lb. per ton of ore produced; candle consumption equals 0.24 lb. and drill steel approximately 0.258 lb. per ton of ore. The dynamite as used is reported at about 18% of No. 1 and 82% of No. 2 grade. The development work during this period was equal to one foot for every 48 tons of ore produced.

At the 240-stamp Alaska-Treadwell mill one pound of iron and steel in the dies crushed 4.22 tons of ore and chrome steel in the shoes, 2.87 tons of ore. The dies were part chrome steel dies and part dies cast in the Treadwell foundry. An average of 4.71 tons was crushed per stamp in 24 hr. The 300-stamp mill crushed an average of 5.50 tons per stamp in 24 hr. and consumed one pound of iron and steel in the dies in crushing 4.16 tons of ore against 2.59 tons per lb. of chrome steel in the shoes. All dies used in the 300-stamp mill were made in the Treadwell foundry.

A summary of two years' operations at the mine indicates that, including development work at the ratio of one foot for every 75.5 tons of ore, the dynamite consumption was about 1.73 lb. per ton of ore, candles approximately 0.74 lb. and drill steel 0.107 lb. per ton of ore.

At the Ready Bullion mill of the Alaska United Company, one pound of chrome steel in the shoes crushed 2.58 tons of ore and one pound of iron in the dies, which were cast in the Treadwell foundry, crushed 4.28 tons of ore at a total cost of 2.86c. per ton of iron and steel consumed. The average crushing rate per stamp was 5.13 tons per day. At the 700-ft. Claim mill one pound of chrome steel in the shoes crushed 2.62 tons of ore against one pound iron in the Treadwell-foundry dies to 5.83 tons of ore. The total cost of iron and steel consumed was 2.58c per ton of ore crushed.

A three-year record on the Ready Bullion shows that the consumption of dynamite is approximately one pound per ton of ore; candles, 0.113 lb. and drill steel, 0.095 lb. per ton of ore. This includes about one foot of development work for every 59.8 tons of ore produced. The dynamite used consisted of 30% of No. 1 and 70% of No. 2 grade. On the 700-ft. claim the ratio of development during the same period was approximately one foot for every 50.7 tons of ore and the consumption of dynamite 1.15 lb. per ton of ore; candles 0.12 lb.; and drill steel, 0.148 lb. per ton of ore. About 23% of the dynamite used was No. 1 and the remainder No. 2 grade.

Based upon one-half year's operations at the Broken Hill Proprietary Block 10 Co., New South Wales, 224 annual tons are secured per man employed in the mine and mill, and 442 tons per man employed underground.

Buffalo Mine and Mill, Cobalt

By W. J. Dobbins*
and H. G. S. Anderson†

The silver occurs in Huronian conglomerate and slate. Drifts are run to the end of a vein before stoping. After preliminary crushing, the milling process includes trommeling, jigging, regrinding in rolls and chilean mill, hydraulic classification, separate concentration of sand and slime and cyanidation of the slime tailing. Vacuum filtration precedes and follows agitation in Pachuca tanks.

The Buffalo mine being one of the earliest to begin operations in the Cobalt camp and the first to start concentration of its low-grade ore was, on account of the peculiar form of the ore deposits and the nature of the ore itself, obliged to work out a system of mining and treatment under new conditions. It was early seen by the management that in the low-grade ore lay one of the chief assets of the property, so that operations were planned with the view of mining the milling rock at a reasonable cost rather than forcing the production of high-grade ore first and then going back after the milling rock at advanced cost.

The property comprises 40 acres lying in Coleman Township, and is one of the mines along what is known as the "Western Ridge" of the Cobalt producing area. Much prospecting has been done and some is still going on west of this property, but so far no producing mines have been developed in that direction.

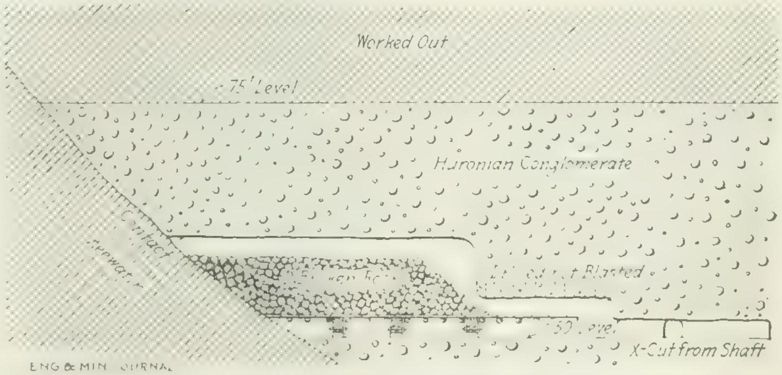
Silver occurs in Huronian Formation

The rock formation is about equally divided between Keewatin and Huronian; the contact crosses the property in a northeast-southwest direction at about the center. So far no silver has been found in the Keewatin, which covers the western half of the property, and this fact places all the workings on the eastern half, which is made up of Huronian conglomerate and slate.

Outside of the veins themselves, which are more regular in the conglomerate, the silver content is much higher in the slate, which is much broken up and well shot with native silver along the cracks and faces. The Keewatin dips to the east at an angle of about 15°, reaching a depth along the eastern boundary of 300 ft. While this is the general dip, a vein developed near the southern boundary has shown the existence of a trough in the Keewatin which allows the extension of the conglomerate, and hence the ore, much farther west than was expected from early development.

The veins which have a general strike of southeast are all narrow ,and high grade, ranging in width from one to six inches with an exceptional place being as wide as 12 in. With the exception of minor faults they hold close to vertical. As stated above the veins in the conglomerate are more regular, while in the slate they are badly broken up, sometimes decreasing to a mere slip, but as the silver is well scattered through the slate it makes good milling rock.

It has been the experience here that as the veins pass the contact and enter the Keewatin they, in most cases, pinch out, or where in one or two cases they hold their width and mineralization, the silver disappears and the vein is made up of barren smaltite. Very recently silver has been found in the Keewatin at other mines along the Western Ridge, but here drifts driven 50 ft. beyond the contact have shown no silver.



Method of Mining at Buffalo Mine, Cobalt, Ont.

What is considered as proof of a constant deposition of silver from the mine water at present has been noted at this mine. Where the mine water seeps through the cracks in the rock a thin scale forms on the face of the rock. This scale has the appearance of argentite and assays high. This may be interesting in determining the genesis of the ore and will be more specifically proven as time goes on.

Aim to have Reserve of Milling Ore

In determining the system of mining the main object was to have at all times a good reserve of broken mill rock. This not only insures a constant supply to the mill but allows the producing of an ore of steady average grade by permitting hoisting from the various stopes at the same time.

The ore extends from 3 to 6 ft. on each side of the vein and as this determines the width of the stopes it makes the timbering problem easy. In opening a vein the drifts are driven 6 ft. wide and 7 ft. high. Before any stoping is done the drift is carried the full length of the vein which means either to the contact or the property line. After this is completed two rounds are taken out of the back and the third one drilled, the muck meanwhile remaining in the drift to set up on. This makes the back from 13 to 15 ft. high with an additional 5 ft. above drilled but not blasted as shown in Fig. 1. The muck is now cleaned out and the stope is ready for timbering.

Simple Timbering Used

Stulls are placed across the stope at an angle of about 15° from the horizontal and 6 ft. apart. These are covered with 4-in. lagging. On the lower side of the timbers at intervals of 20 ft. chutes are placed. These consist of 6-in. posts with plank sides and bottom and with removable plank in the front and are not cribbed up in the stope. The only timbering used in the stopes is cribbed manways one at each end which are carried up with the working and are used for raising and lowering steel and high-grade ore sorted in the stope, also as exits for the men.

When the timber has been placed the round already drilled is shot and stoping proceeds in the same way until the level above is reached, each round raising it about 4 ft. About one-third of the rock broken is drawn off during the stoping. This allows keeping the broken rock within 6 ft. of the back and makes it easy for setting up as compared with staging for from 10 to 40 ft. In stoping, the rock on one side of the vein is shot out; one or two light holes are then put in to break down the vein rock which is sorted and bagged. Only a rough sorting is made in the mines as the ore goes over a picking belt before entering the mill.

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Piston Drills Exclusively

At this mine piston machines are used exclusively. The rock in most cases is exceedingly hard and although many hammer drills are used in the camp it has been found here that, everything considered, the piston drill has the advantage. Hydraulic-compressed air is used. When this air was first introduced some trouble was experienced, as candles would not burn in close stopes where it was used. By driving a raise in these close places the trouble was overcome and now candles are used except in one or two especially long drifts where carbide lamps are necessary. While the lack of oxygen in this air caused trouble with the candles no ill effects are noticed by the miners nor have any of them suffered any effects since its introduction over two years ago.

Private Inspector Employed

Safety in preference to speed has always been the policy of the management. An inspector who comes on duty at the change of each shift is employed. He has an office convenient to the main exit shaft for the men. To him are reported missed holes, needed repairs, and anything of interest to the opposite shift. Each man coming off or going on shift must pass through this office whether he has anything to report or not. This not only protects the miners against accident but saves the time of sending up for materials for repairs after the men are down which the outgoing shift failed to get.

Many an accident might be prevented if the miner's partner on the opposite shift had not failed to see him. By having the men pass through the office regardless of whether they have anything to report minimizes the chance of forgetting anything that should be reported and insures that the one coming on will be seen. A dry and change house with shower bath, wash room, individual lockers, etc., is provided for both mill and underground men.

Conglomerate Hard to Crush

The concentrating plant consists of the coarse-crushing plant, concentrator proper, and the cyanide plant. The coarse-crushing plant has a capacity of 30 tons per hour and sufficient rock is crushed in six hours actual running time to carry the mill through 24 hours. The mill has a capacity of 175 tons per 24 hours and the cyanide plant has a capacity of 100 tons, but has never been worked to full capacity as it is merely an auxiliary to the mill and treats whatever slime is produced by the mill in the process of crushing.

The mill rock is chiefly the typical Huronian conglomerate of the Cobalt district. It is extremely hard and causes excessive wear to all parts of the mill machinery used in the course of reduction. From the nature of the rock it has not developed lines of fracture, and the varying degree of hardness and the rounded shape of the cemented pebbles cause extraordinary jars to the crushing rolls.

This is most manifest on the medium rolls which crush a well sized product averaging an inch in size and which does not contain any fine material to form a cushion. Rapid wear of babbitted bearings, of roll shells which often break off in pieces around the edges, and an occasional broken frame bear testimony to heavy duty imposed. The slate is, of course, not as hard and the mill will put through from 15 to 20 tons more per 24 hours with a marked degree less wear on the rolls. The increased tonnage is easily taken care of by the concentrating machinery with the same efficiency as the lesser tonnage.

From tests it has been determined that 97% of the silver occurs as native silver, the remaining 3% being made up of arsenides, antimonides, and sulphides, such as dyscrasite, argentite, and ruby silver. From the fact that these arsenides,, antimonides, and sulphides are easily slimed it has been found that stage crushing, preventing excessive abrasion, gives the best results.

The massive condition in which the native silver occurs in the conglomerate prevents the ore as a whole being economically reduced by abrasive action to the necessary degree of fineness for profitable cyanidation, hence concentration with cyanidation of the slime made in crushing is the practice adhered to at this plant.

Direct amalgamation was tried experimentally but proved a failure due to the fact that the arsenides, antimonides and sulphides fouled, hardened and granulated the amalgam.

Buffalo Mine, Cobalt, Showing Vein Cut Off by Keewatin Formation

The Buffalo mill differs materially from the rest of the mills in the Cobalt camp in the use of rolls in the grinding of the ore. The fact that the amount of slime resultant from the use of rolls is much less than in the case of stamps doing the same work was the determining factor in adopting this kind of a flow sheet.

The amount of slime made in the Buffalo mill averages 18% which includes the mine slime and the slime made in a 6-ft. Evans-Waddell chilean mill. The mine slime is practically negligible amounting to less than 1% of the total ore milled. The rolls make about 12% slime while the chilean mill will make a variable amount depending upon the degree of hardness of the ore and the amount of middling taken from the concentrating tables.

The accompanying screen analyses, an average of a number taken at different times, will give a fair idea of the amount made in the chilean mill.

SCREEN ANALYSES AT BUFFALO MILL.

Chilean Mill Feed		Chilean Mill Product	
Mesh	%	Mesh	%
+8	27.4	+16	19.8
+12	30.1	+20	10.6
+16	16.2	+30	21.0
+20	3.2	+40	5.6
+30	6.4	+60	10.1
+60	6.0	+80	10.1
+80	4.0	+100	8.2
+100	2.0	+150	8.0
+150	2.1	+200	2.3
—150	2.1	—200	4.2
	99.5		99.9

From these results it will be seen that the distribution of slime made throughout the process of grinding and concentration and which will pass 200 mesh is about 12% due to the rolls and 6% due to the chilean mill.

BUFFALO CONCENTRATOR AND CYANIDE PLANT, COBALT, ONT.

The Buffalo mill was the pioneer of the Cobalt camp operating on low-grade ores and as the ore was entirely different from anything before treated, much experimenting was necessary in order to determine the most suitable flow sheet. As it stands today the flow sheet is an evolution from a point where little was known to a satisfactory method of treating the ore. Various changes have been devised by the management and tried out, the results of which have been in some cases disappointing and in other cases most gratifying.

McCully and Blake Breakers Used

The ore is hoisted from the mine in cars of 1350 lb. capacity and weighed on a Fairbanks-Morse track scales. It is then dumped into a bin of 300 tons capacity. The ore is discharged from the bin by a feeder of the "wall" type worked by a worm and hand wheel. The feeder is of sufficient size to pass boulders of from 350 to 400 lb. The crusher, a No. 5 McCully, rests on a concrete foundation which extends down to bedrock, a distance of 20 ft. The product of the McCully crusher will pass a 2½-in. ring. The crusher is driven by an Allis-Chalmers 50-hp. alternating current motor running 850 revolutions per minute.

The ore passes from the McCully crusher to a Robins conveying belt 30 in. wide, 38-ft. centers, traveling 40 ft. per minute, with 15° slope; it is also used as a picking belt. The picked high-grade ore is dropped into a number of chutes to locked boxes below, from which it is collected weekly and ground in a Krupp ball mill.

From the picking belt the ore passes into a 40-in. x 8-ft. strutbar pattern revolving screen, with 1¾-in. round holes, running at 16 r.p.m. As the crushing plant was designed after the mill was erected, existing conditions had to be complied with in the construction and it was found that the undersize chute from the trommel would have insufficient fall to carry the rock into the 14-in. conveying belt that carries the rock to the mill storage bin. In order to meet these conditions the first 4 ft. of screen were incased in a hood, which is the same as is furnished for a dust jacket minus the perforations. In this manner the ore is carried forward enough to give it a 1:1 slope to the 14-in. conveying belt beneath the secondary crusher.

The secondary crusher is a 20x6 Blake, operating at 250 r.p.m. and set to crush to 1¼ in. This crusher is also set on a concrete foundation 12 ft. high. The picking belt, trommel and Blake crusher are driven by an Allis-Chalmers 40-hp. alternating current motor, the speed of which is 850 r.p.m. A 14-in. Robins conveying belt runs through an opening in the concrete foundation directly beneath the discharge of the Blake crusher and conveys the crushed rock to the mill storage bin, which has a capacity of 110 tons. The angle of slope of the belt is 19½°, and the speed is 200 ft. per minute. The 14-in. belt is driven by a General Electric 3-hp. alternating current motor, making 1200 revolutions per minute.

The rock in the mill bin is fed through a wall-type feeder driven from a shaft making 90 r.p.m. into the No. 1 coarse rolls set to crush to ¾ in. This set of rolls is an Allis-Chalmers 36-16-in., style B, running 90 r.p.m., equipped with chrome-steel shells, which last on an average of four months. The ore is crushed dry and flushed to No. 1 bucket-belt elevator.

This elevator has a 19-in., 8-ply, double cross-stitched "Maltese Cross" transmission belt, 55 ft. centers, running 435 ft. per min.; the size of buckets used is 18x7x5½ in. and they are spaced 18 in. apart. This kind of belt has been found to be superior and more economical than the regular rubber-faced elevator belt and lasts about 10 months.

The boot pulley runs in guides that are free to move up and down and keep the belt always at the proper tension.

TROMMELS PRECEDE JIGS

The ore passes through three sets of trommels, the first of which is 5 ft. long by 26 in. in diameter, running 26 r.p.m. and having ⅜-in., square perforations; the second is a 6-mesh, slotted steel-wire screen, 10 ft. long by 30 in. in diameter, running 20 r.p.m.; the third is a 12-mesh, steel-wire screen, 10 ft. long by 30-in. diameter, running 20 revolutions per minute.

The undersize of No. 1 trommel passes to the 6-mesh screen, the oversize of which passes to the fine jigs and the undersize to the 12-mesh trommel. The oversize of the 12-mesh trommel passes to a 6-ft. Evans-Waddell chilean mill, and the undersize to an 8-compartment classifier. The oversize from the first trommel passes to the No. 1 or bull jigs in duplicate making 200 pulsations per minute and equipped with 3-mm. screens, 24x36 in. in area.

The concentrate from the bed is taken off intermittently and sent to the drier while the hutch product is sent continuously to the chilean mill. The concentrate from the jigs assays from 2000 to 3000 oz. per ton. The tail from these jigs is sent to a trommel 5 ft. long by 26 in. in diameter, running 18 r.p.m. having 1¼-in. square perforations. The oversize is returned to the mill bin and the undersize is sent over a 5x2½-ft. dewatering screen inclined at an angle of 15° and making 160 pulsations per minute to the No. 2 or medium rolls.

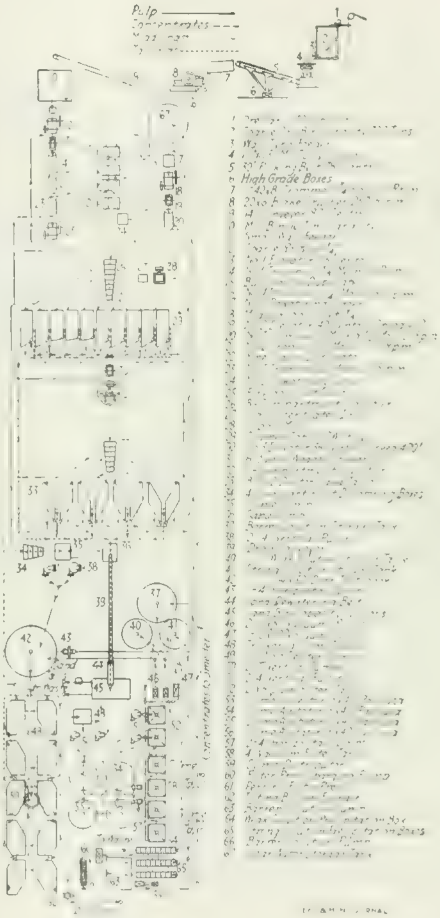
These rolls are 36x16-in. Superior rolls made by the Power & Mining Machinery Co. They are set to crush to ⅜-in., running 90 r.p.m. and are equipped with chrome-steel roll shells. The product of these rolls goes to No. 2 elevator, 40 ft. between centers and running 400 ft. per min.; the belt is 10 in. wide by 6 ply, and the buckets are 10x6x5 in., spaced 16 in. apart. This elevator is equipped with a similar takeup for the boot pulley as the No. 1 elevator.

The elevated product goes into a 3-screen trommel. The first screen is 6-mesh, slotted steel wire, the undersize from which goes to the 12-mesh trommel; the second and third screens are ⅜-in. square mesh, the oversize of which is returned to the No. 1 dewatering screen, the undersize going to No. 2 dewatering screen, which in turn discharges to the fine rolls.

TROMMELS DISPLACE IMPACT SCREENS

The screens used on the trommels are made by the W. S. Tyler Co., of Cleveland, Ohio. The slotted ones are of the "ton-cap" variety. The coarse-mesh screens last on an average of six weeks, the 6-mesh last seven weeks, and the 12-mesh last five weeks. The 12-mesh screen has only recently been installed in place of three Colorado impact screens. The impact screens averaged 55% undersize in their oversize product, making an increased load on the chilean mill and causing unnecessary sliming. The trommel carries about 5% undersize in its oversize product and its maintenance cost is only one-third as great.

The fine jigs are similar to the bull jigs but have a 2-mm. screen on them, the hutch product going to the chilean mill and the bed being taken off intermittently and sent to the concentrate dryer.



FLOWSHEET OF BUFFALO MILL, COBALT, ONT.

These jigs make 210 pulsations per minute.

The tail from the fine jigs is dewatered by means of a 4x2½-ft. dewatering screen inclined at an angle of 20° and making 175 pulsations per minute. The tailing passes from the dewatering screen to the No. 3 or fine rolls. These rolls are Allis-Chalmers, style B, 36x10-in., set close and making 90 r.p.m. The product passes to No. 1 elevator and through the first three screens as undersize.

The 6-ft. Evans-Waddell mill is fitted with 12-mesh diagonally slotted screens. The mill runs 38 r.p.m. with two scrapers set to throw the sand to the screens, and a third scraper set to throw the sand inward and level the bed on the die ring. These die rings last about six months and the tires on the mullers last about eight months. The product from the chilean mill goes to No. 2 classifier similar to the No. 1 classifier but with only 6 spigots.

HYDRAULIC CLASSIFIERS BEFORE TABLES

No. 1 classifier furnishes a classified product for 10 tables, three No. 5 Wilfleys and seven No. 3 James tables. Hydraulic water is used on the first four compartments, the remaining compartments being free settling. The feed from the first spigot is split and fed to two James tables, running 250 r.p.m.; the feed from the second spigot is split and fed to two Wilfley tables, running 250 r.p.m.; the feed from the third spigot to the third Wilfley; the remaining five spigots are each fed to one of the remaining five James tables, all of which make concentrate, middling, and tailing.

The heads average 25 oz. per ton, the concentrate 900 oz., the middling 50 oz., and the tailing 4 oz. The concentrate runs to the concentrate sump, the middling to No. 3 elevator, (8-in. x 4-ply belt, 36-ft. between centers, running 400 ft. per minute, buckets 4x5x8 in. in size, spaced 18 in. apart) and the tailing to the sand sump. The elevated middling goes to the chilean mill for regrinding.

No. 2 classifier furnishes a classified product for the eight No. 2 Deister sand tables. Hydraulic water is used on the first three spigots. The feed from the first spigot is split and fed to two Deister sand tables, running 290 r.p.m.; the second is also split and fed to two Deister tables; the remaining four spigots are fed each to one Deister sand table running 300 revolutions per minute.

TABLE FEED RUNS 25 OZ. SILVER

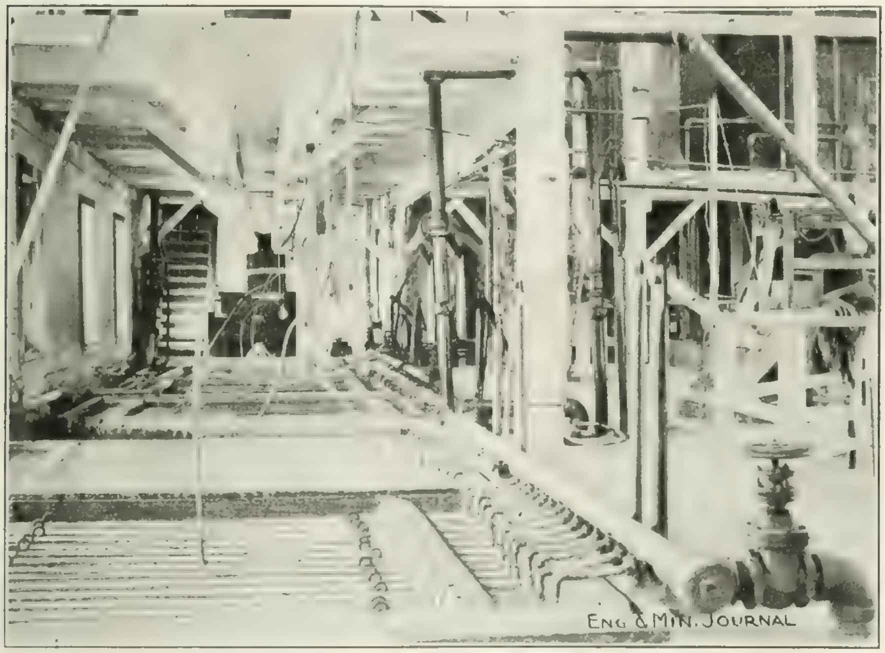
The heads of the Deister sand tables average 25 oz. per ton as do the heads of the James and Wilfleys. The concentrate averages slightly higher than in the former case, the tailing averaging 3.5 oz. per ton. The concentrate runs to the concentrate sump, where it is dried, barreled, and shipped to the smeltery. The middling runs to the middling elevator and the tailing to the sand sump.

The slime overflow from No. 1 and No. 2 classifiers goes to a 4-spigot dewatering box, where the sand is separated from the slime. The dewatered slime overflows into the slime sump. The overflow from the sand sump also overflows to the slime sump. The sand is drawn out of the sand sump and dewatered by means of a drag conveyor, which consists of 10-in. iron disks cast in halves ½ in. thick and bolted in the center of the flights to a ⅝-in. nontwisting cable. These flights are spaced 18 in. apart and the total number on the cable is 110. The angle of inclination of the drag conveyor is 35°, and the speed 43 ft. per minute.

The sand falls off the flights at the head end of the drag, the flights being washed clean by a spray of water, and drops down a chute 4 ft. long to a 22-in. rubber-faced conveying belt. The speed of the belt is 40 ft. per minute, and the distance from center to center is 25 ft. The belt is inclined upwards 1 in. per foot. The excess water drains off the side and is returned by gravity to the sand sump. The sand drops off at the head pulley and the belt is cleaned by means of a small spray of water. The residual moisture of the sand as it enters the bin is about 22 per cent.

Sand Tailing to Waste

The sand bin holds 125 tons and the sand is drawn off from below and carried to waste by a 2-bucket oscillating tramway furnished by the A. Leschen Rope Co., of St. Louis, Mo. The buckets hold 1600 lb. of sand and travel at the rate of 500 ft. per minute. The tramway is run on day shift and the bin can be emptied in six hours with the mill running. The tramway is 550 ft. long and the sand is elevated 75 ft. at the far end of the dump. There is dump room for three years at the present rate, after which the heap may be spread out by means of a stream of water around its base thereby increasing the dumpage capacity. Power is furnished to drive the tramway by a General Electric 15-hp. alternating current motor, running 1200 revolutions per minute.



Butters Filter Plant at Bufalo Mill

The slime in the slime sump is elevated to a 14x30-ft. Dorr thickener by means of a Morris 4-in., vertical slime pump direct connected to an Allis-Chalmers, 25-hp. vertical motor, the speed of which is 850 r.p.m. Lime at the rate of 6 lb. per ton of slime treated is here added to aid the settling of the slime and to provide a protective alkalinity for the cyanide plant. The lime is added in the form of milk of lime from a reservoir holding a sufficient quantity to last 12 hours.

Deister Slime Tables Used

The thickener arms in the Dorr apparatus make one revolution in 3 min. 40 sec. The clear overflow water is returned to the mill by means of a Morris 4-in. horizontal centrifugal slime pump running 1150 r.p.m. and pumping against a 30-ft. head. The thickened slime is drawn off by gravity and run to a circular distributor which feeds 10 No. 3 Deister slimers running 320 r.p.m. These slimers make a concentrate averaging 400 oz. per ton and a tailing assaying from 12 to 16 oz. per ton. The feed to the slimers generally runs 4 oz. higher than the tailing from the same. The ratio of concentration is 65:1. The average extraction by concentration of the sand is 83 per cent.

The tables remove most of the heavy smaltite and other sulphides that act as cyanicides and since their installation a reduced consumption of cyanide has resulted. The tailing from the Deister slimers runs by gravity into a slime sump and is elevated into the cyanide plant by means of a Morris 3-in. vertical centrifugal slime pump direct connected to an Allis-Chalmers 15-hp. vertical A. C. motor, speed 900 r.p.m. One Pachuca tank 15x40 ft. is used as a collector at the top of which is an overflow to carry the clear water back to the Dorr thickener.

Capacity of Motors Exceeds Needs

In the distribution of motive power in the mill a number of motors are of a horsepower much higher than is actually required. This is due to installations of different kinds of machinery and alterations that have been instituted from time to time.

One 60-hp. motor, running at 850 r.p.m., drives the No. 1 or coarse rolls, the No. 3 or fine rolls, and a wall-type feeder. One 60-hp. motor drives the chilean mill, one trommel, and one dewatering screen. One 50-hp. motor drives the No. 2 or medium rolls and two James tables. One 40-hp. motor drives 16 sand tables, one 8-in. elevator, a drag conveyor, sand-dewatering belt, a Dorr thickener and a lime feeder. One 40-hp. motor drives a 19-in. elevator, a 10-in. elevator, four trommels, one dewatering screen and two jigs. One 15-hp. motor, running at 1120 r.p.m., drives ten No. 3 Deister slimers. One 30-hp. motor drives a Krupp ball mill. Alternating current transformed from 11,000 volts to 550 volts is used. The remaining motors are used to drive the different machines individually and have been described before. In all, the amount of power actually consumed in the mill and cyanide plant is 220 horsepower.

The mill water is supplied from Lake Sasaganaga by means of a Morris 5-in. two-stage turbine pump direct connected to an Allis-Chalmers 40-hp. motor running at 850 r.p.m. A 20,000-gal. tank situated on a hill at the rear of the mill is used as a storage tank, the water from which is used in the cyanide plant. A valve on the main line is kept partially open all of the time and the leakage from the valve is sufficient to keep the tank full. The mill uses the water directly from the main line.

Agitation in Pachuca Tanks

The cyanide plant was remodeled in the summer of 1911 to suit the conditions of a continuous system of agitation in Pachuca tanks. The results were so unsatisfactory that the former treatment consisting of charging the Pachuca tanks and intermittent agitation was resumed.

The slime, consisting of one part pulp and one part water, flows by gravity from the collector to two vacuum-filter tanks each holding 14 filter leaves 4x7½ ft. These tanks treat "green pulp" and are known as the charging tanks. Upon charging, the vacuum is run up to 25 in. by means of 6x8 Deane vacuum pumps in duplicate until a cake 1 in. thick is formed. The filtered water is pumped into the Dorr thickener.

The vacuum is then dropped to 10 in. in order to hold the cake on the leaves while the surplus pulp is dropped into the receiving sump beneath and pumped back to the collector by means of Morris 4-in. manganese-lined vertical centrifugal pumps in duplicate, direct connected to an Allis-Chalmers 25-hp. vertical motor, making 850 r.p.m. The filter boxes are then filled by gravity with strong solution of a strength of 3½ lb. KCN per ton of solution from the barren-solution tank. The cakes are now loosened and dropped into the receiving sump below, the pulp being pumped by the centrifugal pumps above mentioned into one of three 15x40-ft. Pachuca tanks. One tank is filled and agitated before filling another.

LEAD ACETATE PRECIPITATES SULPHIDES

At this point, on account of the presence of sulphides of antimony and arsenic which are soluble in caustic alkali in the presence of cyanide, lead acetate is added to the extent of 1 lb. per ton of dry pulp in the charge. Desulphurization of the charge by this means has added materially to the efficiency of the process. The strength of the solution is brought up to 6 lb. per ton in the agitating tanks and agitation is carried on for an average of 100 hr. The pressure of air used is 15 lb., the air being the hydraulic air supplied to the camp.

The tanks are kept at a temperature of 70° or above by means of a steam coil of 2-in. pipe suspended by ½-in. rods from the top of the tank to within 8 ft. of the bottom. The steam pipe has an outlet at the bottom of the tanks and is pumped back to the boiler room. The agitation is carried on by means of a jet of air from a 1¼-in. pipe extending down the center of a 14-in. central column pipe to within 4 ft. of the bottom. Potassium cyanide is added by lowering it in a wire basket hung by a rope.

The agitated pulp is then drawn off by gravity to four vacuum-filter tanks similar to the first and are known as the "discharge tanks." A cake 1 in. thick is formed, the vacuum lowered, and the excess pulp dropped into the receiving sump below, and pumped back to the agitating tanks by means of Morris 4-in. horizontal manganese-lined centrifugal pumps in duplicate, belt driven by Allis-Chalmers 15-hp. motors, making 1120 r.p.m. The filter solution is discharged into the strong-solution storage tank.

Water is now run into the tank and the cakes washed until the filter solution titrates down to 0.3 lb. KCN, the filtered solution being discharged into the weak-solution storage tank. Water is then forced into the leaves and the cakes are dropped into the receiving sump below. The same 4-in. pumps are used to pump the washed pulp to waste, a sample of each discharge being taken automatically as the pulp is discharged.

A sample of a "tank sheet" report, which is made up as soon as results from each agitated charge are obtained, is given herewith.

PRECIPITATION BY ZINC SHAVINGS

The filtered strong solution containing the dissolved silver is drawn off by gravity from the strong-solution storage tank and run into two 8-compartment zinc boxes. The second, third and fourth compartments only are filled with zinc shavings, zinc shavings being moved from one compartment to another in inverse order as it is consumed in the precipitation of the silver in solution.

The overflow from the zinc boxes goes by gravity to a concrete storage sump 25 ft. square by 9 ft. deep, coated with P. & B. paint. This solution is pumped intermittently, by means of a plunger pump operated with air to the barren-solution storage tank. The weak solution is also drawn off by gravity to one 8-compartment zinc box. The overflow from this box is allowed to flow to waste. Formerly this solution was pumped to storage tanks and used as a weak wash but the accumulation became so great that storage room was inadequate.

SAMPLE AGITATION RECORD, BUFFALO MILL, COBALT

Charge No. 38. Tank No. 3 Feb. 6, 1912.
124.5 tons pulp...75.9% moisture...Sp. Gr. 1.17
Temp 78° F Contained 30 tons dry slime
94.5 tons solution 6.2 lb KCN in solution...0.7 lb. protective alkalinity in solution. Filled...17½ hours. Agitated...77 hours. Discharged...34 hours.

Sample	Assay oz.	Remarks
Automatic heads	14.2	
Tank heads	13.6	
8½ hr., washed pulp.........	8.0	
12-hr., washed pulp	7.4	
12-hr., washed pulp.........	4.6	Moisture %......... 77.7
12-hr., washed pulp......	4.0	Cyanide lb 0.4
12-hr., washed pulp	3.6	Protective alkalinity lb 0.2
12-hr., washed pulp	3.0	
Before discharge washed pulp.	2.5	
Tailing	3.8	
Solution........	0.12	
Washed pulp...	3.5	Percentage extracted. 72.0
		Ounces recovered....294.0
		Ounces lost........ 114.0

J. Willey, Cyanide Superintendent.

CLEANUP BY MEANS OF FILTER PRESS AND PUMP

In cleaning the zinc boxes the inflowing solution is cut off, the zinc shavings are washed and the box repacked. Plug valves at the bottom of each compartment are opened and the precipitate is allowed to drain into a sump below. The precipitate is pumped into a Perrins filter press by means of a 3x4 Aldrich triplex pump. After the removal of most of the strong solution, which is returned to the strong-solution sump, air is blown through the press to drive out the excess moisture. The filter press is cleaned by hand and the precipitate barreled and sent to the Steele-Harvey tilting furnace. The small amount of short zinc produced is dried and charged into the tilting furnace. The precipitate is fluxed with borax, soda and niter, with an addition of old slag from time to time, and melted in the tilting furnace. The bullion averages 930 fine and is sent to Perth Amboy, N. J., to be refined.

An overhead crawl above the filter tanks permits easy removal of the filter leaves for acid treatment to remove the lime and for repairing. A 5% hydrochloric-acid solution is used for treating the leaves.

Zinc shavings for use in the precipitating tanks are turned at the plant by means of a zinc lathe. The KCN used is 98% pure and the consumption of cyanide per ton of ore treated is about 4 lb. The average extraction of the cyanide plant is 70%. The combined extraction of the mill and the cyanide plant on the ore treated averages 87 per cent.

The assay office is equipped with a double-muffle assay furnace, button balances, pulp balances and other necessary materials. The sampler is equipped with one coffee mill, bell grinder, high-grade grinder, low-grade grinder and an Abbé Engineering Co., 6-jar pebble mill, all of which are driven by an Allis-Chalmers 7-hp. motor, running at 1200 r.p.m. Assays of cyanide solutions, slime heads, washed pulp, mill tailing and concentrate aggregate 30 per day.

Loon Creek District, Idaho

The Loon Creek District, Ida., has been examined by the U. S. Geological Survey, which has come to the following conclusions (*Bull.* 530-G.): The district is a poorly prospected area of more than ordinary promise, which is held back primarily by inadequate transportation, the nearest railroad point being 110 miles distant (coke is about $46 per ton). There are noteworthy gold placers in the area, and the principal gold-copper deposit has been explored to a depth of 1000 ft. Throughout this extent the ore has ranged in value from $25 to $90 per ton, and there are still no signs of impoverishment in depth. The dolomitic limestone area near the head of Deer Creek is thought to be a promising field in which to prospect for lead-silver deposits.

Owing to the bold relief of the country, it is possible to obtain a depth of 1000 to 2000 ft. on most of the deposits without resorting to shafts, and there are numerous water-power sites. The gravels of the region are loosely cemented and fall apart when undermined by the giant. There is a small smeltery, completed in 1905.

Mining Copper at Lake Superior—III

By Claude T. Rice

The width of the ore varies from 10 to 30 ft. One-man drills are replacing the two-man machines. Square cross-bits are generally used but in some mines the Mohawk pilot-bit is in favor. The footage drilled per machine per shift varies from 24 to 55 ft., and the tonnage broken from 900 to 1400 tons per month. Labor and living conditions are bettered by the companies, and contract work is prevalent.

Before outlining the methods used in handling the broken ore, and describing the drilling practice, it may be well to outline the labor conditions prevailing in the copper country. As a whole they are probably the best in the United States. The companies take a wholesome interest in the welfare of the community and of their employees especially.

LABOR AND LIVING CONDITIONS

Living conditions are most excellent. Good houses are furnished to the married miners at a low rent, and the companies do everything to encourage settled conditions among their employees. There is a marked absence of saloons compared to mining communities in other parts of the country; there are fairly good theatres and places of amusement; the cost of living is not high, as miners can obtain board and rooms in families at about $25 per month. It is odd, however, that there has been considerable of an exodus of the Irish, and to a less extent of the Cornish element to Western camps, and as a result there has been a steady increase in the number of foreign employees on the pay rolls of the companies. This condition is hard to account for. Most of the machine men are Cornish, with Irish, Americans, Italians and Finns in the order named, making up the balance of the drillers and timbermen. The trammers are generally Finns and Croatians, but of course there is really no division of the labor according to nationality.

The Cornish miners are no longer in power in this district to the extent that they were formerly, when most of the mine captains were Cornish. The early Cornish influence, however, is still shown in the customs prevailing in regard to contracts and the hours that the mines work, for from Saturday night at 11 o'clock until Monday morning at seven, nothing but repair work is done in the mines. In working hours the machine men are the most favored, as on day shift they work 5½ shifts per week, and only five on night shifts. The trammers, who in these mines do the shoveling, the trackmen, timbermen, stemmers (those who take the places of timbermen, trackmen or drillers when any of the latter are absent), and the underground laborers, or those men who clean the stopes and do other odd jobs underground work, on day shifts five full shifts per week and seven hours on Saturday, coming on at three o'clock; on night shifts all these men except the trammers work only five shifts. The trammers must work from three till eleven o'clock on Saturday nights. The hours on both day and night shifts are from seven to five, with one hour off in the middle for lunch, and the shifts change every week instead of every two weeks, as in the West. The pay on day shift depends on the number of shifts worked, while on night shift the men are paid for six full shifts unless they are off two shifts, when they are not given the extra shift, but are paid according to the number of days that have been worked.

CONTRACT WORK PREVALENT

Most of the drilling and a large proportion of the shoveling are done on contract. While varying somewhat at the different mines and according to the ability of the individual workmen, the wages for day's-pay work on the different jobs is by the month approximately as follows: Drillers on company account receive about $63 per month in the amygdaloid mines, and about $75 in the conglomorate workings; trammers, $63; underground laborers, $52 to $60; bosses on timbering gangs, $70 to $90; timbermen, $60, and rollermen $52 to $60 per month.

The labor is quite efficient in most respects, and the copper country miner makes up in sobriety and dependability. what he may lack in versatility compared with the Western miner, who generally has run machines and timbered from Leadville to Bisbee, and from Bisbee to Butte, becoming thereby accustomed to many different methods of mining and many kinds of ground. The long rest at the end of the night shift works well in this community, where a good proportion of the employees are married, or if single, are living at home; this would not do at most Western mines on account of the weekly carousals. This shows well the difference between the labor at these mines and in the West. Further, by giving the men a short Saturday on day shift and a five-day-work but six-day-pay week when on night shift, the companies are able to work the men on 9-hr. shifts without objection. This is of considerable benefit to the companies, where the mines are deep, since it takes fully 1¼ hr. to get the men into the deeper conglomerate mines, as no special provision is made for doing this rapidly.

There are no unions among the miners, and there is no desire on the part of the men for them, as the companies treat their employees as well as they possibly can and give them no cause for wanting the union. No small item in the conditions that make it possible to mine and produce copper from these ores at a total cost of about $1.50 per ton of ore, is the fact that by far the majority of the miners remain in the copper-country mines all their lives, learning the practice of the district thoroughly and the way that the ground works. The contract system decreases the cost of supervision and spurs the men on to the greatest individual effort with a gradual but sure increase in the average ability of the miner of the district.

MUCKING THE ORE

In doing the shoveling the trammers use a short, D-handled shovel, having an overall length of about 38 in., as is characteristic of Eastern metal mines. In the amygdaloid mines, the ore rolls down to the bottom of the stope and is there loaded into the cars from a plank sollar, the track being carried within about 1½ ft. of the foot wall, making the quarters rather cramped for shoveling. This is not so important, however, as over 60% of the ore is larger than 4-in. size, and most of it is loaded into the car by hand. Indeed, one of the reasons that a machine breaks so great a tonnage in the stopes of the Lake district, is the large size to which the ore can be broken when it is loaded directly into the cars without passing through chutes. Boulders weighing several hundred pounds are rolled into the cars with planks, while those too large for this work are broken either by blockholes or by using "pasters," unless they are thin enough to be sledged. In sledging, the miners use long, narrow-faced hammers, as these boulders have a tendency to cleave. As the faces of the sledges tend to get rounded and the use of a gad often aids greatly in the ease with which the boulders can be broken, tongs with handles about 18 in. long are provided for holding the gad, so that there is no danger of the men getting their hands smashed.

Filling the cars from a sollar and with about half the ore put into the cars by hand, the men in the amygdaloid mines load from 14 to 15½ tons in a 9-hr. shift when tramming an average of about 600 ft. In the conglomerate mines, where most of the ore from the stopes is loaded into the cars from slide chutes, and the cars are taken from the shaft by rope haulage, the trammers average about three tons more per shift. To insure the safety of the roof in the drift stopes, a special crew of trimmers goes through the amygdaloid mines, barring down any loose rock that may be found along the levels. In the past the drilling in these mines has been done entirely with two-man drills having 3-in. cylinders, later bored out to 3$\frac{1}{16}$ and 3⅛ in., and almost universally of Rand make. During the last year extensive tests have been made on the merits of one-man drills in the drifts. While these one-man machines have not drilled as much in a shift as the large machines have, the indications are that much economy will result in the use of one-man drills in the stopes.

FOOTAGE DRILLED

The footage drilled in the different lodes varies greatly. In the amygdaloid it is dependent principally upon the amount of alteration that the rock in the lode has undergone. In the Kearsarge lode the large machines, in a 9-hr. shift, drill on an average about 40 ft., although at times the footage rises to 45 ft., and at some of the mines, notably the Allouez, it is much lower, being about 30 ft. The ore in the Osceola lode drills better and the machines average about 47 ft. of hole per shift, the footage rarely dropping below 40 ft, and sometimes rising to 55 ft. Owing to the greater quantity of silica in the conglomerate, and possibly because of the larger proportion of copper in that ore, the machines average only about 24 ft. per shift and rarely is a greater footage than 28 ft. drilled. However, the men are not able to commence drilling as early in the shift, because of the poor condition of the hanging wall in the conglomerate stopes, and also because of the brittleness of the ore that causes it to slab away badly under pressure; the machine men are rarely able to get the back picked down, the breast trimmed and the machine set up inside of two hours, and seldom drill more than one hole before noon.

Both in the amygdaloid and the conglomerate mines, the holes in the stopes are generally drilled 8 ft. deep, and an air pressure of from 65 to 85 lb. is used. Fortunately at the mines where the lower footages are drilled, more burden can be placed on the toe of a hole, so that the tonnage broken by a machine is somewhat evened up. For instance, in the conglomerate stopes it is not uncommon to place 4 ft. of ground on a hole, while the average is about 3 ft. In the Kearsarge lode the burden placed on a hole averages 2½ ft., or perhaps a little over, while in the Osceola lode, which is the easiest ground in the copper country to drill, only from 24 to 26 in. can be placed on a hole. In fact, in the Osceola lode two holes must be drilled to break the tonnage that one will break in the conglomerate stopes. The softer the rock for drilling, the less firm is it, owing to alterations, and therefore the less efficiently does it transmit the shock of the explosion, as the cushioning effect is greater. These figures concerning drilling are merely general statements, and conditions differ greatly, so that both in the Kearsarge and the Osceola lodes it is possible sometimes to place as much as 3½ ft. on the toe of a hole.

WIDTH OF ORE

In the northern part of the district the lodes are 12 to 16 ft. wide on the average, although in the Red Jacket workings on the conglomerate, the stopes are 20 ft. wide and in a great portion of the Tamarack stopes a width of 30 ft. prevails. In breaking the ore it is generally sliced out parallel to the level, but in the North Kearsarge the slicing is done up and down the dip. Three holes, one near the foot, the first fired, one in the middle and one near the hanging, are generally sufficient to break the ore from foot to hanging, although in places on the Osceola lode four holes are necessary to break a cut 9 ft. high. When the ore has a greater width than 12 ft., the back is carried with an overhang of ore below the hanging wall, the height to the top of the overhang being about 10 ft. Then either with an upper or a flat roof hole, according to the ease with which the upper can be drilled, the skull of ore that has been left from the last round is skimmed off the hanging.

The ore in most of the mines is inclined to be sticky and dry holes do not drill as fast as water holes. It generally takes half as much longer to drill a dry hole as a wet hole. Consequently the drilling is arranged so that as few dry holes as possible are drilled. Indeed, only in the Mohawk mine are dry holes necessitated by the stoping method used. The ore there is carried as much as possible from foot to hanging, although the lode has a width ranging from 14 to 20 ft., averaging about 18 ft. This is done by carrying a stope about 11 ft. high following along the foot, and by skimming the hanging with a dry hole looking down the stope. In this way a large load can be placed on the dry hole, and as much ore is broken per machine as in the other method. However, there is more likelihood of the hole breaking into the hanging than if a skimming hole is drilled parallel to the roof of the stope and in the direction of the strike, as is the practice in the other methods of drilling in the amygdaloid. In the Mohawk, less trouble is experienced with uppers than in the other mines, either because the ground there is not so damp as in other parts of the Kearsarge and along the Osceola lodes, or because the Mohawk bit allows dry holes to be drilled with less difficulty than does the square cross-bit that is used in the other mines. For skimming the ore from the hanging, more dry holes are used in the conglomerate stope than in the amygdaloid, because less trouble is had with dry holes in the former than in the latter. While there is not much water in the Lake copper mines, a little comes in along cross seams, so that generally water enough for drilling can be obtained by digging a hole in the muck on the floor of a level. In the Calumet & Hecla mines, as well as some of the subsidiaries, these water holes are kept open by burying a powder box with the bottom out of it, in the muck, so as to keep the hole from caving in.

TONNAGES BROKEN

Since ground that necessitates slower drilling generally permits more ore to be placed on the toe of a hole, the amount of ore broken per machine in the different amygdaloid lodes is about the same, while in the conglomerate lodes, although much the hardest ground to drill. the tonnage broken per month is somewhat greater, being about 1400 tons per month of 26 days in the stopes, while in the amygdaloid mines the tonnage is about 1000 tons per machine underground. In the Mohawk mine the machines in the stopes break 1100 tons per month, and in the other mines on the Kearsarge lode from 1000 to 1050 tons, except at the Allouez, where owing to the smaller footage drilled per shift, the machines in the stopes average only about 900 tons. Also in the Osceola workings of the Calumet & Hecla company the average per machine is only about 900 tons per month of 26 days.

The rate of drilling depends largely upon the amount of coarse copper in the lodes, for delays are due almost entirely to that cause. Often two hours are lost on a hole that is in 3 or 4 ft., for frequently if the hole is abandoned a second or third hole will strike the same mass of copper. A piston drill will not cut the copper; yet neither does the copper dull a drill. The only thing to do is to permit the steel to batter its way through the bunch. On the other hand, a Leyner drill, owing to the bit being held against the copper all the time, tends to chip it, but the copper causes trouble with that drill by plugging the hole in the steel. The wear and tear on drill steel is figured at 30 lb. per machine per month in the conglomerate mines, and from 12 to 15 lb. in the amygdaloid mines. In some of the mines the men are charged for all wear, tear and loss above that amount, while in other mines the weight of a drill given to a party of contractors is recorded and in case any of the drills are lost the original weight of the drill is charged to the miner.

DRILLING DONE ON CONTRACT

The drilling in the mines is practically all done on contract, and the drills going to each party of contractors are numbered, to keep them apart and to prevent any scrambling for drills at the station. On surface the drill boys sort out the drills going to each level, and in loading them in the skips they keep the drills for each level separated by piling those for one level bit up, and those for the next level bit down, or else by placing a rope in between the drills for the different levels. At the levels the miners sort out their own drills, the number being cut in deep near the shank end. The drills are made of 1⅛-in. octagonal steel, upset to form the bit, which has a gage of 2½ in. on the starters and 1¼ in. on the 10-ft. drills. Tests are now being made on cruciform steel and it is likely that this form of steel will in time be adopted, as it has generally been found that better speed in drilling can be obtained; cruciform drills mud a hole better than do octagonal steel drills.

SHARPENING THE DRILLS

Two methods of gaging the drills are used, according to the methods of sharpening the steel. With the Word type of sharpener, the one most used in the district, in which a bit is formed by upsetting the edge on itself, a system of step-gaging is used, the gage being reduced ¼ in. for each difference of 2 ft. in the length of the drill. In the Morrison sharpeners, which are used by the Calumet & Hecla company, a system of graduated gaging is used, in which the width of the bit has a definite ratio to the length of the drill, varying for each intermediate length that results as the drills wear down. This is a great advantage in the conglomerate mines, where several drills must be used to a run-out of a machine, but it is not so important at the amydgaloid mines, where one drill will often hold its edge long enough to drill two holes.

The Morrison machines have a large capacity, as two of them sharpen 2900 drills in about seven hours at the Calumet & Hecla mines, where all the drills are sharpened at Calumet No. 2 shaft. The steel is sharpened by passing it from one machine to another by a conveying system that is quite ingenious. At each machine, a portion of the bit is formed and the metal from the center is worked out to the corners, in this way simulating the way that the steel is worked in hand sharpening.

ADVANTAGE OF MORRISON MACHINE

The great advantage of the Morrison machine is that the speed of travel of the steel through the different stages of the sharpening can be regulated so that the bit is finished at the dull red heat.

The working of the metal until it is at this heat, makes the grain of the metal finer than if it were finished with the steel still at a high red, for under the latter condition the metal is lying quiet and the grain can become coarse, resulting in an edge that is not so tough as compared with the other method of sharpening, no matter how well it is tempered. It is probably owing to this working of the metal at the proper temperatures that there was a falling off in the number of drills used in the mine when the Morrison machine replaced hand sharpening. This reduction amounted to about 22%, for with hand sharpening. 3700 drills were dulled per day, while the with the machine sharpening only 2900 were required.

In respect to the heat treatment and the graduated gaging of the bit which the Morrison machine affords the drill, it appears that the Morrison machine ought to make a perfect bit; however, in looking at the bit one often finds that there is an offset in the bit edges, so that a hackly edge is obtained and often not enough steel is worked out to form a good corner to the drill. These drills with poor corners pass the inspectors often. It is there that this sharpener is weak. Word machines, or sharpeners of the upsetting type, never turn out drills with weak corners, for the drill is upset in the dolly to the proper width whenever the edge of the bit has assumed the proper shape.

BITS USED

A 10 ft. drill is generally the longest that is used, as few holes are drilled over 8 ft. Occasionally a 12-ft. drill is employed in the stopes. Square cross-bits are used in most of the mines, but at the Wolverine and the Mohawk, and also at the Ahmeek to some extent, the Mohawk bit is used, having a small pilot bit ahead of the cross-bit. Some mining men in the district consider that the Mohawk bit is the best for all kinds of hard ground, especially when the ground has a tendency to fitcher, while others think that there is not much benefit coming from it except in ground where there is a tendency for the hole to collar, or rifle as it is more often called. The few tests that have been made in the district seem to indicate that there is real merit in the Mohawk bit but it has not been generally accepted throughout the district, although it has been in use at the Mohawk and Wolverine mines for over eight years. At the mines where the Mohawk bit is used, it is the practice to finish the hole with a chisel bit, as such a bit will drill faster than any other as long as it holds its gage.

In drilling deep holes, considerable trouble is met with sometimes in fitchered holes. In the event that this occurs an attempt is made to straighten it by driving a wooden plug into the bottom of the hole or by placing pieces of copper or iron in it. Such methods generally succeed, but in case that they do not, half a stick of dynamite, or possibly more, is placed in the hole and blasted, after the machine and arm have been turned out of line with the hole. In the Mohawk, North Kearsarge and the conglomerate mines, drill boys bring the steel and the water to the bottom of the stope but at the other mines they merely send the drills up and down the shaft. A drill boy at the conglomerate mines, owing to the large amount of steel dulled by a machine, will generally tend only three or four drills, and at the Kearsarge mines, because of the distance between machines, they rarely can tend more than four machines.

DRILLING CONTRACTS

Practically all drilling is done on contract. Only in the cleaning of the foot wall of stopes, are the machine men placed on day's pay and then generally a bonus is offered for all tonnage broken above a certain amount per month. In the amydgaloid mines these contracts are generally let to four men, but in the conglomerate stopes they are generally apportioned to eight men and in some of the heaviest stopes, to twelve, so that three machines can be run each shift in the stope, to hurry the work through. One man on the contract, called the taker, receives and signs for all supplies.

These contracts are let for periods of one, two or three months, and in form are out-and-out contracts in which the miner furnishes all supplies and takes all mining chances. But at most of the mines if the miners meet with harder rock or with ground that contains more than the usual amount of copper, so that they cannot make money at the rate given them, which is generally so much per cubic fathom of lode, or square fathom of lode broken, the company either terminates the contract or gives the miners enough to make up the usual rate of pay for the machine men on company account in such workings.

The companies use this form of contract instead of a guarantee contract where the company takes the mining chances instead of the miner, so that they can keep the less efficient of the miners at work until they either quit of their own accord or else work up into experienced miners earning the average pay. This is a different principle from that used in the West where every miner allowed to stay underground is guaranteed at least so much per shift and the company is the one that gambles on the nature of the ground that will be encountered. There, however, only the best of the miners are paid on contracts and nothing is thought of firing a man, while in the copper country the discharging of a miner is a rare thing and the companies feel that they must help along the inefficient as well as the efficient, when they do practically all the work on contract.

The companies sell supplies to the miners at about four times their actual cost. This is not done to make any profit on them from the miners, as the figure that is paid on the contract is given with the men knowing what price they will have to pay for supplies; it is done to compel the men to be economical in the use of supplies. The principal benefit resulting from this practice is, that it makes the miners drill a sufficient number of holes so that the ground will be broken small enough and will not have to be blockholed to get it into the cars. Unless great care is exercised, the company is apt to find that in order to save in the amount of dynamite used per ton of ore broken, the miner is compelled to drill more holes than would be economical with dynamite furnished to him at the market price.

One-Man Machines

Some difficulty is being met with in introducing the one-man machine in the stopes, where often the drill has to be mounted on a column 10 ft. long. The ore dips at such an angle that a man has a none too secure foothold when he lifts his machine and bar. For that reason the Osceola jack is being adopted for use on the small machines, as the post itself can be lifted out of the jack and the two parts carried about separately in the stope. This is no small advantage, for owing to the width of the lode, a two-screw jack is necessary to secure a firm set-up.

Because it is practically impossible for one man to stand the post alone in these stopes, it is planned either to have the trammers help the machine men make their set-up, or else to place three machines in a stope and have four men working on them, as then there is always an extra man to help in case a hole fitchers, to get dynamite, and otherwise make himself useful. To insure that the men will understand how to take full advantage of their work on the one-man drills, the machine men before they are placed alone on one of these machines, are made to work with an instructor. This drill instructor is a man who has had a considerable experience on one-man machines and he shows the miner the different tricks that make the work easier and the machine man must stay on the instruction machine until he is judged efficient enough to go it alone without having any trouble. In this way care is taken that the men will not condemn the machines because of prejudices they have formed.

(To be continued.)

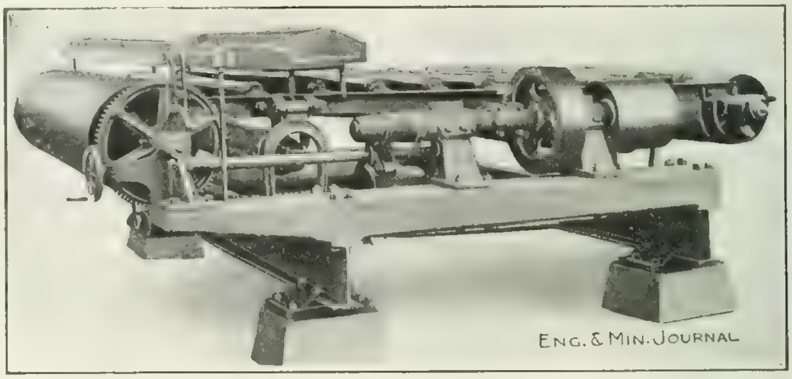
The Pacific Vanner

The Pacific vanner is an improved Frue vanner built by D. D. Demarest Co., of San Francisco, Calif. The entire machine is made of steel and iron, designed to be set up on four independent concrete posts, making a rigid and durable construction. It has the same side shake as the Frue. The belt travel takes in all parts involved in the Frue travel, and includes some improvements over the Frue feed. The belt tightener not only tightens but engages and disengages the gear and regulates the speed. Cone pulleys are employed for regulating the speed of the belt exactly the same as on the Frue machine.

The moving frame is supported on four independent vertical double standards, the two standards on each side resting on the side bar. These standards are longer than the supporting springs of the Frue, giving a flatter motion to the belt and a nearly uniform travel; in other words, with the flat motion given by the long supports every point of the belt gets about a uniform side travel. The main front roller of the moving frame is designed to be adjusted vertically. This adjustment changes the grade of the belt without the necessity of adjusting the small rollers. The supporting standards are independently adjustable, so that it is but the work of a minute to raise or lower the frame at either corner and thus give it any grade desired; or it may be leveled up sideways.

The machine is provided with a single eccentric; the eccentric rod has three prongs, thus holding the machine firm and making all parts move together. The rod is adjustable in the hub of the eccentric, so that by moving the adjustment screw in the eccentric the right position of travel may be obtained. All the moving mechanism is mounted on a single cast-iron sole plate. There is no chance for this mechanism to get out of line. Most of the wearing parts are protected by removable bearings. Beyond the desired adjustment of grade and travel the machine requires no attention to keep it in operating order.

The distributing box is the G. G. Gates patent, which operates as a classifier. The fines are discharged from the forward end; the heavier parts at the rear end; thus the fine material is not mixed on the belt with the coarse, but is separated and has a chance to make its way out. The machine is equipped with a Gates patent step belt, designed to handle exceedingly fine concentrates. The belt is 20 ft. long and 6 ft. wide; the moving frame is 9 ft. long. The whole machine occupies about 120 sq.ft. of floor space as against about 220 sq.ft. occupied by two 4-ft. Frues. The first installation of the Pacific vanner was at the Stickels mill of the Utica Mining Co. at Angels, Calif. This machine was installed in November, 1911, and has made a satisfactory record. Eight of these machines are in operation in the new 20-stamp mill built by the East Eureka Mining Co. at the Poundstone mine; they were placed in commission in May.



Pacific Vanner with Belt Removed

East Butte Report

The report of the East Butte Copper Mining Co. for the year ended Mar. 31, 1912, shows 95,910 tons of company ore treated, of which 65,038 tons averaged 6.9%, and 30,872 tons averaged 2.86%. In addition 47,135 tons of custom ore were treated. Total production was 12,167,363 lb. of copper; 396,524 oz. of silver; and 17,959 oz. of gold. The cost of mining, including development, was $4.14 per ton. The cost of production is given at 9.46c. per lb. of copper.

Development work amounted to 7865 ft. of drifts and crosscuts, and two strikes of previously unknown veins were made. In addition the mine equipment has been overhauled. A new dust chamber, 200x50x40 ft., and stack, 15-ft. diam. by 180 ft. high, have been erected, and a Dwight-Lloyd sintering plant put in. In the converter department, basic lined converting has been adopted.

Physiological Effects of CO

An interesting pamphlet on carbon monoxide has recently been issued by the Bureau of Mines, in which attention is drawn to the dangerous properties of this gas and to the use of mice and birds for detecting its presence in mine air. The author quotes largely from various publications of Dr. J. S. Haldane of Oxford University, who for many years has made special study of the subject of mining hygiene and the dangerous gases met in mines. The author states (p. 6): "According to Haldane, carbon monoxide has no other effect than that resulting from its interference with the oxygen suppled to the tissues, and apart from its property of combining with the hæmoglobin it is physiologically indifferent, like nitrogen." The author also outlines an experiment in which he remained for twenty minutes in an atmosphere containing 0.25% of carbon monoxide, "at the end of which time he suffered only a slight headache, although later he became ill. The illness lasted for several hours and was accompanied by nausea and headache." The quotation from Haldane, and this experiment, are likely to give a false impression as to the dangerous properties of this gas; it has therefore seemed wise to give a few facts that others may not be led to repeat the experiment made by the author of the pamphlet, and to give some idea of the dangerous nature of this gas even when present in very small amount.

Carbon monoxide is a product of incomplete combustion. It is present in large quantities in producer gas and water gas, and in dangerous amounts in the gases from boilers and furnaces of all kinds. It is often present in large proportions, and always in dangerous amounts, in powder smoke, in the gases from underground as well as surface fires, and in the afterdamp from explosions of firedamp and coal dust.

CO Makes Haemoglobin Inert as an Oxygen Carrier

Carbon monoxide produces symptoms of poisoning when inhaled in small amounts because it renders the haemoglobin of the blood inert as a carrier of oxygen. The effect is cumulative and may result in death several years after exposure. Some cases of miners' phthisis are attributed to the effects of carbon-monoxide poisoning.

Note—An article by Prof. Henry S. Munroe entitled "Physiological Effects of Carbon Monoxide," published in the School of Mines Quarterly, July, 1912.

Carbon monoxide has the property of forming a compound with the hæmoglobin of the blood. The effect of this is to make the hæmoglobin, so combined, practically inert and to prevent it from acting as a carrier of oxygen. When so much carbon monoxide is absorbed that the greater part of the hæmoglobin is inert, death results. The affinity of carbon monoxide for hæmoglobin is more than 200 times greater than that of oxygen, so that when present in the air, even in small quantities, it is freely absorbed by the blood. Carbon monoxide is not displaced by oxygen but is dissociated by natural processes, and escapes in the expired air. Where large quantities are absorbed, it may be several days before the last traces disappear. Acording to Doctors Edsall, von Jaksch, Haldane, and other authorities, 0.05% of carbon monoxide is dangerous. According to Haldane, severe symptoms were observed from breathing air containing 0.02%., or one part in 5000. With this small amount present the blood becomes 20% saturated after about 20 hr., producing slight giddiness and shortness of breath. At this point an equilibrium seems to be established, and the dissociation of the gas keeps pace with its absorption. With increasing percentages of carbon monoxide, the saturation of the blood becomes greater and the time required to produce the maximum effect shorter. With 0.08% present, the blood becomes 50% saturated within a few hours; it becomes scarcely possible to stand and even slight exertion results in loss of consciousness, the senses are confused and the judgment is impaired. Sometimes the victim either becomes stupid and drowsy, or much excitement results, not unlike the effects of alcohol. Another experiment by Doctor Haldane proved that with 0.20% CO in the air the blood becomes 50% saturated in 70 min. With 0.25%, the amount present in the Bureau of Mines, experiment, this dangerous condition would be reached in less than one hour.

CO Produces Congestion in the Vital Organs

Acording to von Jaksch, the absorption of 0.8 gram of carbon monoxide is fatal. According to Haldane, if death occurs gradually the hæmoglobin is usually about 80% saturated with carbon monoxide. Post-mortem examinations of persons who have died from carbon monoxide poisoning show that the effect is to produce intense congestion of the vital organs, especially in the brain, usually accompanied by small hemorrhages. It is possible that this congestion is due to the attempt of nature to make good the diminished efficiency of the blood by supplying larger volumes at needed points.

Even when death does not occur, serious results are likely to follow from the absorption of this gas by the blood. The after effects are lesions, cysts and local softening of the brain tissue,[1] inflammation of the membranes of the stomach and intestines, pneumonia, bronchitis, pleural effusions, inflammation of the kindneys, fatty changes in ,the heart, æmenia, splenic enlargement and other derangements of vital organs, sometimes resulting in death even after several years. It is believed that Sir Clement LeNeve Foster was a victim to carbon monoxide poisoning which occurred on a visit as chief inspector of mines to a mine in Cornwall a few years before his death. From the full record given by Mr. Foster of his symptons while exposed to the gas underground it does not appear that there could have been more than 0.08% of carbon monoxide present, nor that his blood could have been more than 50% saturated, although direct evidence on both these points is lacking. The experiment made by the author of the paper recently issued by the Bureau of Mines, in which he exposed himself for 20 min. to an atmosphere containing five times as much carbon monoxide as is known to be dangerous, was therefore hazardous and even though the experimenter apparently suffered but little ill effect a somewhat longer exposure would certainly have resulted in serious injuries, the after effects of which might have proved fatal.

Miners' Phthisis From CO Poisoning

One of the most serious dangers from the presence of carbon monoxide in the air of mines is the effect upon the health of workmen who are daily exposed to the breathing of small amounts of this gas. The blood, when partly saturated, is thereby rendered less able to perform its proper functions, so that the patient suffers from æmenia and all the complications that may result from this weakened condition. According to Doctor Edsall, the disease known as miners' phthisis has been shown to be due chiefly to carbon monoxide poisoning. Recent observations have shown that for some hours after a blast, under the conditions of ordinary mining, carbon monoxide may be present in the air in dangerous amounts, and undoubtedly the blood of men engaged in sinking, drifting, and stoping where the circulation of air is deficient is partially saturated with carbon monoxide the greater part of the time.

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[1] In a personal letter, Prof. Walter B. James, of the College of Physicians & Surgeons, states that a peculiar local lesion of the brain, with softening of the lenticular nucleus is fairly characteristic of carbon monoxide poisoning. The action of the gas upon this area has not been satisfactorily explained. It has been suggested that it is due to the peculiar angle at which minor blood vessels are given off to this area from the arterial trunks. According to Doctor James, the remote consequences of monoxide poisoning is a serious matter. His cases have shown mental aberration of a peculiar type, with great slowness to response, going on to cerebal degeneration and death.

Effect of CO is Cumulative

By some authorities it is believed that the serious effects above outlined, due to absorption of carbon monoxide by the blood, are supplemented by direct toxic action on the nervous system, on the muscles, the heart and other organs. It is believed by others that there is a cumulative action and that those who have been poisoned by this gas are more likely to become victims when again exposed to it. It is quite certain that dissociation of carbon monoxide from the blood is slow and that those whose blood is partly saturated will sooner fall victims where larger quantities of the gas are breathed than those whose blood is free from this gas. Men who have repeatedly suffered from carbon monoxide poisoning becomes very sensitive to the gas, and in most instances are compelled to abandon work in which they are compelled to breathe air containing it.

Manifestations of CO Poisoning

The symptoms by which carbon monoxide poisoning may be detected are not difficult of recognition. The blood becomes a brilliant cherry-red, and in serious cases red or bluish-red spots appear on the front of the neck, on the trunk, thighs and elsewhere, lasting for some days, and in fatal cases apparent after death. The mental disturbances, weakness and lassitude, have been noted. This is followed by headache, accompanied by nausea, often lasting 24 or 48 hr., even in slight cases. In more serious cases, headache may recur at intervals for some months. Loss of consciousness with convulsions, may occur several hours after the poisoning. One of the first symptoms is weakness in the knees and legs, sometimes lasting for days, with aching from the knees to the ankles. Local pains in the region of the heart, and palpitation of the heart, are common and may recur at intervals for a month or more. Foster, and several others, have published valuable notes on these symptoms, which will be found in the appendix of Foster and Haldane's "The Investigation of Mine Air."

Clear zircons of brownish-orange or reddish color are cut for gems and are then known as hyacinths.

The Peck Centrifugal Concentrator

The Peck centrifugal concentrator has been briefly referred to in the JOURNAL from time to time as being in experimental operation at Anaconda, Mont. These operations are now being continued with improved apparatus. A large number of patents have been granted to P. F. Peck and from one of these the following description has been written.

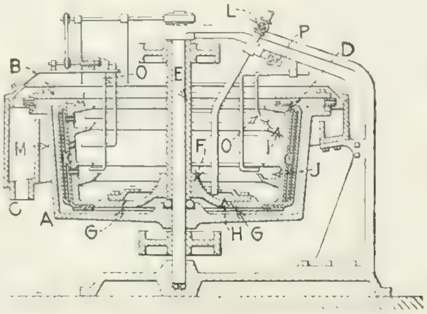

FIG. 1 Section

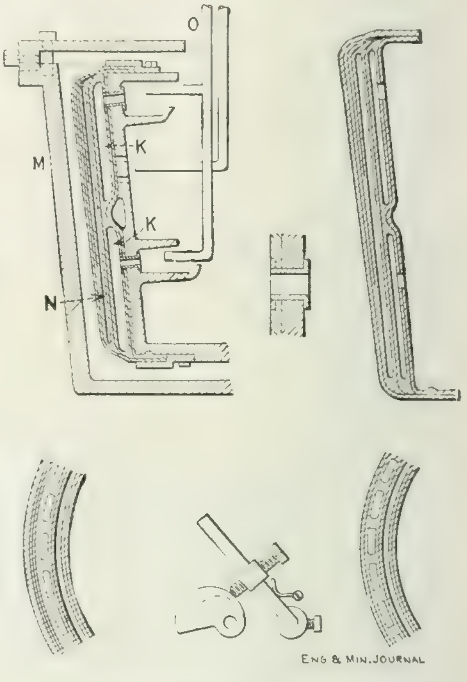

FIG. 2 Details of Canvas Cover of the Revolving Bowl

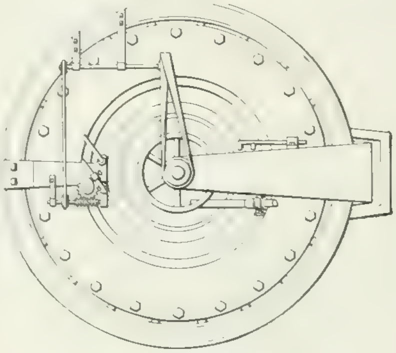

FIG. 3 Plan

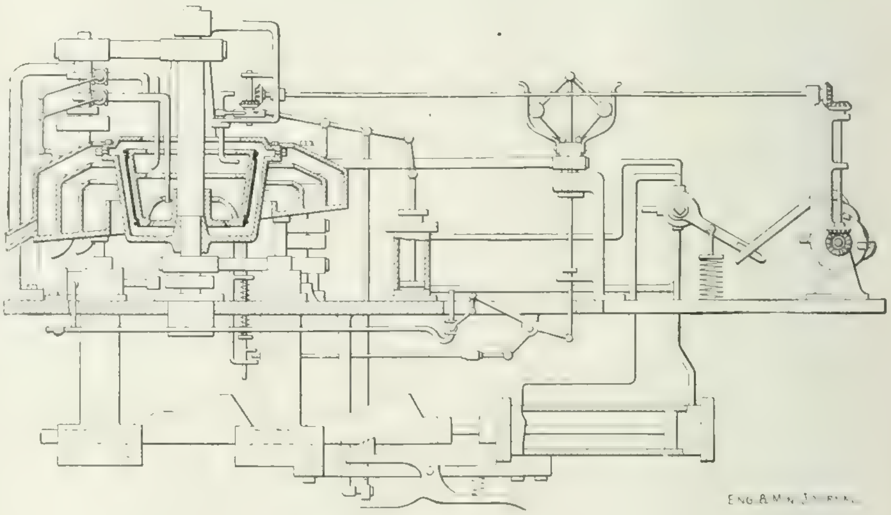

FIG. 4. ANOTHER FORM OF PECK CENTRIFUGAL CONCENTRATOR

The Peck centrifugal concentrator is a cyclically acting device for wet concentration of ore. The separation is effected and the lighter or gangue minerals discharged during the first phase of the cycle; the concentrate is discharged during the second phase.

The machine consists, as shown in Fig. 1, of an outer pan *A*, attached to a vertical spindle driven by the lower pulley shown in the illustration. The top of the pan is open except for the broad ring *B*, attached to the outwardly flanged top. The upper edge of the pan is encircled by the discharge launder *C*. Within the outer pan is an inner pan *D*, called the deflector. This is rigidly attached to a sleeve *E*, surrounding the vertical spindle. To the upper end of the sleeve a pulley is attached. The inner and outer pans may, therefore, be independently revolved and at different speeds.

To the bottom of the inner pan a ring *F*, is attached forming the feed chamber *H*. Holes *G*, connect the feed chamber with the space between the bottoms of the inner and outer pans. Around the inner face of the inner pan are two ring troughs *I* and *J*. These connect with the outer expansion chambers *K*, by several small passages which can be seen upon careful inspection of the illustrations.

The operation of the concentrator is as follows: The two pans are set in motion and the pulp is conveyed to the feed chamber through the pipe *L*. From the feed chamber the pulp flows out into the space between the bottoms and rises in the space between the sides of the two pans. Here the separation is effected. The heavier particles tend to move toward the inclined inner face *M*, of the side of the outer pan and form a crust of concentrate. The lighter particles rise up to the ring attached to the flanged upper edge of the outer pan and flow out through the passages shown in the illustration, into the launder *C*. The lighter particles are prevented from settling on the layer of concentrate on the face *M*, because of the scouring action of the current caused by the deflector or inner pan revolving at a different speed from the outer pan.

When a sufficiently thick crust of concentrate has formed on the face *M*, the feed is shut off by closing the valve in the supply pipe *L*. Then the valve *P* in the lower branch of pipe *L* is opened and clean water is admitted to the feed chamber. At the same time the speed of the outer vessel is reduced, the centrifugal force that holds the concentrate crust on the face *M* thereby being weakened so that the force of the inflowing water from the feed chamber is sufficient to carry the concentrate upwards into the launder *C*, which conveys it to a different receptacle from the one into which it discharged tailing during the first phase of the cycle. This completes the cycle and the machine is again ready to receive and separate another charge of pulp.

As the separating operation is dependent upon the proximity of the outer face of the deflector to the top of the layer of concentrate on the face *M*, it is necessary to make provision for contracting the inner pan as the thickness of the crust of concentrate on the face *M* increases. This is accomplished by making the outer face *N* of the inner pan, of canvas made water-tight by coating with rubber. Between the canvas cover and side proper of the inner pan are the chambers *K*, which, as has been already noted, connect with the troughs *I* and *J*. At the beginning of the first phase, these troughs and chambers are full of water, which, because of its centrifugal force, generated by the rapidly revolving inner pan, causes the canvas walls to bulge out and come in close proximity to the face *M* of the outer pan.

The bulging canvas face is gradually retracted from the face *M*. as concentration progresses, by removing the water from the chambers *K*, and the troughs *I* and *J*. This is done by adjustment of the scoop pipes *O*. These are vertical pipes bent at right angles near the bottom, and dipping into the troughs *I* and *J* as shown in the drawing, and in the direction opposite to the rotation of the inner pan. By gradually moving these pipes to the position of the tangent to the circle of water in the trough, the water may be gradually withdrawn from the chambers *K*, and troughs *I* and *J*. The movement of these pipes is done automatically by the worm and cam shown in Fig. 3, the movement being so timed that all the water will be removed at the instant that the bed of concentrate on the face *M* has attained its maximum thickness and the second phase of the cycle is about to begin. Of course provision is made for again admitting water to these chambers and troughs so that the deflector may be again expanded at the beginning of the first phase of each cycle.

All these events in the cycle of the concentrator are mechanically controlled, the mechanism being so adjusted that the events occur in sequence and in the proper order.

In Fig. 4 another type of the concentor is shown, there being three collecting launders which are actuated by adjustable mechanism so that the troughs are so moved in relation to the discharge orifice that one receives concentrate, another tailing, while the third catches a middling product.

Arbuckle Zinc Field, Oklahoma

By J. I. Blair*

The new Arbuckle zinc field, situated eight miles southwest of Davis and in the heart of the Arbuckle Mountains in Murray County, southern Oklahoma, began to be prospected and developed immediately after the last allotment of the Indian lands. Since that time several cars of surface carbonate ore have been shipped and a few cars of blende in the form of concentrate.

Soon after the field was opened the camp boasted the name Robinette and was granted a post office. Both wood and water are scarce. The timber would probably be exhausted in two years if the camp became prosperous. Drilled wells would be the only source of water.

The country is a rolling plateau reaching an elevation of 1400 ft. formed by folded and faulted gray limestone, known as the Arbuckle limestone which is 6000 to 8000 ft. thick. This limestone lies in regular beds that dip and crop on the surface, rendering the country unfit for agricultural purposes and poor for grazing land. These tracts are destitute of timber but where porphyry hills are found they are covered with a good quality of heavy oak timber.

Limonite and Blende Found

Of the minerals that have been found limonite is the most abundant. This ore occurs in regular strata interbedded with the limestone and is of good quality. It measures from one to four feet in thickness, but is not traceable for any distance. Zinc minerals occur in brecciated limestone in beds and in irregular deposits which outcrop over the entire section. No important discoveries of lead have yet been made. Besides these ores, molybdenite, scheelite and greenockite are found in small quantities; the latter occurs only associated with the zinc minerals.

The zinc ore is mined by openpits. It is a fairly clean ore and occurs as the sulphide at the grass roots, assaying 4 to 10% zinc as mined, an approximate assay of this ore being as follows: ZnS, 14%; $CaCO_3$, $MgCO_3$, 70%; $BaCO_3$ 5%; Fe and Cd, 3%; SiO_2, 5%; not determined, 3%. Associated with the blende as gangue are minerals calcite, dolomite and limestone.

The company developing the properties in the vicinity of the Hope-Schoeber district has a 75-ton mill which has had a varied experience due to the presence of the mineral witherite, which owing to its high specific gravity follows the blende, thereby contaminating the concentrates and enriching the tailings. At this mill there is a pile of tailings containing about 1000 tons which assay 6% zinc. At present the mill is being remodeled to treat these tailings.

A 75-ton Concentrator

A typical day's mill run is as follows: 75 tons of 6% ore yield 4½ tons of concentrates, gross value $200. Cost of production: Transportation to railroad at $2.75 per ton, $12.40; freight to smeltery at $2.25 per ton, $10.10; royalty at 12½%, $25; operating expenses (labor), $30; powder, caps and fuse, $4; fuel (wood) at $2.50 per cord, $9; incidentals, $1.50; total cost, $92; net profit $108. The high royalty is due to the fact that the present owners hold a sublease. The figures given for fuel are misleading in that but a limited supply of wood is available and when this is exhausted the fuel question will become a serious proposition.

Consul Maxwell K. Moorhead, of Rangoon, reports that wolframite has been discovered in commercial quantities in the Tavoy and Mergui districts of Lower Burma and also in the Southern Shan States. The total production in 1911 amounted to 995 short tons, which is more than double the previous year's production. Nearly the entire output was shipped to Germany.

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19,670—NITROGLYCERIN—The Behavior of Nitroglycerin when Heated. Walter O. Snelling and C. G. Storm. (U. S. Bureau of Mines, Technical Paper 12, 1912; 11¼ pp., illus.) Describes investigations made in the explosives laboratory of the Bureau of Mines.

19,671—POISONING—Occupational Poisoning in Chemical Trades. W. Gilman Thompson. (Journ. Ind. and Eng. Chem., June, 1912; 3 pp.) 60c.

19,672—SULPHURIC ACID—Improved Sulphuric Acid Chambers. Thomas H. Norton. (Journ. Ind. and Eng. Chem., July, 1912; 2 pp.) 60c.

19,673—SULPHURIC-ACID INDUSTRY in the United States. (Am. Fertilizer, June 15, 1912; 2¾ pp.) From "Mineral Resources of the United States." 20c.

19,674—WATER TREATMENT — Electrolytic Treatment of Water. G. D. Van Arsdale. (Eng. and Min. Journ., July 13, 1912; 1¼ pp., illus.) 20c.

19,675 —WATER TREATMENT — The "Luminator" Purification Treatment of Water for Steam Boilers. William Cullen. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., Apr. and May, 1912; 6½ pp., illus.) $1.40.

MATERIALS OF CONSTRUCTION

19,676 — CEMENT — Autoclave Boiling Test for Cement. H. J. Force. (Eng. News, June 13, 1912; 5¼ pp., illus.) 20c.

19,677—CEMENT INDUSTRY in the United States in 1911. Ernest F. Burchard. (Advance Chapter from Mineral Resources of the U. S., 1911; 39 pp. illus.)

19,678 — CINDER CONCRETE — Some Observations on the Disintegration of Cinder Concrete. George Borrowman. (Journ. Ind. and Eng. Chem., June, 1912; 1½ pp., illus.) 60c.

19,679 — PORTLAND CEMENT — Free Lime in Portland Cement. H. E. Kiefer. (Journ. Ind. and Eng. Chem., May, 1912; 3¾ pp.) 60c.

19,680 — PORTLAND CEMENT — The Distribution of Power in Portland Cement Manufacture. Richard K. Meade. (Journ. Ind. and Eng. Chem., May, 1912; 2 pp.) 60c.

19,681—PORTLAND CEMENT—United States Government Specification for Portland Cement. (Circular of the Bureau of Standards, No. 33, May 1, 1912; 28 pp., illus.)

19,681—REFRACTORIES—The Testing of Clay Refractories, with Special Reference to Their Load-Carrying Capacity at Furnace Temperatures. (Technologic Paper of the Bureau of Standards, No. 7, Dec. 15, 1911; 78 pp., illus.)

19,682—SAND-LIME BRICK—The Production of Sand-Lime Brick in 1911. (Advance Chapter from Mineral Resources of the U. S.; 3 pp.)

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

C. W. Purington left London on July 20 for Nome, Alaska.

James E. Pope has resigned as president of the New York Metal Exchange.

Frederick G. Clapp, of Pittsburgh, is examining oil properties in West Virginia.

G. Allen Crane, managing director of the Aporoma Goldfields, Ltd., of Peru, has gone to London.

Anthony J. McMillan, liquidator of Le Roi Mining Co., has arrived at Rossland, B. C., from England.

Edward R. Zalinski, of Salt Lake City, Utah, has been examining mines in the Jarbidge district in Nevada.

R. H. Elliot, of Berkeley, Calif., has been appointed mine superintendent at the Liberty Bell mine in Colorado.

Hon. W. H. Hearst, Ontario minister of mines, will shortly leave on a tour of inspection through Northern Ontario.

Charles Poirier, manager of the Vipond mine, Porcupine, Ont., has resigned, in order to practice as a consulting engineer.

Henry H. Armstead has returned to Guanajuato, Mexico from his recent trip to New York and will remain three months.

R. B. Lamb, consulting engineer of the Crown Chartered and Swastika mines, Ontario, has gone on a vacation trip to England.

Albert H. Fay, formerly on the editorial staff of the JOURNAL, but now with the Bureau of Mines and stationed at Pittsburgh, is visiting New York.

Frank W. Royer has opened an office as mining engineer in the Union League Building, Los Angeles, Calif. He still retains his office in the City of Mexico.

Blanchard M. Snyder recently returned to Los Angeles, Calif., from an examination near Globe, Ariz., and has left again to examine a property in the southern part of Nevada.

J. Morgan Clements, of New York, and Howard W. DuBois, of Philadelphia, have been examining mineral claims in the vicinity of Hazelton, Skeena district, British Columbia.

Dr. R. A. Daly is mapping a geological section along the Canadian Pacific Railway between Revelstoke and Golden, in the mountain section through which the railway passes, for the Geological Survey of Canada.

H. A. Brandt, formerly superintendent of the British Columbia Copper Co.'s Napoleon mine and mill, at Boyds, Wash., is now in charge of the company's Lone Star and Washington mines, at Darrell, Washington.

Capt. Harry Johns, for the last two years superintendent of the British Columbia Copper Co.'s Wellington group mines, Boundary district, B. C., recently examined a mining property in Montana for that company.

L. E. Ives, for some time past on the editorial staff of the JOURNAL, has resigned to accept a position with the Penton Publishing Co., of Cleveland, O., as mining and assistant engineering editor of the *Iron Trade Review*.

P. W. Sothman, chief engineer of the Ontario Hydro-Electric Commission, has resigned his position to become the head of a firm of consulting engineers. F. A. Gaby, assistant engineer to the Commission, will be his successor.

H. Kenyon Burch has been appointed chief mechanical engineer for the Inspiration Consolidated Copper Co. T. R. Drummond, superintendent of the company's Inspiration mine, now has charge of the Live Oak mine also.

W. Fischer Wilkinson has resigned his position as principal of the Cornwall, England, School of Mines. He is succeeded by J. J. Beringer, who was the principal for several years prior to 1910, when Mr. Wilkinson was appointed.

Hon. T. W. Crothers, Dominion minister of labor, Ottawa, Canada, was in British Columbia and Alberta early in July. At Fernie, in Crow's Nest Pass district, B. C., and at Lethbridge, Alberta, he was interviewed by deputations representing the coal miners.

Oscar H. Reinholt, recently with the Bureau of Mines, has left Pasadena, Calif., to examine occurrences of potash and phosphate in southeastern Idaho for Los Angeles interests. He will tour the Yellowstone National Park before returning and afterward will locate permanently in San Diego.

William C. Potter, mining engineer, formerly prominent in the business of the American Smelting & Refining Co., which he left in order to become president of the Intercontinental Rubber Co., has resigned from that position in order to accept the vice-presidency of the Guarantee Trust Co., of New York. Mr. Potter will not sever his connection with the Intercontinental Rubber Co., having been named chairman of its board of directors.

Dr. George H. Ashley has been appointed administrative geologist of the United States Geological Survey. This is a new office and makes the holder virtually vice-director of the survey, placing him in complete charge of the organization during the absence of the director, and in addition giving him charge of certain functions of the organization the whole time. Dr. Ashley has been a geologist of the survey since 1901 except for the years 1910 and 1911, when he was state geologist of Tennessee.

OBITUARY

Henry Pennock died in New York, July 24, aged 72 years. He was born in Chenango County, N. Y., and went to Colorado when a young man. He was interested in a number of mines in that state and in Alaska. He retired and returned to New York several years ago.

R. B. Nickerson, formerly manager of the Mikado and Laurentian gold mines in the Manitou Lake district of northwestern Ontario died in California July 14. He left Canada for the Pacific Coast a few weeks before his death, with the intention of returning. He was well known in Canadian mining and business circles.

Isaac McHose died at Reading, Penn., July 24, aged 89 years. He was one of the pioneer ironmasters of eastern Pennsylvania. He helped to build the first anthracite furnace, at Catasauqua in 1839. Later he built and operated blast furnaces at Norristown and Reading. He was one of the organizers of the Temple Iron Co. He retired from business some years ago.

Societies and Technical Schools

Iron & Steel Institute (Great Britain)—The antumn meeting will be held at Leeds, England, Sept. 30-Oct. 4. Besides the business sessions there will be visits made to works in Leeds and the immediate neighborhood, and to places of interest in the vicinity.

Society of Chemical Industry—The annual general meeting will be held in New York Aug. 31 to Sept. 3. On the evening of Sept. 3 members will go to Washington, and Sept. 4 to 13 they will participate in the proceedings of the International Congress of Applied Chemistry in that city. On Sept. 13 the final business meeting of the Society of Chemical Industry and the annual dinner will be held in New York.

Canadian Mining Institute—A meeting of the institute will be held in Victoria, B. C., on Sept. 18 and 19, next. The main object of this meeting is to afford Western members the opportunity of expressing their views on a number of questions relating to the business affairs of the institute, including proposed amendments to the by-laws and other questions of present importance. One or more sessions will be devoted to the reading and discussion of papers; and members proposing to contribute to the program are invited to communicate at once either with E. Jacobs, secretary of the Western branch, Victoria, B. C., or with the secretary of the institute, at Montreal. Arrangements are also being made for a meeting at Lethbridge, Alberta, of which further particulars will be sent out later.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

July 25—The Southern Oregon & Northern Mining Congress, held at Yreka, Siskiyou County on July 19 and 20 was attended by delegates from all of the important mining districts in the extreme southern end of Oregon and the northern end of California. Yreka is the county seat of Siskiyou county and is reached by rail from Montague, a station on the main line of the Southern Pacific. From Yreka the mines are reached only by a wagon road or trail. The town is headquarters for a large amount of mining business, but is at a disadvantage in being off the main line, and because the mines are isolated. The next session of the Congress will be held at Redding in Shasta County. All of the counties in southern Oregon and northern California were well represented in the exhibits of mineral products. The exhibits from Josephine and Jackson Counties in Oregon, and Shasta and Siskiyou in California were so nearly alike that no prizes were awarded. W. H. Storms, state mineralogist for California delivered an interesting and comprehensive address upon the general condition of mining in the state and the work that is expected of the state mining bureau. M. E. Dittman of Kennett, spoke on copper in Shasta County and the condition of the copper market. J. W. Dyer, of Siskiyou County gave an interesting talk on the position of the prospector and also the mineral wealth of Scott Valley. The resolutions adopted by the congress included particularly a request for a large appropriation for conducting the state mining bureau. The congress appreciated that one of the reasons that the California mines have not been better presented to the general public was that the bureau has not been sufficiently recognized financially. The congress insisted on a resolution that the Federal government revoke all concessions and patents issued to the Southern Pacific company for lands in northern California on which minerals have been or may be discovered.

Denver

July 27—The fate of the Denver Northwestern & Pacific Ry., better known as the Moffat Road, now operated from Denver to the Routt County or Yampa coal field and Steamboat Springs, a distance of 214 miles, is now being decided in this city by a noteholders' protective committee. It will be decided whether the road will be sold, or the committee will lend its aid to the stockholders by a further extension of the time for the payment of notes, with a possible change of the receivers and of the policy or operating the road. Newman Erb, receiver of the Pere Marquette R.R., is also here and it is said that he may be asked to act as joint receiver with the present ones, Dodge & Perry.

Following the purchase of 400,000 shares of El Paso Consolidated by Swiss bankers it is now announced that an eastern syndicate, through J. P. Young of Colorado Springs, has offered 25c. per share for a controlling interest of the Isabella Mines Co. owning 120 acres on Bull Hill in the Cripple Creek district. This includes the Empire State mine. The property is credited with a production of $2,000,000 and some rich gold ore was marketed; two carloads at one time brought $316,000. The capitalization is $3,000,000, of which 471,000 shares are in the treasury. E. E. Quentin, of Denver, is president and A. C. Gardner, manager of the mine. The mine is shipping regularly, but the purchasers intend to do extensive deep development.

Salt Lake City

July 25—The Utah Apex is shipping 200 tons of lead ore and 50 tons of concentrates daily. Extensive development is being done, and large tonnages are being added to the reserves. During June the production averaged 183 tons per day, which included about 50 tons of concentrates. The mill is treating about 175 tons of ore daily. Operations in the new electric haulage system installed in the Parvenue tunnel began July 6. The line is over 3000 ft. long. The motor is a General Electric 3-ton, 20-hp., and hauls a train of 30 loaded cars, each carrying 1½ tons out of the mine. A 220-volt direct-current is used, furnished from a motor-generator set by the Telluride power company. The better haulage facilities will make a saving in mining costs, and make increase in the output possible. Net profits for the 14 months ended July 1 amounted to $210,000 in round numbers.

The suit brought by the Conkling Mining Co. against the Silver King Coalition Mines Co. involving title to a strip of ground 135 ft. wide on the western end of the Conkling claim, and an accounting for ore mined therefrom, has been settled in favor of the defendant. The decision handed down by Judge Marshall, of the United States district court, awards title to the ground in question to the defendant, and holds that the apex of the Crescent fissure vein in which the ore occurs is within the Monroe Doctrine, Cumberland, and Constitution claims, which are the property of the Silver King Coalition Co.

Butte

July 24—The Anaconda Copper Co. is preparing to begin operations at the Southern Cross mine in the Georgetown mining district, purchased last spring, and for some time a force of men has been engaged in cleaning up the workings in preparation for the work. The shaft was only sunk about 400 ft. by the original operators, and the company will install modern machinery, electrically operated, and sink a three-compartment shaft, 300 ft. below the present deepest workings. As this is the deepest mine in the camp the Georgetown district is practically virgin territory as far as mining is concerned, and with the thorough course of development which will be pursued by the powerful company owning the Southern Cross, will come the first real knowledge as to the existence of commercial orebodies at depth.

During a recent electric storm, lightning struck the main flue leading from the Washoe smeltery to the stack, causing the falling in of the roof for a length of 50 ft., and compelling an immediate shutdown of the furnaces. It was at first believed that it would entail a suspension of work at the plant for some time, but a large force of men was put to work repairing the damage and the furnaces are in blast again after a shutdown of only two or three days.

The Conrey Placer Mining Co., which is operating four large gold dredges at the mouth of Alder Gulch, has just purchased from James Garrison, of Willis, the Duncan, Fehring & Garrison placer ground, consisting of 85 acres in Alder Gulch, opposite Adobetown, for $16,000 cash. This ground was among the richest in Alder Gulch and has been worked with excellent results for many years by the ground-sluicing method. Most of the gravel has been worked in that manner, but it is believed that only a small percentage of the gold was extracted. The Conrey Placer Mining Co. now owns practically the whole of Alder Gulch from Nevada, a mile below Virginia City, to Alder, a distance of eight miles, the only exception being a fraction of a claim at Junction, owned by James H. Vanderbeck. It is believed that the company will build a dredge for the working of the newly acquired ground in the near future.

Kingman, Ariz.

July 25—A petition is being circulated in the county with the intent of invoking the referendum on the miners' lein law. It is understood that similar petitions are being circulated in Yavapai, Graham and Cochise Counties. The measure seems to be in general disfavor, one local paper stating that on account of its passage, the Consolidated Mines Co. has closed its leases, thereby throwing several hundred men out of employment. Of course, such actions may be taken in protest to the law and may influence sufficient voters to cause the recall of the measure before it has had a fair trial. To one not directly affected, it appears that it would foster legitimate enterprises and discourage wildcat ventures if its intent were properly considered and the necessary agreements for mutual protection were made between mine owner and lessee. Although the conditions imposed would undoubtedly work a hardship upon many until the effect of their operations were clearly shown by the temporary curtailment of development, it is believed that these same conditions are a step toward putting that branch of mining upon a better basis, incidentally protecting the miner and the merchant against financially irresponsible operators.

Negaunee, Mich.

July 27—The valuation of mines at Ironwood for 1912 has been completed by the local assessor. The three mining companies, Oliver Iron Mining Co., Newport Mining Co., and Cleveland-Cliffs Iron Co., were given 10% reduction on real estate values, but the personal-property assessments of the mining companies was increased by $1,796,875 over last year's figures. The total assessment, real estate and personal, of the Oliver Iron Mining Co., in Ironwood, is $16,752,890, which is distributed among the Norrie, East Norrie, Aurora and Pabst mines. The Newport Mining Co., owned by Ferdinand Schlesinger, of Milwaukee, is assessed at $9,340,644, which is practically all from the big Newport mine, the largest iron mine in Michigan. The Ashland mine, owned by the Cleveland-Cliffs Iron Co., is assessed at $162,000, besides which there is a valuation of $192,000 on personal property, making a total of $364,000 against the company.

The school for miners started by the Cleveland-Cliffs Iron Co., for training men as foremen, has been started with classes at Ishpeming and Gwinn. The number of members has increased from 50 to 130, and it is proposed to engage an assistant for the instructor, J. H. Swent. It is desired to keep the different class divisions small, preferably less than 20, to permit individual instruction.

Jarbidge, Nev.

July 23—Recent developments on the Success have been highly satisfactory to the owners and of great importance to the future welfare of the district. Two orebodies have been encountered on the lower level, 400 ft. below the outcrop, showing better grade and greater width than in either of two levels above. This is the greatest depth yet attained in the camp and the block of rich ore found here will have a tendency to stimulate the opening of other properties at depth. There have been several other places where veins have been opened at depths of 100, 150 and 250 ft., but increase in grade was not as pronounced as at the Success. The engineer in charge for Mr. Wingfield ran in a tunnel along a small vein which showed little quartz and hardly any gold, for a distance of over 400 ft.; after a careful survey and figuring the possible difference in dip as shown between the upper workings in this mine and those of the adjoining Bluster mine, he concluded he was not on the main vein and ran a crosscut west for about 70 ft., where the Bluster vein was cut, showing quartz, but little gold. After drifting both north and south along this vein for about 75 ft. in each direction, the conclusion was reached that the gold in the vein did not go down as far as 400 ft. and Mr. Wingfield gave up his option on the property. After the snow was off the ground and the surface water was no longer causing annoyance, the owner of the mine tried to find the ore on this lower level. He worked for several weeks cleaning up the tunnels and timbering, then started to go ahead with both drifts. He had run less than 10 ft. in each when the vein matter suddenly changed and soon the owner had a full face of the best ore found in any part of the mine. The dip of the vein to the east had been less than expected and the inclination of the ore shoots to the north was greater, thus leaving the former work in the barren part of the vein between two oreshoots.

Albuquerque

July 27—The smeltery of the Santa Fé Gold & Copper Co. was blown in on July 25, according to reports from San Pedro mining camp; 200 men are employed in the mines and plant. The monthly payroll is $30,000. Superintendent Haines Gridley, and other officials of the company were present when the plant started. The smeltery, which is 21 miles from the Santa Fé railway and 18 miles from Stanley, the shipping station on the New Mexico Central, starts out with an output of 200 tons per day. The company has about 3400 acres of land, and the best ore yet remains to be handled in spite of the fact that in years past the company has turned out hundreds of thousands of dollars worth of products. It is mining chiefly copper, which contains silver and gold. In 1901 the ore averaged 4.25% copper, 3 oz. silver and 0.08 oz. gold. The smeltery produces a 60% matte, which is sold to the American Smelting & Refining Co. The coke is received from Raton.

Toronto

July 26—The trial of four men arrested for high-grading at Cobalt took place at North Bay, July 23, before Judge Valin. The principal witness against them was George P. Williams, the Pinkerton detective, who gained their confidence and ostensibly joined an expedition to rob the Timiskaming mine. One of the prisoners was discharged and the others convicted and sentenced as follows: Robert Pierce, 14 months' imprisonment; John Mitchell, 13 months, and Peter Cassell, 9 months.

Final arrangements have been made to change the location of the mining town of Frank, Alberta, which is in danger of destruction from a landslide. The municipal authorities have called for tenders to be received by the end of July for the removal of all the buildings.

Porcupine

July 26—The action of several of the mines in the Pearl Lake district reducing the wages of their employees to correspond to the scale paid by the Dome and Hollinger has given rise to rumors concerning a general strike throughout the district. The possibility of such action by the miners is most unlikely, as the union has not a strong hold, and is in a weak financial condition. The presence of so many foreigners among the miners is also another argument against a strike, as the union finds it almost impossible to influence them.

Nelson, B. C.

July 20—There is some talk here of a consolidation of Sheep Creek properties and the erection of a central reduction plant. The mines considered can be divided into two groups: The Queen Kootenay Belle, and other properties in the immediate vicinity, on the south side of Sheep Creek; on the north side, the Nugget, Motherlode and perhaps the Golden Fawn. The topography of the district is suitable for a scheme of this kind, as at this point the valley narrows into practically a cañon. The Nugget-Motherlode series of veins parallel each other and can be developed at considerable depth from the Sheep Creek slope. At present these properties are running small mills, with their attendant disadvantages. A central mill, and uptodate reduction methods, would probably cut down the costs and increase the recovery.

The Mining News

The Current History of Mining

Alaska

Alaska Treadwell—During June the mills were operated 30 days crushing 82,180 tons of ore for a gross yield of $204,577 and $96,458 net yield.

Alaska Consolidated—This company is employing a large force of men to open its Nugget Creek mines. A crosscut at 200 ft. recently cut the large calcite-bornite vein. The condition of the trail alone prevents shipments by pack train. Preparations are being made to sink a shaft 250 ft. at which depth crosscutting will be done. A pumping plant will soon be delivered at Strena, to be sledded in on the first snow. About 1000 sacks of 65% ore are piled on the dump and another year's development is expected to place sufficient ore in sight to warrant the erection of a reduction plant.

Rarus—At this group of claims on the Kuskutana River, the property of the owners of the Alaska Consolidated, there is a contact vein about 400 ft. wide. A contract has been let for 100 ft. of tunnel to Danielson & Oeterson. Alfred B. Iles is manager.

Kuskutana Copper Co.—Twelve men are working on two of the levels and results are said to be satisfactory. The property is the southern extension of the Rarus and was taken over last autumn by E. F. Holden. One level has entered the mineral zone after passing through the limestone at a depth of 100 ft. The drift is being continued to tap other veins.

Kennicott—These mines are shipping 50 tons of ore per day and the concentrator will probably be running smoothly in a few days.

Arizona

Cochise County

Calumet & Arizona—It is reported that the company is developing an openpit mine that it has held under option for several years. It is said that for some years to come, steam shovels can be used with little stripping.

Gila County

Barney—Churn-drill hole No. 3 on the Barney group west of, and adjoining the Live Oak mine, has been discontinued at a depth of 1015 ft., and the exploration of the claims has been finished. No more holes will be drilled and the Lewisohns will relinquish their option on the property. Three holes were drilled, one 1450 ft., one 600 ft., and one 1015 ft. deep, none found ore, although sulphides of iron and copper were discovered in small quantities.

South Live Oak—Churn-drill hole No. 2 is over 655 ft. deep in granite. No ore has yet been discovered.

Old Dominion—Reports state that an immediate increase in the output to 500,000 lb. per month, is planned. Lower-grade ore will be treated.

Southwestern Miami—Churn-drill hole No. 5 corresponding to hole No. 3 of the Barney group and which was being drilled at the junction of the Barney, Southwestern Miami, and Inspiration Consolidated properties at the equally shared expense of the three companies, has been discontinued at a depth of 1015 ft. without ore having been discovered, although the schist was found to be slightly mineralized. Three other holes are being drilled as rapidly as possible, the deepest of which is over 720 ft. deep. All holes are in schist.

Miami—Two churn-drills are at work developing the northeastern part of the property where it is officially stated that a large tonnage of low-grade ore is being proved. Diamond-drilling continues on the 570-ft. level.

California

Amador County

A committee of 125 men has been named by the board of supervisors to confer with the state highway commission regarding the extension of the county roads in Amador and Sacramento counties to connect with the proposed state highway. It is understood that if the connection is made Amador's share of the expense will have to be raised by a bond issue.

Bunker Hill—The 73d. monthly dividend was paid on July 15, at the rate of 7½c. per share. The semi-annual statement shows that the dividends for the six months aggregated $90,000; surplus in treasury July 1, $40,613. Ore mined and milled, totaled 31,475 tons, yielding between $5 and $5.50 per ton. The mill was operated 151 days, and was hung up from Feb. 12 to Mar. 9, owing to the breaking of a skip cable. As a large amount of development is in progress the directors intimate that it may be expedient to reduce the rate of dividends. The drain tunnel at the 1250-ft. level has been cleared, thus making an extra outlet from the mine. The sinking of a second shaft is contemplated. E. Hampton, superintendent.

Keystone—The shaft was deepened 102 ft. in June, the formation being hard greenstone. The new compressor and blower are operating in good order. C. R. Downs, Sutter Creek, manager.

Calaveras County

The Utica Mining Co. which supplies water and electric power for other mines at Angels Camp besides its own has tapped the supply reservoir at Silver Lake, thus assuring a supply for the mines and the town for the next three months. At the end of February there was fear of a shortage of water, but the April and May rains provided against such shortage as might affect the mining.

Lightner—Sinking is now in progress below 900 ft., where a good block of ore was recently disclosed.

Utica—A new shoot of ore is reported at the Cross shaft, disclosed in the prospect winze.

Gold Cliff—A new orebody is reported in this mine, which is one of the Utica properties, and which adjoins the Dolling. F. J. Martin, superintendent.

Eldorado County

Yeadon—This property at China Hill near Eldorado has been bonded to San Francisco and Oakland men who are proceeding with development.

Greenstone—Development is in progress by New York men, and it is reported that the work of the last six months has shown some fine prospects.

Davidson—This property near Placerville is being prospected by shaft, drift and opencuts. E. M. Morgan, manager.

Kern County

Goodhope—A large body of ore is reported to have been blocked out in this mine. The control of the Consolidated Mines Co., which operates the mine, has not been settled yet.

Blackhawk—This mine is being operated by the owner, D. A. Blue. A shaft is being sunk 200 ft. on a well defined vein. This vein averages about 5 ft. wide. There is a 5-stamp mill in operation, crushing $18 ore.

Mariposa County

Treasure—The 300-ft. shaft is being deepened. Drifts were driven from the 250-ft. level 300 ft. north and 175 ft. south. Drifts will also be driven from the 300-ft. level. The mine is equipped with a 10-stamp mill, electrically driven. J. W. McGinn, of Hornitos, superintendent.

Placer County

Big Bursar Mining Co.—This company has purchased the properties of the Orpheum Mining Co. in the Ophir district. The price is not made public, but it is estimated that the mill and other equipment are worth about $50,000. K. Wertheimer, of San Francisco is president; Charles H. Peach, of Newcastle is secretary.

Republic—Snedakar & Foley have purchased a compressor and will install it at this Grouse Cañon mine.

Home Ticket—W. S. Keith, manager, has suspended work on this property on account of shortage of water.

Pacific Mining Co.—Installation of the pumping plant at the Big Bar placer mine has been completed.

Colorado

Clear Creek and Gilpin Counties

New Era—This Trail Creek mine is being unwatered with the view of further development in the lower workings. James Cousins, manager.

Stanley—During June the fifth level south heading was advanced 130 ft. The drift has passed through another porphyry dike and is again in ore. The best ore is usually found just south and west of each porphyry intrusion.

Gem—The reconstruction of the shaft house is under way; George Keys, contractor in charge of the work.

Mattie — Additional development is planned. The mill in Chicago Creek is being overhauled. A contract has been let to sink the main shaft 300 ft. and the work will be started at once. The shaft is now about 700 ft. deep.

Bates—This mine in Chase Gulch is now being reopened after a long period of idleness. Trial shipments have been satisfactory.

Lake County—Leadville

Fairplay—Gold ore is being sacked which was taken from a 3-ft. streak which produces about five tons daily; 20 tons of medium-grade ore are being hoisted daily.

Colonel Sellers—From the lower levels 5000 tons of zinc sulphide ore are being hoisted daily. Manager Barglar can increase his output as soon as the smelteries have increased capacity.

Yak Tunnel—About 12,000 tons is the output of this property for the month. The company is prospecting in Vegas territory at the head of Big Evans.

San Juan District

Camp Bird The total net profit for June operations at all the properties of the company was £33,400.

Smuggler-Union—The new mill is in operation and treating about 350 tons per day, about 35 tons of which is from old dumps in Marshall Basin.

Lewis—The trail through Bridal Veil Basin to this mine is open and the transportation of supplies and concentrates by mule train has commenced. Concentrates produced last autumn are being taken to the railroad for shipment. Development was continued during the winter with satisfactory results. T. L. Livermore is manager.

Ophir Consolidated—The crosscut tunnel is over 1800 ft. long and has cut two blind veins that show fair milling ore. The Butler vein is expected to be cut within 50 feet.

Carbinera—This mine on Silver Mountain is shipping from one to two cars per week of lead-silver ore, to the Salida smeltery, that nets about $40 per ton.

Alta—This mine, owned and operated by the Wagner Development Co. is shipping about 40 cars per month of lead-silver concentrates.

Teller County—Cripple Creek

Strong—Since the drainage of the shaft of this mine at Victor, by the deep drainage tunnel, the shipments have been increased to two cars per day of high-grade ore. Samuel McDonald is manager.

Gold Coin—The complete success of the deep drainage tunnel is exemplified by the fact that in this mine at Victor, the water has receded 160 ft. since the flow was first tapped in the heading. It is still receding at the rate of 4 in. per day and is now 75 ft. below the 10th level. In the west end of the district the recession is still greater.

Montrose—From a lease started only three weeks ago by Martin & Walker, on the Montrose shaft on Ironclad Hill, ore is already being mined and a shipment is ready to go out.

Petril—A five-car shipment of ore is reported by Finley & Rankin, lessees from the Petril on Squaw Mountain. The ore is being mined through the Squaw Mountain tunnel.

Molly Kathleen—The plant will be steamed up at once by Abram Rapp, who has been given a lease by Gartner & Co., the owners, and extensive development will be done.

Squaw Mountain Mining Co.—A 15-hp. electric hoist has been installed on the April Fool claim, and a shaft will be sunk at once. The company has its headquarters at Springfield, Mass. Manager Cole in charge.

United States Reduction & Refining Co.—The company has opened its cyanide plant near the Standard mill for the treatment of the tailings from the plant, amounting to about 90,000 tons. The plant will treat about 700 tons per day and 25 men will be employed at the work, according to Supt. C. A. Sheetz.

Jennie Sample—General Manager John T. Hawkins of Colorado Springs has leased the dump to Morgan & Churchill; they have billed out the first shipment of mill ore.

El Paso—The Nicholls shaft will be completed to the 800 level by Aug. 1, opening 250 ft. of virgin ground, and a heavier hoisting plant is being erected, which will largely increase the producing capacity.

Idaho

Lemhi County

The Gilmore camp is shipping about 150 tons per day of lead-silver-gold ore averaging from $30 to $40 per ton.

Gilmore—The company recently opened a 10-in. vein of gold ore, of exceptionally high grade.

Oriole—This company is contemplating leasing the Mountain Boy mine, four miles from Gilmore. M. R. Lare is secretary, at Gilmore.

Shoshone County

Tamarack & Chesapeake—It is reported that the officers have been instructed, at a recent special meeting of stockholders, to complete the organization of the Tamarack & Custer Consolidated Mining Co., which will be a consolidation of the Tamarack & Chesapeake with the Custer company.

Michigan

Copper

Osceola—Operations have been resumed at all the shafts of the Osceola's North Kearsarge branch. It is said that the pumps are handling the water satisfactorily and that practically no tonnage was lost.

Wolverine—Developments in the Osceola lode on Wolverine territory have not been encouraging. The lode was found in the crosscut driven from the shaft to intercept it, but results were somewhat disappointing. Wolverine averaged 24½ lb. copper per ton for June output.

Calumet & Hecla—Under the provisions of an indenture dated Mar. 1, 1909, between the Calumet & Hecla Mining Co. and the City Trust Co., trustee, notice is given that all of the outstanding 5% gold coupon notes of the Calumet & Hecla company, dater Mar. 1, 1909, and issued under the indenture will be paid and redeemed by it on the next semi-annual interest date, Sept. 1, at par and accrued interest, at the Old Colony Trust Co. Interest on the notes will cease on Sept. 1. The notes to be redeemed amount to $1,000,000 and were for 10 years, payment being anticipated. They were issued for the purchase of Bigelow properties, the total cost of which was $8,519,000; a total of $5,819,000 in 10-year notes remains outstanding.

IRON

The Jones & Laughlin Steel Co., is the most extensive user of diamond drills on the Marquette Range. The Cleveland-Cliffs Iron Co., the largest producer of the district, which had a dozen drills in commission a few years ago, is now doing little exploratory work, the development of the deposits already discovered being sufficient to occupy its attention for years to come.

United States Steel Corporation—This corporation is testing a number of tracts in the Republic field and in the Fence River country, but has fewer drills working than in former years.

American-Boston Mining Co.—This company, at Diorite, will install in its power plant, a 500-kw., 2300-volt Curtis turbo-generator, that will be furnished by the General Electric Company.

Salisbury—At this mine of the Cleveland-Cliffs Iron Co. in Ishpeming, the old Cornish pump, which has done service for many years, will shortly be changed for an electric centrifugal pump to be run from the company's new water-power plant; an electric hoist will also be installed.

Mineral Mining Co.—At the Konwinski or Wauseca mine at Iron River, the new air shaft is nearly completed.

Jones & Laughlin Co.—At the Forbes mine at Iron River, operations have been delayed by waiting for the new steel headframe. It is expected to start shipping ore this autumn; 50 men are employed, 12 of whom are engaged in sinking the shaft, which is down 200 feet.

Breitung-Kaufman—The big high-grade stockpiles at the Mary Charlotte and Breitung-Hematite mines are fast becoming depleted. These ores are among the highest grade soft ores on the Marquette range.

Montana

BUTTE DISTRICT

Anaconda—The Pennsylvania mine of the Anaconda company was closed down July 17 for remodeling the hoisting engine for compressed air in place of steam. Immediately preparations were begun toward the resumption of sinking the main shaft, three compartments wide, from its present depth of 1800 ft., to the 2000-ft. level. A station will be cut when this level is reached, and crosscutting to the veins will be started. For sinking a small single-drum hoist, to be run by compressed air, is being placed on the 1800-ft. level, and sinking will be begun before Aug. 1. Retimbering of the air shaft, three compartments wide, from the 1400-ft. level to the surface, which was commenced some months ago, has now reached a place slightly above the 700-ft. level, and will be continued uninterruptedly to the surface, which it should reach within the next three or four months. The development work being carried on by the driving of the south crosscut on the 1800-ft. level, will be continued during the shutdown. The breast of this crosscut is now about 1775 ft. from the shaft, and advance is being made at the rate of about 100 ft. per month. In addition to this work, development will be carried on as formerly by a drift on the 1800-ft. level, a raise on the 800-ft. level, and a drift on each of the 1400- and 1500-ft. levels. No stoping will be done, nor ore hoisted during the shutdown. The chippy hoist will be kept in commission as usual during the period that the mine is closed, for lowering supplies, and for hoisting to the surface, waste taken from the shaft and development workings.

West Gray Rock—The shaft was sunk from the 1300- to the 1600-ft. level, and was completed to this level early in July. A station has been cut on the 1400-ft. level, and similar work has been started on the 1600-ft. level. On the former level exploration work is being carried on, and will shortly be commenced on the bottom level. A new surface plant consisting of a carpenter shop, machine shop, and blacksmith shop, is in the course of erection, and a new and modern changehouse, containing 280 steel lockers and 12 shower baths, as well as a separate compartment for the use of the shift bosses, has just been completed. A new timber yard has been graded and is ready for stocking with mine timbers; also a trestle has been constructed for a spur from the railroad track to the timber yard so that the timber may be skidded direct from the cars to the yard platform. There are about 210 men on the payroll at present, and an average of 11,000 tons of ore is being hoisted monthly.

Butte & London—It is reported that a crosscut in a northeasterly direction has been run from the High Ore mine of the Anaconda company on the 2000-ft. level through a claim adjoining the Butte & London property on the west, intersecting a wide vein carrying high-grade ore in commercial quantities. This vein passes through Butte & London ground and is said to apex in it. It is believed that a deal will be closed whereby operations in the Butte & London will soon be resumed.

Silver Bow—About 125 men are employed underground and on the surface, and an average of approximately 6000 tons of ore is being hoisted monthly. The quintuplex electric pump recently installed on the 1000-ft. level is pumping about 240 gal. of water per minute to the surface. This water carried in solution about 0.1% copper, and it flows through a precipitating plant on the surface, which is operated under a lease from the company. The old Riedler steam pump, which was used before the electric pump was installed, was left connected on the 1000-ft. level, and is used whenever it is necessary to shutdown the new pump for the changing of plungers or other repairs.

Berkeley—Sinking has been resumed in the shaft from the 1000-ft. level, and a crosscut is being driven on the 1500-ft. level of the Tramway mine to a point under this shaft, when raising will be commenced to meet the sinking force. On account of bad air encountered in this crosscut from the Tramway workings, only one shift of eight hours each day, is working there. There are about 225 men on the payroll, and about 14,000 tons of ore is being hoisted per month.

Nevada

COMSTOCK LODE

Ward—The Starret pump has been lowered to the 2200 level. The work of pumping out the shaft to the 2475 station has begun.

Consolidated Virginia—Sinking in the ore chimney below the 2400-ft. level has, been started. A drift in the same vein at the top of the 3-compartment raise on the 2300, will also be undertaken soon.

CLARK COUNTY

Yellow Pine—The first dividend amounting to $28,508, or 3c. per share on the stock outstanding, has been declared and is payable July 25, 1912. It is the intention of the company to declare a regular monthly dividend of 1c. per share, amounting to $10,000, and to divide the surplus quarterly. At the present rate of output, the surplus will exceed the regular dividend. Orders have been placed for a classifier and additional concentrating tables of the Overstrom type; a new pumping plant is to be installed. The force at the mine has been increased, and considerable development is contemplated.

Lost Sheep—Charles F. Byram, of Chicago, has purchased a controlling interest in this property, on the north slope of Charleston mountain, about two miles from Harris Springs. Development is being done under the superintendence of J. E. Armstrong. The deposit is a vein of copper glance and carbonate in sandstone, containing gold and silver.

Pilgrim—The shaft is now 160 ft. deep; stringers of lead carbonate ore have been found in the face. Hardy & Robbins are owners of the property; Harvey Hardy, manager.

ELKO COUNTY—JARBIDGE

Etta B.—A. S. Baty has started work on this claim. Some of the coarsest gold specimens found anywhere in the camp were taken from this claim late last season from a prospect hole on the Bacon vein. The Bacon vein was traced for about two miles and gold was found along it on five different properties.

Buff—There is a tunnel about 30 ft. on the vein which is beginning to show ore of more even grade. The vein has been opened by trenches. There is more iron sulphide in the vein here than at the north end of the camp, although as far as tested the surface ores are low in gold.

Sixth Crater—About one mile east of the Buff and just over the ridge near the head of Cougar Creek, several parties are working and some rich specimens of ore have been found, but there is considerable snow, and it is hard to tell as yet whether this gold comes from quartz in place or from float.

ESMERALDA COUNTY

Florence-Goldfield—The new orebody on the 250-ft. level has been explored extensively and an excellent grade of milling ore has been opened. The main shaft is about 1175 ft. deep.

Goldfield Merger—The work of enlarging the Grizzly Bear shaft of the Consolidated is nearing completion, and drifting will soon be resumed on the 1300-ft. level.

Sandstorm-Kendall—Lateral work has been suspended and sinking of the old Kendall shaft from the 420-ft. point to the 500-ft. level is progressing. A three-drill compressor was recently installed.

Goldfield Merger—Rapid progress is being made in the sinking of the large shaft which has now reached a depth of 1150 feet.

C. O. D. Consolidated—A winze is being sunk in the milling ore recently encountered on the 100-ft. level. If conditions warrant the present small hoist will be replaced with a larger one.

HUMBOLDT COUNTY

F. C. Alsdorf, representing New York men, is drilling for copper ore at Red Butte, about 60 miles west of Winnemucca. Indications are said to be favorable.

Barber Cañon Placer Mines—Messrs. Mead and Jackson, of Denver, have taken over these mines in Barber Cañon, about 20 miles southwest of Winnemucca. Machinery has been installed, including a No. 9 Cameron pump and a 50-hp. boiler, and development has been commenced. J. B. Truett, Mill City, Nev., is superintendent.

LYON COUNTY

Mason Valley—During the first 15 days in July, the smeltery treated 10,877 tons of ore, an average of 735 tons per day. The number of custom shippers is increasing satisfactorily, at present amounting to over 50. During the above period the smeltery received 1759 tons from these custom shippers, an average of 117 tons per day.

Tonopah Mining—During the quarter ended May 31, ore worth $832,074 was milled. Gross value of mill products was $751,916. Net income was $453,795 and $15,239 were spent on exploration.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended July 18, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,850	96,369
Tonopah Belmont	1,950	59,026
Montana-Tonopah	1,022	29,532
Tonopah Extension	1,036	28,283
West End	750	20,549
Midway	40	300
MacNamara	458	10,935
North Star	......	80
Totals	8,606	245,074
Estimated value	$240,150	......

The Cash Boy, Monarch Pittsburg and Great Western properties resumed operations this week.

Tonopah Extension—The mill clean-up for the first fortnight of July resulted in the shipment of 25 bars of bullion, weighing 2770 lb. (estimated value $31,200), from 2304 tons of ore. The big orebody on the 500-ft. level has also been opened on the 600-ft. level. In the extreme western workings 900 ft. west of the shaft the western ore shoot has been opened on the 660-ft. level.

MacNamara—The 50-ton filter press in the mill was struck by lightning, July 19, entailing a loss of $4000, fully covered by insurance. Not a leaf was injured. While a new filter press is being installed the output of the mine will be maintained by shipments to the smelters.

Jim Butler—Shipments to the old Belmont mill at Millers will be commenced in a few days. The property shows reserves of over 20,000 tons, said to assay from $25 to $33 a ton.

Tonopah-Belmont—The new mill commenced operations July 24. The plant comprises 60 stamps, 8 tube mills, 12 Deister concentrators and complete cyanide plant; cost $450,000, and one year was required for building.

Golden Anchor—The crosscut from the 985-ft. level entered the foot-wall side of the vein July 24 and shows the ore to be of much higher grade than when cut in the shaft. A more powerful hoist and a 10-drill compressor plant has been installed.

Mizpah Extension—Rich ore has been found on the 1000-ft. level. A shipment will be made soon.

Halifax—A crosscut to the vein has been started from the 1400-ft. level.

Tonopah Midway—A car of high-grade ore from the 535-ft. level was shipped this week.

New Mexico

GRANT COUNTY

Phelps-Dodge officials were in Fierro recently looking over the mining claims and inspecting operations. Operations of late have been increased at Fierro and the shaft on the gold-copper mine will be sunk 200 feet.

The output of the mines at Fierro has been more than doubled this month, and two trainloads of 14 or 16 cars each of ore are shipped out daily or an aggregate of 1200 tons. About half of this is mined by the Colorado Fuel & Iron Co., which is again working the "86" mine as well as the Jim Fair.

United States Copper Co.—At Hanover ore is being taken from the Philadelphia mine, which is proving to be a valuable property, the grade of the ore improving with development. Floods during the last week have threatened to carry away much of the railroad track between Hanover and Fierro and the railroad company has a large force of men at work strengthening the weak places.

Chino—During June production amounted to about 1,540,000 lb. of copper. Good progress is being made at the concentrator. Three units are in commission. One unit has been shut down pending certain adjustments, but two units are always in commission. Some of the steam shovels are now working in clean sulphide ore, which should increase the extraction. This is now said to average between 65 and 72%.

LUNA COUNTY

Tres Hermanos—Three shafts are sinking in ore, some of which is of shipping grade. This is being stored. D. Hathaway is foreman.

Victoria—Frank Wyman is making regular shipments to the El Paso smeltery. A car of high-grade zinc carbonate was recently shipped to Iola, Kan.

SOCORRO COUNTY

Deadwood Mines—The erection of the new headframe and resetting the hoisting engine were accomplished in record time. The mine equipment is again complete and regular hoisting established. The new 50-hp. auxiliary engine for the mill is about ready for operation.

Deep Down—Lessees continue to send a good tonnage of ore to the custom mill.

Ernestine Mining Co.—The new oil engines are giving excellent service. During the week 595 tons of ore were treated, yielding 78 sacks of high-grade concentrates, and the usual amount of precipitates, which are being smelted. The low weekly tonnage was due to shortage of water for a few days, but the summer rains have started and there will doubtless be an ample flow in the creeks for the continuous operation of all the mills henceforth.

Oaks—The week's development on the Pacific and Johnson mines yielded 70 tons of ore which was sent to the Deadwood mill. The last 115 tons treated from these mines averaged $22 per ton.

Mogollon Gold & Copper—Three shifts are sinking the winze in the Little Charlie tunnel, now down 80 ft. Proceeds of ore taken out in development are more than ample to meet development expenditures.

Iron—A good tonnage of ore is being delivered to the Deadwood mill from the development of this group.

Oregon

Lane County

Treasure—This mine, formerly owned by an English syndicate, has been sold.

Great Northern—Considerable development has been done on this property. The buildings that were destroyed by fire last autumn, have been replaced and men are getting the machinery in shape.

Vesuvius—F. J. Hard, manager, states that he will have the 10-stamp mill at this mine in operation soon. Good free-milling ore has recently been opened in the lower levels.

Pennsylvania

Pittsburgh Steel Co.—Rapid progress is being made on the construction of the blast furnaces at Monessen. Men are working night and day, except Sunday. Four of the stoves of the first blast furnace have been practically completed, and work has been started on four more of the second blast furnace.

American Sheet & Tin Plate Co.—Announcement is made that the American Sheet & Tin Plate Co. will construct at once two additional openhearth steel furnaces at its Vandergrift, Penn., works making a total of 12 furnaces, and utilizing all the space it now has in its present buildings for this purpose. It is quite likely that four additional furnaces will be added later.

South Dakota

North Homestake—The company has completed about 450 ft. of development on the 620-ft. level of the mine, at Maitland, with satisfactory results.

Golden Reward—D. D. Findley is cleaning up the company's old smeltery at Deadwood, with encouraging results. Several cars of furnace bottoms have been shipped, together with flue dust and miscellaneous gatherings from the ruins of the old furnaces and stacks.

Castle Creek—The dredge at Mystic is operating steadily after the winter shutdown. During the idleness the boat was thoroughly overhauled and some minor changes made. Rollers were put in the main screen to break up clay balls which it was found were carrying off an appreciable amount of gold.

Golden Summit—This mine, at Hill City, operated by D. Canfield, has recently produced some unusually rich ore. The high grade has been shipped to smelters and the balance treated in the stamp mill on the ground.

Forest City—A new 10-stamp mill has been erected on the property and is said to be one of the best-equipped small plants ever built in this district. It is practically ready to run. The mine contains a small vein of high-grade, free-milling quartz.

Utah

Beaver Conty

Horn Silver—June shipments are given as 20 cars; nine cars as the July output thus far. About 70 men are employed.

Juab County

Tintic shipments for the week ended July 19 were 192 cars.

Gold Chain—Shipping ore has been followed for 80 ft. on the 700-ft. level, and it has been developed for 90 ft. above and 50 ft. below it. Ore has been found on the 500, which appears to be a continuation of the blocks on the lower levels. From 500 to 600 tons weekly are being shipped.

Lower Mammoth—During the first six months of 1912 over 2000 ft. of drifting and 350 ft. of raising was done. Much of this work was done on the 1000 and 1500 levels. On the former, where crosscutting west into unexplored ground has been done, a fissure opened 125 ft. from the west side line is being followed. On the latter, new ground to the north and west of the shaft, showing much mineralization is being prospected. A drift to the north from this level is 230 ft. in Gold Chain ground, and that company is paying the expenses of the work. Receipts were $19,376, which includes $10,000 from assessment No. 29 and $186 from assessment No. 30 (the latter amounting to $10,000 did not fall delinquent until July 19), and an overdraft of $7564, July 1. Expenditures, labor, supplies, etc., including an overdraft of $5091, July 1, were $19,376.

Grand Central—The drift to the southeast on the 2300-ft. level is within 30 to 40 ft. of a point directly below the winze in ore from the 2200. The output for the week ended July 19 was 14 cars.

Beck Tunnel—Ore has been opened on the 175-ft. level in a drift to the southwest. During the week ended July 19, four cars were shipped.

Salt Lake County

Utah Consolidated—During the first six months of 1912 there were shipped 100,808 dry tons of copper ore and 8025 dry tons of lead ore, net earnings being estimated at slightly over $300,000. The tonnage of lead ore in sight has been increased over the figures given in the last annual report, and the copper ore reserves have been maintained at approximately the same tonnage and grade.

Utah Metal—The tunnel is within 2600 ft. of completion; the Bingham side is in 1600 ft., and the Tooele side 7600, the total projected length being 11,800 feet.

Bingham-New Haven—A dividend of 10c. per share, amounting to $22,869, has been paid; up to date $2 a share has been paid. The property, which adjoins the Utah Consolidated, is controlled by Eastern men.

Utah Copper—The June output amounted to 9,234,465 pounds.

South Hecla—A mineralized cave has been opened on the Quincy level under the Kate Hay shaft, where a heavy flow of water was encountered. Drifting to the left is being done to avoid the water, and to cut the vein beyond the cave.

Michigan-Utah—Shipments for the last 30 days amounted to 600 tons of ore, averaging $30 per ton. The work of constructing the 4½-mile tramline to Tanners Flat is in progress, and it is expected that the line will be in operation by the end of August. The initial capacity of the line will be 100 tons daily, and ore from both the Utah Mines Coalition and the City Rocks will be sent out via this route, which, it is thought, can be kept open through the winter.

Summit County

Alta-Emerald—Articles of incorporation for a new company to be known as the Alta-Emerald Mining Co. are being prepared with a view to operating the Emerald claim in Alta near the South Hecla. The property is being opened through an old tunnel in the gully near the Alta-Hecla boarding house. This tunnel, which is 600 ft. in, will, with 40 ft. more work, reach a place 200 ft. below the discovery shaft on the Emerald.

Park City shipments for the week ended July 19 were 4,711,620 pounds.

Snake Creek Tunnel—The tunnel is 500 ft. in, or about one-third of its projected length. The face is in limestone mineralized with iron pyrites. A large flow of water has been developed.

Barry-Coxe—The first shipment for 1912, amounting to 120,000 lb., has been made.

John the Revelator—Leasers on this property in the Snake Creek district have shipped three cars of ore. The ore contains copper, silver, lead and gold.

Tooele County

Consolidated Mercur—New ore has been opened, which assures another six months' operation, at least.

Canada

ALBERTA

It is reported that surveys will begin soon for the system of 1450 miles of railway line of the Northern Territorial Ry., financed by an English syndicate and capitalized at $40,000,000. The road will extend from Fort Churchill, on Hudson's Bay, to Port Essington on the west.

Edmonton Portland Cement Co.—Work on the plant of this company at Marlboro, 140 miles west of Edmonton, is progressing rapidly, 80 cars of machinery having arrived on the ground where all the foundation work has been completed. It is expected that the mill, which has a capacity of 1500 bbl. per day, will be in operation early in October.

BRITISH COLUMBIA

Granby Consolidated—The following is a summary of the results of June operations: At the mine 102,200 tons of ore was shipped in 28 working days, a daily average of 3720 tons; development work consisted of 428 ft. raising, 419 ft. drifting, 55 ft. sinking and 1415 ft. of diamond drilling. At the smeltery 2256 tons of ores other than from Granby mines were received; 102,045 tons of Granby and 1862 tons of foreign ores were smelted.

British Columbia Copper Co.—Shipments of copper since July 1 exceed those for the corresponding month last year by nearly 100,000 lb. The company on Aug. 1 will have on hand in cash and free metal an aggregate exceeding the amount on hand at the time of the declaration of the dividend paid on July 1, while the visible ores of its own mines and of proprietary companies is said to be greater than ever before.

Surprise—The raise has been connected with the old workings above. The distance raised was about 860 ft., and this was done with hand drills. Several shoots of ore were passed through.

NEW BRUNSWICK

Minto Coal Co., Ltd.—This company has been organized with a capitalization of $400,000 to take over the coal interests recently acquired by Sir Thomas Tait in Queen's and Sunbury Counties, in the Grand Lake district. Estimates place the amount of coal in the deposits at nearly 2,000,000 tons. The company is erecting upward of 40 houses at Minto for its employees and preparing to ship coal in large quantities over the Gibson & Minto R.R. by the end of the year.

ONTARIO

Copper has been found in Lebel township, 20 miles north of Englehart, according to an official report received by the Timiskaming & Northern Ontario Ry. This is practically the first official assurance of the existence of copper fields in the district.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended July 26, and for the year to date, are:

Beaver	38.85	219.75
Buffalo	30.71	727.96
Casey Cobalt		212.15
City of Cobalt		812.51
Cobalt Lake..		399.24
Cobalt Townsite	27.00	880.68
Chamb.-Ferland		257.05
Coniagas		1,143.63
Crown Reserve		302.08
Drummond....		330.30
Hudson Bay		408.27
Kerr Lake..		424.14
La Rose	46.27	2,000.47
Lost and Found		15.00
McKinley-Darragh	72.89	1,592.11
Nipissing		1,235.63
O'Brien	69.39	345.62
Provincial		22.22
Right of Way....		180.01
Timiskaming ..	30.78	650.24
Trethewey		283.54
Wettlaufer		229.04
Totals..	315.90	12,671.64

ONTARIO—PORCUPINE

Tough—An option has been taken on this Swastika property by C. A. Foster, of Haileybury.

Dome Lake—The Merrill Metallurgical Co. will design a 10-stamp mill for this company.

Algunican—This company will develop the Bougan mine, in Whitney township.

QUEBEC

Amalgamated Asbestos—The Standard mill at the Thetford mines, owned by this company, was destroyed by fire on the night of July 21. The loss was largely covered by insurance.

YUKON TERRITORY

An extension of the White Pass railway from White horse to the Tantalus coal fields, 120 miles, has been announced.

Yukon Gold—Cable advices from Dawson report the gross production for June as follows: 856,600 cu.yd. dredged, compared with 667,339 cu.yd. dredged in June 1911; average recovery per yard 73c., against 57c.; value of bullion produced $626,400, against $381,449. For the season to June 30 last there were 1,460,400 c.yd. dredged, against 1,173,917 cu.yd. in the same season of 1911; average recovery per yard 76c., against 55c.; value of bullion produced $1,116,700 against $654,668.

Mexico

DURANGO

Mexican Iron & Steel Co.—This Monterey company is negotiating for the purchase of the "Iron Mountain" at Durango.

GUANAJUATO

Guanajuato Consolidated—The report for 1911 shows net profits of $13,419. Surplus increased to $38,175. The management estimated ore reserves at between 800,000 and 1,400,000 tons upon which a profit could be shown.

JALISCO

San Pedro Analco—The United States Smelting, Refining & Mining Company has relinquished its option on this silver property on the Santiago River after an investigation of several months during which considerable development was done. The mine is owned by the Gill interests of Guadalajara.

MICHOACAN

The Concepcion mine in the Tlalpujahua district and the Santiago west of this district are under option to Canadian men. Both properties are controlled by Samuel Lederer.

SONORA

Greene-Cananea—At the last meeting of the directors of the Greene-Cananea Copper Co., at which a dividend of 25c. per share was declared, payable Aug. 31, it was decided to pay dividends quarterly, beginning with next December. It is believed that the rate will be continued at 25c. per share. The company has readjusted the wage scale. The premium system has been abolished and work hours reduced from 9½ to 9 per day.

Russia

Sissert Co., Ltd.—This company has been promoted in London, with $5,000,000 capital, to take over the Syssertski District Mining Co., owning over 340,000 acres of copper and other mineral land in the Ural Mountains.

Asia

CHOSEN

Oriental Consolidated—During May the mills crushed 25,230 tons of ore yielding gross receipts of $130,334. Operating costs were $75,302; improvements, development, etc., $3473. Net profit for the month was $51,558.

SIBERIA

Lena Goldfields, Ltd.—A press dispatch recently received reads: At the Lena goldfields, where hundreds of workmen were recently shot down, and where a senator, with a large staff, sent by the Czar, is now making a strict investigation, the relations between the offended workmen and the much-criticized local representatives of their employers have suddenly taken another turn for the worse. It is reported that the men have decided to leave the mines, and request the government to assist them to quit work. They have just sent away the widows and orphans of their murdered comrades. At a mass meeting of workmen from all the mines, only six out of 3000 voted against the resolution to leave the region. It is said that Captain Treshtchenkoff in command of the troops at the goldfields, has been committed for trial for illegally accepting large sums of money from the officials of the company.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, July 31—Coal trade in the West is gradually improving. Demand for steam coal is good while dealers and consumers are beginning to think of winter stocks.

The Lake trade is still held up by congestion at the upper ports. Vessel owners are complaining of delays in unloading, while many cars are kept waiting at the Lake Erie ports.

The seaboard bituminous trade is more active than for some time. Local demand at consuming centers is better, and coastwise trade more active.

The anthracite collieries are still working hard to fill orders. In the seaboard trade another 10c. comes off the summer discount on Aug. 1, increasing schedule prices by that amount.

British Coal Trade—Exports of fuel from Great Britain, with coal furnished to steamships in foreign trade, six months ended June 30, long tons:

	1911	1912	Changes
Coal	31,493,959	26,173,323	D. 5,320,636
Coke	462,559	388,108	D. 74,451
Briquettes	851,867	635,283	D. 216,584
Total exports	32,808,385	27,196,714	D. 5,611,671
Steamer coal	9,558,647	8,125,897	D. 1,432,750
Total	42,367,032	35,322,611	D. 7,044,421

Imports of coal for the six months were 10.647 tons in 1911, and 169,144 in 1912; increase, 158,497 tons.

IRON TRADE REVIEW

New York, July 31—Notwithstanding various predictions to the contrary, the iron and steel markets have not materially relaxed their activity. New orders, while not quite so numerous as in June, are still large, while specifications on contracts continue to come in freely. The mills are rushing work and find it hard to keep up with deliveries. The intensely hot spell of mid-July has not been repeated, making steadier working possible.

Steel prices are now advancing with considerable rapidity, and there is a controlled market in the sense that sellers are individually avoiding the naming of prices other than those which are generally quoted. There is, of course, no formal agreement to maintain prices, none being necessary when the market is so clearly an advancing one, as buyers are specifying heavily and placing such additional contracts as are acceptable with the same confidence they showed in 1909 when precisely similar conditions obtained. It can no longer be said that deliveries of steel products are only against actual current consumption. There can be no question that many buyers are accumulating stocks as they did in the fall of 1909, simply because prices show a continued upward tendency. The only question is how long prices will continue to advance, and when the point will come that buyers will begin to draw upon their stocks instead of adding to them. Such a point will be reached eventually and when it arrives the steel trade will find itself in an uncomfortable position.

Pig iron is still quieter than finished material. Foundry buying has been good, and there is a fair demand for basic pig. Prices are firm, with a tendency to advance, but the number of furnaces ready to blow in is rather a check on increases in price.

The American Iron & Steel Association reports the make of pig iron for the first half of 1912 at 14,072,274 tons, an increase of 2,405,278 tons, or 20.6% over the first half of last year.

United States Steel Corporation—The statement for the quarter ended June 30 gives the following figures for net earnings over operating and maintenance expenses:

	1911	1912
Apr.	$9,412,573	$7,509,207
May	9,590,414	8,846,821
June	9,105,503	8,746,237
Total net	$28,108,520	$25,102,265
Renewal and subsidiary charges		$5,075,119
Interest and sinking funds		7,311,963
Total charges		$12,387,082
Surplus for the quarter		$12,715,183
Dividends		12,658,700
Balance		$56,483

The dividends paid were 1¾% on the preferred and 1¼% on common stock. For the six months ended June 30 the net earnings were $42,929,238; surplus over charges, $19 081,749; dividends paid, $25,317,594, leaving a deficit of $6,235,845 for the half-year.

Baltimore

July 29—Exports for the week included 3,495,320 lb. steel rails and 212,880 lb. rail joints to St. John, Newfoundland; 931,620 lb. steel rails and 113,813 lb. rail joints to Nuevitas, Cuba; 1,336,329 lb. castings, 6,711,459 lb. structural steel and 1,763,375 lb. miscellaneous iron and steel to Panama. Imports included 1095 tons ferromanganese and 81 casks silicospiegel from Baltimore; 33 casks manganese ore from Hamburg; 6000 tons manganese ore from Batum, Russia; 4675 tons pyrites from Huelva, Spain; 25,075 tons iron ore from Cuba.

Birmingham

July 29—Pig-iron manufacturers in Southern territory are not anxious to sell iron further at $11.50 for No. 2 foundry. The product is being sold right along for delivery during the latter part of the year, in the fourth quarter, at $12, and while $11.50 has been the price for iron for immediate, or third-quarter delivery, but one or two companies are handling any quantity of that business. The make during the month of July will show but little improvement over June. One blast furnace went into operation during the month. Two other furnaces are scheduled to blow in during August but there is a probability of a furnace now in operation being blown out. With but one exception, all companies are depending on the probable make for deliveries and there is a little delay on low-grade irons. The greater portion of the accumulated iron in the Southern territory, in fact practically all of it, belongs to one company and that company is in a comfortable position. Furnace companies in the South recently had opportunity of booking considerable foreign business, but the shipping interests could not make a favorable rate.

There is still a good demand for steel rails and fabricated steel and the plants of the Tennessee Co. have good prospects for the balance of the year. There is some demand for steel-wire goods and the plant of the Southern Iron & Steel Co. at Gadsden can continue in steady operation if there is no interruption through legal sources. Further litigation is threatened in the federal courts. In the meantime efforts at reorganization are being made and the plans for financing the company are being pushed.

Foundry and machine-shop proprietors in the Southern territory still report trade a little quiet. Labor troubles with molders are to be noted, more than 200 men being out, their demands being for 9-hour day and $3.25 per day minimum.

There is still a little charcoal iron being manufactured in the Southern territory with the quotation for the product holding around $22 per ton. The scrap-iron market is fairly good yet.

The receivers of the Alabama Consolidated Coal & Iron Co. are keeping one blast furnace in operation with coal and ore mines and coke ovens sufficient to supply raw material.

Chicago

July 29—The pig-iron market has been active in the last week and all lines of finished products show a strong market. Sales of pig iron have aggregated 60,000 to 70,000 tons, a very large record, and there is evident a general disposition to cover all needs for the last half, while some consumers would like to contract for their first-quarter supplies. The furnace agents, however, will not go into 1913 on the basis of last-half prices. Northern No. 2 foundry is 50c. stronger than last week, being now held firmly at $15.50, furnace, which means $15.90@16 delivered locally. Southern No. 2 foundry remains at $12, Birmingham, or $16.35, Chicago. The demand for Northern is such that it bids fair to advance further within a few days.

The pressure on the local mills for deliveries of iron and steel products continues so great that little business is being sought, but it comes in large volume. Bars are in large demand, with 1.40c. the minimum quotation on iron bars and soft steel bars selling at 1.43c. Structural material is in large demand over a wide territory and sales are running about 20,000 tons a week. Railroad supplies are in like condition; the demand for standard rails and track fastenings is heavy and continuous. The railroads seem at last to have come to the long-expected point of supplying their needs generally. For plates and sheets the demand is large, while sales of wire products have been but little checked by advanced prices. Billets continue scarce at $31 for openhearth forging. General trade conditions are very good and promise to become better because of encouraging crop prospects.

Cleveland

July 29—It seems to be harder than usual this season to keep the balance on Lake traffic. Ore movement is heavy, but coal movement is blocked by the congestion at the upper Lake docks, and many boats are going up light.

Pig Iron—Business is fair, but prices in this district remain low. Quotations, Cleveland delivery, are $15.15@15.25 for bessemer; $13.75 @14 for No. 2 foundry; $13.25 for forge; $16.25@16.50 for Lake Superior charcoal.

Finished Material—Mills in this district have work enough on hand to carry them for four months or so; some of them up to the end of the year. The trouble now is to get the material out in time. More advances are expected on new orders.

Philadelphia

July 31—Now that the coke situation has improved and cost of pig-iron production can be known, there is more disposition to reply to inquiries for fourth quarter and even later delivery. Prices are nominally 25c.—in a few cases 50c. —higher on good brands. The point is, will present asking prices hold as actual selling prices? The situation favors makers from every point of view, but even so, certain makers might be moved from their position if large orders were to be had. At present most buying is in small lots. The Southern pig-iron situation is strong and local furnace interests feel safe against competition for an indefinite period. The possible wabbling in prices hinted at above will come, if it does come, from Southern irons. Basic iron, though quiet, stands a good chance to sell in large lots. Forge iron keeps moving in small lots. Low-grade iron for pipe is wanted. No. 2 X foundry is $16; gray forge, $15@15.25; basic, $15.50, and low phosphorus, $20 per ton.

Steel Billets—Openhearth, $24.40, bottom price, and forging, $29.40, inside price, at which some business has been closed.

Bars—The movement in common iron for late delivery is active and recent business has been booked at a fractional advance. Quotations: 1.32½@1.37½c. Business is accumulating at several mills, and steel bars are especially active.

Sheets—A further advance in sheets is very near, according to the views of manufacturers. In fact, on ordinary business for early delivery, an advance is in force.

Pipes and Tubes—The volume of business for July from this territory exceeded that of any month for a long period, especially in tubes.

Plates—Further advances are inevitable in view of the enormous requirements in sight. Even on fourth-quarter and later deliveries, quotations made on very recent inquiries show there is a general upward movement. Mills are not in position to accommodate belated customers who want early deliveries.

Structural Material—All ordinary business is taken at a further advance of $1 or $2 per ton, to say nothing of premium rates which are becoming rather frequent.

Scrap—Good grades of scrap are exhausted. Prices are marked up 50c. per ton and the supply is quickly absorbed.

Pittsburgh

July 30—The mills are advancing bars, plates and shapes $2 a ton. Probably because previous advances showed too much appearance of unanimity, the present advances are announced on behalf of a single interest first, others following at a respectable distance. On Monday it was announced that the Republic Iron & Steel Co. had advanced its price on bars $1 a ton, from 1.25c. to 1.30c., while on Tuesday it was announced that the Jones & Laughlin Steel Co. had advanced its price on plates and shapes $1 a ton, from 1.30c. to 1.35c. By the end of the week the whole market will doubtless be at the higher level.

Late on the afternoon of July 24 the National Tube Co. decided to advance merchant steel pipe and boiler tubes one point, or about $2 a ton, and the next day independent producers followed. It develops that when steel pipe was advanced in June some of the iron-pipe mills made a corresponding advance, while a prominent eastern producer did not, and no general advance in iron pipe can occur until this interest first works up to the existing level.

Pig Iron—The Westinghouse Air Brake Co. has bought between 15,000 and 20,000 tons of forge and foundry iron, for delivery over the balance of the year, from half a dozen producers on the basis of $13.50, furnace, for No. 2. The Standard Sanitary Manufacturing Co. is inquiring for 5000 tons of foundry and forge iron for fourth-quarter delivery, while the Pittsburgh Steel Co. and the Colonial Steel Co. are in the market for basic iron and the American Steel Foundries is understood to have bought about 10,000 tons of basic for Alliance. Bessemer iron has been quiet, but the market seems to be on the verge of a heavy buying movement on the part of large steel companies, similar to that which occurred from June to October, 1909, and which sent the market up. Bessemer is already quotable 25c. higher, simply from the withdrawal of lower quotations, and without any active movement, though it is a fact that the Steel Corporation has quietly bought several lots in the past few weeks. The market stands quotable as follows: Bessemer, $14.50; basic, malleable and No. 2 foundry, $13.50; forge, $13.25, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—There was considerable contracting for ferromanganese just before last week's advance from $48.50 to $51, consumers apparently having gotten wind of a prospective advance. Some of this contracting extended into next year, and a large part, though probably not half, the consumption for the first half of next year is now under cover. The market is now quotable at $51 for prompt metal and on contracts for any period to July 1, 1913, f.o.b. Baltimore.

Steel—A sharp difference is to be observed between bessemer and openhearth steel, the former being in good supply, with ample deliveries on contracts, though no steel is actually pressing upon the market, while in the latter deliveries are usually less than requirements and consumers are constantly inquiring for additional tonnages. In one or two cases sales of sheet bars have been made for fourth quarter, but as a rule sellers are refusing to quote at present, evidently expecting a higher market. For prompt and third-quarter delivery the market is quotable as follows, though sometimes it is hard to secure deliveries at the prices named: Bessemer billets, $21.50 to $22; bessemer sheet bars, $21.75@22; openhearth billets, $22@22.50; openhearth sheet bars, $22.50@23; axle billets, $27; forging billets, $28@29, all f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are stiffer, at $25@26, several makers quoting only the higher figure.

Sheets—Specifications are very heavy, perhaps heavier than in June, and the question of delivery takes precedence, with many buyers, over the question of price. Mills are running better, as repairs are almost completed. As a rule delivery on new specifications can only be made in from six to eight weeks in black and galvanized and in from three to six weeks in blue annealed. We quote: Black sheets, 28-gage, 2@2.05c.; galvanized, 28-gage, 3.05@3.15c.; blue annealed, 10-gage, 1.45@1.50c.; Painted corrugated, 28-gage, 2.20@2.25c.; galvanized corrugated, 3.10@3.20c., per lb., Pittsburgh.

Connellsville Coke—Sales of prompt furnace coke have been made in the past week at $2.20@2.25 and the situation has been relieved from the sellers' standpoint in that there is practically no coke awaiting shipping instructions, so that sellers are somewhat firmer, and the immediate effects of the break noted a week ago are past. Both prompt and contract furnace coke is offered at $2.25, but sellers evidently expect an advancing market, after the ice has been broken by a few contracts on this basis. Inquiry is relatively light, and the furnaces which contested so long against the $2.50 price are still disposed to defer inquiring as long as possible. Considerable coke, however, will have to be bought for August delivery. Furnace coke is unchanged at $2.40@2.50 for prompt and $2.40@2.75 for contract.

St. Louis

July 29—The pig-iron market during the last week has been quite brisk and quite a few inquiries and contracts have been received. Furnaces are, of course, not working full as yet as prices would not warrant it. It is thought that in the course of the next week prices will probably advance a little. The current figure is $11.50@12 per ton, Birmingham, for Southern No. 2 foundry, or $15.25, St. Louis. Northern iron is a little dull at present and brings $15.75 per ton, St. Louis.

Coke is firm at $5.65 per ton, St. Louis, for good foundry.

Iron Ore Trade

A little buying of Lake Superior ore is going on to fill up stocks. Prices remain the same: Bessemer ores, 55% iron and under, 0.045% phosphorus, $3.75 for Old Range and $3.50 for Mesabi; nonbessemer ores, base 51.5% iron, $3.05 for Old Range and $2.85 for Mesabi; all f.o.b. Lake Erie docks.

The Spanish-American Iron Co. has some surplus of ore mined, and has been selling some to furnaces in the East. This ore is a bessemer ore, 55 to 60% iron, and has been sold at a price equivalent to 7.25c. per unit, f.o.b. cars, Philadelphia. This would put the price to $4.25@4.50 at furnace.

British Iron and Steel Trade

Exports and imports of iron and steel and of machinery in Great Britain, six months ended June 30, as valued by the Board of Trade returns, were:

	Exports	Imports	Excess
Iron and steel	£21,550,651	£5,713,864	Ex. £15,836,787
Machinery	15,689,186	3,427,375	Ex. 12,261,811
Cutlery and hardware	5,893,524	3,852,853	Ex. 2,040,671
New ships	2,696,590	....	Ex. 2,696,590
Total	£45,829,951	£12,994,092	Ex. £32,835,859
Total, 1911	45,384,013	12,030,655	Ex. 33,353,358

Increase in total exports this year, £445,938; increase in imports, £963,437. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports	2,274,495	2,253,688	D. 20,807
Imports	901,769	888,673	D. 13,096

The increase of value in imports was entirely in machinery and hardware.

METAL MARKETS

New York, July 31—The metal markets this week have been rather variable, and in some cases inclined to speculation. Prices have been generally firm, with small changes only.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
June 1912	$ 7,149,035	$ 5,611,057	Exp. $1,537,978
" 1911	3,074,755	4,767,714	Imp. 1,692,959
Year 1912	33,374,836	25,264,342	Exp. 8,110,494
" 1911	13,251,562	33,773,026	Imp. 20,521,464
Silver			
June 1912	5,045,944	4,879,485	Exp. 166,459
" 1911	5,777,703	3,506,446	Exp. 2,271,257
Year 1912	33,668,972	25,264,249	Exp. 8,404,723
" 1911	34,443,203	21,960,601	Exp. 12,482,602

Exports from the port of New York, week ended July 27: Gold, 272,100, chiefly to Argentina, silver, $1,176,081, largely to London Imports: Gold, $204,620; silver, $148,667, principally from Spain and South America.

Gold—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for India and a little for Germany. No large exports from New York are reported.

Iridium—The price for pure metal is unchanged at $63 per oz., New York.

Platinum—The market is still rather quiet but steady. Dealers ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, 10% iridium. The foreign market is rather inactive, but firmer.

Our Russian correspondent writes, under date of July 18, that prices are nominal and subject to negotiation but remain unchanged. Quotations for crude metal, 83% platinum, are 9.80 rubles per zolotnik at Ekaterinburg and 37,500 rubles per pood at St. Petersburg—equivalent to $36.85 and $36.75 per oz., respectively. The Duma has passed the law prohibiting the export of crude platinum from Russia. The law will take effect in the fall, and consequently all the metal available is being exported to be held in stock abroad.

Silver—The market continued steady on favorable Monsoon reports until July 30, when the price dropped to 27⅝d. in London on selling by China banks and also by the Indian bazaars.

SILVER AND STERLING EXCHANGE

July	25	26	27	29	30	31
New York	60⅝	60⅝	60½	60½	60	60¼
London	27⅞	27⅞	27 13/16	27 13/16	27⅝	27¾
Sterling Ex.	4.8770	4.8770	4.8750	4.8745	4.8740	4.7820

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to July 18, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£4,865,300	£3,858,200	D. £ 800,100
China	890,400	933,500	I. 43,100
Total	£5,548,700	£4,791,700	D. £ 757,000

Messrs. Samuel Montagu & Co. write from London, July 11: "The higher level of price, about 28 instead of 24d., has had apparently considerable influence on the consumption of silver by the Continent. Compared with the first six months of 1911 the exports in ounces of the last half year to other countries of Europe show a reduction of about 50%. This falling off is especially marked in the case of France (65%) and Russia (55%). The movement of silver to China and India has not been affected to anything like the same degree. The exports to these two countries have only decreased 11%. The imports from Germany and France combined have nearly doubled."

Gold in the United States July 1, is estimated by the Treasury Department as follows: Held against gold certificates outstanding, $1,040,057,369; in Treasury current balances $165,996,878; in banks and circulation $607,445,193; total $1,813,499,440. Gold held against certificates includes bullion as well as coin.

Coined silver in the United States July 1, as estimated by the Treasury Department: Standard dollars $565,350,367; subsidiary coins $169,812,806; total $735,163,173. Of this $481,541,000 are held in the treasury against silver certificates outstanding.

Copper, Tin, Lead and Zinc

NEW YORK

July	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
25	17½ @17¾	17.45 @17.50	44¼	4.70 @4.75	4.57½ @4.60	7.10 @7.15	6.95 @7.00
26	17½ @17¾	17.45 @17.50	44⅝	4.70 @4.75	4.57½ @4.60	7.05 @7.10	6.90 @6.95
27	17½ @17¾	17.45 @17.50	44⅞	4.70 @4.75	4.57½ @4.60	7.05 @7.10	6.90 @6.95
29	17½ @17¾	17.40 @17.50	45⅛	4.70 @4.75	4.55 @4.57½	7.05 @7.10	6.90 @6.95
30	17½ @17¾	17.40 @17.50	45¼	4.70 @4.75	4.55 @4.57½	7.00 @7.10	6.85 @6.95
31	17½ @17¾	17.40 @17.50	45½	4.70 @4.75	4.55 @4.57½	7.00 @7.10	6.85 @6.95

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

July	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
25	78⅝	78⅝	84	200½	197½	18 9/16	26¼
26	78⅜	78¼	84	202½	200	18⅝	26¼
27							
29	78⅛	78¼	83	204	202	18¾	26¼
30	77½	77½	83	204⅜	202	18¾	26⅛
31	78 1/16	78¼	83¼	205¾	203	18⅞	26⅛

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21 [illegible]

Copper—The violent fluctuations in the London standard market have continued to create unsettled conditions. The European demand for refined copper from this market has been all but completely cut off. At certain times during the week arbitrage transactions again became profitable and some operators quickly took advantage of this. Buying copper in Europe with which to fill contracts for delivery there released copper for delivery here, and the terms of the exchange permitted the offering at material concessions here. However, the demand from American consumers has been only slight. Several first hands have offered electrolytic at 17⅝c., delivered, usual terms, and some have effected business on that basis while others have failed to bring out orders. Some sales at 17.45c., cash, New York, are reported, and even under that. The business in Lake Copper has also been dull. Some sales of special brands have been made at as high as 17¾c. At the close, Lake copper is quoted at 17½@17¾c., and electrolytic copper in cakes, wirebars and ingots at 17.40@17.50c. Casting copper is quoted nominally at 17¼@17⅜c. as the average for the week.

The London market for standard copper has been quiet and weakish. On July 25 it closed at £78 12s. 6d. for both spot and three months; on July 29 it declined to £78 2s. 6d. for spot, and £78 5s. for three months, and on July 30 both positions were down to £77 10s. The market closes somewhat better at £78 1s. 3d. for spot, and £78 5s. for three months. Cables report continued bear selling of three months and bear covering of spot, which explains the previous backwardation and the present small contango.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 3141 long tons. Our special correspondent reports the exports from Baltimore at 1149 tons.

Tin—The market has been strong and advancing, due to the good American demand and the reduction in the quantities of Banka tin which will be sold at auction during 1913, amounting to a difference of 1800 tons. Prices have advanced steadily from 44¼ on July 25 to 45½c. July 31, at the close.

In London, the market has also experienced a continued advance. On July 25 it was quoted at £200 10s. for spot, and £197 10s. for three months; on July 26, £202 10s. for spot, and £200 for three months; on July 29, £204 for spot, and £202 for three months; on July 30, £204 7s. 6d. for spot and £202 for three months. The market closes at £205 15s. for spot, and £203 for three months.

Lead—There is a fair demand, which, however, has been filled at somewhat lower prices. St. Louis is now quoted at 4.55@4.57½c. and New York at 4.70@4.75 cents.

The London market for lead is very strong, and material for near-by shipment is scarce. Spanish lead is quoted at £18 17s. 6d. and English at £19 per ton.

Spelter—There has been a good demand, principally for fall shipment, which has been freely met, and large transactions have taken place at slightly lower figures. At the close the market is quoted at 6.85@6.95c., St. Louis, according to delivery.

The London market is slightly lower, good ordinaries being quoted at £26 2s. 6d. and specials at £26 7s. 6d. per ton.

Base price of zinc sheets is $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—The market has been quieter, with few sales. Prices are unchanged at 24@24½c. per lb. for No. 1 ingots, New York.

Antimony—Business continues active and prices are firmer. Cookson's is held at 8.60c. per lb. for spot and early deliveries and 8.50c. for September and forward. Hallett's and U. S. are 8c. for spot, while 7.50@7.75c. per lb. is asked for Hungarian, Chinese and other outside brands.

Quicksilver—Business is steady and prices are unchanged. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and 8.50c. for September and forward. is £8 10s. per flask, with £8 7s. 6d. asked from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. in New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots.

Zinc and Lead Ore Markets

Platteville, Wis., July 27—The base price paid this week for 60% zinc ore was $59@60. The base price offered for 80% lead ore was $59 per ton.

SHIPMENTS, WEEK ENDED JULY 27

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point......	753,310	.	.. .
Benton ..	479 300	......	634,000
Hazel Green ...	320,000	......	.
Platteville	294,000	......	176,400
Galena .	286,900	.. .. ..	.
Shullsburg......	260,000	.. ...	
Cuba City	229 280	......	
Linden . .	206,440	.....	60,000
Harker......	146,860	.. ...	
Highland ,	131,200	....	. .
Rewey .	84,000	....	86 200
Total....	3,191,290	..	956,600
Year to date....	117,656,600	5,181,290	17,833,870

Shipped during week to separating plants, 2,522,600 lb. zinc ore.

Joplin, Mo., July 27—The high price of zinc sulphide ore this week was $66.50, the base per ton of 60% zinc was $58.50@64. Zinc silicate sold at $30@32 per ton of 40% zinc. The average price, all grades, was $58.48 per ton. The high price of lead ore was $61 and the average price, all grades, was $58,68 per ton.

The zinc market was still on the upward trend this week and one lot of ore sold for $64 assay base. Competition, while not as strong as that of the two previous weeks, was spirited, but not near so much ore was purchased for delivery next week and this may mean that prices will go no higher, but the demand will prove whether they do or not.

SHIPMENTS, WEEK ENDED JULY 27

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,434,990	.	824,590	$157,786
Joplin........	2,159,360	.	300,680	74,728
Galena. .	745,310	.	97,860	25,245
Duenweg...	660,430	. .	49,280	21,290
Alba-Neck....	639,040		11,600	19,831
Miami.......	318,560	...	259,530	16,067
Oronogo.. .	501,690	.	68,640	15,027
Cave Springs.	185,000	.	168,370	10,601
Carl Junction	256 160	. .	.....	7,940
Granby . .	204,610	129,060	4,070	7,450
Spurgeon	.....	191,200	20,530	3,855
Jackson.....	113,470	. . . ..		3,290
Carthage..	110,480	...	...	3,203
Aurora. ...	57,280	67,830	.....	2,745
Springfield ...	88,000	.	...	2,500
Sarcoxie	85,000	.	.	2,465
Stott City. .	57,290		. .	1,660
Totals..	10,616,670	388,090	1,805,150	$375,683
7 mos......	304,734,540	18,548,120	52,239,380	$9,546,388

Blende val., the week, $315,373; 7 mos., $7,826,301
Calamine, the week, 6,435; 7 mos., 277,846
Lead value, the week, 53,875; 7 mos., 1,442,241

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January.....	$41.85	$44.90	$40.55	$43.54	$55 68	$58 92
February..	40 21	45.75	39.16	43 31	54 46	52 39
March. .	39 85	51.56	38.45	49.25	54.57	54.64
April........	38 88	52.00	37.47	50 36	56 37	54 18
May	38.25	55.30	36 79	53.27	55 21	52.45
June . ..	40.50	55 88	38.18	54 58	56 49	55 01
July. . .	40 75		38 36	. ..	58 81	
August ..	42 50		41 28	......	60 74	
September ..	42 63	.....	41 29	......	59 33	.....
October	42.38	.. .	40 89	..	54 72	. . ..
November...	45.40	.	43.25	......	57 19	...
December...	44.13	...	40.76	......	62 03	......
Year.	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, July 31—No change is reported in the general market, which is quiet and steady.

Arsenic—The market has fluctuated sharply. American producers seem to be out of the market, and buyers have apparently been holding off as long as possible. Spot lots have been in demand and supplies are scarce. As high as $4.25@4.75 per 100 lb. has been paid for spot; while $4@4.12½ per 100 lb. is named for futures.

Copper Sulphate—Demand is steady and sales are good at unchanged prices, $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is not especially active but is firm, and prices are unchanged, 2.45@2.50c. per lb. being named for all positions.

Petroleum

Oil production in California for the six months ended June 30 was 43,697,642 bbl., an increase of 3,331,530 bbl. over 1911. Deliveries were 33,020,127 bbl., a decrease of 1,222,878 bbl. Stocks on hand were 44.444,658 bbl. at the end of June.

MINING STOCKS

New York, July 31—On July 25 the Exchange was fairly active and prices improved. General Chemical had a sharp rise of 12 points. On the Curb there were large sales of Tonopah Merger and West End Extension. Cobalts were quiet. Copper shares were active but irregular. Heavy sales of Greenwater were made.

July 26 the Exchange was quiet but inclined to weakness, recovering toward the close. On the Curb there was some dealing in miscellaneous mining stocks, but coppers were quiet.

July 27 the Exchange was generally firm, on limited trading. The Curb was dull and dealings in mining stocks small, with few price changes.

July 29 the Exchange was a little weaker. Higher money rates tended to check speculation. On the Curb coppers were in demand, but irregular. Braden, Davis-Daly and Butte & New York sold freely. There were good sales of Tonopah Merger, Tonopah Extension and El Paso Consolidated at slight declines.

July 30 and 31 the Exchange was rather quiet, with only small fluctuations. The Steel statement had been generally discounted and produced little effect. The Curb was more active, with good sales of copper and other mining stocks at generally firm prices.

At auction in New York, July 25, the following securities were sold: Sloss-Sheffield Steel & Iron Co., 50 shares common, $100 par, $54.75 per share; United States Steel Corporation, 30 shares common, $69.75 per share, 20 shares preferred, $112 per share, and $5000 bonds, 102½% of par; San Pedro Gold Mining Co., $500 bonds, $51; New Jersey Mineral Co., $100 bond, $53; United States Metal Products Co., 385 shares, $100 par, $22 per share; Monterey Coal & Mining Co., 75 shares, $100 par, $11 for the lot.

Boston, July 30—The market has been dull and narrow for mining stocks. There was no pressure to sell; on the other hand, buying orders were few. The result was that traders had no difficulty in depressing prices fractionally, but on very small business. In the more important stocks there were no appreciable changes. Calumet & Hecla sold at $5.20; Osceola at $116. Lake lost a fraction, as did Calumet & Arizona.

The half-yearly statements of the Calumet & Hecla subsidiaries show encouraging gains, which would have helped

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	April	May	June
Alaska shipments.	1,243,911	1,720,391	4,134,569
Anaconda	25,480,000	25,800,000	.. ..
Arizona Ltd.	3,400,000	3,500,000	3,300,000
Copper Queen.....	6,806,425	7,024,087	7,622,730
Calumet & Ariz. ..	4,104,000	4 424,000	4,160 000
Chino..	1,150,000	1,275,850	1,474,979
Detroit...	2,506,718	[illegible]	1,959,634
East Butte..........	1,400,000	1,445,000	. .
Mammoth.	1,718,450	1,760,000	. . .
Mason Valley......	1,503,056	1,520,000	. .
Nevada Con ..	6,115,095	6,063,462	5,913,832
Ohio...............	675,000	685,000	... ..
Old Dominion ..	2,167,000	[illegible]	2,130,000
Ray...............	2,611,920	2,924,913	2,992,500
Shannon	1,544,000	1,464,000	1,270,000
South Utah..	284,215	236,884	....
United Verde*.....	2,250,000	2,500,000	....
Utah Copper Co..	8,615,775	9,564,919	8,772,742
Lake Superior*....	18,250,000	21,250,000	15,000,000
Non-rep. mines*	7,625,000	8,400,000	[illegible]
Total production.	97,400,495	105,830,984	. ....
Imports, bars, etc..	26,842,014	25,836,519	....
Total blister.....	124,242,509	131,697,503	....
Imp. in ore & matte	9,350,972	6,410,226	....
Total American..	133,593,481	138,107,729	....
Miami†............	2,554,352	2,676,702	2,683,310
Brit. Col. Cos.:			
British Col. Copper	1,043,173	875,000	996,000
Granby	1,941,797	1,914,460	1,888,400
Mexican Cos.:			
Boleo† ...	2,149,280	2,260,160	1,851 920
Cananea .	4,654,000	4,600,000	4,310,000
Moctezuma .	2,797,718	2,892,521	3,176,819
Other Foreign:			
Cape Cop., S. Africa	954,240	754,880	....
Kyshtim, Russia...	1,545,000	... ...	....
Spassky, Russia....	649,600	694,400	757,120
Famatina, Argen..	. ....	....	....
Tilt Cove, Newf'd	119,869	123,087	....
Exports from:			
Chile ...	6,496,000	3,696,000	9,856,000
Australia	9,408,000	7,840,000	8,176,000
Arrivals in Europe‡	12,064,640	9,976,860	12,667,200

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VI, 1911.......	124,554,312	[illegible]	71,460,519
VII	112,167,934	[illegible]	74,880,658
VIII.	[illegible]	59,935,364	69,855,660
IX..............	115,588,950	[illegible]	50,824,011
X...............	118,255,442	64,068,307	[illegible]
XI..	111,876,601	68,039,776	67,049,279
XII.............	122,896,697	65,988,474	[illegible]
Year.... . .	1,431,938,338	709,611,605	[illegible]
I, 1912	119,337,753	62,343,901	80,167 904
II............	116,035,809	56,228,368	63,148,096
III... ..	125,694,601	67,487,466	58,779,566
IV......... ..	125,464,644	69,513,846	53 252,326
V..... .	[illegible]	[illegible]	69,485,945
VI.	122,315,240	[illegible]	61,449,650

VISIBLE STOCKS

	United States	Europe	Total
VII, 1911	157,434,164	195,932,800	353,366,964
VIII..........	137,738,858	191,891,840	329,630,698
IX.	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI ..	134,997,642	176,825,600	311,823,242
XII .	[illegible]	164,281,600	276,066,788
I 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III .	62,939,988	141,142,400	204,082,380
IV	[illegible]	136,819 200	199,186,754
V...............	[illegible]	134,176,000	199,242,089
VI...........	49,615,643	117,801,600	167,417,232
VII...........	44,335,004	[illegible]	152,521,047

the market if it had been at all active. The present quiet seems likely to run into next month.

On the Curb, the most active stock was Stewart Mining. South Lake and Davis-Daly were firm. The Curb was perhaps a little more active than the Exchange.

Assessments

Company	Delinq.	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0.10
Belmont, Ida	July 22	Aug. 22	0.002
Chollar, Nev	July 7	Aug. 5	0.10
Confidence, Nev	July 15	Aug. 9	0.20
Con. Imperial, Nev	July 28	Aug. 21	0.01
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Conqueror, Ida	July 20	Aug. 10	0.001
Dennemora, Ida	July 20	Aug. 20	0.002
Eagle Mt., Ida	July 31	Aug. 22	0.00
Gould & Curry, Nev	July 19	Aug. 12	0.05
Hypotheek, Ida	July 19	Aug. 14	0.005
Laclede, Ida	Aug. 1	Aug. 24	0.003
Majestic, Ida	July 16	Aug. 6	0.005
Manhattan Red Top, Nev	July 12		0.01
Mineral Farm, Ida	July 15	Aug. 15	0.002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
National Copper, Ida	July 15	Aug. 15	0.01
New Reliance, S. Dak.			0.01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida.	July 18	Aug. 19	0.001
Sandstorm-Kendall, Nev	July 8		0.01
Sierra Nevada, Nev	July 4	July 30	0.10
Silver Mt., Ida	July 15	Aug. 15	0.002
Springfield, Ida	July 30	Aug. 31	0.002
Tonopah North Star, Nev.	July 15		0.02
Union Consolidated, Nev	July 12	Aug. 7	0.15
Utah, Nev	July 12	Aug. 6	0.05
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171		24.428	24.082	
September	53.295	52.440		24.567	24.209	
October	55.490	53.340	..	25.596	24.594	.
November	55.635	55.719		25.680	25.649	.
December	54.428	54.905	..	25.160	25.349	.
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.529	54.971	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405		12.634	.....	56.266	
September	12.201		12.508		55.253	
October	12.189	.	12.370		55.170	.
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.973	

New York, cents per pound. London pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	41.519
February	41.614	42.962	August	42.319	
March	40.157	42.577	September	39.755	
April	42.185	43.923	October	41.185	
May	43.115	46.053	November	43.125	
June	44.606	45.815	December	44.655	
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500		4.406		14.260	
September	4.485	.	4.356		14.744	..
October	4.265		4.139		15.332	...
November	4.298	.	4.181	.	15.821	. .
December	4.450	.	4.332	....	15.648	. .
Year	4.420	.	4.286	....	13.970	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.219	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953		5.803		26.801	. .
September	5.869		5.719		27.750	.
October	6.102	..	5.951	..	27.256	.
November	6.380	. .	6.223		26.795	. .
December	6.301	...	6.151		26.849	.
Year	5.758	..	5.608	.	25.281	. .

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.61
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.25	14.03	14.54	14.53	14.54
August	15.90	..	14.00		14.47	.
September	15.90		13.57		14.40	. . ..
October	15.43	......	13.44		14.34	.
November	14.92	..	13.30	.....	14.25	. .
December	15.15		13.10	. ..	13.90	. . .
Year	$15.72	......	$13.94		$14.49	.....

STOCK QUOTATIONS

COLO SPRINGS July 30		SALT LAKE July 30	
Name of Comp.	Bid	Name of Comp.	Bid.
Acacia	.05	Beck Tunnel	09
Cripple Cr'k Con.	.01	Black Jack	12½
C. K. & N.	18¾	Cedar Talisman	02
Doctor Jack Pot	.05¼	Colorado Mining	21½
Elkton Con	.65½	Columbus Con.	25
El Paso	.97½	Crown Point	02¼
Findlay	.05½	Daly-Judge	‡5.85
Gold Dollar	18	Grand Central	57
Gold Sovereign	.02	Iron Blossom	1.25
Isabella	.13⅛	Little Bell	35
Jack Pot	.04	Lower Mammoth	03½
Jennie Sample	.04⅛	Mason Valley	13.00
Lexington	‡.02	May Day	12
Moon Anchor	‡.085	Nevada Hills	2.00
Old Gold	.03	New York	‡02½
Mary McKinney	.69	Prince Con	1.25
Pharmacist	.01	Silver King Coal'n	2.50
Portland	.91	Sioux Con.	04½
Vindicator	.83	Uncle Sam.	.15½
Work	.01	Yankee	07

TORONTO July 30			
Name of Comp.	Bid	Name of Comp.	Bid
Conlagas	‡7.35	Hollinger	12.50
Hudson Bay	‡70.00	Imperial	02
Temiskaming	37	Pearl Lake	15
Wettlaufer-Lor	52	Porcu. Gold.	26
Apex	01	Porcu. Tisdale	01
Central	‡5.56	Preston E. D.	01
Crown Chartered	00	Rea	25
Dobie	1.25	Standard	‡01½
Dome Exten.	.13	Swastika	09
Foley O'Brien	13	West Dome	.05

SAN FRANCISCO July 30			
Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.08	Belmont	9.37½
Belcher	42	Jim Butler	65
Best & Belcher	08	MacNamara	22
Caledonia	1.13	Midway	60
Challenge Con.	.13	Mont.-Tonopah	2.35
Chollar	11	North Star	.18
Confidence	1.00	West End Con.	1.65
Con. Virginia	.35	Atlanta	25
Crown Point	.51	Booth	08
Gould & Curry	06	C. O. D. Con	10
Hale & Norcross	18	Comb. Frac.	.19
Mexican	2.77	Jumbo Extension	.41
Occidental	.50	Pitts.-Silver Peak	99
Ophir	.99	Silver Pick	13
Overman	80	St. Ives	.30
Potosi	.03	Tramp Con	02
Savage	11	Argonaut	‡2.00
Sierra Nevada	.24	Bunker Hill	‡4.50
Union Con.	.68	Cent. Eureka	44
Yellow Jacket	.59	So. Eureka	‡2.90

N. Y. EXCH. July 30		BOSTON EXCH. July 30	
Name of Comp.	Clg.	Name of Comp.	Clg.
Amalgamated	82⅛	Adventure	8⅝
Am. Agri. Chem.	60¼	Ahmeek	‡350
Am. Sm. & Ref., com	82⅝	Algomah	5¼
Am. Sm. & Ref., pf.	108	Allouez	‡46½
Am. Sm. Sec., pf. B	87¾	Am. Zinc	30¼
Anaconda	41⅛	Ariz. Com., ctfs.	5¾
Batopilas Min.	1⅝	Bonanza	‡.40
Bethlehem Steel pf	67	Boston & Corbin	7¼
Chino	31⅞	Butte & Balak	3½
Comstock Tunnel	10½	Calumet & Ariz.	74½
Federal M. & S., pf.	44	Calumet & Hecla	520
Goldfield Con.	4	Centennial	24
Great Nor., ore., ctf.	42¼	Con. Mercur	‡.01
Guggen. Exp.	54½	Copper Range	57
Homestake	95	Daly West	5½
Inspiration Con.	18¾	East Butte	13¼
Miami Copper	29½	Franklin	11
National Lead, com	58½	Granby	53½
National Lead, pf.	108	Hancock	30½
Nev. Consol.	21¼	Hedley Gold	‡16
Pittsburg Coal, pf.	91	Helvetia	‡1¼
Ray Con.	20¾	Indiana	17
Republic I & S, com	25⅝	Island Cr'k, com.	55¼
Republic I & S, pf.	84	Island Cr'k, pfd.	90½
Sloss Sheffield com	55	Isle Royale	34½
Sloss Sheffield, pf.	100	Keweenaw	1 9/16
Tennessee Copper	42	Lake	34½
Utah Copper	61¼	La Salle	6⅝
U. S. Steel, com	69⅝	Mass	‡7
U. S. Steel, pf	112⅜	Michigan	‡2¼
Va. Car. Chem.	49⅛	Mohawk	‡69
		New Arcadian	‡3
		New Idria Quick	‡6⅞
		North Butte	30
		North Lake	5⅝
		Ojibway	‡4½
		Old Dominion	56½
		Osceola	116
		Quincy	89½
		Shannon	16⅞
		Shattuck-Ariz.	20½
		Superior	47
		Superior & Bost.	1¼
		Tamarack	41
		Trinity	6
		Tuolumne	2⅞
		U. S. Smelting	45¼
		U. S. Smelt'g, pf.	49¼
		Utah Apex	‡2¼
		Utah Con	12½
		Victoria	3¼
		Winona	5½
		Wolverine	108
		Wyandot	‡2

N. Y. CURB July 30	
Name of Comp.	Clg.
Barnes King	30
Beaver Con	.44
Braden Copper	7
B. C. Copper	5⅜
Buffalo Mines	1.35
Caledonia	40
Con. Ariz. Sm.	⅝
Davis-Daly	2¼
Diam'field-Daisy	9
Ely Con	7/32
Florence	1 1/32
Giroux	4⅜
Gold Hill Con.	
Greene Cananea	10¼
Greenwater	06
Internat. S. & R.	‡124
Kerr Lake	2⅞
Keystone	2
La Rose	3⅛
McKinley-Dar-Sa	1¾
Min. Co. of A. new	2⅞
Motherlode Gold	1
Nev. Utah M. & S.	02
Nipissing Mines	7⅞
Ohio Copper	15/16
Pacific Sm. & M.	7/32
South Live Oak	2
South Utah M. & S.	½
Standard Oil (old)	1000
Stand'd Oil of N. J.	400
Stand'd Oil Subs.	‡525
Stewart	1¼
Tonopah	6⅝
Tonopah Ex.	2 9/16
Tri-Bullion	[illegible]
Tularosa	[illegible]
Union Mines	7/16
United Cop., pfd.	10
Yukon Gold	3 15/16

LONDON July 31	
Name of Com.	Clg.
Camp Bird	£1 6s 9d
Dolores	1 10 0
El Oro	0 14 9
Esperanza	1 6 0
Mexico Mines	7 7 0
Oroville	0 5 3
Stratton's Ind.	0 3 1½
Tomboy	1 6 3

BOSTON CURB July 30	
Name of Comp.	Last
Bingham Mines	3½
Boston Ely	1
Boswyocolo	03½
Butte Central	6½
Cactus	07
Calaveras	2 1/16
Chief Cons	1
Corbin	1
Cortez	1 1/16
Crown Reserve	3¼
First Nat. Cop.	2
Majestic	46
Mazatan	½
Moneta Porc.	05
Nevada-Douglas	3
New Baltic	2½
Oneco	1
Raven Copper	8
Rhode Island Coal	20
San Antonio	3
S. W. Miami	5
South Lake	10
Trethewey	‡.45
United Verde Ext.	32
Vulture	‡5.00

‡Last quotation.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres ROB'T MCKEAN, Sec'y
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London E. C.
Unter den Linden 71—Berlin, N. W. 7

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94. AUGUST 10, 1912 No. 6

The Treatment of Low Grade Ores

The American Mining Congress through its officers is persistent in its beseeching of Congress to make appropriations to assist the mining industry. Investigations by Federal scientists to discover more profitable methods for the treatment of low-grade ores is the theme that is harped upon constantly. In a recent statement prepared by Mr. Callbreath for the members of Congress, the following remarks are made:

"For some years past the metalliferous mining industry of the West has not kept pace with the development of other lines of enterprise. With rare exceptions the population of all the mining camps in the West decreased during the period 1901-10 and in many instances low-grade mining camps have been entirely abandoned.

"A solution of the problem of economical treatment of low-grade ores is the one method through which this great fundamental industry can be revived. This problem is too great for private enterprise and whenever improvements are made by private effort the results are kept secret and do not serve the general good. The West has a right to expect Federal aid in the solution of these problems."

More misleading ideas are concentrated in these unsupported allegations than it is often given to any individual to compass.

Is it true that the metalliferous mining industry of the West has failed to keep pace with other industries? If so, wherefore the huge increases in the production of copper, lead and spelter?

If it be true that the population of all the mining camps in the West, with rare exceptions, decreased during the period, may it not be that improvements in the arts of mining and metallurgy enabled an increased tonnage of ore to be worked with fewer men? If so, is not that an economic advantage?

If many low-grade camps have been abandoned, may not that be because their mines have been exhausted?

Mr. Callbreath says that the problem of low-grade ores "is too great for private enterprise and whenever improvements are made by private effort the results are kept secret and do not serve the general good."

Let us consider the progress in the art during the last 25 years. Excluding the advances that have been purely mechanical developments, such as the art of gold dredging, the improvement of crushing machinery, the increases in the dimensions of furnaces and the like; excluding, moreover, the progress in special arts, such as the manufacture of aluminum and the extraction of brimstone from rock in place; shutting our eyes to the marvellous progress in the art of mining, and confining our view to ore dressing and metal extraction alone, we are inclined to summarize the major developments in the art, those that have introduced new principles and have been of far reaching effect, as follows:

Electrolytic Copper Refining.
The Cyanide Process.
Pyritic Smelting.
The Wilfley Table.
Magnetic Separation.
Blast Roasting.
Sliming and Cyaniding.
Concentration by Flotation.
Bag Filtration of Smelting Fume.
Basic Copper Converting.

In some of these methods the inventors have enjoyed a moderate royalty, but in no case has there been the creation of any great fortune, although the inventions have been of the first order in metallurgical importance. In most cases, however, the actual introduction of the method has been the result of the crystallization of the ideas of many persons long previously expressed and no generic patent has been possible.

Who will have the temerity to aver that these problems have been too great for private enterprise, and if not them what problems are! Let the doubters read the life of Sidney Gilchrist Thomas and reflect on the way he tried the basic bessemer process.

We should like to be informed if the details of any of the great metallurgical steps that we have enumerated have been kept secret and if their results have failed to serve the public good. In fact they have, each and all of them, contributed to the exploitation of low-grade ores.

American Institute of Mining Engineers

Measures for the adjustment of the affairs of the American Institute of Mining Engineers are gradually being formulated. The latest is the issuance to the members of the Institute by Dr. Douglas of an appeal for subscriptions to liquidate the indebtedness on account of the land fund. Dr. Douglas has made this appeal as a purely personal matter, no committee or group of members being involved in it.

The original obligation was $180,000. So far $112,000 has been promised and $106,000 collected. This has come through 91 subscriptions, $61,667 having been obtained through five subscriptions of $10,000 and over. Members and friends of the Institute who are residents of New York and Pennsylvania have given $95,000. Members resident in the remainder of the country have not yet made any general or generous response.

The offer of Mr. Carnegie which led to the indebtedness of the Institute was submitted to the members thereof, and was accepted by a vote of 99¼ per cent. of the members who recorded their acceptance or refusal. The members of the Institute having gone into this thing, they ought to pay for it. There are 3500 members who pay dues. The sum of $21.14 paid in cash by each member would liquidate the outstanding indebtedness of $74,000. The same result would be accomplished by the promise to pay $4.71 per annum for five years.

It would be visionary to expect that every one of the 3500 paying members will now do his duty. Many of them are young men who are not in a position to shoulder any additional financial burden at present. Some of the older men, also, will no doubt have good reason for standing aloof. It is not unreasonable, however, to expect that 1750 members of the Institute can make a subscription of $10 per annum for five years or $50 in cash without great inconvenience. We think that this ought to be done. It has all along been our opinion that the members of the Institute ought themselves to pay the debt that they incurred, and ought not further to rely upon the generosity of outsiders or of some few members, or expect it, or even ask for it.

Dr. Douglas, and the great mining and commercial interest that he leads, have been among the large donors to this fund, and no one is better entitled than he to issue such a circular and appeal as he has just sent out. We urge upon members of the institute to make a prompt and generous response. They should pay their debts *pro rata* and should be too proud to let others do it for them.

The Steel Trust Investigation

The Stanley committee, appointed by Congress to investigate the Steel Corporation, has submitted a report, or rather reports, which hardly seem to come up to the level which might have been expected from the time employed in the work. As has been noted from time to time, the evidence taken by the committee brought out little or nothing that had not already been known for a long time. Beyond some expressions of individual opinions, more or less interesting, there was very little that was not already on record. The report itself does not seem to be of very much importance, largely for this reason. The committee divides chiefly on political lines, the majority finding that the Steel Corporation aimed at a monopoly in the trade, and that its object—or one of its objects—was to control the trade by absorbing and controlling the supply of raw materials. Accordingly some action is recommended which takes the form of a bill intended to check and control trust operations. It is hardly worth while at present to summarize or analyze this measure, since it will certainly be much modified before adoption, if it is adopted at all.

The minority of the committee also submits a measure, but it is not at all likely to find favor. It provides for regulation of a sort, adopting Judge Gary's idea of fixing prices by some government bureau, or court. The course of the iron markets for the past six months is a pretty good argument against this measure, and it is not at all likely that we shall be called on to turn over the control of this important business to the government just yet.

It is not probable that either of the proposed measures will be taken up or discussed at the present session of Congress, which is already overweighted with the necessary appropriation bills. The whole matter will go over to the short session, which begins next December and will possibly be further postponed

Wages at Butte

The newspapers estimate that the increased wages recently granted at Butte, Anaconda and Great Falls on the basis of 17c. for copper will cost the companies about $2,225,000 per year. We are unable to verify that estimate, but it does not look unreasonable. The difference between 14c. and 17c. for copper on 300,000,000 lb. of production is $9,000,000. The companies get about 75% and the men about 25%, other things remaining equal, which is not unfair. The troublesome uncertainty is about other things remaining equal.

According to one press dispatch: "Anaconda officers say this increase will soon be wiped out by benefits from new economies being employed, and others that are constantly being introduced. They are also confident that the company will get better results from the miners by reason of the increase in wages."

These remarks exemplify one sound and one unsound idea in practical economics. Labor is the residual claimant upon production. After the competitive requirements of capital and all other charges have been satisfied, all the rest goes to it. Capital and brains introduce new economics, benefit temporarily, pass on the benefit, and try to repeat the process.

It is unsound, however, to expect that increased wages produce better results in efficiency, etc. Experience has shown the contrary. This is explained by human nature, which largely permeates economics anyway.

The advances in copper have been accompanied by increases in price in several of the minor metals. Aluminum has been raised by the foreign convention, and antimony also is higher than for two years past, owing to a more active demand.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Caving System of Mining in America

The caving system, although I believe originally introduced from the north of England iron-mining districts, has apparently been greatly developed and improved in America and exceedingly low costs are quoted as the result of mining under this system. In Australia this method of mining has not so far been introduced into any mine and I unfortunately have not been able to inspect any mine working under these conditions, but have been interested in reading all the papers written describing the various methods adopted. As doubtless there are many mining engineers similarly situated, interested in the system and anxious to fully appreciate its advantages and disadvantages and the conditions that are necessary for its successful application, but unable to visit places where it is in use and therefore dependent upon writers' descriptions, perhaps a criticism of the system, bringing out the details upon which so far I have been unable to acquire definite information, may lead some engineer to take up these points more fully and give the profession a paper which I am sure would be both interesting and instructive to many of us.

The Pewabic Caving System

I have before me descriptions of three methods of caving: The first is that described by W. H. Storms in his book "Timbering and Mining." It is the method used at the Pewabic mine in Michigan. This method consists in blocking out the orebody in blocks measuring 250 ft. along the strike by crosscuts driven from a main traveling way in the hanging wall of the deposit. From these crosscuts raises are put up 50 ft. apart, to within 20 ft. of the caved ground above and from the top of the raises drifts are driven across the deposit, immediately above the original crosscuts upon the main level. By underhand rill stoping a cut is then taken eight feet wide right down to the main level cutting the orebody from wall to wall. While these two end cuts are being made a sill cut is being mined across the whole of the block, leaving only pillars to protect the main level crosscuts and sufficient pillars under the block to support the ore and insure the safety of the men. When this work has been completed, the supporting pillars are first robbed as far as it is safe to go, and then the pillars are bored and all the men having been withdrawn from the section, the shots are fired and the ground caved. After the ground has settled, properly closely timbered drives are pushed into the caved ground and the ore is mined by allowing the crushed orebody to run into the crosscuts through the opening in the end or breast of each. The following questions arise: Why are the raises, and therefore the cuts isolating the ore to be caved, only carried to within 20 ft. of the caved ground? With a stope only eight feet wide it should be possible without much inconvenience to carry this cut up to the caved ground and support the roof with stulls while the ground would cave more readily and evenly if the cuts were carried right up.

Nature of Orebody Important

What is the physical nature and hardness of the ore? It would appear that the ore must be homogeneous in character, not intersected by dikes or planes of weakness and be fragile. It must be good-standing ground to allow of the mining of the sill cut leaving pillars small enough to be mostly blown out with the one firing. To what height is the sill cut taken? Apparently to not more than 10 ft. and, therefore, unless the ore is of a fragile nature, the settlement of a block 100 ft. thick a distance of 10 ft. would hardly be sufficient to crush the ore so that "80% of it will pass a 3-in. opening." This system must depend upon the physical nature of the orebody and it would be interesting to know within what degrees of hardness this system is considered suitable.

The name "caving" for this class of mining seems to be unfortunate because apparently the success of the system must largely depend upon the crushed ground not forming caves. It must be essential that both the crushed ore and the overburden should readily follow the mining operations and keep replacing the ore removed by shoveling and not allow the formation of large cavities in the crushed zone which, upon eventually breaking, would suddenly crush down upon the levels and be a source of danger to the men and drifts. How is this guarded against and are any precautions taken, such as the regular measurement of the subsidence on the surface, to enable the manager to be warned in time to prevent accidents?

Cave May Form While Crushed Ore Appears in Drifts

It is quite possible for the crushed ore to be appearing at the face of the drift and still for a cave to be forming some distance above, assisted by the jambing of some rocks and a subsequent arch action developing. As the weight of the overburden and caved worthless material has apparently much to do with the success of the process, by the pressure and crushing action they exert upon the settling ore, what depth of overburden is considered advisable or necessary? Is it customary to keep filling up the surface depressions formed by the settlement of the ground with suitable material that will not bind but will follow up the settlements so as to increase the weight and therefore the crushing effect of the overburden?

In removing the caved ore it is allowed to run on to the floor of the drifts and then is shoveled into trucks. Is it not possible largely to cut out this shoveling by erecting chutes in the end of the drift so that the broken ore can be run directly into trucks? If the caved ground is so crushed that 80% will pass a 3-in. opening it should be possible to handle this crushed material through suitable chutes to minimize the shoveling. If handling of the material is desirable to facilitate a certain amount of hand picking could not this be done to better advantage on the surface by means of a sorting belt or at any rate the broken ore be allowed to run on to a platform situated on a level a little above the top of the trucks when at least the action of lifting would be eliminated? To facilitate this it would appear that it might be easier to drive the crosscuts necessary for the removal of the broken ore, not actually in the caved ground itself but just below it so that the sides of these drifts would be protected by solid ore and only the roof would require careful timbering. It would then be possible to put up sloping chutes from the sides of the drifts into the caved ground, so placed that they would deliver direct into trucks.

The increased cost of driving these crosscuts in solid ore would surely be counter-balanced by the saving of timber and reduction of maintenance costs. It is probable that this method is either in operation at some mine or has been tried and found unsuitable. In either case it would be interesting to have a description from some engineer who has tried it with a comparison of its advantages and cost with the described method of running the crosscuts wholly in the caved area.

System Has the Advantage of Safety

This system as described seems an excellent one and has the advantage of great safety for the men, as its only dangerous period is when the pillars of the sill cut are being reduced before caving, and a little experience should enable the manager to do this work without running any big risks with his men. As the suitability of the system depends almost wholly upon the physical nature of the ore, some careful description of the various ores, which those operating the system consider are suitable for caving, would be extremely useful.

The second method is the top-slice method of caving. This might be described as a retreating longwall system of mining with the disadvantage that instead of having a fairly sound roof, which can be worked to bring a suitable pressure upon the ore to assist in its mining, the roof consists of caved ground. It is rather difficult, with the information available, to appreciate how such low costs as quoted are obtained. Is this class of caving only suitable for such soft ore that it would be impossible to mine out a sill cut as described in the first method? Unless the ore is very soft the great drawbacks to this system must be; all ore is mined from the solid; it must be necessary to advance the crosscuts, by which all the ore is mined, by some system of spiling and all timber must be kept close to the face; an excessive amount of timber must be required, none of which is apparently recovered. It would be interesting if from some mine using this system a statement could be procured giving the quantity of timber required per ton of ore extracted. It looks as if it would be heavier even than in the square-set system of timbering, which is extravagant enough in timber. It must be difficult to have efficient transport of the ore to the chutes as the continual shifting of the lines will not make it worth while to expend the time necessary to lay down a good track, which is necessary for the expeditious and cheap handling of big tonnages. It is claimed that the ventilation is good. This requires an explanation as the bare statement does not carry conviction with it and it is hard to see, from the description I have before me, how the ventilation can be other than bad; how mining by drifts driven from the top of blind raises and connected in no way to higher levels can be good certainly needs explanation. This system can hardly be called "the caving system of mining" but should rather be alluded to as "the caving system of filling," as it will be noticed that none of the ore is actually caved but is mined from the solid and after its extraction the roof is allowed to cave in to fill the empty stope instead of trying to support the roof either by timber or by the introduction of filling. This system must surely be much more limited in its application than that first described.

Sub-level Caving Systems

The third method is the sub-drift variation of caving. This system consists of blocking out the ore upon the main level into blocks about 50 ft. square. At 50-ft. intervals along these drifts and crosscuts raises are put up to the caved ground above and from the raises, at vertical intervals of from 12 to 15 ft., sublevels are driven until eventually the whole block of ore is honeycombed by a series of horizontal and vertical passages. When this stage has been reached the actual caving is begun working from the top downward. The ore above the sublevels is allowed to fall by the removal of the timber and is then shoveled away, the caved filling being temporarily supported by spiling and posts. The pillars are removed by the top slicing in a manner similar to that already described.

In this method about 40% of the orebody must be removed by raises and drifts, generally the most expensive method of mining, while of the remainder all that contained in the pillars has to be mined from the solid under a roof formed of caved ground. This seems to show that the method is only suitable for soft ore which can be cheaply driven through and requires practically no boring or explosives. Otherwise, it is hard to see how the low costs quoted can be obtained. This system must also require a large quantity of timber and it would be useful to know the quantity per ton. Not its cost per ton as the cost of timber varies so on different fields.

Adaptability of Various Methods

The following conclusions appear to be sound from the information available:

Caving by the first method depends upon a depth of overburden sufficient to crush the undermined ore by its weight and also of such a nature that it will settle evenly and regularly. That the ore must be of such a nature that upon settling 7 to 10 ft. it will break up through a depth of 100 ft. and assisted by the weight of the overburden in a comparatively short time will crush into pieces of moderate size. Under these conditions it appears to be an ideal method of mining. For the general profession a careful description of the ores that have been found by experience to answer these requirements is much to be desired.

Caving by the top-slice modification does not depend at all upon the weight of the overburden to assist in the mining and therefore can be used on shallow deposits. The ore must be very soft and easy of extraction or the expense of mining the whole of the orebody from the solid would not allow it to compete with other methods. Timber must be cheap in the district.

Caving by sub-level, not depending upon the assistance of overburden in crushing the ore, can be used in shallow deposits but in common with others this method requires that the overburden should settle readily and rapidly after the extraction of the ore. The ore must be soft and easily excavated as such a large proportion of it has to be mined from the solid; and not be of such a nature that it will readily break up upon settlement as otherwise the first method described would surely be much cheaper. Timber must be cheap and also I should say of a soft variety. From the experience I have had in Australia in driving through collapsed stopes containing hard wood, I should say that it would be impossible to mine with a reasonable degree of cheapness under a mat consisting of broken overburden and sticks of iron-bark or other hard wood.

I trust that if these conclusions of mine are wrong that some engineer using the system will correct them and also give some more information about the physical character of his orebody.

J. Bowie Wilson.

Sydney, N. S. W., Apr. 12, 1912.

Colorimetric Copper Assay

The article on copper determinations at Granby by Frank E. Lathe, in the Journal of June 1, 1912, seems to me an excellent resumé of the best modern practice. Referring to his colorimetric method for copper in slags I notice that he finds a difference in color between standards and assays containing the same amounts of copper and also that he adds iron and aluminum to his standards to make conditions the same as in the assays.

For some time I have been using this method in a way which overcomes both of these difficulties and makes the conditions under which standards and assays are run almost identical. Several typical slags are procured varying in percentage of copper within the limits of the required standards. Careful copper determinations are made on these slags and then relative amounts are weighed out for the standards and treated exactly the same as the assays. The colors will be found to be exactly the same in standards and assays and all other conditions are practically the same in both cases. The method used in this way will be found satisfactory and is useful for rapid copper determinations on daily slags.

R. L. Hallett.

Brooklyn, N. Y., July 30, 1912.

Geology Applied to Mine Examination

By Ira B. Joralemon*

Geology is nearly always the determining factor in an examination of a prospect or partially developed mine, where the extent of mineralization, level of ground water and depth of enrichment must be judged from surface indications.

The purpose of a mine examination is to determine whether or not it is worth while to invest money in a mine or prospect. From the nature of his work, the examining engineer must take a much more commercial point of view than either the prospector or the geologist in charge of underground exploration. In planning exploration, the geologist tries to find all the available ore in his mine, without estimating the actual profit on the money invested in the property which that ore will give his employers. The prospector must have an unquenchably optimistic disposition, which will imbue him with a strong and often a blind faith that he will find a great mine, or he would never adopt so uncertain a calling. The examining engineer, however, must secure for his employers a good return on the money invested, or forfeit his position.

Relation of Expectation of Profits to Risks

Few mining investments are safe, and the possible profits from a venture must increase with the degree of uncertainty. In the rare case where the mine has ore enough developed or fairly well indicated to make possible an estimate of the total output, the engineer may be satisfied with a moderate profit, and may safely pay a large cash price for the property. In the more usual case where the result of the speculation is doubtful, the possible return, if the mine turns out well, must be many times the amount invested, and cash payments must be avoided.

It is important that the examining engineer accomplish his task as rapidly and with as little expense as possible. The cost of examination of many properties must be paid by the few that are taken. If a high purchase price, inaccessibility, or any other condition proves in a short time that it is out of the question to buy a mine, the engineer is not justified in making a thorough examination, no matter how interesting the locality may be from a geologic standpoint. Usually the work is rather a reconnoissance than a careful study.

The examining engineer then must balance the possible profit in case the mine proves to be a good one against the chance of failure, to determine if the speculation is worth making. One good mine will pay the cost of a dozen failures, and it is far better to suffer a dozen disappointments than to let slip a possible Bisbee. To condemn a good mine is the cardinal sin of the examining engineer. Since unexpected types of deposits are constantly being discovered, any examining engineer of great experience is a hardened sinner. To avoid this sin as much as possible, he must risk his reputation and his employer's money wherever there is a reasonable chance of success. He must prepare his pride for many failures, and must rely on the laws of chance to bring him out a winner in the long run.

Examinations are Made on Three Types of Properties

The properties on which examinations are made fall naturally into three classes. The commonest are the undeveloped prospects, or those on which a little work has been done with negative results. In determining the values of these properties, geology is the only guide. Such examinations are closely akin to the work of the prospector.

The second class of properties includes the partly developed mines, in which ore enough has been found to give some idea of the nature of the ore occurrence. Here also geologic inference is the chief factor in determining the value of the property. The examination of partly developed mines is more like the work of the geogolist who plans mine exploration.

In the third class belong the fully or nearly fully developed mines. In examining these geology is of comparatively little use. Frequently, however, the geologist may find chances for new ore which have been overlooked in the development of the mine.

The methods of procedure in these three cases differ, and each case may be considered separately. I refer in this description chiefly to the examination of copper properties, though the methods apply with a few changes to all metal deposits.

When examining an undeveloped copper district, the first thing to look for is a widespread and thorough mineralization. Where there has been mineralizing action strong enough to form important orebodies, it is almost certain that this action will have had a great effect on the rocks over a large area. In the greater part of this area the mineralization is usually too slight to make commercial ore. It may take the form of pyritization with surface iron staining of a large mass of igneous rock or schist; of seams of copper-stained iron oxides in limestone; of interlacing or parallel veinlets far from a large vein, or many other forms. However promising the smaller outcrops may be, I consider it very unlikely that they will develop into great mines unless there is some such general mineralization. The Southwest is strewn with outcrops of rich ore or of fine gossan on which fortunes have been spent only to prove them gash veins or shallow surface deposits which have not paid the cost of development. There may be important vein deposits accompanied by comparatively little mineralization of the walls, with no smaller veins leading from the great one. In the case of copper deposits at least, it is safer to let someone else pay for developing such solitary veins. In all the great mining districts of the Southwest, the mineralization extends with decreasing strength for several miles from the center of the district. Without such general and thorough mineralization, I do not consider a copper property worth developing.

Where the general conditions are favorable, there is a fair chance that valuable ore deposits exist somewhere in the district. The next task for the examining engineer is to determine what the nature of these deposits is likely to be. Here he must rely on the similarity of geologic conditions to those in developed districts. For this work, it is most important that he be familiar with many deposits of all types. He must judge from his experience whether the ore in the new region is likely to be in veins, contact or replacement bodies, disseminated deposits, or in any other forms of ore occurrence. With this accomplished, he can concentrate his more detailed work on the smaller area in which ore is likely to occur.

Limestone Resembling Gossan Outcrop

The extent of the area in which ore may be expected should next be determined. Often it will be found that this locus of the orebodies is too small to contain a large mine. For instance, it is common in the Southwest to find floating in porphyry small blocks of limestone, the remnants of sedimentary deposits that have been almost entirely eroded away. Often these blocks are long and narrow, the bottoms of synclines or of V-shaped troughs formed by dropped fault blocks. Such narrow limestone masses are the "lime dikes" of the prospector. Since all parts of the limestone are near porphyry contacts, there is an excellent chance for contact metamorphism. Often the whole mass of limestone is changed to iron oxides and lime and iron silicates, with abundant copper stains and seams of carbonate ore. Some of the finest gossan outcrops I have seen are of this nature. They are often pointed out as the outcrops of fissure veins, and where the bands are so narrow that none of the limestone structure can be seen, it is easy to mistake their true origin. The geologist may determine whether the outcrops are vein material or the result of metasomatic action, and may save his employers the chagrin of finding barren porphyry a few feet below a magnificent gossan outcrop.

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Note—A paper presented before the Phelps-Dodge Geologic Conference, at Morenci, Ariz.

In many other ways the locus of the possible orebodies may be too small to harbor a mine. Few properties will pass the examination even to this point, the beginning of the real work.

Primary Ores Seldom of Commercial Grade

Two main problems must now be attacked—the nature of the primary mineralization and the probable degree of enrichment. While there is commercial primary ore in many great mining districts, it is not safe to figure on primary ore in buying an undeveloped property unless great quantities of this ore are exposed on the surface. This I have never known to occur. The importance of knowing the character of the primary mineralization lies in the indication that knowledge gives of the amount of concentration which will be necessary for the formation of commercial ore.

Material which has escaped leaching or enrichment may be found on the surface in areas between shear zones, or in the bottoms of rapidly-cut gulches. If this material is of such a nature that with surface alteration it might form the nearby outcrops, and yet is entirely barren, there is not likely to be ore under the outcrops. For instance, if a mineralized and leached shear zone grades in a cañon into fractured, pyritic porphyry with no trace of copper, it would be almost hopeless to try to find a copper mine in the shear zone. But if the pyritic material assayed ½% copper, it might easily be enriched to a commercial ore. Thus, though the primary ore near the surface is seldom of commercial grade, it is most important to determine the nature of this ore.

Even if no primary ore can be found, some idea of the character of the mineralization may be obtained by a close study of the outcrops. Here, too, it is essential that the examining engineer shall have become familiar with many different ore deposits. The resistance to erosion of an outcrop, its color, mineral composition, physical structure, and the relative amounts of different constituents, all give valuable clues to the nature of the primary ore and also to the strength of the surface alteration. An excellent paper on the outcrop of orebodies, by W. H. Emmons, was published in two numbers of the *Mining and Scientific Press* in December, 1910. This subject is greatly neglected in the literature of geology, and information on it can usually be obtained only by searching through long descriptions of mining districts, or through articles on superficial alteration. Experience is the only trustworthy teacher of the meanings of outcrops, and even experience often leads astray those who put too blind a faith in its virtues.

The last step in the examination is the study of the leaching and of the probable enrichment. This involves a study of the nature of the gossan, the ground-water level and its movement, the rapidity of erosion, the character and permeability of the rocks, and the fracturing. And these must be determined from surface conditions alone, with little or no assistance from underground workings.

Worth of Mine Dependent Upon Extent of Enrichment

The ground-water level often cannot be located from surface indications. Yet the examining engineer must express an opinion on the value of the property, which value depends largely on the amount of leaching and enrichment. In such cases he must adopt some working assumption on which to base a decision which will be fairly safe without being too conservative. I have considered it safe to assume that in the smaller, desert mountain ranges the water level will be at least as low as the floors of the surrounding large valleys, while in large mountain ranges the level may be considerably higher than the bottoms of the main cañons.

The rate and direction of change in the water level can seldom be discovered certainly from surface indications. The rapidity of erosion is the best evidence, though occasionally a study of faulting may give a clue to great and rapid changes.

Whether or not the leaching and consequent enrichment have kept pace with a sinking water-level can usually be determined fairly easily. When erosion has been very rapid, primary sulphides are generally found near the surface. The character of the rock and the degree of fracturing in it indicate the ease or difficulty with which it may be leached. If there is even slight fracturing limestone is usually oxidized to the water level, or at least deeply, while the fine-grained igneous rocks require very thorough crushing to allow much leaching. The color and nature of the outcrop may give an idea of the strength of surface alteration. Large amounts of copper carbonate or silicate on the surface generally indicate that leaching and enrichment will be shallow at that point. Many such indications help convince the geologist whether or not the primary ore is likely to have been enriched into large workable orebodies.

The process of examination has been one of elimination, leaving at the end only properties in regions thoroughly mineralized, where the locus of the orebodies is great enough to allow large deposits, where outcrops are large and promising, where the primary ore contained the metal sought for in appreciable quantities, and where the conditions of water level and enrichment are apparently such that this primary ore may have been concentrated into orebodies of commercial grade. When a property has passed these tests, the engineer may proceed to the question of whether or not the chance of finding a mine justifies the payment of the purchase price and the cost of development. After a few disappointments, when beautiful surface showings have covered ore too low-grade or too refractory to mine, the engineer becomes unwilling to make cash payments on undeveloped mines.

Character of Primary Obtained from Enriched Ore

In examining partly developed properties, the work of the examining engineer closely resembles that of the geologist who plans exploration work. He makes a study of the occurrence of the developed orebodies and of the outcrops which represent them, and from this determines what is likely to be found in the rest of the property. The points which were uncertain in the examination of the undeveloped properties are here far clearer. The water level is usually either developed or shown to be so deep that much enrichment is possible above it. The actual depth of leaching and the character of the enriched ore are almost always proven. The character of the primary ore can usually be determined either through exposure below the enriched zone or by a study of the composition of the enriched ores. Thus the engineer finds out how the ore in the new district occurs.

The determination of the probable limits of partly developed ore is most important. Where the thickness of enriched ore is not proven, a fair idea of this thickness may sometimes be obtained by reasoning from the value of the primary ore, the value of the enriched ore, and the depth of leaching. Often, however, rapid erosion of the leached material makes such reasoning invalid. Where the character of the primary ore is indicated only by the enriched ore, the problem becomes a difficult one. How much of the value of an enriched ore is due to the enrichment is always hard.

and often impossible to determine. In some mines it seems likely from the nature of the enriched ore that the primary ore will be rich enough to mine and that the ore will continue to great depth. Other conditions too may make possible a good guess as to the limits of the ore. An orebody is often bounded on one side by a fault, and the geologist may become convinced that part of the orebody is beyond the fault. By all possible means he should try to ascertain the amount of ore that may reasonably be expected in the area developed or partly developed.

Having studied the developed orebodies, the examining engineer returns to the surface and determines the areas in which conditions for ore deposition should be as favorable as in the proven ground. Knowing the amount of ore below certain outcrops, by comparing other outcrops with these he may form a fairly reliable opinion on the ore that may be expected in the property.

Often, however, there is a chance that there may be ore of a different character from that developed. If ore has been found in limestone near an intrusive contact, there may be disseminated ore in the intrusive rock. By hunting for such possibilities, the geologist may find that the mine has a possible value far greater than the developed orebodies indicate.

The Limit of Amount of Cash Payment

After forming his opinion of the probable value of the mine, as in the case of the undeveloped property the engineer compares this value with the purchase price and the cost of development to determine whether he can recommend buying the mine. Here it is seldom safe to make a cash payment much greater than the probable profit from the ore already developed.

In the third case, where properties are fully developed, the work of the examining engineer becomes the purely mathematical problem of measuring the ore, figuring the profit from it, and determining whether this profit will pay the purchase price, interest, and amortization charges. Fully developed mines are very rare, however. In nearly every property the geologist can discover a possibility of more ore. Unless there is a chance that the real limits of the ore have not been reached, or that there may be new orebodies of a different sort, the geologist will find little to interest him in the examination.

Such is the general procedure in making mine examinations. Geology is nearly always the determining factor. But with the most careful geologic work, the results of the examination will be unreliable unless there are added two unusual qualities, good judgment, and breadth of vision. These qualities are rather inherent than acquired, and by their aid engineers with scanty geologic training are often more successful in examination work than the most thoroughly trained geologists.

By the very nature of his work, the examining engineer is more or less of a pioneer. New types of deposits are constantly being brought before him. If he is prejudiced in favor of any one theory of ore deposition, or if he relies too much on the universality of the types of deposits with which he is familiar, he will miss the possibilities of fields where his theories will not apply. He will see mines that he has condemned spring up to mock his prejudices. Nature is many sided, and the one-sided man misses much of her greatness.

The examining engineer must be always ready to accept new conditions, yet must have the judgment and insight that determine whether the chances of success are good enough to warrant testing the conditions. With careful geologic work, supplemented by good judgment and breadth of vision, he may secure the satisfaction of bringing new mines and new types of deposits to productiveness, and may secure lasting prosperity to those by whom he is employed.

Volumetric Method for Thorium

A volumetric method for thorium has been worked out by Metzger and Zons (*Journ. Ind and Eng. Chem.*, July, 1912), which depends on the precipitation of thorium with a standard solution of ammonium molybdate, an excess of the precipitant being shown by the use of diphenyl carbazide on a spot plate.

The method as appied to monazite sand is as follows: Treat 1.0 gram of the powdered sand in a porcelain crucible with 10 to 15 cc. concentrated H_2SO_4. Heat several hours, then cool and transfer crucible contents, a little at a time, to 700 cc. of water cooled to nearly 0°C. Allow to stand several hours (over night if convenient), to insure solution of the sulphates. Filter and wash.

Nearly neutralize the filtrate with ammonia, and add 50 cc. of a cold saturated solution of oxalic acid. Allow to stand over night, filter, and wash the oxalate precipitate with dilute oxalic acid. Transfer precipitate and paper to a beaker, and add 20 to 25 cc. of strong potassium-hydroxide solution and heat to boiling. Dilute, filter, and wash with hot water.

Dissolve the precipitate of rare-earth hydroxides off the filter with hot dilute nitric acid, and evaporate to dryness on a water bath. Add a few cubic centimeters of water and again evaporate to remove free acid. To the dry residue add 200 cc. glacial acetic acid, dilute with 300 cc. of water, add one gram of sodium acetate, and stir until dissolved. The excess of acid holds up other rare-earth molybdates.

Titrate at room temperature with standard ammonium-molybdate solution. The standard solution contains about 20g. per liter of ammonium molybdate, but must be standardized on a known thorium salt. The ammonium molybdate should be added a few tenths of a cubic centimeter at a time, with a vigorous agitation after each addition, finally finishing drop by drop. The end point is reached when a drop of solution produces a pink coloration on the spot plate, with a drop of diphenyl carbazide.

The diphenyl carbazide is prepared as follows: Add 23 grams of phenyl hydrazine to 7 grams of urea in a flask, and heat in an oil bath at 160 to 170°C. for six hours, using a reflux air condenser. Allow to cool, add 50 cc. ethyl ether, heat on a hot plate for one hour, decant and add 50 cc. more ethyl ether and heat for two hours longer. A white precipitate remains. Purify this by dissolving in alcohol and reprecipitate by addition of an excess of water. Repeat this purification. Filter on a Büchner funnel, wash and dry at 105° C. The yield is about 14.3 grams of diphenyl carbazide.

This is white when first precipitated, but turns brownish-yellow in time. A trace of impurity causes it to turn pink, hence all vessels used must be scrupulously clean. The indicator, when on the white tile, should be yellowish or brownish yellow. It is necessary that this indicator be at least two weeks old before using, as the freshly prepared solution requires a large excess of molybdenum to produce a pink coloration.

Antimony a Byproduct Only

Information received by the U. S. Geological Survey indicates that no antimony ore was produced in the United States in 1911, but considerable quantities of antimonial lead were made as a byproduct in smelting the precious metals. There was also a large recovery of antimony from secondary sources, such as scrap bearing and type metals, antimonial lead, drosses, and solder; 14,078 tons of antimonial lead containing a total of 2254 tons of antimony, were produced. The price of antimony was so low in 1911 that there was little encouragement for American miners to produce the ore unless it contained other valuable metals.

The production of secondary antimony as antimony in the United States last year was 10 short tons; and 2359 tons was recovered in alloys. In 1910 the recovery was 9 and 2770 tons, respectively. Antimony is used principally in antimonial lead as type metal and as babbitt and other bearing metals.

Operations at Goldfield Consolidated for June 1912

During the month of June, 1912, the total production of the Goldfield Consolidated Mines Co. was 32,365 tons, containing $573,658, or an average of $17.72 per ton, of which 29,040 tons was milled with an average extraction of 92.63%, and 3325 tons was shipped of an average assay of $23.91 per ton. The net recovery from all ore was $16.60 per ton. The total net realization to the company was $325,475, or $10.06 per ton.

The total cost of mining, development, transportation, milling, office and general expenses was $6.82 per ton, distributed as shown in the accompanying table:

OPERATING COST, GOLDFIELD CONSOLIDATED MINES CO., FOR JUNE, 1912

Mining:		
Development	$0.79	
Stoping	2.51	
		$3.30
Transportation		0.08
Milling		2.03
Marketing		0.06
General expenses		0.47
Bullion tax		0.12
Marketing ore shipped		0.70
Construction		0.06
Total cost of operation		$6.82
Miscellaneous earnings		0.06
Net cost per ton		$6.76

Results of Development

Supt. J. F. Thorn reports that the stope in the Reilly vein of the Combination mine, southeast of the shaft, produced 1341 tons of $22 ore. The 402-G stope, 300 ft. north of the shaft, between the fifth and sixth levels, produced 353 tons of $ 8 ore. This is the deepest place in the mine where ore has been found. A new stope is being opened on the second level, 200 ft. east of the 136 stope, under the old January workings; 102-X and 103-X drifts, driven through the quartz, produced 117 tons of $15 ore.

At the Mohawk, the work being done north of the 3 stope on the 150-ft. level through the old Sheets-Ish country, is proving a large tonnage of good-grade ore. The 3-J sill, 50 ft. north of the 3-E stope, produced 43 tons of $37.60 ore. The 29 drift, being advanced north in the foot wall of the Sheets-Ish stope, produced 38 tons of $31 ore. The 170-L stope, on the 250-ft. level, produced 105 tons of $28 ore. The 111-N, on the 250-ft. level, under the Hayes-Monnette stope, produced 354 tons of $40 ore. The 354-Q, in the foot-wall section of the 354 stope, produced 1389 tons of $43.20 ore.

At the Clermont, the 426-X intermediate, between the 750- and 600-ft. levels, and close to the old 401 stope, produced 108 tons of $28 ore. During the last month the development on the 1300-ft. level on the Grizzly Bear has been satisfactory. The 802 drift in the orebody has been shipped as broken, the last round of muck averaging $64 per ton. The third compartment of the shaft from the 1300- to the 1000-level was completed, and pipes, ladders and electrical equipment moved over. Guides were put down the former manways from the surface to the 1300, and a double-drum electric hoist installed on the surface. Sinking the next lift of 140 ft. is now in progress.

July Mining Dividends

July is, in the mining as in the industrial world, a month of large dividend disbursements. Thirty-seven United States mining companies report to the Journal dividend disbursements of $6,888,977; metallurgical, coal, iron and holding companies, $3,748,605; and Canadian and Mexican mining companies, $1,658,156. There are three new names in the list, Gold Chain, of the Tintic district, Utah, Pittsburgh-Silver Peak, of Nevada, and Seven Troughs Coalition, as well as a number of returns after long absences, in which class are Tonopah Extension, Colorado Fuel & Iron, Le Roi No. 2, and Consolidated Mercur.

United States Mining Companies	Situation	Per Share	Total
Ahmeek, c	Mich.	$5 00	$250,000
Am. Z. L. & S., z.l	U.S.	0.50	81,640
Anaconda, c	Mont.	0 50	2166,250
Bing-New Hav c	Utah	0.10	22,869
Bunker Hill & Sull., l.s	Ida.	0 20	65,400
Center Creek, z	Mo.	0 05	5,000
Champion, c	Mich.	1.00	100,000
Continental, z.l	Mo.	0 50	11,000
Con. Mercur, g	Utah	0 03	30,000
Cop. Range Con., c	Mich.	0 05	196,723
Daly-Judge, s.l	Utah	0.15	45,000
Daly West, sl.	Utah	0.30	54,000
Fremont, g	Calif.	0 02	4,000
Frontier, z	Wis.	2.00	5,000
Gold Chain, g	Utah	0 02	20,000
Golden Cycle, g	Colo.	0 02	30,000
Goldfield Con., g	Nev.	0 30	1067,074
Hazel, g	Calif.	0.01	9,000
Hecla, l.s	Ida	0.02	20,000
Homestake, g.	S.D.	0.50	109,200
Iron Blossom, s.l.g	Utah	0.10	100,000
Mary McKinney, g	Colo.	0 02	26,185
New Idria, q.	Calif.	0.30	30,000
North Butte, c	Mont.	0.50	205,000
North Star, g	Calif	0.15	37,500
Old Domin, M. & S., c	Ariz.	1.25	205,000
Opohongo, g.s.l	Utah	0.02	17,980
Osceola, c	Mich.	6.00	576,900
Portland, g.s	Colo.	0 02	60,000
Pitts.-Silv. Peak, g	Nev.	0.16	288,000
Seven Troughs Coal., g	Nev.	0 02½	37,500
Tonopah-Belmont, g.s	Nev.	0.05	375,000
Tonopah Exten., g.s	Nev.	0.02½	23,586
Tonopah Min., g.s	Nev.	0 40	400,000
Wasp No. 2, g.s	S.D.	0.01	5,000
United Globe, c	Ariz.	4 50	103,500
Wellington, g	Colo.	0 00½	5,000

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Ag. Chem., pfd	U.S.	$1 50	275,730
Am. Ag. Chem., com	U.S.	1.50	171,141
Am. Sm Sec. pfA	U.S.	1.60	255,000
Am. Sm. Sec. pfB	Mex.	1.25	375,000
Colo. Fuel & Iron, pfd	Colo.	2.50	50,000
Central Coal & Coke, com.	U.S.	1.50	76,875
Central Coal & Coke, pfd.	U.S.	1.25	23,437
Gen. Chem., pfd	U.S.	1.50	150,000
Guggenheim Expl.	U.S. Mex.	2.50	519,833
Nat. Carb., com	U.S.	1.50	82,500
Old Dominion, c	Maine	1.00	293,245
Pittsburgh Coal, pf	U.S.	1.25	371,262
Sloss-Shef	Ala.	1.75	117,250
U. S. Sm. R. & M., com	U.S.	0.50	175,552
U. S. Sm. R. & M., pfd	Mex.	0.87½	425,530
Va.-Car. Chem Co., pfd.	U.S.	2.00	360,000
Vulcan Detinning, pfd	N.J., Ill.	1.75	26,250

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Beaver Con., s	Ont.	0 03	59,989
Brit. Col., c	B.C.	0.15	88,756
Buffalo Mines, c	Ont.	0.05	50,000
Crown Reserve, s.	Ont.	0.05	88,441
Dominion Coal, com.	Can.	1.00	150,000
La Rose, s	Ont.	0.12½	187,328
Le Roi No 2, g c	B.C.	0.24	29,160
McKin.-Dar Sav., s	Ont.	0.10	224,769
Nipissing, s	Ont.	0 38½	150,000
Nova Scotia. S. & C., com	N.S.	1.50	90,000
Nova Scotia. S. & C., pfd	N.S.	2 00	20,600
Standard Silver Lead, l.s	B.C.	0.02½	50,000
Temiskaming, s	Ont.	0.03	75,000
Temiskaming & Hudson Bay	Ont.	3 00	23,283
Wettlaufer-Lor s	Ont.	0.05	70,830

Unfortunately the last is more a subject for gloom than rejoicing, as it is understood to be a liquidation dividend, preparatory to winding up the affairs of the company. Colorado Fuel & Iron had not paid dividends since Feb. 20, 1903, until the declaration of 2½% for July and 2½ for next February. It is to be hoped that this company is now out of its troubles.

Increases in dividends are to be noted by Ahmeek, North Butte, Old Dominion, Osceola and United Globe, reflecting the high prices of copper, while North Star and Opohongo increased their disbursements just as a matter of increased prosperity. The most important change, however, is the reduction in Goldfield Consolidated to a 30c. quarterly basis.

Mining dividends declared by United States companies making public reports amount to $34,582,575 for the first seven months of 1912, and those of mining, metallurgical and allied companies to $97,032,408.

Chronology of Mining for July, 1912

July 1—Butte miners voted to accept wage proposition of Anaconda company to pay $4 per day on the basis of 17-c. copper, to be effective June 1.

July 4—An explosion of firedamp in the Osterfield colliery near Oberhausen, Germany, killed 14 miners.

July 7—An explosion of dynamite killed 10 and injured two men loading holes in the Eureka pit of the Nevada Consolidated.—At the Braden copper mine, in Chile, 30 men were killed by an explosion underground.

July 8—Earthquake shocks felt at Fairbanks, Alaska. A fire in Tonopah destroyed property valued at $250,000.

July 9—An explosion killed 88 men in the Cadeby colliery in Yorkshire, England, the day after that mine had been visited by King George V.

July 11—An explosion in the Panama colliery of the Ben Franklin Coal Co. at Moundsville, W. Va., killed eight men.—The Arizona Commercial mine was purchased by Charles Smith at public sale for $1,000,000.

July 16—Six miners were killed and three were seriously injured in an explosion at the Gayton colliery of the Old Dominion Development Co., about 20 miles from Richmond, Va.

July 18—A cloudburst in the Seven Troughs district, Nevada, drowned 13 people and did much damage in the towns of Mazuma and Seven Troughs.

July 21—Standard mill of the Amalgamated Asbestos Co. at Thetford, Que., was destroyed by fire.

July 24—The new mill of the Tonopah-Belmont company commenced operation.—A cloudburst swept away a dam, drowning 13 men in the Superba No. 2 colliery near Uniontown, Pa.

July 25—The smeltery of the Santa Fé Gold & Copper Co. in the San Pedro district, New Mexico was blown in.

July 26—Three men were burned in the shaft of the No. 3 colliery of the Monon Coal Co., six miles southwest of Linton, Indiana.

July 31—Announcement of the consolidation of the Alaska-Perseverance, Oxford, and Sheep Creek properties near Juneau, Alaska, as the Alaska-Gastineau Mining Co.

U. S. Borax Production

The U. S. Geological Survey reports a considerable increase in the production of borax for 1911 over that of 1910. The production for last year was 53,330 short tons of the crude material, valued at $1,569,151, and the 1910 production was 42,357 tons of crude material, valued at $1,201,842. California furnishes almost the entire borax product of the United States. The mineral is principally colemanite, a borate of lime. The product as mined varies widely in its content of anhydrous boric acid.

Borax was first commercially produced at Borax Lake and Lake Hachinhama, by evaporation of the lake water, but the method was supplemented by recovering the mud from the bottom of the lake and washing out the contained borax crystals.

The dry-lake borax deposits were discovered later in Western Nevada and contiguous California. Some of the more important deposits of this type are Fish Lake, Columbus, Rhodes, and Teals marshes in southwestern Nevada,—Searles Dry Lake, Cane Lake, Saline Valley, and Death Valley in California.

The borax industry was established practically on its present basis in 1882, when the bedded colemanite deposits were discovered at Death Valley, and the year following at Calico. Since the working of the colemanite deposits on a large scale, the dry-lake deposits have been neglected. Borax is now made exclusively in the refineries of the large companies in California and at Eastern points.

The production of borax for 1911 was the largest in the history of the United States except that for 1906, when the output was 58,173 short tons, but the value of the 1911 production was greater.

Lime in Cyanidation

By C. E. Rhodes*

The use of lime in cyanide plants is, of course, universal, but there are a number of methods of introducing it into the plant circulation. Each of these is probably most efficient in some special case, but there are few records of definite facts obtained by especially designed experiment. The accompanying facts determined at this mill and for this particular ore may, therefore, be of interest. Doubtless all of the information may be gleaned from the various textbooks on the subject and the article is submitted only as illustrative of our practice with no claim for originality.

Method of Using the Lime

At this mill all lime is added to the ore before it reaches the mill bin. Unslaked lime is fed by hand to the belt conveyor which delivers the ore to the battery bins. It varies in size from dust to pieces 4 in. in diameter. This method is economical. To handle something over 200 tons of lime per month costs $22.50, or $0.0006 per ton of ore, about 35,000 tons being milled per month. The cost of lime is $6.75 per short ton and it contains approximately 70% soluble CaO. There is no machinery to look after nor power needed and it is easy to increase or decrease the amount of lime in solution. Another advantage is that the lime is in contact with the ore before the cyanicides have a chance to exercise any deleterious effect.

At this plant approximately 10% of a heavy sulphide ore is treated, which is kept in a separate division of the main ore bin and is crushed separately by 10 stamps of the main battery, and the lime is so added that this portion of the ore always contains a large excess of lime.

A possible disadvantage of this system would be the damage to the conveyor belt, but here the lime usually falls upon a bed of ore, or if not, there is always a thin layer of dirt which protects the belt. Damage might result from lime dust getting into bearings, but this objection would apply equally to any dusty ore. The cheap Mexican labor could not be obtained at all plants, and handling lime every day for from 8 to 12 hours is a rather disagreeable task.

A series of experiments was made by A. B. Myers at this plant, to determine the effect both as to extraction and cyanide consumption by using different quantities of lime. The first four experiments started with: (1) One pound lime per ton solution. (2) One and one-half pounds lime per ton solution. (3) Two pounds lime per ton solution. (4) Two and one-half pounds lime per ton solution. All were given 36-hr. agitation in small cones and no lime was added to the tests, shown on the next page.

Effect of Lime on Extraction and Cyanide Consumption

It will be noted that up to 2 lb. of lime, the total extraction increased, and the cyanide consumption decreased with the increased quantity of lime, and that in every case all the lime had been neutralized at the end of the 36-hr. agitation; also that in the first three tests reprecipitation had taken place after the protective alkalinity had been destroyed, while in the fourth test there was a slight increase due, probably, to the fact that while the protective alkalinity had been destroyed, enough time had not elapsed to allow for reprecipitation. All reprecipitation was of gold.

A second series of experiments was made in which it was attempted to keep the solution at: (1) One pound lime per ton solution. (2) One and one-half pounds lime per ton solution. (3) Two and two-tenths pounds lime per ton solution. (4) A saturated solution. This result was not obtained, although a large excess of lime was added. In all these later experiments the cyanide consumption remained about the same and the total extraction increased with the greater protective alkalinity.

Many apparent contradictions in the above will be found, for instance in the statement that the total extraction increased on using more lime while the highest results shown are after 24-hr. agitation with 1½ lb. lime (see tests 5 and 6), but in this case only the total extraction after 36-hr. agitation was considered.

Also comparing the first and second series the question naturally arises whether reprecipitation was due to lack of protective alkalinity, or excessive aëration, or both. Also it is possible in some instances that this apparent reprecipitation might be due to error in sampling or assaying. With this ore probably only 24 to 30 hours' agitation is necessary and a series of tests, taking samples at 6-hr. intervals, might show much better comparative results.

At this plant the most efficient protective alkalinity seems to be about 2 lb. CaO per ton, and our solutions titrate between 1.8 lb. and 2.2 lb. Lime consumption here is very high, varying from 13 lb. to 17 lb. per ton of ore treated.

It has been claimed by some that a high alkalinity is liable to cause a slight falling off in the gold extraction, but the results on this particular ore do not bear out the claim.

Effect of Lime on Zinc Consumption

Another point which may be of interest is the effect of protective alkalinity on precipitation and zinc consumption. A weak solution (0.006% KCN to 0.012%

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*Cyanide superintendent, El Oro Mining & Ry. Co., El Oro, Mexico.

KCN) cannot be successfully precipitated, even though the zinc shavings have been dipped in lead acetate, unless the protective alkalinity exceeds 0.4 lb. CaO per ton, and generally the best results are obtained when the lime in solution is carried somewhere between 0.6 and 0.8 lb. per ton. Very high protective alkalinity causes an excessive consumption of zinc and also is liable to cause such violent action in the boxes that the danger of mechanical loss, with a heavy flow, is increased.

Unless a large excess of lime is used, it would seem that there is little probability of lime being lost on account of not having gone into solution, especially in an all-slime plant where from 70% to 85% of the ore ground will pass a 200-mesh screen, and the total time of contact from ore bin to filter press tails is from 48 to 96 hr. However, there does seem to be a chance for a fairly large loss of lime where air agitation is used, as we have found that a 24-hr. air agitation of solution alone caused a drop in lime from 2.26 lb. to 1.20 lb., while mechanical agitation caused a drop from 2.26 lb. to 1.88 pounds.

TABLE SHOWING EFFECT OF VARIOUS AMOUNTS OF LIME ON EXTRACTION AND CYANIDE CONSUMPTION

Test No.	Agitation Hr.	Lime per ton lb.	KCN %	Per Cent Extraction Au	Ag	Total	KCN Consumed per ton ore lb.	Remarks
1	0	1.04	0.060					
	12	0.24	0.054	77.96	66.67	75.94		
	24	0.01	0.045	89.83	73.33	86.87		
	36	0.00	0.036	88.62	73.33	85.88	3.74	No lime added.
2	0	1.50	0.060					
	12	0.59	0.054	89.17	73.33	86.45		
	24	0.18	0.052	92.16	73.33	88.93		
	36	0.00	0.040	91.47	73.33	88.36	2.20	No lime added.
3	0	1.98	0.060					
	12	0.89	0.052	90.11	73.33	87.44		
	24	0.35	0.052	92.21	73.33	89.20		
	36	0.00	0.042	91.79	73.33	88.85	1.98	No lime added.
4	0	2.50	0.058					
	12	1.25	0.052	89.47	66.67	85.43		
	24	0.45	0.052	89.95	73.33	87.01		
	36	0.00	0.042	91.15	73.33	87.99	1.76	No lime added.
5	0	0.98	0.058					
	12	0.93	0.049	91.46	68.18	88.68		
	24	0.71	0.048	94.65	77.27	92.57		
	36	0.99	0.048	91.46	75.00	89.49	1.10	Lime added.
6	0	1.58	0.061					
	12	1.34	0.050	91.22	70.45	88.80		
	24	1.33	0.050	94.81	77.27	92.77		
	36	1.50	0.049	92.02	75.00	90.04	1.32	Lime added.
7	0	2.26	0.058					
	12	2.20	0.050	89.54	68.18	86.78		
	24	2.20	0.049	91.90	72.73	89.42		
	36	2.17	0.048	92.80	77.27	90.79	1.10	Lime added.
8	0	2.26	0.058					
	12	2.26	0.050	89.54	68.18	86.78		
	24	2.24	0.048	87.29	68.18	84.82		
	36	2.10	0.048	93.59	75.00	91.19	1.10	Intended to have been saturated.

Amount of Lime Should be Determined by the Metallurgist

From experience at this plant it does not seem that it is necessary to exercise anything like as much care in the addition of lime as that employed in adding zinc dust, but the quantity of lime used should be determined always by the metallurgist or cyanide superintendent as it is a matter of but little interest to the mill man, especially when, as in this case there are neither plates nor concentrators in the mill.

Contrary to the experience of certain investigators,[1] it was found here in times past, that excellent results were obtained, as regards settling, by adding slaked lime to the charge at the end of each agitation. The objection to this method was the high cost for slaking and distributing the lime over the plant and also considerable breakage of pump runners in handling pulp, due to rock and unburned lime residues.

At the plant of the Cia. Minera Las Dos Estrellas, the lime was added in the form of an emulsion for several years, the lime being ground in a pan, in KCN solution, with an overflow, but the practice has been discontinued, and lime is now added to the ore before going to the batteries.

One advantage in using lime in the form of an emulsion is, that unburned lime and other admixtures which the poorer grades of lime may contain are kept out of the plant. However, as the total amount of lime added to an ore rarely exceeds 1%, this is of minor importance.

Tantalum is used for making pens, surgical instruments, electrodes in X-ray tubes, and the filaments of incandescent lamps.

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[1] Eng. and Min. Journ., May 4, 1912, p. 869.

Rhodesia Mining Notes

Johannesburg Correspondence

Is a mine like the Lonely over or under valued? It is valued in the market at about £1,000,000. It is working a quartz vein having a shoot of ore about 1000 ft. in length and the reef has been cut at the eighth level or at a depth of about 900 ft. The ore developed, practically all above the seventh level, is estimated at 148,738 tons over a stoping width of about 48 in., assaying 23 dwt. per ton, and the profit in sight was calculated to be £484,458 on Mar. 31, 1912. The plant was to be capable of milling 4000 tons per month, but owing to transport difficulties and the necessity of adding another tube mill to crush the ore finer than was anticipated, it has not yet reached that figure. Last year the profit was £38,336. The vein is a regular one in serpentine schist and except for enriched ore at the outcrop, the lowest level shows the best grade and widths of ore. The vein averages on this level 45½ in. wide with a value of 37s. Working costs are about 25s. per ton.

The ore reserves in the Giant mine are rapidly decreasing and the end of the life of the mine is in sight if another orebody is not discovered. On Mar. 31, 236,837 tons remained and the mine is crushing 11,000 tons per month, the yield being £1 12s. 1d., and profit 18s. 3d. per ton.

The Rezende mine is working a large low-grade quartz reef at Umtali, from which some argentiferous galena is also concentrated. The net profit for 1911 was £13,119, the yield 27s. 2d. per ton, and working cost 21s. 4.7d. The ore reserves include 102,248 tons valued at 7 dwt. and about 40,000 tons of low-grade ore worked by tributors. A mill of 56 Nissen stamps is ordered for the Shamva mine, to reduce 50,000 tons per month.

Midwest Oil Co., Casper, Wyo.

Special Correspondence

Though little is heard of it, extraordinary activity and production is reported as going on in the oil district of Casper, Wyo. The Midwest Oil Co., operating four flowing wells and having 40 others which are down to the oil sands, together with a refinery at Casper, has announced a dividend of 2% on the $2,000,000 preferred stock of the company. This is the first dividend and is the result of six-months' operation. Earnings at the present rate of production are equivalent to 13% on the preferred and 7% on the $5,000,000 of common stock. There is said to be in storage enough crude oil to keep the refinery going for 100 days and the plant is being increased to a capacity of 8000 bbl. per day.

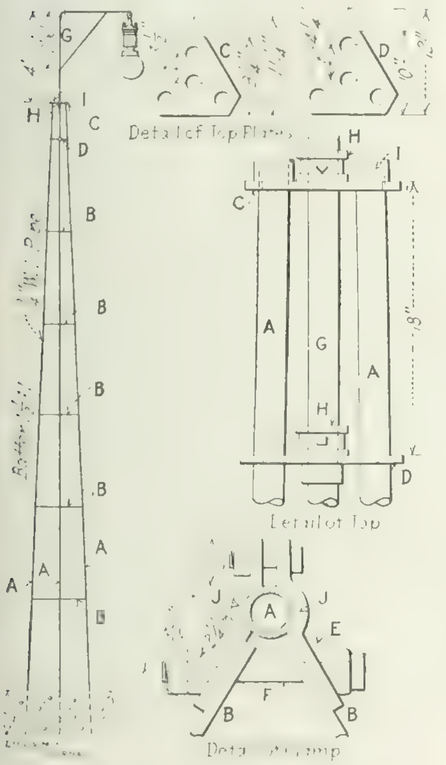
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

An Arc Light Tower

The details of construction of an arc-light tower, made chiefly of pipe, and used at the mines of the St. Louis Smelting & Refining Co., in Southeastern Missouri, are shown in the accompanying drawings. These towers are used to support the arc lights that illuminate the yards in the immediate vicinity of the main shafts and shops.

The legs *A* of the towers are pieces of 1¼-in. pipe set in concrete pedestals at a batter of ½ in. per ft. The three pipes are tied together at intervals of 4 ft. by cross braces *B*, that are made of pieces of ⅜x1¼-in. steel cut to the proper length, and by bolting to the standard clamps *C*, that are made of pieces of the same size of steel bent to the shape shown in the accompanying detailed drawing of the clamp and held together by bolts; 30° malleable-iron angle washers *E* being used on the coupling bolt *F*. At the top there are two triangular plates *C* and *D*, that slip over the legs. These are made so as to ride the legs about 18 in. apart. Caps *I* are screwed on the top of the legs after the plate has been put on. In the center of these plates a hole is bored to receive the pipe *G*, also made of two pieces of 1¼-in. pipe put together with an elbow and reinforced by an angle brace of ⅜x1¼-in. steel. On this top piece that carries the arc light are two collars *H*, that rest upon the two triangular plates. Owing to the way that the three legs are strapped together, all the fittings are standard and the cost of the towers is small.



ARC-LIGHT TOWER FOR SURFACE USE AT MINES

City Deep Winding Engine

JOHANNESBURG CORRESPONDENCE

A new type of electric winding engine has been installed at the No. 2 shaft, of the City Deep mine for hoisting men and material. It has two cylindrical drums 11-ft. diameter, 4-ft. face, one being loose on shaft and controlled by a jaw clutch and the other fast. The drums are on the same shaft as a three-phase induction motor of 1600 boiler hp. controlled by the Eddy current brake. There are only two main bearings for drums and motor. The hoist can raise a net unbalanced load of 5 tons at a speed of 3500 ft. per min. from a depth of 3250 ft. at 100 r.p.m. of the motor. The hoisting rope is 1½ in. and a tail rope is attached. The motor takes current at 2000 volts, 50 periods, and is controlled through a three-phase water resistance in the motor circuit. Both drums are fitted with brakes operated by compressed air. The Eddy current brake consists of a revolving direct-current field-magnet system constructed like an alternator, having a hollow cast-iron stator turned true to reduce the air gap, and being hollow and water cooled.

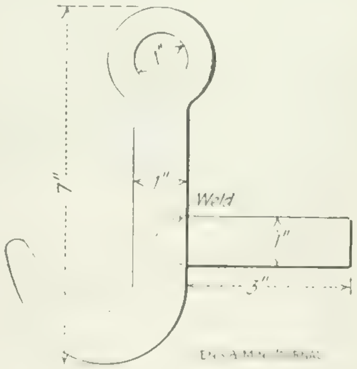
Eddy currents are generated in the stator varying in strength with the direct current exciting the magnets and the braking is so powerful that the hoist can be lowered at any speed without using the post brakes. A generator for exciting the magnets is driven by a three-phase motor to supply current and a storage battery is held in reserve. There is a similar winder at the Turf Mines shaft 3000 ft. deep. The British Westinghouse company supplied the electrical portions of the hoisting apparatus.

In an assay office using an ordinary pot-fusion and muffle-cupel furnace, it required about four gallons of oil composed of four parts crude oil to one part engine distillate; fed under a 30-lb. air pressure to run 50 assays.

A Bucket Dump-Hook

In the Joplin district practically all the ore is hoisted in buckets. The hoisting engine is set in a four-post derrick frame next to the well of the shaft, and the hoistman hooks the tail, or dumping, rope into the ring in the bottom of the bucket, and slacking off on his friction brake, dumps the bucket. In order to allow the hoistman to grab this hook and at the same time to swing over the door that closes the shaft, this bucket hook is made with a handle sticking out behind. This handle should start out from the shank of the hook about level with the tip. This makes the missing of a ring less likely to occur as the hooking is then a punching action directed so as just to miss the ring in the bucket.

The advantage of the handle, no matter where it is put, is that the point of the hook is always at a constant distance above the hand, and as all the fingers hold the handle and none is used around the shank of the hook there is no danger of mashing the hand. Consequently, the hoistman can hook with no other thought than properly placing the point of the hook in regard to the ring. This may seem to be a small item, but really it is largely through this handle on the dump-rope hook that the remarkable speed in Joplin hoisting is obtained. When a man hoists and hooks 1031 buckets in 7½ hr. from a depth of about 250 ft., the design of the hook is of importance. It is no uncommon thing for 900 buckets to be raised in 7½ hr., and usually about 500 buckets are raised. Often a round trip is made from a depth of 250 ft., measured from the floor of the derrick, in less than 30 sec., including the time of hooking and unhooking the bucket underground and dumping at surface.



DUMP HOOK USED IN JOPLIN DISTRICT

Headframe with Guy Rope Bracing

The headframe at the No. 4 shaft of the St. Louis Smelting & Refining Co. in southeastern Missouri, is approximately 70 ft. high, and no bracing legs are used in the construction. The frame is surrounded by the shaft house with a landing platform for pulling off the cars at the level of the top of the bins, which are about 30 ft. high, but this shaft house and bin do not aid in steadying the structure. The bracing is obtained by four ⅞-in. guy ropes that are anchored to concrete deadmen. The guy ropes are tightened by turnbuckles or else by pulling the rope back on itself after passing around a small sheave anchored to the deadman. This wheel is large enough to permit the rope to be pulled around it without injury, by a block and fall fastened to the end of the rope and attached to the rope itself. This is the best way of tightening the guy rope.

When turnbuckles are used they may be put in the main guy lines, but this gives less binding together and less strengthening against vibration than when an auxiliary rope or even two ropes are brought over from each of the main guy ropes and fastened to the steel work of the headframe. Then by means of turnbuckles and these binding ropes the whole guy line can be pulled together as tightly as desired. In case the sheave is used the auxiliary guy ropes are put on first and the whole tightened by pulling with the block and tackle on the main guy rope. Turnbuckles can also be added to these auxiliary ropes in the sheave system.

The ore is hoisted on one-deck cages in 1-ton cars, and little trouble is experienced from vibration of the headframe. There are several of these headframes in the district in which no back legs are used, but in which the bracing is done entirely by guy ropes. Little trouble from vibration is experienced as the guy ropes are always maintained taut.

Joplin Ore Buckets

In the Joplin district of Missouri practically all the ore is hoisted in buckets. These buckets, or cans or tubs, as they are commonly called, are made with straight sides. The ears are welded to straps instead of being riveted to the sides. The buckets are used without a crosshead to guide them through the shaft, and so have to stand much rough usage.

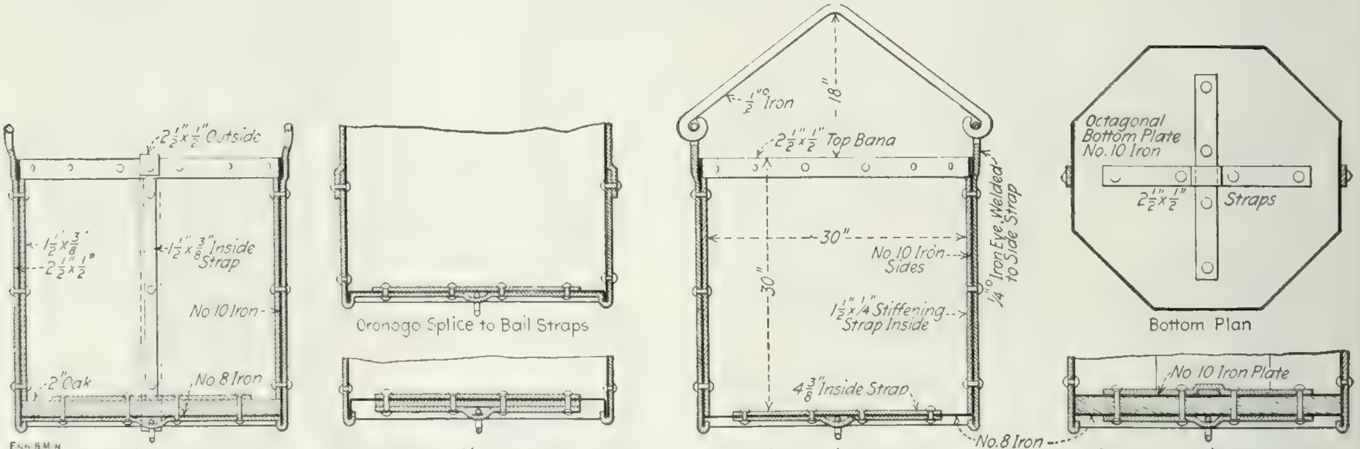
They are made with a bottom flange about 1½ in. deep so that the buckets will rest flat upon the tub cars. On the bottom there is a cross strap riveted to another strap inside. This distributes the strain of the pull from the bottom ring while dumping the bucket at surface by a tail or dump rope fastened to the derrick frame. The side straps also are riveted to stiffening straps on the inside, while the ears are of 1¼-in. Norway iron welded to the 2½x½-in. side straps. The bail is of 1½-in. Norway iron of V-shape with a slight curve at the apex for the reception of the hook. This bail is made with the hooks turned in so as to be less liable to catch on timbers during hoisting.

Characteristically the side straps come down and turn up so as to hook over the flange at the bottom, thus throwing the weight of part of the load on the hook as well as on the three rivets by which the side straps are attached to the bucket. But in the case of the buckets at the Oronogo Circle mine the side straps end on the sides where they overlap and are riveted through the bottom strap which runs up the sides for about a foot as is shown in the accompanying drawing. In this way the strain of dumping is taken from the bottom, which already takes the most of the wear and tear of usage, and is thrown on the sides. But a slight drawback is that by this arrangement the whole weight of the load is thrown on the three rivets of the side straps. At the Underwriters mine, commonly called the Yellow Dog and better known by that name, an extra piece of iron is put in under the bottom strap, as shown in the drawing, to keep the ring from punching a hole through the bottom of the bucket.

In the case of the majority of the buckets used in the Joplin district the bottom is only a sheet of No. 8 iron. To protect this from wear the shovelers are made to throw in fine dirt at first, and then after a protecting layer has been formed on the bottom, the boulders are loaded. In the case of the Federated Zinc Co. and a few others, tubs with wooden bottoms are used. This wooden bottom of 2-in. oak is protected from the cutting of the boulders by a plate of No. 10 iron, and seems to be serviceable.

The flange at the bottom of the bucket becomes battered in the course of time. In one instance instead of flanging the bottom plate, buckets were made with an angle-iron ring riveted to the sides at the bottom. The bottom plate then rested on this angle, but such buckets are much more expensive to make than are those of the flange type.

Owing to the fact that the hoisting is done without a crosshead, the buckets often catch on the cribbing timbers. On that account the top of the bucket is reinforced by a band of 2½x½-in. iron. A few buckets are built with side stiffeners put in half way between the side straps. These run vertically from top to bottom of the bucket and are turned over to form a hook over the top band as well as at the bottom flange. As these extra side straps are riveted to the top band there is less danger of the bucket being bent out of shape when it catches on the timbers in the shaft. But the main advantage is that the bucket, in landing on the plat at the bottom of the shaft strikes on these side straps; consequently the flange is less liable to be bent. In many instances, the bottom strap is extended clear across the bottom and caught in under the turn-up of the ear straps. This seems to be the best way of putting on the bottom strap as in this way part of the strain is thrown on the side straps


$2\frac{1}{2}$"x$\frac{1}{2}$" Outside
$1\frac{1}{2}$x$\frac{3}{8}$
$2\frac{1}{2}$"x$\frac{1}{2}$"
$1\frac{1}{2}$"x$\frac{3}{8}$" Inside Strap
No 10 Iron
2" Oak
No 8 Iron
Eng & M. N. Journal
$\frac{1}{2}$"° Iron
18"
$2\frac{1}{2}$"x$\frac{1}{2}$" Top Band
30"
30"
No 10 Iron Sides
$1\frac{1}{2}$"x$\frac{1}{4}$" Stiffening Strap Inside
$\frac{1}{4}$"° Iron Eye Welded to Side Strap
$4\frac{3}{8}$" Inside Strap
No. 8 Iron
Octagonal Bottom Plate No. 10 Iron
$2\frac{1}{2}$"x$\frac{1}{2}$" Straps
No 10 Iron Plate
Composite Bucket

Oronogo Splice to Bail Straps

Underwriters Ring Attachment

Typical Joplin Bucket

Bottom Plan

Section of Bucket with Wooden Bottom

TYPES OF ORE BUCKETS USED IN JOPLIN MINES while the bucket is being dumped and taken off the bottom plat, but it is not commonly done as the bucket is slightly harder to make that way than the other.

Probably the best bucket is obtained by toeing the bottom strap under the hook of the ear straps, using a wooden bottom, and putting in the extra side straps already mentioned. But there is the drawback that this makes the bucket somewhat heavier and more awkward for the hooker to handle when he changes buckets at the bottom of the shaft. Moreover, they are somewhat more costly in upkeep. In case that a wooden bottom is not used, it is well to put in the extra strap so as to protect the bottom from wear by the ring. Such a bucket combining the good points in several of the "tubs" in use in the Joplin district is shown in an accompanying sketch.

These tubs or buckets are made in certain standard sizes. The largest buckets used in the Joplin district are those at the Davey mines of the American Zinc, Lead & Smelting Co. These are 34 in. in diameter and 34 in. high. They hold as loaded about 1200 lb., but at the rating placed on buckets in the district these large buckets would be called 1600-lb. cans. The most commonly used sizes are the 30x30-in. buckets, with 30-28-in. and the 28x30-in. buckets close seconds, the diameter being given first in all cases. These are called 1200-lb., large 1000-lb. and small 1000-lb. cans, respectively. Other sizes used in the district are 26x28-in. tubs called 850-lb. cans, 24x28-in. buckets rated at 750-lb. and 22x26-in. tubs rated at 500-lb. capacity. These last three buckets are used at the silicate and the lead gouges rather than at the zinc and silicate mines. In some instances 28x32-in. and 30x32-in. as well as 32x34-in. tubs have been used.

None of these buckets hold what they are rated at, for they are rarely filled more than four-fifths full. In mining the ore breaks in many boulders, especially in the case of the stope holes, so that there is much empty space in the buckets. Indeed, it is necessary to keep a close watch upon the shovelers to prevent them from building "windies," as they are called in the district, by piling the boulders into the tubs in such a manner as to leave a large percentage of the tub unfilled. The larger the diameter of the bucket, the more difficult is it to build these "windies" so that it is better to use either a 30x30-in. or a 30x28-in. than a 28x30-in. bucket, especially when mining the deposit by a "stope." The real amount that these different buckets hold depends upon the richness of the ore for upon that, to a large extent, depends the fineness to which the ore breaks, as well as upon whether the ore comes from a stope or a heading. The 30x30-in. cans which are rated at 1000-lb. capacity throughout the district have been found, in many instances when their contents was weighed, to hold about 850 lb. on an average when loaded with dirt broken fine from a heading, while the buckets that were loaded from the stope piles only weighed 800 lb. Many of the operators in the district make such allowances in calculating their yield and their costs, but some use the rated capacities.

Concrete Collars for Mine Shafts

Inclines at mines in the copper country are now commonly equipped with a concrete shaft collar so as to keep the surface water from coming in. Moreover such collars prevent possibility of fires extending underground. Generally the shafts have to be sunk through a considerable depth of overburden, and often this is a sort of quicksand. The general procedure is to strip a large enough area of overburden to open a pit in which the sides stand at the angle of repose of the material without interfering with the putting in of the shaft collar. The concrete collar is started from a bench cut down to solid rock so as to permit making a water-tight joint between the rock and the collar. After the collar has been finished, the ground is piled in again to fill the excavation.

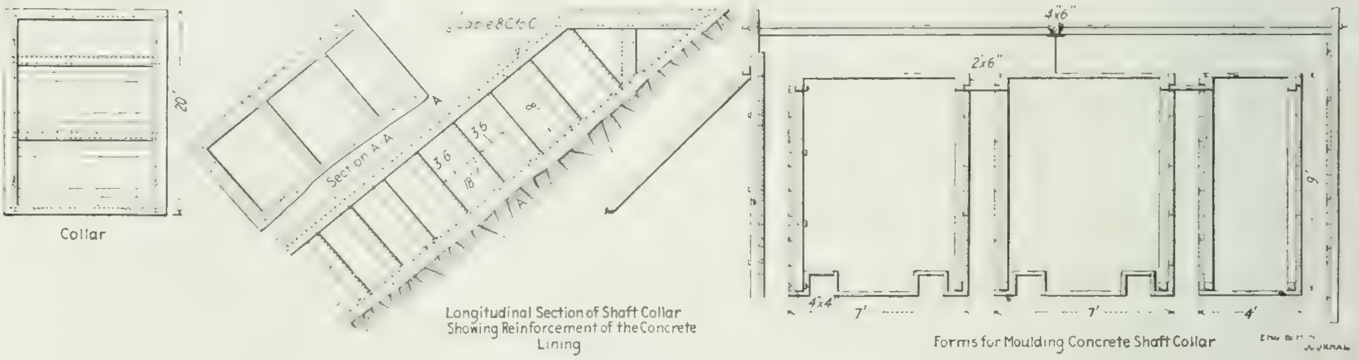
Forms Used in Concreting the Mohawk No. 6 Shaft

Starting the Concrete Collar from Level of Solid Ground

Forms Near Surface Showing Method of Delivering Concrete

At the Mohawk No. 6 shaft, where the collar was 99 ft. long and had outside dimensions of 22x11 ft. with walls 12 in. thick, the burden was 45 ft. deep. The accompanying halftones show the manner of putting in the collar, with the forms in place, and the troughs, down which the concrete was poured from a mixer at the top. In order to keep the concrete from separating as it went down the troughs splash boards were put in every few feet to retard the descent, while at the bottom the concrete was caught on a platform, turned over with a shovel and then shoveled in to the forms. As the work progressed upward, the platform was also raised. No trouble was experienced by the mixed concrete separating and the turning over was done as a precaution more than as a necessity, while the sliding of the concrete down from the mixer, placed where the materials were near at hand, made the cost much less than it would otherwise have been. This was the first time that an attempt had been made in the copper country to slide concrete down troughs to the forms. A 1:3:5 mixture was used, the rubble being rock from the mine, crushed to pass a 2-in. screen with the fines left in.

Another feature of the erection of this concrete collar was the use of knockdown forms made in the carpentry and used over and over again as the collar progressed upward. This was the first time that practice had been attempted in the copper country, but it proved to be satisfactory and enabled making a considerable saving in the cost of erecting the forms, which is one of the main expenses in putting in concrete collars. An accompanying drawing shows the manner of building the knock-down forms, and the way that they were held in place by braces and bolts on the inside as well as on the outside, while the accompanying halftones give a still better idea of the manner of putting in the forms, when studied in connection with the detailed drawing.



Collar

Longitudinal Section of Shaft Collar Showing Reinforcement of the Concrete Lining

Forms for Moulding Concrete Shaft Collar

CONCRETE COLLAR OF THE MOHAWK SHAFT IN MICHIGAN

In reinforcing the collar at the Mohawk shaft, main dependence in strengthening the concrete against tensile and shearing stresses was put on pieces of old hoisting cables. These were cut from discarded 1⅛-in. hoisting cable that had been cleaned by going over its surface with wire brushes to remove the rope "dope" on the surface, while the dope which was imbedded between the strands was scraped out with an iron hook. Burning of the rope dope was out of the question as enough heat would have been generated to take the temper out of the wires so that the rope would then have stretched and become useless as reinforcement. In fact, the main recommendation of old hoisting cables for reinforcement is, that by service in the shafts practically all the stretch has been taken out. This hoisting cable was laid off in the proper lengths with pieces of string as markers, and cut by passing it under a steam hammer that struck the cutting tool when held at the proper place. This was found to be a cheap and rapid way of doing the cutting, for practically all blacksmith shops in the copper country are equipped with a steam hammer. This rope was put in to form the cross rods for strengthening the bottom, top and sides of the collar, and each alternate rope was turned up at the ends at an angle of 45°. In this way the shearing stresses near the ends were taken care of in a cheap but effective manner, for it would have been too expensive to try to take care of them in these collars by stirrup pieces as would be done in a good beam properly reinforced.

In figuring the reinforcement the rope was assumed to have half the strength of an iron bar of the same area, and the area of the rope reinforcement at the bottom of the collar was kept at about 2% of the sectional area of the walls so as to be sure that there would be ample reinforcement. Consequently, these ropes were spaced at intervals of six inches in the lower part, but as the weight of the burden decreased the space was increased until near the top of the collar the rope pieces were about 10 in. apart. These ropes were placed in the forms so that they would be about an inch from the inside surface of the walls; approximately one-tenth the depth of the wall.

The divider columns, which were carried along both between the tracks and the tracks and the manway, in order to brace the top, were 12x18 in. in section and were reinforced by four ¾-in. bars wound with ¼-in. rods to hold them in position with respect to one another and to aid the post in resisting bending stresses. These bars ran down a little beyond the bottom of the collar to aid in anchoring it to the overburden. The rods for strengthening the dividers were fastened to two pieces of hoisting cable that ran down along each line of divider columns to reinforce the beam, six inches deep, that was carried along between the dividers to bring the top weight between the columns back on them.

Poultry netting was put in, not as reinforcement, but as centering to hold the pieces of rope in their proper relation to one another and to the forms. To this heavy poultry netting the rope was wired. After this poultry netting carrying the ropes had been nailed to the inside forms so as to secure the reinforcement in its proper place with respect to the finished structure, the outside forms were erected around it, and the concrete, shot down by chutes from the mixer to the platform, was shoveled in. Then the planks of the top form were nailed on as fast as the forms were filled with concrete. After about four forms has been filled, and the concrete in the bottom form had set about a day and a half, the outside forms of the bottom section were removed by loosening the top bolt and knocking out the side braces, while the inside forms for the walls and the colunms were also taken off. The forms were then re-erected and used again.

In fact, the whole 99 ft. of collar was completed 19 days after the beginning of concrete work. In its construction 9000 ft. of 1⅛-in. hoisting cable weighing nine tons was used together with 176 rods ¾-in. diameter and 11 ft. long, weighing about 1½ tons; 888 ft. of ¼-in. rod weighing 147 lb., 4500 sq.ft. of heavy poultry netting; 16, 45-lb. rails; two 60-lb. rails and 12,000 bd. ft. of pine. This lumber was used for forms while the rails were used in reinforcing the bottom of the collar where it was seated on the ground.

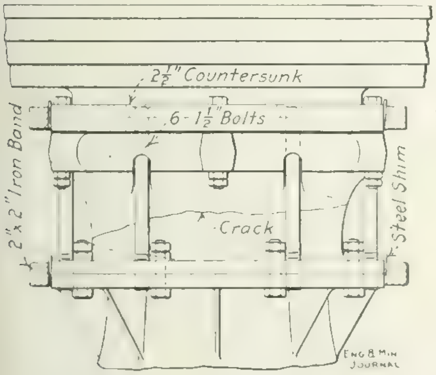
At a recent meeting of the Institution of Mining and Metallurgy, W. H. Trewartha-James stated that in reaming out a certain borehole, rods had to be used that were much smaller than the reamed hole. This caused considerable vibration in the rods, which was corrected by using collars on all the rods. These collars offset any tendency of the rods to bend at the middle.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Repairing a Gyratory Crusher

At the Leadwood mine, of the St. Joseph Lead Co., some trouble has been experienced by the breaking of the top shell of No. 4 style B, and K Gates gyratory crushers that are used for crushing coarse ore. The shells of two No. 4K and of one No. 4B crushers have been repaired. The trouble seems to have arisen from the fact that the shell between the two rings is not reinforced by ribs. As these parts cost about $269 new, an economy was effected by repairing them as it only cost about $30 to $40 to fix one of the cracked shells. One of the top shells that has been fixed in the manner to be described, has been in use for four years and gives no sign of failing, while another has been in use for two years. The third has just been repaired and has not yet been put in service again.



Repairing Cracked Shell of a Gyratory Crusher

A crack running around the shell and almost cutting the top off the bottom part before the crack runs down into a flange, seems to be the characteristic way for a shell to fail. The sketch illustrates this. The two parts have to be bolted together, and to insure the bolts not breaking out of the flanges, bands have to be shrunk on the shell at the flanges. These hoops or bands are made by welding together bars of 2x2-in. iron, while six 1½-in. bolts are used to tie the top and bottom pieces together.

The reinforcing bands are made as nearly round as possible and are welded so as to make a tight fit on the shell. They are put around the flanges and any places where they do not quite touch are filled in with thin shims or wedges of steel. To shrink on a band a ring of firebrick is built around the shell, then a 1½-in. pipe with holes bored in it is put around between the bricks and the shell, and is connected with the compressed-air supply pipe. Coke is piled on top of some kindlings; the fire is started; and the air turned on this improvised forge. In this way the reinforcing bands are heated. While the bands are hot the wedges are driven in as tight as can be. Upon allowing the shell and bands to cool, the reinforcement shrinks tightly on the flanges so that there is no possibility of breakage by the strain from the bolts that are later put in.

Holes are bored in the flanges for 1½-in. bolts. The holes for the top flange are countersunk so as to receive the heads of these bolts, as the hopper has to be set on top of the top flange, while the holes in the bottom flange are tapped so as to catch the thread of the reinforcing bolts. Then with Stilson wrenches, the six bolts are tightened as much as they can be, while held at a place between flanges to prevent turning. In this way the shell is bound tightly together and is made almost as strong as it was when new.

The Diaphragm Cone Classifier

The Caldecott diaphragm, cone classifier illustrated in the accompanying sketch, was introduced into South African ore-treatment practice in 1908. It differs from other types of hydraulic classifiers in that it must be operated while filled or partly filled with settled solids, instead of with the usual fluid pulp carrying ore particles in suspension and rapid movement. The diaphragm is a support for the settled solids, and is placed near the bottom of the cone at a little distance from the sides so that the solids may gradually pass down the annular space around the periphery of the diaphragm to the outlet at the apex of the cone. As a rule the diaphragm consists of a plain disk of wood or thin sheet steel, conveniently supported as shown in the illustrations. Conical, perforated, and curved forms have been proposed, but in practice these show no special advantage. The simplicity and cheapness of the device renders an adjustable form hardly necessary, since a few trials with wooden disks will speedily result in the most suitable diameter and position being ascertained for any existing set of conditions.

In general it may be said that the coarser and more granular the pulp fed to a diaphragm cone, the greater its capacity, but with a fine pulp containing much colloidal slime its capacity is less, and owing to the tendency of the settled solids to cohere and bridge over the annular space at all except one point, this space must be made wider by placing the diaphragm higher in the cone. Unless this is done, the function of the diaphragm in preventing a single vertical channel from forming in the mass of settled solids down which the pulp descends, cannot be performed and its efficiency is in consequence impaired.

The diaphragm cone is largely used in South Africa for separating coarse sand from the pulp for crushing in tube mills. The standard cone for this purpose on the Rand, for a 5½x22-ft. tube mill is 6 ft. in diameter by 9 ft. deep with a flat disk diaphragm 8 in. diameter, and so placed in the cone as to have an annular space around it 2½ in. wide or more, according to the more or less slimy nature of the crushed ore.

The circular outlet at the apex of the cone, in the shape of a replaceable cast-iron nozzle, is 1½ to 2¼ in. in diameter, and yields an underflow of 200 tons to 400 tons of solids per 24 hours, as a pulp containing about 27% moisture. A cut-off gate, shown in the accompanying illustration, is used to regulate the underflow to any further degree required, or to stop it entirely. Owing to its viscous nature, the underflow must be allowed to fall freely from the cone, as any attempt to change its direction by means of a curved pipe from the outlet merely results in choking. This thick underflow issues at a slow velocity, and when large tonnages are fed to the tube mill, is usually diluted with water or solution, before entering the tube mill, to a pulp containing about 40% moisture. The slow velocity of the underflow is the reason why so large an outlet can be used, and this practically obviates any risk of choking by chips of ore or accidental refuse to which ordinary classifiers with fluid underflow and small outlets are liable.

Smaller cones can of course be used, but a sufficient superficial settling area is always desirable to allow all particles requiring regrinding to settle, as otherwise return sand, safety cones for the overflow pulp are necessary. In most cases on the Rand the tailing pulp overflowing from the classifiers must be delivered at a considerable height for subsequent cyaniding, so that there is usually ample fall available for the installation of cones of any desired dimension. The use of a large cone is not detrimental from the classification standpoint, as the settled solids form a basin of greater or less diameter, according to the volume of inflowing pulp, which serves as an automatic regulator and insures a uniform and constant underflow. If a coarser pulp than usual is delivered to the classifier, the coarseness of the underflow and overflow is correspondingly increased, and the tonnage of the former is also increased, while its moisture is slightly decreased. A diaphragm cone, run so full of settled solids that the outflowing pulp stream near the periphery is hardly ¼ in. deep, is practically a center-discharging buddle, with the consequent efficacy of that well known metallurgical appliance for retaining pyrite for further comminution.

The following grading analysis illustrates the nature of the classification effected by the cone for separating sand for return to tube mills, the underflow of the cones entering the tube mills and the overflow passing to the cyanide plant.

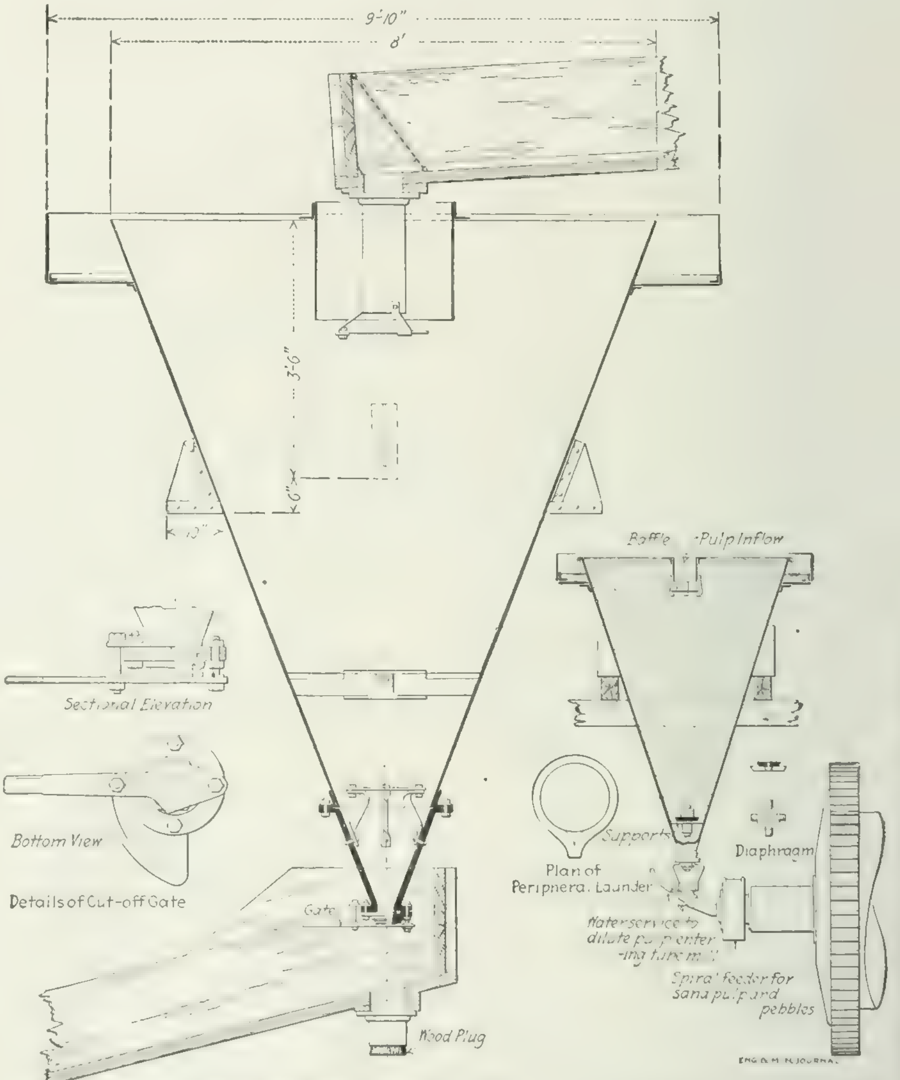
	+ 60	— 60 - 90	— 90
Underflow	67.1%	20.7%	12.2%
Overflow	7.4%	15.9%	76.7%

Large cones, 8 ft. diameter by 10 ft. deep are used on the Rand to separate the leachable from the unleachable sand in the pulp, the sand going to the Caldecott sand filter tables for further dewatering the thick sandy underflow. The diaphragm cone was indeed originally devised as an accessory to these filters to insure their receiving a large steady volume of sandy pulp containing a minimum of slime and moisture. The following table shows the grading analysis of the pulp which was classified into about equal tonnages of sand and slime while treating a very large amount of crushed ore per day.

Screen	Sand, Per cent.	Slime, Per cent.
+ 60	8.4	.....
+ 90	33.3	.....
+ 200	46.3	2.21
— 200	12.0	97.79
	100.0	100.00

While the operation of these large cones is the same in principle as the tube-mill cones, the fine-slime overflow renders larger cones necessary to settle all the sand, and the underflow of sand pulp contains about 30% moisture. Two diaphragms will be observed in the figure, the upper being to reduce the tendency of the settled solids to pack, while the under supports of the lower diaphragm afford a clear annular space for settling and reduce the tendency, if much colloidal slime is present, for the settled sand to be cemented together and bridge over this space at all except at one point, thus destroying the efficacy of the diaphragm. The efficiency of the diaphragm for affording an underflow almost free from slime is due to the small amount of moisture present, to which suspended slime is proportional, since with a tailing pulp of 7 of water to 1 of solids and containing 60% sand, 96% of the total water passes away with the slime in the overflow, while the underflow contains 30% moisture or little more than the water in the interstitial spaces of the settled sand. By varying the number of these cones and by diluting or not the underflow with water before entering similar cones so as to wash out more very fine particles, the percentages of sand and slime separated can be varied within wide limits.

These large cones are also extensively used for dewatering cyanide-plant tailing before pumping or gravitating through a borehole into a mine for filling purposes. The surplus water in the pulp enters the diaphragm cones, overflows and is returned in circuit to the pump to serve for bringing up more sand. This system has been in satisfactory use during the last year at the Simmer & Jack mine.



Dewatering Cone for Sand Filter Tables or for Mine Filling   Diaphragm Cone for Feeding Tube Mill

APPLICATIONS OF THE CALDECOTT DIAPHRAGM CONE

Keeping the Commutator Clean

When the commutator on a direct-current motor becomes dirty, relief may sometimes be had by wrapping one group of the brushes with a piece of thick felt, so that the brush tension will hold the felt firmly against the commutator surface, and leaving the felt in position with the motor in operation, says the *Electrical Review*, July 6, 1912. Canvas cloth may be used in place of felt. The cloth should be tied securely around the brushes. As soon as the commutator has acquired a bright, glazed surface, the cloth should be removed.

The cloth being an insulator, it may be impracticable to wrap all the brushes in one group, where the number of groups of brushes on a machine is small. In such a case, the desired results may usually be obtained by wrapping one brush in one group and another brush in another group not tracking with the first, and so on until the entire surface of the commutator is rubbed with the cloth while the armature is rotating.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Gold Absorption by Retorts

The work of Murray and Stanley on the above subject has already been noted (ENG. AND MIN. JOURN., Mar. 9; Mar. 16, 1912). The same authors now make the following suggestions as to reducing this (*Journ.* Chem., Met. and Min. Soc. of So. Africa, May, 1912). If a sheet-metal liner, say, $\frac{1}{8}$ in. thick, could be placed inside the cast-iron retort it would certainly absorb less gold than the cast iron would. White iron would absorb less than gray iron, because of the absence of graphite, although this difference would disappear in time. While suitable trays will prevent gold coming into contact with the retort, there is always likelihood of spilling over the side; of "spitting," from entrained water; of leakage through an accidental crack; or of transmission of gold by a thoroughly saturated tray. The two last evils can be somewhat alleviated by using stamped-metal trays instead of cast iron.

The authors also make a suggestion that absorption of rich lead by furnace bottoms can be prevented to some extent by dipping individual bricks into a wash of lime and borax, drying and refiring.

Shipping Cement in Bulk

Shipping cement in bulk has been initiated by the Universal Portland Cement Co., (*Eng. News,* July 25, 1912). The company has issued the following statement:

Recently a carload of Universal left the mill at Buffington, Ind., consigned to Milwaukee. The experiment proved highly successful in every way. The car arrived at its destination with absolutely no signs of loss or damage. The cement was left smooth and undisturbed in apparently the same condition as when it left the mill. The car was unloaded with shovels into wheelbarrows and the operation seemed to cause less dust than does the handling of cement in sacks. Some of it was wheeled directly to the mixing plant of a block and sewer pipe factory and the rest of the cement was stored in a warehouse.

Dealers and cement users who have to team will probably continue to demand shipments in sacks, but factories making cement products and contractors doing big jobs adjacent to railroad tracks and using central mixing plants could probably be served better and more economically with bulk shipments of cement. The experiments may show that a large amount of capital is unnecessarily tied up in sacks, and if it is found that cement can make a trip from the mill to the job in bulk just as well as in sacks, a heavy item of expense will be eliminated.

Grain and other commodities having a much higher value per ton are shipped in box cars in bulk. It is believed that with a very small investment in unloading equipment and storage facilities, those who receive shipments of cement will find it a paying proposition to receive carloads in bulk.

Pig Steel by Direct Smelting

The production of pig steel direct from the ore, in the electric furnace, is the subject of a paper by Dr. J. W. Richards before the Engineers' Society of Western Pennsylvania. Owing to the decreasing supply of charcoal, the Swedish iron makers have been forced to take up the electric furnace in order to decrease the carbon consumption. When running with the low carbon and low temperatures possible under such conditions a product was obtained carrying 97 to 98% Fe; 0.1% Si; 0.1% Mn; and as little as 0.5% C; that is, the product is a pig steel.

Under these conditions there is no carbon banked up in the furnace and the furnace runs fast, while there is so little impurity to remove that the openhearth furnace has its capacity increased at least 50%, so that the process is claimed to be of advantage in every way.

Potash from Insoluble Silicates

The Bureau of Soils has recently been investigating the various methods proposed for the recovery of potash from various insoluble silicates, such as feldspar, mica, etc. (*Circ.* No. 71, U. S. Dept. of Agriculture). These methods are nearly all based on the decomposition of the silicates by lime or calcium chloride, or some similar reagent, and after extensive experimenting it is thought that to be a commercial success, the byproduct as well as the potash must be useful.

It was noted in calcination experiments at high temperatures that the alkalis were volatilized with comparative ease, so that the method is suggested of heating feldspar with lime or calcium chloride in such proportions as to produce a clinker which, after the alkalis are volatilized, will be of the proper composition for grinding into portland cement. For instance, one part of feldspar with 1.68 parts of CaO, will, on ignition, lose 0.17 parts of alkalis, and leave a clinker carrying 25.8% SiO_2; 7.3 Al_2O_3 and 66.9 CaO; while a portland-cement clinker will carry 19 to 26% SiO_2; 4 to 11 Al_2O_3; 58 to 67 CaO; 2 to 5 Fe_2O_3; up to 5 MgO; up to 2.5 SO_4; and up to 3 of alkalis.

Elemental Character of Tellurium

It is interesting to note that William L. Dudley and E. V. Jones have again been working on the nature of tellurium (*Journ. Am. Chem. Soc.,* Aug., 1912). Suspicions as to the true character of this element have been raised by its atomic weight, 127.5, being higher than that of iodine, 126.92, whereas their relative positions in Mendeléeff's table would indicate the reverse. The authors found that fractional precipitation with hydrazine chloride gave purer tellurium than had before been obtained, and that spectrographic results on this purified metal are indicative of its being a true element, instead of a mixture of two elements, one of lower atomic weight than iodine, and the other higher than the present tellurium. Tellurium purified by the regular methods, although apparently pure by chemical methods, showed traces of copper, iron and silver.

The authors are, however, unwilling to accept their results as being conclusive except insofar as apparently negativing the existence of Mendeléeff's hypothetical dvitellurium (at. wt. 212), but say that the existence of two substances in tellurium (such as existed in didymium), differing but little in atomic weight and remarkably alike in other properties is possible, and that future research must be on the line of a possible fractionation of these two substances.

Value of Sanitation

The value of preventive measures against disease is most strikingly shown by the results on the Adriatic lines of the Italian railways, says *Rivista Tecnica delle Ferrovie Italiane,* June, 1912. The campaign was started in 1899 immediately after the discovery of the part that the anopheles mosquito plays in malaria, and consists of drainage and petroleum distribution over ponds, all supervised by an extensive sanitary staff. In addition, the employees are under strict medical supervision and no small part of the work has consisted in the proper distribution of quinine to these men. In the period from 1885 to 1890 it is stated that the number of railway employees seized with fever on these lines comprised 87% of the total number of employes residing in the dangerous zone, which included about 700 miles of road. During the year 1911, out of 22,520 employees living under the same conditions, but operating about 2000 miles of road the number of persons stricken with fever was only 13.3% of the total.

Salt Industry Byproducts

As byproducts of the salt industry in the United States, bromine and calcium chloride are produced. In 1911, the production of bromine was 651,541 lb., and of calcium chloride, 14,606 tons, according to the U. S. Geological Survey. The manufacture of bromine is conducted by concentrating the bittern water to about 41 to 43° Bé., after which it goes to sandstone stills, where it is mixed with sulphuric acid and potassium chlorate. Steam is then blown into the mixture, heating it to a temperature of about 180° F., when the bromine passes off through lead pipes to a condenser. The residual liquor is neutralized with lime, and heated to a thick, sirupy liquid, which is run into drums, holding 600 to 700 lb.. where it cools, and forms a solid mass of calcium chloride.

Solubility Of Gold In Nitric Acid

The solubility of gold in the nitric-acid-combination method for the assay of copper bullion is well known to most assayers. It has been ascribed to the presence of the nitrous acid formed, to the filtration of gold through the filter papers used, and to selenium. Dr. Edward Keller has shown that the rate of cooling of the copper bars exercises a great influence on the amount of soluble gold (*Bull* A. I. M. E., July, 1912). His attention was first called to this by the differing solubility of gold in samples taken from supposedly identical copper cast in large and in small shapes, and was verified on synthetic alloys, cooled at varying rates. The greater solvent action is exerted on the more slowly cooled bullion.

He, therefore, draws the following conclusions, which, however, he is careful to point out, are more or less hypotheses. From what is known of the action of nitric acid, or other chemicals, on gold, it would follow that there would be no discrimination between gold in slowly and in quickly cooled bullions. The difference would, therefore, rationally be sought in the chemical nature of the alloys in the copper as influenced by heat treatment. It seems justifiable to assume that in the slowly cooled bullion, the gold combines with some, or all, of the accompanying elements, forming nitric acid-soluble compounds; that the reaction take place through a narrow range of temperature just above the freezing point, and that its velocity is slow as compared to the speed of cooling; that at higher temperatures the gold compounds dissociate, and that quenching the samples leaves the gold in free state, hence unattacked by the acid. Since neither gold- nor impurity-increase augments the amount of soluble gold beyond a low maximum, it would appear that the soluble gold compounds are formed only in dilute solid solutions.

With a gold-selenium alloy, quenching seems to be ineffective, leading to the idea that either the gold-selenium compound forms at higher temperatures than other gold-metalloid compounds, or else that the dissociation temperature is not reached in the furnace in which the alloys are melted. [This seems to show a rational basis for the prevalent assayers' belief that much of the difference between nitric-acid and all-fire assay can be laid to selenium.—EDITOR.] The highest amount of soluble gold found was 0.0017% of the weight of the bullion.

Separation of Zinc and Iron

A method which should be of great use to the zinc analyst is given by Koninck and Wininwarter (*Bull.* Soc. Chem. Belg., p. 239, 1912; abstr., *Journ.* Soc. Chem. Ind., July 15, 1912). The authors believed that the retention of zinc by the usual ferric-hydroxide precipitate was due to the formation of a double hydroxide, which they attempted to prevent by the addition of another metal for which iron would have an equal or greater affinity. It was found in the presence of enough ammonium chloride to prevent the precipitation of magnesium as hydroxide by ammonia, that the retention of zinc by ferric hydroxide was completely obviated by the addition of 5% of magnesium, as magnesium chloride, to the solution.

Cottrell Fume Precipitation

In a recent paper[1] before the American Institute of Mining Engineers, F. G. Cottrell gives further data on his electric fume-precipitation process, an account of the work of which up to July, 1911, we have already given.[2]

The Cottrell system has since been tried at the plant of the Riverside Portland Cement Co., in southern California. An installation was made to treat about 50,000 ft. of gas per minute, issuing from one of the 10 kilns. One of the interesting developments here was that the collected dust runs high in water-soluble potash, and it is hoped that a commercial means of potash recovery may be developed through the use of high-potash materials for making cements.

It has also been applied to handling about 3000 cu.ft. of gas per minute derived from the Pierce-Smith basic converters at the Garfield plant. Both of these installations were successful.

The original cost of the Balaklala installation, treating 250,000 cu.ft. of gas per min., is given at $107,000, and subsequent alterations at $15,000 more. The complete installation at the cement plant, to treat 500,000 cu.ft. of gas, will probably not cost over $150,000. To treat about 50,000 cu.ft. per min. of the cement-plant gas requires about three to four kilowatts. In the Balaklala plant, 120 kw. were required.

Regulation of Engineering Practice in Austria

A departure is being undertaken in Austria to improve the status of engineers in the community, says *Eng. News*, July 25, 1912. A bill has been placed before the legislature, which will call for the establishment of bodies similar to chambers of commerce or bar associations, but of official character to the extent that membership is required of those practicing engineering. A hearing on the bill was held by a committee of the Abgeordnetenhaus, on July 10, at which a number of speakers for the engineering profession spoke in favor of the bill. The minister of public works also advocated the bill. The committee thereupon approved the bill and decided to report it to the legislature.

Power Direct From Blast Furnace Gas

The power developed by using blast-furnace gas in internal-combustion engines is double that developed by burning the same gas under boilers, says the London *Min. Journ.*, July 6, 1912. Installations for using the gas in this way are in Germany 480,428 hp., in America 337,490, in France 55,050, in Belgium 46,714, in Austro-Hungary 25,500, in Great Britain 24,986 and in other countries 63,341. The distribution of this power is 855,819 in metallurgical works, 68,200 in coal mines, 34,950 in electrical factories and 74,540 in various kinds of workshops.

Spontaneous Combustion of Charcoal

There were 63 cases in 1911, in the United States, of spontaneous combustion in charcoal undergoing transportation. The passage of air currents containing sulphur dioxide especially increases the danger, says the National Physical Laboratory. However, wetting the charcoal does not seem to increase the danger of spontaneous combustion.

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[1] "Bull," A. I. M. E., July, 1911.

[2] Eng. and Min. Journ., Oct. 14, 1911.

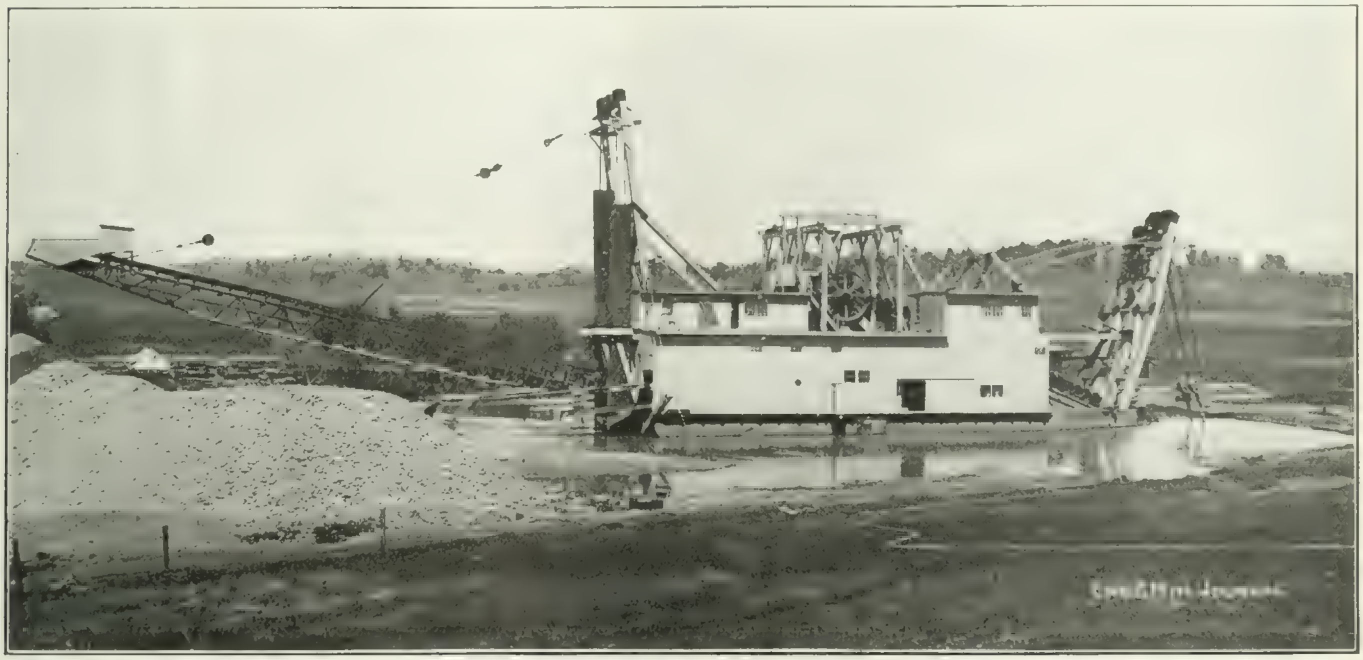
The Union Dredge at Folsom, Calif.

By Lewis H. Eddy

The latest boat to be put in operation in the American River district was the 9-cu.ft. dredge of the Union Dredging Co., which was completed in March, 1912, at a total cost of $225,000. This close-connected, bucket-elevator dredge is designed to dig 55 ft. below the water line.

The 9-cu.ft., close-connected bucket-elevator dredge, installed by the Union Dredging Co., on the Blue Ravine Channel, about 1½ miles from Folsom, in the American River district, California, was started for a trial run on Mar. 12, 1912. It averaged 4025 cu.yd. per day during the test, which is 70% of its rated capacity. The necessary adjustments to bring the dredge up to full capacity were expected to be completed by June 15, 1912.

The Union Dredging Co. was organized under the laws of Delaware in December, 1909; the contract for the dredge was made with the Bucyrus Co., of South Milwaukee, in June, 1911; the construction contract was sublet to the Yuba Construction Co., of California, and work was begun on the ground in the following August; the machinery was in place and the dredge ready for operation on Mar. 12, 1912. The cost of the dredge complete was about $225,000. The head office of the dredging company is at Philadelphia and the local office at Folsom. Edgar A. Gillinder is president; Benjamin C. Warnick, general manager; Andrew Turner, of Folsom, superintendent; George L. Holmes, of San Francisco, consulting engineer.



THE 9-CU.FT. UNION DREDGE AT FOLSOM, CALIF.

DREDGE DESIGNED FOR DEEP DIGGING

In the employment of 9-cu.ft. continuous buckets rather than a smaller or a larger size, the two chief elements of economic operation, construction cost and operating cost were considered. The character and depth of the gravel, as determined by prospecting, require an especially strong boat of the larger type, as the ground is tight, though no cemented gravel has been found. In order that the results may justify the expenditure essential to such installation, the largest possible yardage is not only desirable but necessary. The dredge is designed to dig 55 ft. below the water line, and it is quite probable that in much of the ground the full capacity will be demanded.

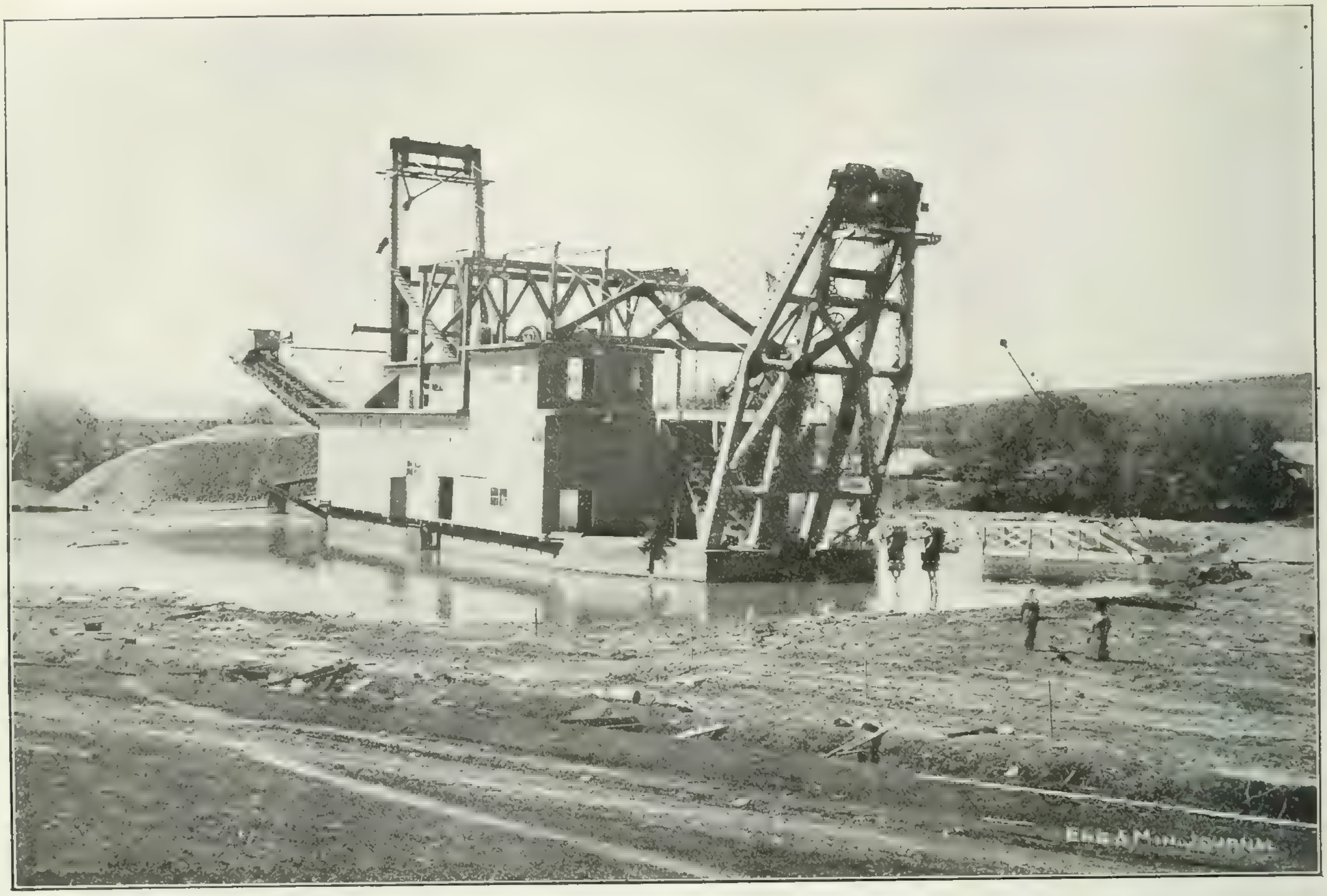
The hull is 135 ft. long, 46 ft. 6 in. wide, 11 ft. 6 in. deep; over 400,000 bd.ft. of Oregon-fir lumber were used in hull and superstructure. The gantries are of the standard type and a little heavier than installed on the Folsom No. 6 boat, and of the usual Yuba Construction Co. make. The digging-ladder frame is of the plate-girder type, hung from an independent ladder-suspension shaft and weighs 138,000 pounds.

The lower tumbler is six-sided, made in halves, the threads being faced with manganese-steel wearing plates. The upper tumbler is a six-sided, single-piece, open-hearth steel casting, with renewable cushion plates. The shaft is of forged nickel steel and is bored hollow. The ladder rollers are 14-in. diameter and are made of high-carbon steel with forged-steel shafts pressed in. The buckets are in three parts, composed of pressed-steel hoods and bottoms and manganese-steel lips. Each bucket has two front eyes and one back eye, the latter provided with a manganese-steel bushing. The bucket pins are above the average size, 6¾-in. diameter and made of high-carbon steel. The ladder hoisting tackle consists of two upper and two lower blocks having 45-in. diameter sheaves grooved for 1⅛-in. rope.

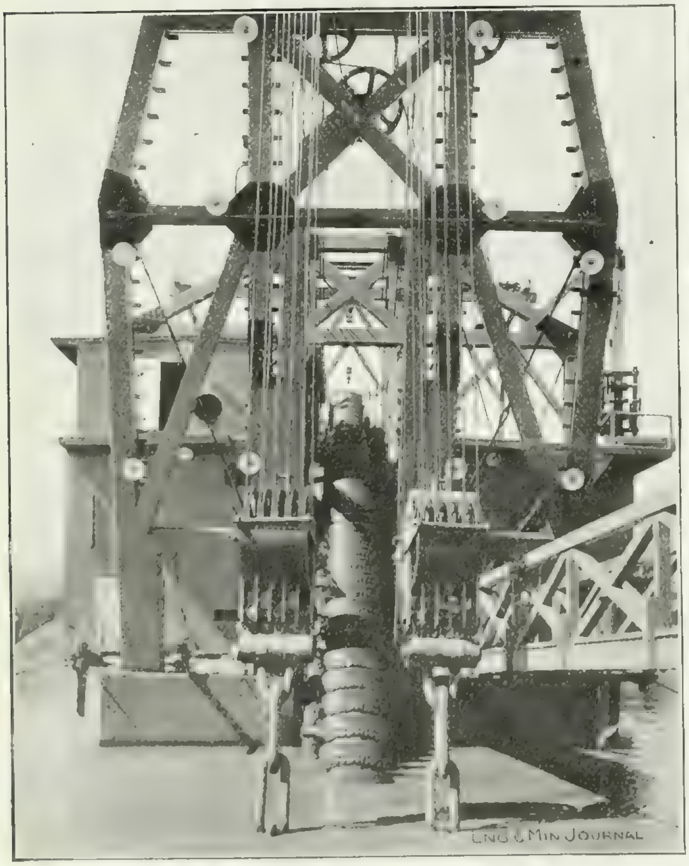
A 150-FT. TAILING STACKER

The tailing stacker is a 38-in. belt conveyor mounted on a steel truss of 150-ft. centers. The head drum is 42-in. diameter and the lower 32-in. diameter. The stacker belt is driven from its outer end by a motor, situated above the conveyor belt. Cast steel gears and pinions with cut teeth are used in the drive. The stacker winch is a single drum with worm-wheel drive. The dredge is provided with two steel spuds, each 31x57-in. cross-section by 70 ft. long, weighing 124,000 lb. The revolving screen is 7-ft. diameter by 37 ft. long. The perforations taper from ⅜ to ½ and ½ to ⅝ in. The screen is provided with nozzle washers, eight at the upper end and six at the lower end. The gold-saving apparatus is the standard California double-bank type, and has a total area of 3200 sq.ft. The riffles are of wood shod with iron straps $\frac{3}{16}$ in. thick.

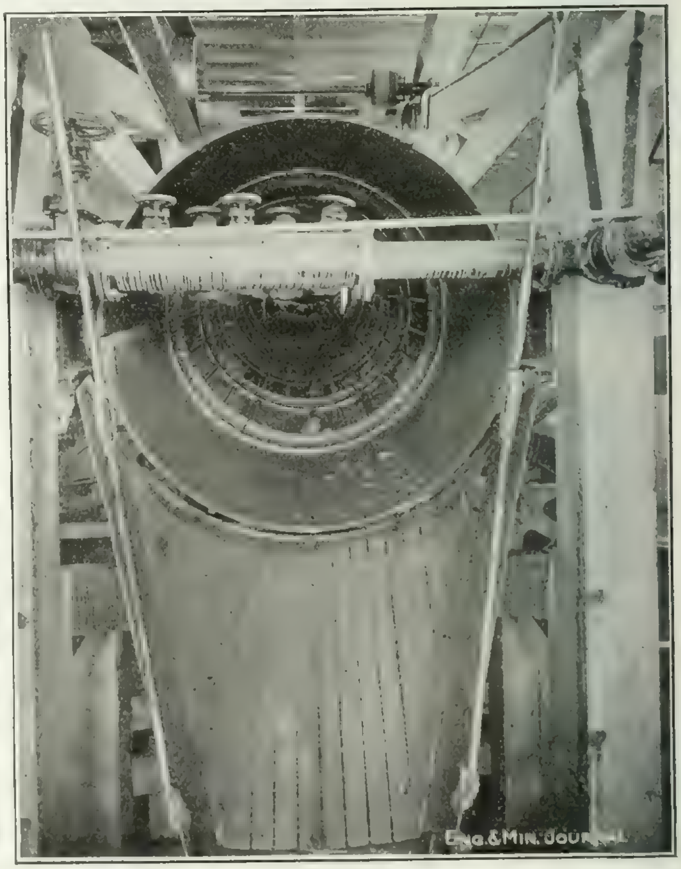
The winch machinery consists of seven drums as follows: One auxiliary long drum mounted on its own shaft; two long



Another View of the Union Dredge, Designed for Digging 55 Ft. Below Water Line

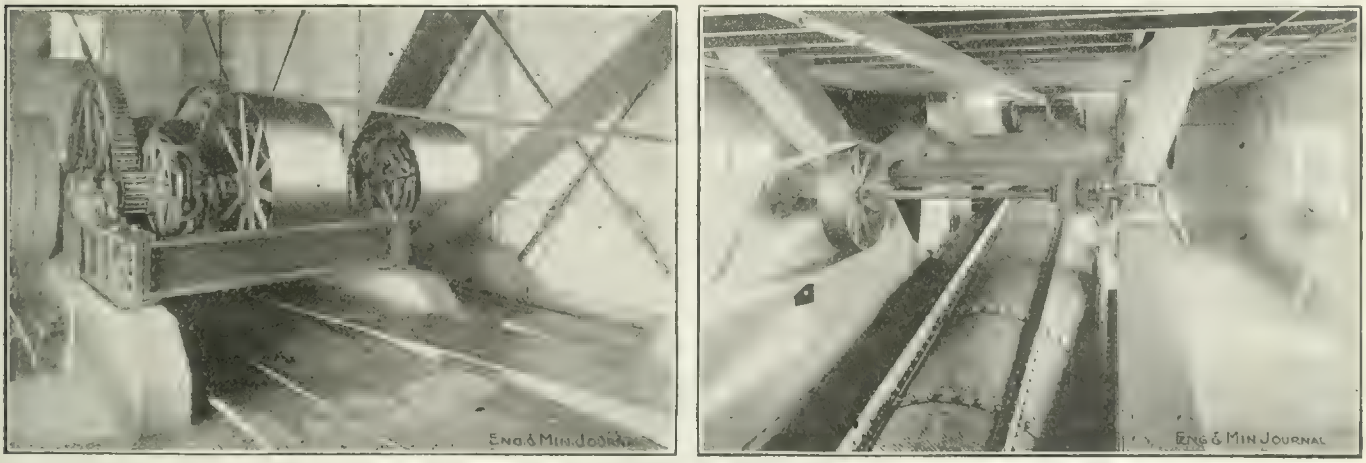


Bow End of Union Dredge; Buckets are 9 cu.ft., Close Connected



Revolving-screen Discharge, Showing Nozzle Washers

BELT-CONVEYOR TAILING STACKER



INTERIOR VIEWS SHOWING WINCH AND REVOLVING SCREEN, UNION DREDGE, FOLSOM, CALIF.

drums each on its own shaft for the forward swing lines; two short drums mounted on one shaft for the stern swing lines; two drums mounted on one shaft for the spud-hoisting line. All drums are 17½-in. diameter. Friction clutches of the fiber-lined, internal-expansion type are provided and the brakes are the wood-lined, outside-band type. Fast and slow speed is obtained by change gear with a jaw clutch.

DREDGE ELECTRICALLY DRIVEN

The dredge is electrically driven, the power being furnished by the Great Western Power Co. All motors are 2200-volt, 60-cycle, three-phase alternating current. The distribution of power is as follows: Bucket-chain motor, 200 hp., variable speed, 600 r.p.m.; starboard winch, 30 hp., 2-bearing type, variable speed, 900 r.p.m.; 12-in. high-pressure pump, 100 hp., direct connected, speed 900 r.p.m.; 12-in. low-pressure pump, 50 hp., direct connected, constant speed, 720 r.p.m.; two-step hopper pump, 30 hp., 2-bearing type, speed 900 r.p.m.; revolving screen, 40 hp.; tailing stacker, 50 hp.; total, 500 hp. The pilot house is equipped with a three-panel slate switchboard with overload circuit breakers for all motors. The wiring is the 3-conductor cable system in a steel conduit.

The monitor equipment includes two No. 1 giants, a two-stage, 10-in centrifugal pump with a capacity of 2000 gal. per min., against 150-ft. head, direct connected to a 125-hp. motor. An automatic time-recording instrument is provided, which is connected to the digging ladder in such a manner as to indicate accurately the different depths of digging and the operating time.

U. S. Barytes Production

The production of crude barytes in the United States in 1911 was 38,445 tons, valued at $122,792, according to the U. S. Geological Survey. Compared with the production of the preceding year this was a decrease of 4530 tons in quantity but an increase of $1046 in value. The total quantity of refined barytes reported as sold by mills in 1911 was 39,611 tons, valued at $503,867. The greater part of the barytes produced in the United States is used as a pigment in the manufacture of mixed paints.

Barytes occurs in veins as a gangue of metallic ores, also in veins in sandstone and limestone or as a replacement of limestone. The mineral has a wide range in geologic time and an extensive distribution. In the United States the principal sources are, however, limited to two districts—the Missouri district and the Appalachian district. A single county in Missouri—Washington County—produced about 45% of the total output.

The high price of platinum has led the International Committee of Weights and Measures to favor the use of tantalum (*Chem. Trade Journ.*, Feb. 17, 1912), which is hard and unalterable, and from which standard weights can be made at a third of the cost of those of iridio-platinum.

The Parks Electrocyanide Process*

The object of the Parks electrocyanide process is to apply economically all of the chemical and physical forces necessary to extract and collect the precious metals, applying them at their highest potency, and simultaneously. Ores, in their raw state, were made to yield their precious metals rapidly in the form of amalgam, in a single operation, in a single machine, eliminating all filtering and precipitating devices.

COPPER CATHODE AND IRON ANODE PLATES

The Parks electrocyanide pan consists of a wooden tub, 15-ft. diameter and 30 in. deep, through the center of which projects a small conical casting for the passage of the working shafts. Practically the entire bottom of the pan is covered by an amalgamated copper plate, to which quicksilver is automatically added during operation, in proportion to the amount of precious metal in the ore being treated. About 9 in. above the copper, or cathode plate, a cast-iron anode plate equal in area to the copper plate is mechanically suspended. The cast-iron plate is divided into two annular rings, the outer one containing 60, and the inner one 40% of the anode area.

These annular anodes are revolved in the same direction, and independently, by means of pulleys, gears, and a solid and a hollow shaft, so that any midway point of the inner ring travels practically the same number of feet per minute as any midway point of the outer ring. On the lower side of each of the anode rings, wooden paddles 7 in. deep are fastened radially, about 5 ft. apart, the bottom of the paddles being 2 in. above the copper plate.

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*Excerpt from an article by John R. Parks, in the Columbia School of Mines Quarterly, July, 1912.

The compound rotary motions of the anode rings and their paddles give to the pulp confined between them and the cathode plate a uniform spiral motion outward, keeping the ore in a perfect state of suspension, and at a little higher speed than pulp travels down a stamp-battery plate. By the centrifugal force of the paddles, the pulp on reaching the staves of the pan is forced up between them and the outer edge of the outer anode to a height of about 16 in. above the anode, retaining the rotary motion imparted by the paddles and now endeavoring, by gravity, to seek the lower level at the center of the pan; the resultant motion is a downward and inward spiral until the ore passes over the inner edge of the inner anode, near the center cone, when it again meets the paddles and starts to repeat its cycle of travel.

Compressed Air Furnishes Oxygen

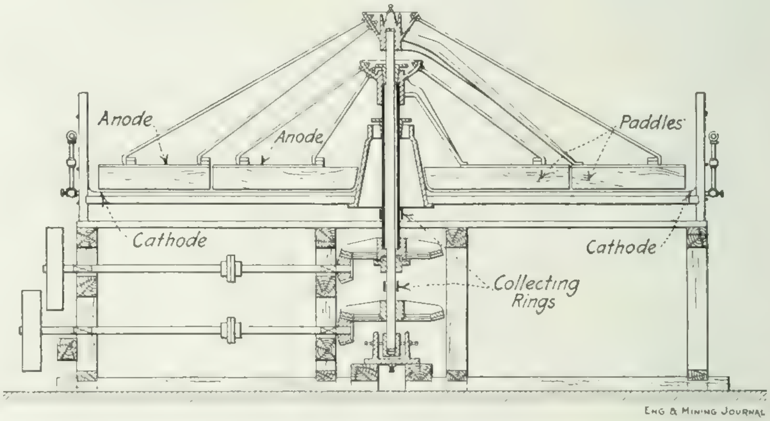
At the periphery of the pan, and on a level with the cathode plate, 20 jets of compressed air are admitted through needle valves set at regular intervals around the pan. The air pressure—about 12½ lb. per sq. in.—is sufficient to overcome the centrifugal force of the pulp against the valve exits and to keep them clear. The amount of air is calculated from the oxygen demanded by Elsner's formula for dissolving the precious metals by cyanide salt, with an allowance for unavoidable waste in mixing. The air, on leaving the valve, travels against the outward spiral motion of the pulp between the anode and cathode plates, and nearly all the excess makes its appearance as a light effervescence around the center cone, being thoroughly incorporated with the pulp; comparatively little escapes by rising to the surface without passing between the plates. At 100 lb. pressure, 1½ ft. of air per min. is an ample supply for the pan during treatment.

During the last eight years I have experimented with many iodine, bromine and other compounds, seeking economy and efficiency, and have found nothing so effective and economical as commercial potassium or sodium cyanide, or the commercial double salt, together with common lime and common salt, aided by the sodium amalgam and caustic soda generated by the process.

The electrical factor of the process which consumes from 75 to 80% of all the physical power necessary to operate it, and accounts for the speed, efficiency and economy of this as compared with other processes, is worthy of considerable attention.

From a 10 to 12-volt, 400-ampere, direct-current generator, the positive wire, after leaving the switch and indicator board, is led to the mechanical portion of the pan in four branches, each of which terminates in a suitable brush; two play against the copper collecting ring on the solid shaft which drives the outer annulus of the anode, and two against a similar ring on the hollow shaft which drives the inner annulus of the anode. By this means, the electric current passes up the vertical driving shafts, insulated from the cone through which they pass, and proceeds down the driving arms and supporting rods to the anode annuli, where it is uniformly distributed.

The negative wire from the electric generator, after passing through the switch and indicator board, also terminates in four branches, each of which connects with a copper tail piece projecting through the pan, each tail being a portion of one of the four segments of the copper plate forming the cathode. Owing to the insulation of the machine, all the electric current must pass from anode to cathode through the pulp.



Parks Electrocyaniding Pan

Cyanide, Mercury and Salt Used

In treating a charge consisting of 7½ tons of ore (dry weight) with an equal weight of water, and containing its quota of lime previously added during the crushing of the ore, such an amount of strong cyanide solution is added as to equal 1 lb. of cyanide salt per ton of ore in the pan. After addition of cyanide, finely crushed common salt is added until the ammeter registers 300 to 500 amperes, at 9.5 to 10 volts, as determined by a test run. The pan is then put in motion, the air is turned on, and the quicksilver is put into its distributor. Many complex chemical compounds are formed, some of which are decomposed, in a manner which baffles the skill of the electro-chemist to explain, but among the established effects of the electric current the following may be stated:

The salt is decomposed by the electric current and metallic sodium is constantly precipitated on the mercury-coated copper plate, forming sodium amalgam; the sodium is converted into caustic soda, by its reaction with water, which, uniting with acid radicals in the ore, protects the cyanide from compounds from which the lime does not so readily protect it, thus saving a much larger portion of cyanide salt than can be saved without the current. Chlorine is also generated, but rarely indicates its presence, probably being united with basic radicals of the complex charge.

These several ions travel very slowly in quiet solutions, but in this mechanical device the pulp travels an average of seven miles over the copper plate in a 2½-hour treatment, presenting the cations rapidly for discharge and deposition. This is analagous to the method by which copper is precipitated on a platinum dish, in modern electro-analysis for copper, by a revolving anode in a small fraction of the time required for precipitation in quiet solutions.

The cyanide anion probably seizes a potash or soda radical and is reconverted into nascent cyanide salt, unless a particle of precious metal, for which it has a greater affinity, presents itself first. However, there can be no question as to the so called restoration of cyanide, for I have frequently found much more free cyanide of potash or soda in a sample of solution taken a half hour or an hour after a previous sample.

Loss of Mercury Small

Theoretically no mercury can be lost by scouring or flouring in the charge, as any subdivided particle of this metal too small to seek the cathode by gravity is sufficiently small to yield to electro-cyanide solution, whereby it is electro-chemically precipitated back on the plate. Practically, a small amount is lost, for in a 2500-ton run on Ruth ore a loss of about 5 lb. was reported.

On samples containing 0.8575 oz. of gold per ton, I have reduced the average tailing sample to 0.0075 oz. per ton, showing an extraction of 99.1% by six hours' treatment in the electric pan, using 1 lb. KCN per ton of ore; the same ore, reduced to the same fineness, yielded but 92% to solution in 48 hours' treatment in Pachuca tank (generally recognized as one of the best aero-agitating devices) using three tons of solution containing 3 lb. KCN per ton, or 9 lb. of cyanide salt per ton of ore.

Base Metals also Precipitated

Many of our Western precious-metal ores from oxidized zones are contaminated by carbonates of lead, zinc and copper, which preclude economic treatment by the ordinary cyanide methods, owing to the difficulty in precipitating the precious metals in the presence of the cyanides of the base metals, aside from the excessive consumption of cyanide salt. The electric current, however, precipitates the base metals as well as the precious metals, on the amalgamated plate. I have produced, by the electric pan, bars of bullion worth $1200 or $1400 which averaged but 512 fine in precious metals, the other 50% of the bars being lead, zinc and copper, alloyed with the precious metals.

As precipitation of precious metals takes place more rapidly from strong than from weak solution, in treating certain ores economy can be introduced by discharging the pan at a fixed value of unprecipitated precious metals in solution (50c. to $1 per ton). After passing the charge through a revolving settler used as a precautionary amalgam trap, it may then be sent through a Dorr thickener, whereby 50% of the solution from a 1:1 charge, and 80% of that from a 1½:1 charge, can be returned clear for original charges; this not only saves time and increases the daily capacity of the plant, but secures a higher percentage of recovery of the precious metals, while preventing undue waste of common salt and unused cyanide.

The total power required for a single pan is 0.6 hp. for mechanical agitation; 1 to 1.5 hp. for compressed air; and 4.5 to 6 hp. for electric current. The capacity of the pan depends on the amount and character of gangue in the ore and on the nature of its precious-metal minerals. The proportion of gangue determines whether one ton of ore may be treated with one ton or will require 1½ tons of water; none but the exceedingly clayey types require the 1:1½ charge.

Capacity 36 to 60 Tons Daily

A single pan charge of the 1:1 class is 7.5 tons of ore, dry weight, and of 1:1½ ore, is 6 tons; the time required for treatment varies from 1 to 12 hours, generally being 2½ to 4 hours; hence the capacity of the pan, allowing for charging and discharging, varies between limits of 15 and 90 tons per diem, but on the average run of ores it varies from 36 to 60 tons per diem.

The large capacity of the pan, the small tonnage of ore under treatment in the mill at one time, and the small amount of machinery and apparatus required, reduce the total cost of installing mills using this process to 30 to 60% of the amount necessary to install any other process of equal daily capacity.

High Extraction Obtained

A few examples will show the efficiency of the process. At the Ruth Gold Mining Co.'s mill, Kingman, Ariz., the daily capacity is 50 tons. The ore is quartz with a large amount of manganese minerals and but little free gold. The precious metals occur in sulphide minerals; the ratio of gold to silver is 1 to 12. The test was made in a 40-in. testing plant. A 215-lb. charge of 200-mesh pulp was given a 6-hour treatment, 1 lb. of KCN per ton of ore being used. The results were as follows: Precipitated as amalgam, gold 96.76%, silver 87.7%; total extraction 95.6% of the value of the ore. Shortly after the mill was turned over to the Ruth company, three pans being used, each with 7½-ton charges, the assays of the mill foreman's samples showed that on an $18 ore using 1-lb. KCN solution, after 6 hours' treatment 96.66% of the gold and 87.77% of the silver were precipitated as amalgam, the total extraction being 95.09% of the value of the ore.

At the Maginnis mill, Maiden, Mont., one pan is used in which 7½ tons of 30-mesh pulp are treated. The ore, containing 0.33 to 0.50 oz. gold and from 1.5 to 4 oz. of silver per ton, is contaminated with the carbonates of lead, zinc, and copper. By a 2½-hr. treatment with 1 lb. of KCN per ton, 86 to 92% of the gold and 62 to 72% of the silver were precipitated as amalgam. The low silver contents of this ore prohibited the economic use of cyanide salt in stronger solutions, in order to secure higher extraction from its silver minerals.

An ore from Kendall, Fergus County, Mont., a decomposed, porous limestone, impregnated with gold, was an ideal cyanide ore. A test on 225 lb. of $8 ore, crushed to 12-mesh, gave the following results with 1 lb. of KCN per ton. After one hour, 90.5% of the gold was precipitated as amalgam; after 2½ hr., 97% was precipitated.

An ore from Orient, Wash., an auriferous pyrite in andesite with no free gold, averaging 1.03 oz. per ton, yielded 95.35% of its gold as amalgam after a 4-hr. treatment with 4½ lb. of NaCN; the pulp was 120-mesh, lots of 230 lb. each being treated.

At the Whitman mine, Pearl, Idaho, the ore contains 25 to 27% arsenical pyrites, 40% pyrite, and 35 to 37% gangue, a 6-hr. treatment with 41 lb. KCN; of 120-mesh pulp assaying 1.3385 oz. gold gave an extraction of 88.8% in the form of amalgam.

Ore from the Metates mine, Sinaloa, Mexico, containing 5% pyrrhotite, with galena and antimonial-sulphide minerals in quartz gangue, assayed 0.625 oz. gold and 63.015 oz. silver. After a 12-hr. treatment of 230 lb. of a 120-mesh pulp with 12 lb. of KCN, of which 7.7 lb. were consumed, an extraction of 99% of the gold and 91.1% of the silver was obtained. All of the results cited above were obtained by direct pan treatment, without returning any solution once passed through the pan.

Advantages of a Level Stope

By H. Y. Russel*

In deciding to carry a level stope there are at least two factors that must be considered; the question of cheaper mining cost, and the effect on the ore output.

The usual method of opening stopes is to start drifts along the vein from the shaft. These drifts are from 6½ to 8 ft. high. After the drift has been driven for 150 or 250 ft., the machines are taken to a place about 50 ft. back from the breast and are used to drill down five or six feet of the roof; this is sometimes called the "cutting-out stope." The timbers to hold the stope are then put in under the heightened roof, and stoping is started.

The Inclined Stope

Driving is again begun in the drift and at intervals the cutting out for the stope is repeated, the stoping length being gradually extended. Under this process stoping starts near the shaft, and by the time the stope is cut out 500 ft. along the drift it is 50 or 60 ft. high where it was first started, and is carried upward on an incline rising from the drift to its highest point near the shaft. In some cases the incline becomes steep owing perhaps to the high part of the stope running into a barren zone and necessitating for a time a larger amount of ore from the lower end.

The difficulty of keeping such a stope in condition for easy travel is apparent. The time taken to carry machines, mill timbers, rock or supplies, is considerably greater than if a good footway could be kept. The men going to their work and the shift bosses going their rounds take much longer than they should, all of which adds to the cost. I do not think that one realizes the additional amount of work that a man in a level, well kept stope will do, until he has had experience with the different methods.

In blasting on an incline it frequently happens that the ore or waste will run down the slope, blocking it completely, delaying the men going on shift, interfering with the ventilation and burying tools, etc., that have been left in places where in a level stope they would have been out of range of the blasted rock. In the hurry to get the stope cleaned and work started these tools are not seriously sought for; then they are forgotten. Furthermore more ore is lost in a rough stope than in a well kept one.

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*Mining engineer, 123 Guy St., Montreal, Canada.

The Level Stope

The method of opening a level stope is not unlike that for the inclined one. It is necessary however to carry the development farther ahead and to open more stoping ground before taking out ore. The ideal length for a level stope is that where every man working can be kept busy for the whole shift. A stope in which enough drilling can be done in five hours to keep the shovelers, timbermen and trammers busy eight hours is not getting good results. It is impossible to move men and their tools from one stope to another without waste of time.

In opening level stopes the output must be considered. As the vein is developed an idea has to be arrived at as to what the output should be to give the best returns. When this has been decided enough stoping ground must be prepared to keep this output coming steadily. To give some idea of the length of stope necessary to maintain a certain output I might refer to a case that came under my personal observation. The mine in question was one of the most efficiently worked properties I have known. The property was equipped with a mill of a capacity of 134 tons per day.

To maintain this output 1800 ft. of stoping back was necessary, the vein being about three feet wide. There were three stopes on three different levels, each stope being about 600 ft. long. The average daily raise in the stopes was 0.31 ft. This will give some idea of the amount of stoping ground necessary to maintain such an output.

Development

It will be seen that the development for an inclined stope is rather less expensive than that for a level one. With the former results are obtained from the development every 50 or 100 ft., in the latter 1200 to 1800 ft. of development must be done before stoping may begin. This gives the level-stope method a higher cost of maintenance for the opened drift and it also requires a larger development fund.

In opening new stoping ground for the level stope 300 ft. seems to be as short a stope as can be economically worked. On the supposition that three levels are producing 134 tons per day, and that the vein removed to furnish this tonnage from 1800 ft. of backs amounts to 16,740 sq. ft. per month of 30 days, it is necessary to drive, cut out and timber about 170 ft. per month with levels 100 ft. apart. This is 57 ft. per level, about what is usually done in ordinary mining work. This makes about 5½ months drifting before any ore is forthcoming, and much money is tied up, but I think it is more than compensated for by the cheaper mining done in the level stope.

Results

In discussing results I will have to refer to the mine already mentioned. The stopes were about 600 ft. long and were raised between manways; there were additional manways every 100 ft. and chutes 25 ft. apart. There was seldom a difference of more than two feet in the length of any of the chutes. The stopes were well kept, in fact were more like sidewalks than any stopes I have seen. Two hammer machines were used in each stope in the day shift; in one stope where the ground was harder two machines were used on the night shift; eight machine shifts per day in all.

The machine men did nothing but drill. They would start drilling within 8 or 10 min. after reaching the stope and drill until tally. In two stopes each machine took care of 300 ft.; in the other stope two machines were put on 300 ft. Before tally the foreman marked such holes as he wanted blasted and they were shot by a man who also did other work. When a man got his 300 ft. of stope drilled he came back to his starting point and drilled through again, always keeping a little ahead of the blasting. The stope was filled with waste obtained by shooting down the walls which were drilled by the machine man as he went along. The result was that the eight machines broke 124 tons of ore per day (allowing 10 tons per day from development, a fair allowance in this case) and filled the stope, a duty of 15½ tons of ore, and allowing for the chutes and manways, an equal amount of waste or a combined duty of 31 tons per hammer machine per shift.

The same good service ran all through the mine crew, the total number of men employed in and around the mine to produce 134 tons, excluding only the manager and bookkeeper, was 60. Not many mines working narrow veins can show such a high standard of work and I think it was largely due to the ease and quickness with which the men could move through the stopes. While it was impossible to figure accurately the saving by the level over the inclined stope, it was considered about 35c. per ton.

Effect on Ore Output

In the majority of fissure veins the ore is secondary; it either has been enriched or has been redeposited. I have seen these orebodies of a length of 5000 ft., 1000 ft. is not uncommon. In these orebodies there are occasionally horizontal zones of pinching, which are not usually high but may last through five or six feet vertically. Nearly all fissures show minor variations or folds in the dip, and when one wall slips down before the fissure is filled it will pinch the flatter part of the fissure and widen the more nearly vertical part, so that when the vein is formed there will be lean zones where it flattens.

The whole back of a level stope may run into one of these lean zones almost at once and for from two to three weeks a startling reduction of tonnage will ensue. It is quite possible however to foresee this condition as the vein pinches gradually, flattening as it pinches. In order to protect the output two plans are available. One is to have additional stoping backs ready; the other is to use the stope chutes as storage pockets. These chutes are built 4½ ft. square in the clear for the first 25 ft. above the drift, they are then drawn down to two feet square. This pocket gives storage for about 29 tons or in a 600 ft. stope about 400 tons allowing certain chutes for waste; a very fair storage considering the extreme improbability of all stopes running out of ore at once. If this should happen the level-stope system would break down. An inclined stope does not run this danger as only a small portion of the back can run into pinched ground at any one time.

U. S. Production of Magnesite

The U. S. Geological Survey reports a decline in the production of magnesite for the year 1911, the output being 9375 short tons, valued at $75,000, against 12,443 tons, valued at $74,658 in 1910. The advantages which will result from the opening of the Panama Canal are tending to revive interest in the California product, which is recognized as high-grade. Magnesite is quoted at the California mines at $8 per short ton, but the Eastern and Mississippi Valley markets are supplied by importation. Imported magnesite is quoted at $10@11 per long ton for the raw and $30@35 per long ton for the calcined and powdered product at New York. These figures indicate why the use of the California product is limited practically to the State. It is hoped that the opening of the Panama Canal will tend toward bettering the condition of the California producers. The imports in 1911 amounted to 122,075 short tons of calcined and 12,974 short tons of crude magnesite.

Mining Copper at Lake Superior—IV

By Claude T. Rice

Drift-stopes and raise-stopes are characteristic of the development in amygdaloid practice. A typical drift-stope is 9x19 ft. in section. Progress of a drift-stope averages about 50 ft. per month, and about 40 ft. for a raise-stope. All holes are blasted at the end of each shift.

Because of the greater weight of the hanging wall in the workings along the conglomerate lode, the drifts and raises in those mines are made small and agree more nearly with Western practice. The size of the raises is about 7x7 ft., and the drifts are generally about 8x8 ft., although in the Red Jacket workings, drifts are driven 7x11 ft. to permit double tracks to be used to serve the stopes. In the Tamarack mine, the idea of obtaining tonnage from the development workings was tried in the conglomerate but with disastrous results, as small fortunes have since been required to keep these drifts open. Huge railroad tunnels, 20x20 ft., were driven at first, as they did not cost much more than the smaller drifts.

Characteristic Development in Amygdaloid Mines

The amygdaloid mines contain the characteristic development in the copper country, as the remarkable strength of the hanging wall permits drift stopes and raise stopes. It should be remembered that ore reserves in the Lake district are not measured in tons having a certain assay value, but that they consist of blocks of ground, ready to stope, containing a certain tonnage that it is assumed will yield at the mills, about as much per ton as similar appearing blocks of ground have averaged in the past. In conglomerate workings, the grade can be determined more accurately if large samples are taken, but not so in the amygdaloid mines. Until the ore has passed through the mill and the copper has been recovered, its real grade is merely a matter of opinion, formed from previous experience with ore from that mine. For that reason, the drifts are driven to enable the ore to be stoped rather than to develop tonnage, as in the West, and consequently there is no stimulus from necessities of tonnage development, to urge speed in drifting.

It is purely a question of doing the drifting in a manner that will result in the greatest ultimate profit from a block of ground. Therefore, the drifting becomes an integral part of stoping, as tonnage is even sought from the stopes. This was not always the case in the copper country; at one time, the drifts, as in other parts of the country, were considered to be principally for development purposes and were driven small, but it was found difficult to keep the muck out of the way of the machine men. There was trouble in turning the small drift with the vagaries of the hanging wall, as it is desirable to strip the hanging wall clean in the amygdaloid as the drifts are advanced. It gradually became customary to use large drifts drilled from a side set-up, as the turns could then be made easier, the muck interfered less with drilling than formerly, and the ventilation was better because there is an outward and inward current of air maintained in the larger drifts. It was finally found that with two-man machines, it was more economical to make the drifts still larger and to combine cutting-out stoping with the drifting.

Shallower Cuts With One-Man Machines

With the one-man machine now being used, it is not necessary to get in such deep cuts or to make as great an advance at a squaring of a drift, as when two men work on a machine. With one-man machines it has generally been shown to be the most economical in drifting, to take a depth of cut such that the man can square his drift in a shift, provided the ground will break to the bottom of the holes. There is less trouble with ventilation because there is less muck left in the drift. It is likely that the advent of the small one-man drill will have a marked effect on the drifting and raising practice in the district, as well as on the stoping. It has already been found that drift stoping is cheaper with only one man at the machine than with two. The principal reason that there is such a likelihood of the drifting practice changing is that of the difficult angle at which the holes in a drift stope must be started. Fig. 1 shows this clearly.

Owing to the angling character of the holes, about 3 ft. of hole must be drilled per ton of rock broken in a drift stope, while in stoping only a little over half that depth of hole is necessary. With the one-man drills it might be wiser to use more dynamite and less hole. The drift stopes in these flat-dipping lodes are driven 9 to 10 ft. high and from 16 to 25 ft. wide, according to the strength of the hanging wall, for they are driven so that the bottoms of the pillars, left in the stopes to protect the levels, will come at the top of the drift stope without further cutting away of ore under the pillars. The drawback to this drift-stope practice comes entirely from beginning stoping before the drift stope has reached the boundary on that level, and this crowding of the real stope on the heels of the drift stope comes from the fact that the latter cannot be driven nearly as fast as could smaller drifts. When these drift stopes strike poor rock that has been found on several other levels, the size of the stope is drawn in to 8x10 ft., and continued at that until good ore is struck again. This contraction of the drift does not seem to affect the ventilation in the drift stope to any great extent.

Practice in Raising

The practice in raising is not always to drive a raise stope, for in some of the mines a small raise is put through from level to level. While this seems to be the better practice, it is not the one generally followed. A raise is generally considered as being driven primarily for ventilation, and secondarily to give access to a stope from above. With this in view it seems contrary to good practice to enlarge such an opening to a size 25 ft. long and as wide as the width of the lode. The idea in doing it is to get more water holes, and to have a greater proportion of the holes breaking with full efficiency, thereby cheapening the cost of the tonnage coming from the workings. The question still remains as to the advantage of doing stoping in an opening that should be hastened to get ventilation. It is necessary to burn out the cut in either the raise or the raise-stope, and it is questionable whether the more efficient holes are drilled in the raise itself or are left to be put up in the stope. Ventilation, of course, is better in the large raises than in the small ones, but this advantage is more apparent than real, since during the time that the raise is being driven the ventilation of some other working is being delayed. The tonnage costs are lower than in a small raise, but little gain results, as the tonnage from a small raise would not amount to much. The raise-stope, however, has its field in helping to keep stamps going with ore from a mine that is not opened far ahead of requirements.

Piece-Meal Blasting in the Drifts

Another feature of the development work in the Lake copper mines, is the piece-meal drilling of the rounds in all workings and the blasting at the end of each shift, of all holes drilled. This is done because the amygdaloid ore is much broken by fractures that run parallel with the strike of the lode, and better progress can be made by blasting the holes in re-lays; in this way the men on the next shift can take full advantage of any joints and slips that may show up and also they can see how the holes break in these large rounds, for a miscue in the breaking of one hole might tie up a round and cause a number of holes to break badly. The rounds are not drilled in any of the workings as they would be in the West; in all development work in the amygdaloid and conglomerate mines, full advantage is taken of the good wall from which to draw the cuts. In the drift-stopes the cut is drawn from the hanging wall in what is called the corner-cut arrangement of the holes, while in the shafts and raises, in both the conglomerate and the amygdaloid, the cut is generally drawn from the foot wall. In the latter event, the holes are drilled to take out the ground with a center-V cut, although in some cases, depending upon the strength of the hanging wall, the cut is drawn from the latter.

Experience in the conglomerate lode has shown that the roof in the stopes stands better if a brow of ground is left along the level to help support the hanging, while cutting-out stoping is going on to make room for timbers. There is also a better developed slip along the foot wall than along the hanging. For these reasons, the drifts in the conglomerate mines are driven following the foot wall, and a corner cut is taken off that wall. These holes are drilled in a manner to throw the ore to one side in the drift, and the floor of the working on the side that the set-up is made, is kept fairly clean of muck and the miners do not have to do much shoveling to get a set-up. Not much advantage is gained by the piece-meal blasting in the conglomerate mines, as that ore is not broken up so much by slips and joints as the amygdaloid. In the Tamarack mine it is the practice to drill the whole round before blasting any of the holes.

Pyramidal Cut in Tamarack Drifts

In the Tamarack mine, to push the drift to the boundaries as rapidly as possible, two machines are used in some of the drifts, although all of the drifts are driven 9x10 ft. Because of the use of two machines, the ordinary corner cut has to be abandoned, and instead, a central, four-hole, pyramidal cut, looking slightly downward so that all of the holes of the cut may carry water, is used. These four holes are drilled so that they meet at a point, and are chambered before being blasted, so that the ground between them at their apex will be burned out and room made for loading them with a large charge. A good cut is obtained in this way. The other holes in this round are also chambered at the Tamarack. In this respect the practice differs radically from that of the other mines in the northern part of the district.

About one stick of dynamite is used in springing a hole. A drift can generally be broken with 18 holes, there being three lifters, three back holes, and three rows of four holes each, in between. Occasionally an extra hole or two has to be put in to insure breaking of the entire round. The cut holes are fired first; then the enlarging holes and the holes for squaring up the drift. From 7 to 7½ ft. of advance are made per round, as the holes break to the bottom, and about 25 ft. of holes are drilled per shift. When drifting with two machines on a vertical bar, and drilling day and night shift, an advance of from 90 to 110 ft. per month is made. Because of the blasting of this round practically at one time, an enormous pile of muck results. To avoid delay, therefore, the machine men set up on a short post 2½ or 3 ft. long, having a two-screw pack. From this short post they drill the top holes of the next round. Meanwhile the muck is being cleaned out so that the machine men can get a set-up on solid bottom.

Drifting Speeds

In the one-machine drifts a corner cut is taken off the foot wall. To make the cut, turn it and square up the drift, requires from 18 to 20 holes and in this round the holes are also chambered with a stick of dynamite before being loaded. Owing to the large pile of muck that results, the machine men in the one-machine drifts also set up on top of the pile with a short post and drill the top holes of the next round while the drift is being mucked out. With two men on the machine, drilling day and night shifts, an advance of 50 to 55 ft. per month is made. A slightly greater advance is accomplished per round in the one-machine than in the two-machine drifts owing to the use of the corner cuts, as the pulling of the ground from the foot wall permits a better cut to be obtained than when with two machines in the drift a center cut must be resorted to. As far as footage costs are concerned the one-machine drifts are, therefore, cheaper to drive. However, when the development work is behind in the mine and the boundaries cannot be reached on a level before stoping begins, it probably pays to spend a little more per foot of advance in order to be able to reach the boundaries sooner.

Drifting in the Calumet & Hecla Conglomerate Workings

In the Red Jacket and the other conglomerate workings of the Calumet & Hecla company, the drifts are all driven with one machine. At the Red Jacket these drifts were formerly 7x7 ft. but in order that two tracks can be laid so as to permit timber to be taken to the stopes without interferring with the trammers, the drifts are now made 7 ft. high and 11 ft. wide. A corner cut drawn off the foot wall and drilled to expose about 2 ft. of foot wall, is used. From six to eight holes are generally required to get the cut in properly, but most of these are short top holes, necessary to pull the toe that remains in the last round, and are not over 2 to 3 ft. deep. After a depth has been attained, equal to about half of the distance to be advanced in the round, the cut is turned. The turning holes are each 8½ to 9 ft. deep, as they are drilled from a side set-up. The rest of the holes in the round, those drilled to square up the drift and pointing straight with the direction of the drift, are put in about 8 ft. deep as an advance of from 7 to 8 ft. is made. From 22 to 24 holes are required in a round and it takes from four to five shifts to do the drilling. The holes are blasted in three volleys, as fast as they are drilled; first the cut, then the widening-out holes and finally the squaring holes. None of the holes are chambered as it would take too much dynamite per round, for low cost and not speed of advance is desired at the Calumet & Hecla mines, where development is always kept well in advance of mining. At the Red Jacket an advance of 38 to 40 ft. per month is made in these drifts.

At the south Hecla workings of the Calumet & Hecla, an 8x8-ft. drift is used and this is generally drilled with a corner cut drawn off the foot wall. A round of from 20 to 21 holes is required in them and an advance of about 7 ft. is made. Each shift the miners blast the holes that they have drilled, tearing down the post when blasting all but the cut pop-holes. Because of the narrow drift, this necessitates more shoveling by the machine men to get a set-up, than in the larger drifts, but it pays as the men can judge better how much burden to place on these holes. It is harder to judge this in the case of the corner cut than it is in the drift rounds such as are used in the West. In these 8x8-ft. drifts a monthly advance of about 50 ft. is averaged, it varying from 48 to 54 ft., as seven cuts per month are averaged. Because of the angle at which they are drilled, most of the holes in a round are 8½ ft. deep and about 24 ft. of hole are averaged per shift. The mucking in these drifts is done on day's pay, while the drilling is all done on contract.

Drift-Stopes in Amygdaloid Mines

The width of the drift-stopes in the amygdaloid mines varies according to the strength of the hanging wall, for that determines the width of ground that can be left unsupported over a level. The typical size of one of these drift-stopes is 9x19 ft. That width prevails in the Osceola workings of the Calumet & Hecla company, the South Kearsarge mine of the Osceola Consolidated, the Ahmeek and the Centennial mines. In the Allouez, because of the shattered condition of the hanging wall in many places along the lode, the size of these drift-stopes has been reduced to 9x16 ft., while at the Wolverine, owing to the strength of the hanging and the width of the lode, they are enlarged to 11x25 ft. In the North Kearsarge, the drift-stopes are driven 10x16 ft. in section.

In all of these drifts, the foot wall is carried up at the dip of the lode as soon as the stoping width is reached. However, at the Mohawk mine, the drift-stopes, instead of following up on the foot wall in their upper parts, follow the hanging wall with an approximately rectangular section, 12x20 ft. in size, contracted in some places to 12x16 ft. The vein in much of the Mohawk workings has a width of 20 ft. measured perpendicularly from wall to wall and this drift generally comes inside of the vein, there never being more than one hole in rock at the bottom of the drift. The drift is wide enough to accommodate two tracks so that in case stoping must begin in an outside stope, before the drift-stope has reached the boundary of the ground to be mined through that shaft, as is generally the case, switches and a double track can be placed at that point so that the mucking in outside stopes does not interfere with the tramming from the drift-stope within. The width of the vein in the Mohawk permits such a drift as this to be driven with a flat floor, but at the other mines where the ore is narrower, this method cannot be used unless narrower cars are used.

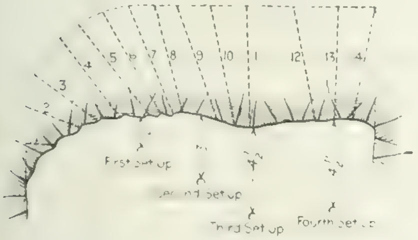

FIG. 1. PLAN OF HOLES IN A DRIFT-STOPE

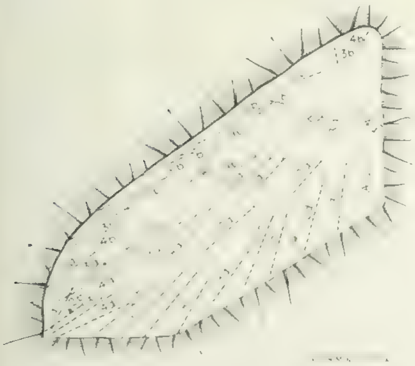

FIG. 2. DRILL HOLES IN A DRIFT-STOPE ON THE OSCEOLA LODE

CUT TAKEN FROM HANGING WALL

As shown in Fig. 1, in drilling a round in one of the drift-stopes, the cut is taken from the hanging wall in the lower corner of the stope. A few drawing pop-holes, 2 to 3 ft. deep, are first put in to take out the toe of ground left from the preceding round and then deeper holes are drilled to carry in the real cut. The cut having been worked in 3 or 3½ ft. by these holes that draw the ground from the hanging-wall line of weakness, enlarging holes are drilled to work the cut in to a depth of 6½ or 7 feet.

In the Osceola lode this cut requires from six to eight holes according to the number of pop-holes required to take out the toe from the preceding round, and all these holes are drilled from a vertical bar set about 7 ft. from the lower side of the drift-stope.

The cut is then turned with from 16 to 20 holes according to how many of the holes are considered to be part of the cut, as in the Osceola lode it takes approximately 28 holes to put in the cut and to turn it. By that time a space has been obtained in the drift parallel to the strike of the lode, and the enlarging or squaring-up holes have a good chance to break. These last holes have almost as good a break as in a stope, so that the amount of ground on the toe is increased from about 20 in., to 30 in. or possibly more, according to the breaking ability of the ground. There are about 12 of these enlarging holes, so that in the drift-stopes on the Osceola lode there are about 40 holes per round. But on the Kearsarge lode, owing to the greater burden that can be placed on the toe of a hole only 30 to 35 holes are required to break a drift-stope of large section.

FOUR SET-UPS USED IN DRIFT-STOPING

The holes in the drift-stopes are drilled from four set-ups, first the cutting-in, next the turning cut, and finally the two enlarging or squaring-up set-ups. When the cut has been extended from the floor of the level to the hanging wall, the holes are drilled in rows of three with an occasional row of four if necessary in enlarging the cut, and the holes are jumped up the foot with respect to those in the row ahead. All holes are drilled from an arm, the machine being carried on the side of the post toward the roof of the stope. The column is set up about 1½ ft. from the face while the side holes are being drilled, but in the case of the last two set-ups, where the holes are placed parallel or nearly parallel with the direction of the drift-stope, the column is placed about 3 ft. back so that the long drills can be taken out of the holes without trouble.

In the drift-stopes, all holes but the last two are water holes. All the other holes put in to skim the hanging, are drilled as flat as possible and yet carry water, while the two lower holes in each row look down. The lower hole in each row draws the ground from the floor of the drift stope. The middle hole is blasted first, then the one next the hanging, while the bottom hole is fired last so as to throw out of the way the muck coming from the other holes. A burden of about 20 in. is placed on the holes, until the cut has been turned enough so that the holes can be drilled nearly parallel to the strike of the lode. After that as much burden is placed on the hole as would be in a stope. In blasting the cut pop-holes, the post is left standing and only the machine and arm taken down, but at all the other blastings the post must be taken down. Owing to the manner in which the holes are drilled in these wide drift-stopes, the muck does not get in the way of the men and they do not have to shovel much to get a set-up.

PROGRESS MADE IN OSCEOLA DRIFTS

On the Osceola lode the men square up about nine times per month and an advance of about 48 ft. per month is averaged in the drift-stopes, while on the Kearsarge lode an advance of about 52 ft. is made in the eight cuts per month that are blasted. In these drift-stopes a machine breaks only from one-half to two-thirds what it does in stoping, so that, while it is better mining to drive these drift-stopes and combine the cutting-out stoping with the drifting in the amygdaloid mines, when things are running smoothly, the question arises, when the development work is behind the stoping and the boundary cannot be reached before stoping must begin on that level, whether it is not better policy to drive small drifts and have fewer machines on development. In the latter case the drifts can be driven faster when small.

MOHAWK DRIFTING AND CROSSCUTTING COSTS

The cost of the drift-stoping in the Mohawk mine where these workings are driven 12x20 ft., is given in the following table:

TABLE 1 AVERAGE COST OF DRIVING A 12x20-FT. DRIFT SLOPE IN THE MOHAWK MINE, 1909 AND 1910

	Per Ton of Rock Broken	Per Foot of Advance
Labor		
Machine men	37.4c.	$7.11
Drill boys	1.8c.	
Shoveling and tramming*	21.0c.	4.20
Supplies	10.9c.	1.98
Totals	71.1c.	$13.29

*Eleven tons per man per day at $2.30 per shift.
†Dynamite, 40%, costs 12c. per lb.

The tonnage broken per machine per two-shift day was 30.3 tons and the average wage earned per man per shift in drift-stopes during 1909 and 1910 was $2.83, while in the 9x16-ft. crosscuts the respective figures were 22.1 tons and $2.70 per shift.

TABLE 2. COST OF 9x16-FT. CROSSCUTS FROM SHAFT TO LODE, MOHAWK MINE

	Per Ton of Rock Broken	Per Foot of Advance
Labor		
Machine men	49.0c.	$6.17
Drill boys	2.4c.	
Shoveling and tramming*	12.0c.	1.44
Supplies	15.7c.	1.89
Totals	79.1c.	$9.50

*Approximately.

The raise-stopes in the amygdaloid mines are put up about 24 ft. long by the width of the lode wide and it takes about as many holes to break one of these raise-stopes as it does an ordinary drift-stope. However, the rate of advance in one of these raise-stopes is only about 40 ft. per month; in a drift-stope there are two or three dry holes in a round, while in the raises two-thirds of the holes are drilled dry and such a hole takes about one-third longer to drill than a wet hole. One machine is used in these raises and a center cut is drilled, that is drawn from the foot. In putting in the round the characteristic practice is followed of blasting all the holes drilled at the end of each shift.

(*To be continued*)

Tin Production of Seward Peninsula

Although practically all the mineral production of the Seward Peninsula, Alaska, for 1911 was derived from gold placers, interest has been renewed in the tin deposits, and a production of about 100 tons of concentrates, worth about $50,000, is reported from the tin placers on Buck Creek, says the U. S. Geological Survey. Not only has dredging for placer tin been carried on, but lode-tin mines near York have been reopened under the superintendence of a competent mining engineer. It is understood that the company intends to ship the tin concentrates to Seattle, where they will be smelted.

Paul Speier, of Breslau, reports, under date June 24, (*Min. Journ.*, June 29, 1912) that prices of cadmium remain unchanged. The Upper Silesian production during the first three months of this year totaled 10,881 kg., which compares with 10,200 kg. for the corresponding period of last year.

Thornthwaite Mine, England

London Correspondence

The Thornthwaite mine is situated in the Lake district of Cumberland, only a few miles from Keswick and two miles from Braithwaite station. This mine was sunk to a depth of 65 fathoms, and has been intermittently worked for 400 years, or before the use of gunpowder was known in mining. The shaft was sunk in the valley and levels were extended over a mile on the course of the north and south vein. The upper part of the veins on the hillsides was well prospected by means of adits. Steam and water power are used in the working of the mine. The rock is of the Skiddaw slate series. This mine is a notable proof of the romances of mining, the rich shoots being found at the time when needed most.

Lead and Zinc in Quartz

The machinery is worked by a small Pelton wheel about nine months of the year, and by a suction gas-producer plant (Tangye's make) three months. The shaft is on the left, and the mill on the right of the main Keswick and Cockermouth road; they are connected by a short trestle bridge, which does not materially detract from the beauty of the surroundings. The ore is brought to surface through a vertical shaft in cars of 14 cwt. capacity. The valuable minerals are lead and blende in about equal proportions, while the gangue is largely quartz.

The ore is dumped into a small storage bin, and raked from the bin on to a horizontal grizzly. The oversize is lifted by hand into a Blake crusher. All the ore is washed into a second crusher and from this crusher passes through a 2x12-ft. trommel, so arranged that the fine screen is at the feed end, and the coarse screen at the discharge end. From the trommel the ore is raised by means of a cup elevator high enough to pass through a set of Cornish rolls, 2 ft. in diameter.

From the rolls, the residues fall on to Luhrig jigs, which give entire satisfaction. In this mill there are 12 three- and four-compartment jigs. Green, Thomas and Luhrig types of jigs are used, which are equally satisfactory to the alloted work. One of the Green jigs is reserved for removing all impurities, such as the heavy sulphides of zinc, iron, etc., before the concentration can be said to be complete.

The jig tailings are pumped to a separator or classifier, and the slimes flow to Luhrig tables, where the heads, which look like pure galena, are pumped to another Luhrig table. Here the heads show two markedly distinct lines, the first being galena and the other blende. The blende contains 58% or more of zinc. The tailings from the jigs, which still carry a little lead and zinc, are conveyed to a small set of rolls and re-treated.

Wilfley and Buss Tables Used

In the slime department there are Wilfley and Buss tables. (The first Wilfley tables in England were used here.) The slimes flow into two large concrete tanks, with four compartments in each. After settling, the water flows over the outlet, the entire width of the tanks, while subsequently the slime flows into a small compartment or tank, and from there is pumped to the tables for treatment. The refuse slimes from the tables are allowed to settle in large reservoirs.

After the slime has settled, the gravel from the jigs is trammed and discharged into catchpits of from 12 to 20 ft. in depth. It is imperative that the river from Derwentwater that flows into Lake Bessingthwaite, just below the mine, should not be polluted, or even discolored by mine water, on account of the amenities of the district and the alleged destruction of the fish. There seems to be little evidence, however, that discoloration from impounded tailings is as injurious as represented.

This mill is old and has a capacity of four tons an hour. There is probably no mill anywhere which uses more water for concentration; the jigs for the coarse and fine, and the tables for the slimes, are practically on a level, and a strong current of water is necessary to convey the pulp from one department to another.

To obviate this difficulty, the launders were lined with glass, but it was not a success, owing to the rapid erosion of the glass by quartz gangue. Glass-lined launders should not be exposed to shocks of any kind, as the glass easily breaks; the sand insidiously gets in the crack and under the glass, raising it, thereby minimizing the efficiency of the launders. Under the most favorable circumstances, the glass-lined launders would not last more than six months. At present 4- and 6-in. drain pipes are in use and are much approved. It has been observed that when one pipe shows signs of wear, every pipe in the set does, and there is a decided saving in the matter of time and expense by replacing the whole set at one time.

The mill is to be remodeled, so as to economize in water, but there will not be much change in the jigs or tables, as they do good work, since they are well watched and are not crowded. The lead is dressed to 82%, carrying about 10 oz. silver per ton. The blende as cleaned in the jigs assays 52% zinc; the slimes assay over 58%.

In this and other old mills, no efforts were made at first to treat the slimes. They were allowed to be washed into the rivers, or into the sea. Consequently in all the old mills the slimes plants are supplemental which accounts in part for the disconnected appearance of the old mills, and for the waste of power, water and labor.

Bolivian Tin Mining

By Mark R. Lamb*

Bolivia is a country devoid of prospectors, and is in danger of losing its miners by migration and unsanitary living. Bolivian mines sold on past reputation. No reserves ever blocked out. Good chance there for American prospectors and investors.

Tin mining in Bolivia is a business which has been too much neglected by Americans. Bolivia supplies one-quarter of the world's production, so the tin is there. The product shipped in a concentrate, which, if 70% tin, sells for $600 per ton in London.

When it is remembered that the mines now operating treat ores with 6 to 20% tin, besides silver, and besides frequently find 60% shipping ore, it is easy to understand how immense profits are made.

Bolivian Mines Sell on Reputation Not Reserves

Bolivian, English and Chilean capital predominate for several reasons. One is that it is the custom to buy tin mines on their records and not on ore blocked out; so far, the Americans who have come to the country have not done this. Another reason is that there are no prospectors in Bolivia. The ground between two producing mining districts is entirely innocent of prospect shafts and even of empty tin cans. Except that hard work is impossible on the plateau at the elevation at which most of the mines are found, prospecting in Bolivia is no more difficult than in Nevada. New mines are not being found, but neither are they being sought as they would be elsewhere.

Clear titles are not easy to obtain and frequently one hears of a series of suits brought against successful mines. However, the condition is probably not worse than in Mexico, South Africa and Australia—and not nearly so bad as in Butte. As in other countries, it is possible to buy, depending on the care exercised, either a mine or a lawsuit.

Except in the modern plants, copper and tin ores are crushed under *quimbaletes* by hand or foot power. Even with some of the companies which have hand-fed stamps and hand-discharged chilean mills, the miners working on contract to deliver concentrate, use *quimbaletes*. As will be guessed, the ore crushed in this way sometimes reached 200-lb. per shift per man. Women then wash the crushed ore by hand in tiny moss-bottomed launders, dignified by the name "square buddle." One washing is not sufficient. The heads are accumulated, washed and rewashed until the concentrate reaches the required grade. One concentrator in Huanuni who justly prides himself upon shipping nothing under 70% dries his concentrate and carefully screen-sizes it for the final purifying washing.

The concentrate is all shipped abroad, but not to the United States, though the States uses over 50% of the world's tin. The same thing occurs with Peruvian and Brazilian rubber—the American manufacturer will not buy in New York, but insists upon English brands.

Nearly without exception, silver accompanies the tin and usually it is recovered by a chloridizing roast, and lixiviating. Sometimes copper occurs, but it is rarely saved owing to lack of facilities. Bismuth is a frequent valuable byproduct and also seriously affects the value of the concentrate when it cannot be entirely separated. When pyrite accompanies the tin it is removed by roasting the ore or the concentrate, depending upon its amount, and in the latter case a re-concentration of the concentrate is necessary.

Reduction Works of the Llallagua Tin Mine, in Bolivia

Tin concentration should not be difficult as the specific gravity of cassiterite is high. My own opinion is that the greater part of the losses now sustained is due to lack of careful classification and regrinding. A proof that classification is faulty is the fact that mill tailing is successfully washed by hand without further grinding. A proof that grinding would decrease the loss is found in the fact that jig tailings of half-inch size are discharged which contain 2% tin. One elaborate mill was built not long ago beginning with ¾-in. jigs, where the tin occurs in the ore in particles ⅛ in. and less. Fine grinding stopped the greatest part of the loss at that plant.

Huanuni Properties Consolidated

Lately Señor Patiño has purchased what is considered the most important group of mines in Bolivia—the properties at Huanuni. For years the two important owners in this district have been in litigation. After Chilean, English and then American promoters had tried to reconcile conflicting interest and had failed, Señor Patiño bought the entire region. The purchase price was $2,000,000, payable within a short period, relatively. No formal examination was made which would have satisfied American investors, and but little ore is blocked out.

Señor Patiño is an example of a quick rise based on almost uncanny good judgment. From a modest beginning but with some backing from his intimates and those who believed in his judgment, he has in eight or 10 years attained an income reaching $10,000 daily from his mines, banks and industrial schemes. His plants under Herr Block's management are not to be criticised lightly. There is one feature of his management which could be profitably imitated in mines elsewhere. The managers, superintendents and administrators are given moderate salaries with a percentage of the profits, or a few dollars for each ton of concentrates shipped. Some of Patiño's managers are making big money under this arrangement and he is keen enough to let them continue doing it.

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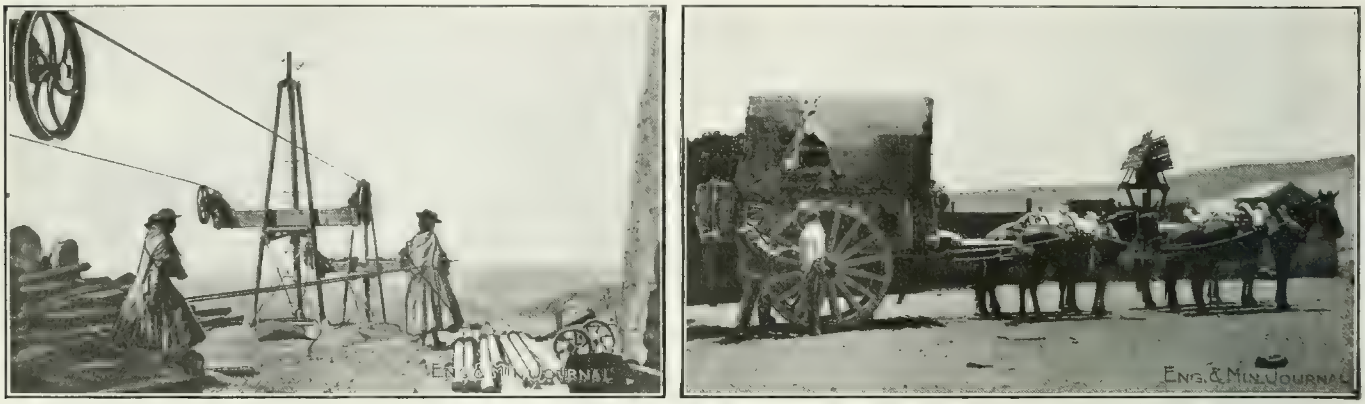
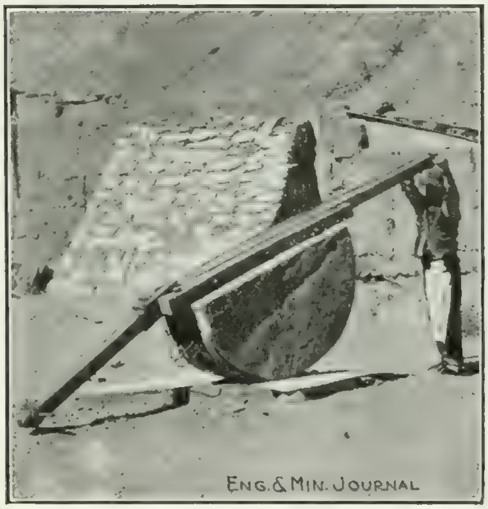
*Manager in South America for Allis-Chalmers Co., Santiago, Chile.

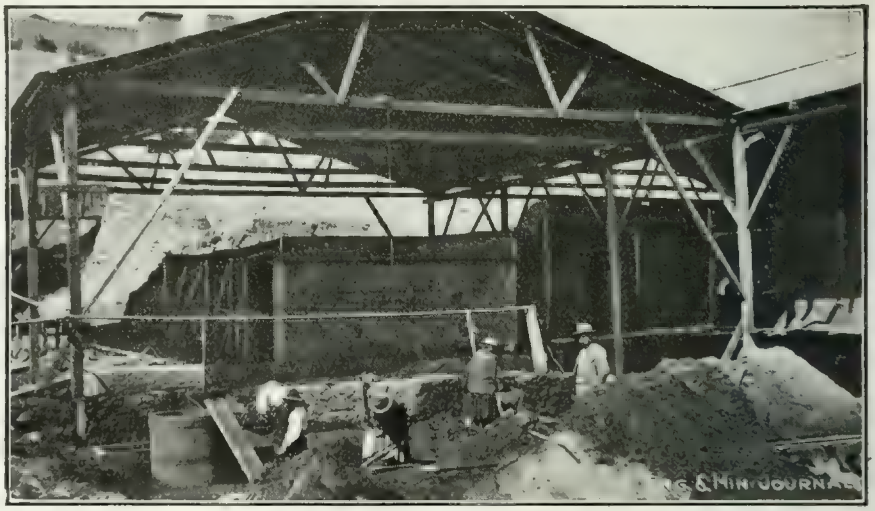
For nearly two years the price of tin has been high and tin mines are not held at low prices. Nevertheless there are opportunities to buy prospects, mines, waste dumps and tailings that will pay handsome dividends.



Transporting Mine Supplies in Bolivia



A Quimbalete



Hand Concentration of Hand-crushed Ore

Where mines are located some distance from the railway the concentrate is shipped on llamas in 50-lb. bags. Llama transportation is cheaper than by carts since the pack animals find their own food along the way, while feeding stations must be provided for the cart mules. Carts are quicker but in the words of the Arkansas hog herder, "what is time to an Indian?"

Inefficient Railroading

The Antofagasta & Bolivia Ry., Ltd., is certainly worthy of the booby prize among the world's railways. A collection of its stupid, laughable—almost incredible qualities would clog a No. 21 Gates. The La Paz paper says that 20 years ago in pre-railway days, the llama freighter took two weeks for the journey between Oruro and La Paz and was forced to make good all losses. After him came the carts which made the trip in a week and were also responsible. But now La Paz has only the railway, which frequently requires a month to deliver goods—and is not responsible for losses. There is a change of gage at Oruro, which will soon be at Uyuni. This means a transfer from narrow to broad gage, and whoever goes mining in the territory tributary to that railway system must expect and be resigned to long, unnecessary, unavoidable delays. One of my customers, by a free use of the telegraph to Antofagasta and of the cable to London, succeeded in trans-shipping one car load from narrow to broad gage in eight days, but this is unusually quick time. The Bolivian must not be blamed for this since the railroad is owned by an English company. It is not typical English railroading—it is simply the Antofagasta & Bolivia Ry. Ltd.

Fuel is the Bolivian problem. Not fuel for the household because the house is not heated and only enough llama dung is needed in the kitchen for cooking. Sometimes hydraulic power is available, in which case, whatever it costs, it is cheap in comparison with coal or oil. Usually it is necessary to use either producer-gas or oil engines. Señor Patiño has several oil engines and until tank cars are put into service he imports crude oil in barrels and tins. He is reported to have said that cologne would be cheaper.

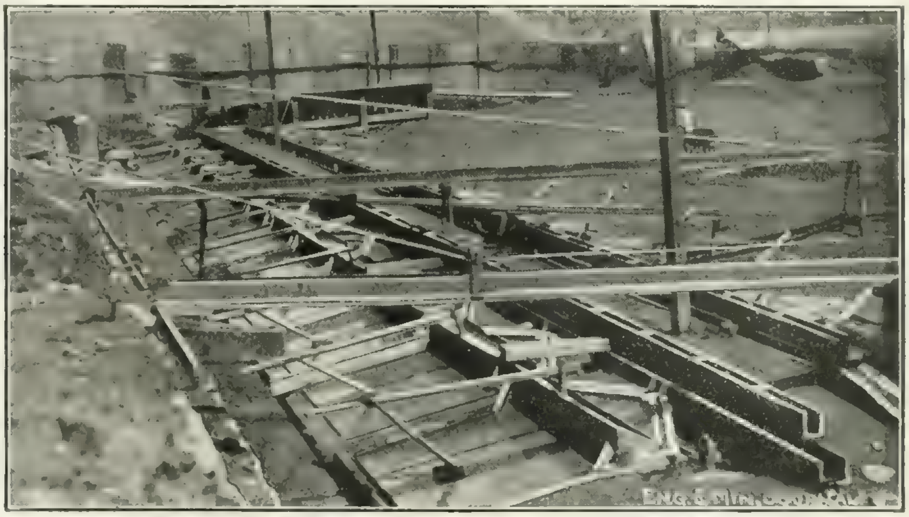
Producer-gas engines are the common prime movers. Anthracite coal is imported from Australia and Pennsylvania. Its cost on the coast is the price at the mine plus a reasonable freight rate, but from Antofagasta it accumulates value on its way inland like a Berkshire in clover. By the time it reaches Oruro it is a precious metal and long before Uyuni it is watched like jewelry. The new Arica to La Paz railway which has just run its first train through from the coast, will shorten the haul by half and reduce the freight by more than half. The branch railway from Rio Mulatos to Potosí will be a big help to the miners at the latter place and the same comment applies to the railway to Cochabamba. It will never be possible to hire a special train and rush a hoist from Chicago to the mine in a week as was done in the golden days of Goldfield. The usual time for shipments from Chicago will rarely be less than 45 to 60 days. This means heavy stocks of supplies and repairs and stores and even more—it means a storekeeper who can read the future.

Bolivian Labor Conditions

Managers and men filling other responsible positions are generally foreigners. This will continue to be so, as long as the better class of Bolivian youths are educated in European countries where to work is a disgrace.

The normal Bolivian worker is a good laborer. If his government would protect him from alcohol instead of protecting the alcohol, it would be better for the country, the tin miner and the laborer. The Indian does not drink continuously but waits for a holiday, whereupon all of him gets drunk and stays so for weeks, the plant and mine shutting down meantime. One German engineer, manager of an important property, states that in 10 years there will be no laborers for his mines. Bolivia is doing much railway construction and Chile requires laborers for the nitrate fields. Both of these industries are taking laborers from the mines. The miners cannot easily be replaced by importing from other countries on account of the altitude but as soon as hand labor is replaced with air drills and labor saving machinery of other kinds, it will be possible to import Italian and Spanish workers.

WOMEN CARRYING TAILINGS FOR RECONCENTRATION



AUTOMATIC SLIME TABLES AT A BOLIVIAN MINE

The Bolivian Indian is addicted to cocaine, so at times he is stupid. He is honest and dependable, however, when trusted with a mission. He takes no care of his children and the supposedly intelligent foreigner who will need the children in 10 years more is doing nothing to help care for them. Last June, after a driving, cutting snowstorm at 14,000-ft. elevation the trail of a party of Indians crossed mine. The tiny barefoot tracks, occassionally stained red, among the larger foot prints, told the story plainer than words. In a country where it is considered womanish and even unhealthy to live in a warmed house or to dress warmly, where there are only two stoves (one is in the lake and the other is broken), and, where the native mother says "another angel to pray for me" if she loses a baby, the labor problem needs attention.

The price of tin as stated above, has been around 42c. per lb. for nearly two years. So far as the wise ones can see, there is little chance of its going lower and every chance of its going higher. The production from the Malay Straits is decreasing due to shortage of labor supply and to the fact that the tin from there is placer. Cornish production has fallen off until recently. Every war scare increases the demand for tin for preserved foods.

We have an excellent, live American minister at La Paz who is *persona grata* in Bolivia and who is working to attract real American investments to Bolivia.

The Bolivian mining laws are quite different from American—better in some respects and worse in others. From all reports, it is simply a question of keeping within the law. One American company has had difficulties, but has stuck stubbornly to the position it had taken. It is now finally reported to have won.

Tin is of course the main resource of the highlands of Bolivia. Besides this metal are silver and copper on the plateau region and rubber from the hot country in the valleys of the rivers tributary to the Amazon. As the tropical country can be reached in a few hours on horseback from La Paz, there is little doubt that a railway will shortly be built.

Bolivian Mine Examinations Expensive

Recently a small American syndicate sent engineers to examine a copper property, but their whole capital did not suffice to make the examination. The right way to get into tin or copper is to establish headquarters in Oruro and patiently examine every mine and the man who offers it. Americans have the reputation of arriving today, examining the mine in a week, and then returning to the States without taking time to see other possible opportunities. It would be easier to examine all the mines of California than of Bolivia in a week.

A prospecting expedition would stand an excellent chance of success if well equipped. The members of the party would require some time to become used to the altitude and would spend considerable money at first. The opportunities for capital are numerous because there is little capital in the country.

The Corocoro copper ores of Bolivia are easily mined and concentrated. The deposits are large and the companies now operating are treating not less than 5% ore. The copper occurs native and the rock is soft. The copper ores are nearly as attractive as tin since the former are near the railways.

Political conditions in Bolivia are good and the feeling towards Americans is favorable. The Bolivian government is as stable as any other in South America. The Bolivian of the better class is an educated, traveled and polished citizen of the world. There are many opportunities in Bolivia for the man who can see them.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Experience in mining is an essential qualification.

R. C. Vanderford, formerly of Spokane, Wash., is now in the Eureka district in Nevada.

H. F. Baker, secretary of the Lehigh Coal & Navigation Co., has been chosen a vice-president of the company.

Will C. Russell, manager of the Rawley mine, has returned to Bonanza, Colo., from a short trip to New York.

Richard V. Roane, of Pulaski, Va., has been appointed state mine inspector of Virginia. He is a mining engineer of long experience.

T. L. Sharp, formerly with the University of California, has been appointed professor in the University of Utah at Salt Lake City.

D. C. Jackling, of Salt Lake City, Utah, is to have supervisory charge of the operations of the Butte & Superior Mining Co., in Montana.

J. R. Kennedy, of Cobalt, Ont., is inspecting mining properties in the Manitou Lake district for a syndicate of Ottawa capitalists.

Hamlin B. Hatch, of Porcupine, Ont., has accepted a position as field man with the Canadian Mining & Exploration Co., recently organized.

O. P. Thomas, of Johnstown, Penn., has been appointed chief engineer and general manager of the Bayless Coal & Coke Co., at Oakland.

W. S. Keith, manager for the Frankmont Mining Co., has gone to Towle, Calif., for the Helester Mining Co., to superintend mill construction.

M. H. Lovemann, of Nevada, a graduate of the Columbia School of Mines, is investigating gold properties in the Manitou Lake district, Ontario.

S. H. Hamilton, of Philadelphia, is spending the month of August examining deposits of iron and copper pyrites on Notre Dame Bay, Newfoundland.

Mosher F. Pack, formerly instructor in geology in the University of Utah, has opened an office as consulting mining engineer in the Kearns Building, Salt Lake City.

J. W. Merritt, assistant in mineralogy at Northwestern University, Evanston, Ill., has been appointed instructor in geology at Dartmouth College, Hanover, New Hampshire.

E. R. Garrett, of the University of Oklahoma, and the Oklahoma Geological Survey, has been appointed assistant in mineralogy at Northwestern University, at Evanston, Illinois.

J. Frank Ritter has been appointed acting superintendent of erection at the Steelton, Penn., works of the Pennsylvania Steel Co., to succeed Frederick C. Cohen, who has resigned.

Capt. Bernier, late commander of the Canadian government steamer "Arctic," left Quebec on July 29 on the schooner "Minniemaud" for a cruise in the Arctic islands in search of gold mines.

A. R. Brown, who has been in charge of mine-rescue work at Birmingham, Ala., has been appointed assistant superintendent of coal mines of the Tennessee Coal, Iron & R.R. Co., second division.

Harold C. E. Spence, of the International Mining Syndicate, Ltd., has been spending a month in examining mining properties in Nova Scotia. He will be in Montreal and Toronto during August.

H. H. Pinckney has been appointed division coal inspector in West Virginia, in place of P. A. Grady, who has resigned to take charge of the mines of the Davy Pocahontas Coal Co., in the Pocahontas district.

Otto Wertenweiler, late constructing engineer of the Belmont mill at Tonopah, Nev., has been engaged to construct the new 300-ton mill for the Montana Tonopah Mines Co. at the Commonwealth mine at Pearse, Arizona.

Capt. William Goodman has been appointed underground superintendent of the mines of the Breitung estate, on the Marquette iron range in Michigan. He has been mining captain at the Mary Charlotte mine for several years.

F. A. Farrar, of Brainerd, Minn., is president of the newly organized Brainerd-Cuyuna Mining Co., formed to explore lands on the Cuyuna range. Henry Nelson, of Duluth, is vice-president, and Edmond Ingalls, Duluth, is secretary and treasurer.

Dorsey Hager has resigned his position in the oil department of the Southern Pacific R.R. Co., and will open an office as consulting geological engineer at Los Angeles, Calif. He is now visiting the oil fields of the San Joaquin Valley in California.

George Harris, superintendent of the McIntyre mine, Porcupine, Ont., recently sustained a severe injury to his left leg, the knee cap being broken by contact with sharp steel used in drilling. The accident occurred when he was coming up the shaft in a cage.

J. B. Hoeing, of Lexington, has been appointed state geologist of Kentucky. The governor has also appointed the following advisory board for the survey: John C. C. Mayo, Paintsville; Percy Heley, Frankfort; R. K. Vausant, Lonier; L. D. Herrington, Richmond.

Alexander N. Winchell has resigned from the United States Geological Survey in order to resume work as a consulting mining geogolist. He has recently returned to his office in Madison, Wisconsin, after spending several weeks in Nevada in connection with litigation regarding the ownership of the ore deposits of the National Mine in that State.

C. M. Eye, who recently returned to the United States after seven years spent in the Philippines, has been appointed manager of the Concheño property, in the Rayon district, Chihuahua, Mexico, owned by the Corrigan-McKinney Co., Cleveland, Ohio. Until regular mail service is reëstablished in Mexico, his address will be Roberts-Banner Building, El Paso, Texas.

W. B. Pattison has been appointed superintendent of the mines of the Breitung estate on the Marquette iron range, succeeding Capt. Joseph Hodgson, who resigned to accept a position in Arizona. Capt. Samuel Jewell has been named as assistant to the superintendent. He has been connected with the Oliver Iron Mining Co. as mining superintendent for several years. He will have charge of all underground work.

Leggett & Hellmann announce the dissolution of their partnership as a result of Mr. Leggett's acceptance of the position of consulting engineer to the mining department of the American Smelting & Refining Co. Thomas H. Leggett's address will henceforth be 165 Broadway, while Fred. Hellman will remain in the present offices at 60 Broadway, New York, and continue the business in his own name.

The Oliver Iron Mining Co. has created a new office to be known as mine-rescue engineer, and has appointed to the position Charles H. Hawes, of Duluth, late in the service of the government. The duties of the office consist in maintaining a general supervision over rescue stations at all of the company mines in Minnesota and Michigan; inspection of equipment such as oxygen helmets, fire extinguishers, etc.; and the conducting of demonstrations.

OBITUARY

George L. Jones died at Bloomfield, N. J., Aug. 3, aged 59 years. He had been manager of the Keystone Coal Co. for over 25 years.

Societies and Technical Schools

American Geographical Society—W. J. Olcott, president of the Oliver Iron Mining Co., Duluth, is in charge of arranging for the visit to the Mesabi range of 70 members and guests of the American Geographical Society this month. The party comprises a number of distinguished scientists from 16 different countries, Russia, Servia, Spain, Sweden, Norway, Switzerland, Germany, Austria, Denmark, Belgium, France, England, Portugal, Hungary, Italy and the Neitherlands. The tour is in celebration of the sixtieth anniversity of the American Geographical Society.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Aug. 2—Production of structural materials in California in 1911 as shown by the report of the state mineralogist just issued, amounted in value to $17,194,057, an increase over 1910 of $1,820,589. The principal increase was in cement and crushed stone, due to activity in the construction of concrete buildings, road work, breakwater construction and similar building work. The cement production amounted to 6,371,369 bbl. valued at $9,085,625; crushed rock totaled 6,487,223 tons, valued at $3,610,357. The material having the next largest value was brick, $2,638,121. There was a decrease in the production of brick as compared with 1910, due probably to the substitution of concrete in construction work, although in some instances the decrease was due to the lower price, which was 7% lower than in 1910. The price of lime also was about 7% lower than in 1910, and there was a decrease in the production due partially to the curtailment in the production of copper and the consequent lessened demand for limestone for fluxing. The production of marble did not vary much from the production of 1910. Paving blocks were about the same in amount of production, but a little higher in price. Pottery clay production fell off materially, though the indications from the activity in the establishment of new works are that there will be an increase for 1912. In the list of structural-materials production the report names 44 of the 56 counties. Los Angeles County was the largest producer, with a total value of $2,040,314. The figures on production of metals and minerals and petroleum are in preparation by the State Mining Bureau, and will be made public as soon as completed.

Denver

Aug. 2—On Dec. 4, 1912, Albert Thompson, receiver for the Red Mountain Railroad, Mining & Smelting Co., will sell in Ouray, for the highest sum obtainable in cash all the real and personal property of this corporation consisting of about 70 mining claims, most of them in the Red Mountain district in the vicinity of Ironton in Ouray County, 89,000 shares in the Silverton Smelting Co., 100,000 shares of the capital stock and five hundred $1000 bonds of the Silverton Railway Co.; and a claim against that railway company for $58,000, and other property. William Chalfant, Jr., is the plaintiff, and the defendant company is the creation of George Crawford. He and O. P. Posey were the original promoters of the rich Yankee Girl, Robinson and other mines at Red Mountain, which with the drop in silver of 1893 were closed. About seven or eight years ago they were again promoted by the same George Crawford, whose later operations have been no more successful.

A rather severe blow to the mining industry is the closing of the 6000-acre Castle Creek gold placer in the Granite district, an injunction having been issued by the courts preventing dumping of débris into the Arkansas River. For several years the towns along this river have been trying to put a stop to this pollution and the litigation has lately been decided in their favor. It is said, however, that the property could be worked by dredges.

Butte

July 31—A referendum vote of the members of the mill and smeltermen's union of Anaconda, will shortly be taken to decide upon the new wage scale offered by the Anaconda Copper Mining Co. The union asked for an increase of 25c. per day while copper is above 15c. and below 17c. per lb., and of 50c. per day when copper is 17c. per lb. or more. After a conference held in Butte between a committee from the union, and officers of the company, the request was refused, but the following offer was submitted: All men within the jurisdiction of the union will receive an increase of 25c. per day above the wages paid in June 1912, as long as the average monthly price of electrolytic copper is 15c per lb. or more, and when the price is less than 15c. per lb. the wage rate will be the same as that in force during June 1912, this to be conditional upon the signing of a contract for not less than three years from date of its execution. Should an employee for any reason terminate his employment before the end of the month, the rate of wage settlement would be as follows: Settlement made up to the middle of the month would be rated upon the average price of electrolytic copper during the previous month, and the rate of settlement for any part of the month after the 15th day would be based upon the average price of electrolytic copper for the first half of the month, including the whole time of employment during the month.

Salt Lake City

Aug. 1—The branch line from St. John on the Salt Lake route to Ophir in Tooele County, 9½ miles long has been completed, and daily freight and passenger service will be maintained. The better transportation facilities are a great importance to the mines of the district, among which are the Ophir Hill, Cliff and Lion Hill.

A meeting in the interest of the metal mining industry of the state will be held at the Commercial Club of Salt Lake City, Aug. 2, and the committee on mines and mining of that institution has extended an invitation to all to be present who are directly or indirectly interested in mining. E. L. Wolcutt, assistant secretary of the American Mining Congress, is to be present at the meeting. Plans will be formulated for such remedial legislation as may appear to be best for the metal mining industry, especially in regard to the mineral patent laws, as interpreted by the Department of the Interior.

Kingman, Ariz.

Aug. 2—The heaviest assessments levied in Mohave County as the result of the tax commission determining the rate according to the production are the Tom Reed mine, approximately $875,000, the Gold Road $700,000 and the Golconda $60,000. The total tax roll this year will be about $7,000,000, which is nearly $5,000,000 more than last year's roll. Of this amount, about 30% is the assessment of the mines of the county, 40% is on the property of the Santa Fé R.R. and the remainder on other property not included under these two headings. The Tom Reed and Gold Road mines were assessed on a basis of their total bullion production and the improvements on the properties. In the case of the Golconda, which is a base metal mine, the rating was calculated on the value of the improvements and half of the bullion production. D. R. Muir, of the Gold Road company, Charles Grimes and S. S. Jones, of the Tom Reed, John Boyle, of the Union Basin Mining Co., which operates the Golconda mine, and Supervisor J. S. Withers met the state tax commissioners at Phoenix for the purpose of reconsidering the assessments levied against the companies mentioned. The commission deferred action on the cases.

It is reported that a sufficient number of signatures have been obtained to the petition seeking the recall of the miner's lien law to have it placed upon the ballot for decision by the voters of the state. As far as can be judged from the popular expression of feeling against the measure in this county, it will be overwhelmingly recalled.

Negaunee, Mich.

Aug. 2—On the Swanzy range, south of Negaunee, the Cleveland-Cliffs Iron Co. is shipping ore from the Stephenson and Austin mines, its other properties in that district being idle. Two steam shovels are kept busy shipping stockpiles, and much ore has been forwarded from the big stockpile at the Princeton mine, which contains several hundred thousand tons. In addition to these mines, the Cleveland-Cliffs Iron Co. has five concrete shafts sunk in the vein in this district with but little drifting completed; these shafts have been allowed to fill with water until such time as the ore will be needed. At the Smith or Gwinn shaft a little drifting had been done, and when the work was temporarily abandoned the drifts were walled up near the shaft to facilitate progress when it is desired to unwater the mine. The Kidder or Jopling shaft and the Northwestern or Francis shaft are also full of water. At Rice Lake, on the Southeastern end of the range, work has been stopped at the Mackinaw and Gardner shafts; these shafts were sunk a few feet into vein and sealed.

At Iron River, when the C. & N. W. Ry. desired to build a new railroad station to serve Iron River and Stambaugh, the owners of the proposed site decided to sink a diamond-drill hole on the chance of there being ore beneath. It is now announced that the drill is in commercial ore and that the railroad station will have to be built elsewhere. John Sipchen and associates are owners of the tract of land which is situated in the eastern outskirts of the city of Iron River.

Calumet, Mich.

Aug. 2—A drilling contest is to be held at Calumet, Mich., on Aug. 17. The contest will be in the nature of a rigging-up contest and will be in two classes; a two-man team using a 3-B Rand drill and the other one-man with C-113 butterfly drills. The conditions are that each team or contestant is to carry the outfit 10 ft., rig up, turn on full air, run for two minutes and change steel. Time being taken from the start to the time the steel is changed. Each operating mine in the copper country will be allowed one entry for each event. There are to be three prizes for each class, viz.: $100, $50 and $25. A special contest is also to be held between the hammer-and-drill team winning the prize at the Calumet & Hecla miners' picnic, which is to be held Aug. 10, and one man with an Ingersoll-Rand type drill to be selected by Richard Knight, representative of the Ingersoll-Rand Company.

Webb City, Mo.

Aug. 2—An employment bureau has been opened by the mine operators of Webb City, with headquarters in Room 21 of the Wagner Building. Shovelers, engineers, ground bosses and other laborers may register and will be placed without cost, the only restriction being that nothing but American labor will be considered. Negroes and non-English-speaking men are barred.

Wages are being increased, due to the high price of jack. Machinemen and helpers are receiving a raise of 25c. per day, while shovelers are being paid from ½c. to 1c. more per can. Some of the companies gave the increase voluntarily, but the rest are being forced into line by the prospect of a strike. In addition to the raise, several companies pay a bonus. In the case of the shovelers this amounts to 25c. per shift, providing they work six shifts per week. Bonus for the machinemen and other employees is calculated on amount and cost of work done.

Albuquerque, N. M.

Aug. 2—The public does not fully realize the magnitude of the mining industry of southern New Mexico. The Chino Copper Co. now has one of the largest and best equipped plants in the West, and Santa Rita and Hurley have taken their places among the most important centers in this district. Activity and output in the Mogollon district are increasing steadily. The camp of Kelly, in the Magdalena zinc field is slowly, but surely, becoming one of the large low-grade mining fields of the Rocky Mountain region. This in connection with the resumption by the Santa Fé Gold & Copper Co. at San Pedro and other developments demonstrate that following statehood the mining industry is showing the greatest awakening for many years.

Toronto

Aug. 3—An important decision affecting the rights of land owners to natural gas in the oil regions of western Ontario has been given by the British Privy Council in the test case of Farquharson *vs.* the Canada Land Co. The lands in Essex County and adjoining districts were largely purchased by the original settlers from the Canada Land Co., and the deeds reserved to the company "all mines and quarries of metals and minerals and all springs of oil." The oil and natural gas rights were later sold to other companies, and their operations interfered greatly with the owners of the surface rights. The point at issue in the action was whether gas was included under the term "mines and minerals." The court of first instance decided in favor of the plaintiff, holding that gas was not a mineral, and this decision was confirmed by the supreme court. A final appeal was taken to the Imperial Privy Council which has dismissed the appeal and upheld the original decision.

The Ontario government has passed an order-in-council opening to prospectors a strip of land one-half mile wide on each side of the Transcontinental Ry. in northern Ontario, which was withdrawn in 1909 from prospectors.

Cobalt

Aug. 2—Twelve miles of roadbed on the Elk Lake branch of the Timiskaming & Northern Ontario Ry. is ready for the steel and it is expected that the commission will start laying it within two weeks. This stretch reaches to the Jean Baptiste River where the work will be delayed until the bridge is erected. When this is completed the roadbed to the Montreal River, 12 miles further, will be ready for the steel. Another bridge over the Montreal River will be necessary, and then there is another stretch of seven miles to the town of Elk Lake. It is expected that the road will be completed and service be commenced in December. The completion of this line will benefit the Gowganda mines of which at present there are three regular shippers. A healthy interest is being developed in the country, which is now in better condition than it has been for some time.

Porcupine

Aug. 3—The managers of several Porcupine mines recently agreed upon a uniform scale of wages to conform to the scale in use at the Dome and Hollinger. They have now received notice that the members of the miners' union was applying to the Department of Labor for the appointment of a conciliation board to settle matters in dispute between the miners and the managers. The question at issue is the new wage scale which comes into effect Sept. 1; this causes a reduction in many departments, but still is the same as that in use at the largest mines in the district.

Nelson, B. C.

Aug. 1—The California group, a half-mile south of Nelson, has been bonded to Montana men. The property was formerly owned by McKenzie & Mann and has had a large amount of work done on it. The ore carries gold principally, but also some silver and galena. The new owners intend to push development and eight men are at work. This force will be increased when necessary machinery arrives. Until then the ore will be shipped to the Greenwood smeltery. The Highland mine, at Ainsworth, is installing a new aërial tram from the No. 1 mine to the concentrator. The Nine-mile Development Syndicate, that owns good-sized deposits of silver-lead ore, on Midge Creek, is doing extensive development work.

The Mining News

The Current History of Mining

Alabama

James Bowron, president of the Southern Iron & Steel Co., has been appointed receiver of that company, on the petition of attorneys representing the company and creditors in the Federal court at Birmingham, Ala. Mr. Bowron has been at the head of the company for two years. It is announced that there will be no interference with operations of the plants of the company and the steps taken looking to the reorganization of the company will not be interfered with.

The receivers of the Alabama Consolidated Coal & Iron Co. are still operating one furnace together with coal and ore mines, coke ovens and limestone quarries to furnish the raw material. Efforts are being made to finance this company, with prospects of success.

Alaska

Considerable activity is reported in the Nizina district, near the inland terminus of the Copper River & Northwestern Ry. The railway contributes largely to the increased development, making it possible to get in supplies and machinery.

Frank A. Iverson of the Bonanza Gold Mining Co., who recently made a strike on his property at Mile 192 near the railroad, is now ready to purchase a 5-stamp mill and material for a 1275-ft. tram.

Erickson—At this Glacier Creek mine a tunnel has been driven 160 ft. in decomposed porphyry in which native copper occurs. The tunnel is being driven toward a well-defined vein which it will probably cut within 40 feet.

United Copper Exploration Co.—This company claims to have a large reserve of copper ore developed by drifts and crosscuts.

Kruhm—At this property on Dan Creek a tunnel is being driven toward a dike that contains antimony minerals and gold. Several small lots of high-grade ore have been shipped to the Tacoma smeltery.

Alaska-Gastineau Mining Co.—Hayden, Stone & Co. have secured a large low-grade gold property at Juneau, which is a consolidation of three groups, the Alaska-Perseverance, Oxford and Sheep Creek. The company is capitalized with $3,500,000 bonds and $12,000,000 stock. The property was recently examined by D. C. Jackling and A. F. Holden. It is reported that about $5,000,000 will be expended immediately for extensive development of the property and the erection of a mill of 6000 tons daily capacity. The claim is made that 15,000,000 tons of ore is actually developed above the tunnel level, which figure does not include any of the partially developed or possible ore below the tunnel level. The securities owned by the syndicate will be placed with a new company to be known as the Alaska Gold Mines Co. It is intimated that a profit of $4,500,000 can be made with a 6000-ton mill, and it is the intention of the management to double the milling capacity a year or two after the installation of the first unit.

Arizona

Gila County

Inspiration Consolidated — The main west working shaft is more than 200 ft. deep and is being sunk at the rate of 5 ft. per day. During July, it was sunk 164 ft., which is said to be the record for the state for a three-compartment shaft. Sinking of the Scorpion shaft has been discontinued at a depth of 545 ft., and that of Live Oak No. 2 at a depth of 1181 ft.; a pumping station is being cut at the 1160-ft. level. Live Oak No. 1 shaft is being sunk and is 496 ft. deep. Underground development work is proceeding at the rate of about 4200 ft. per month. The new dormitory and mess house for the members of the staff are nearing completion and a new office building will be erected near the mill site. H. Kenyon Burch is at the mine.

Superior & Boston—A new stope is being opened on the sixth level. Two stopes are being worked on the Limestone vein, one on the second, and one on the third level. On the 12 level, the east crosscut is in schist 500 ft. from the shaft and the crosscut being driven south toward the Limestone vein is in 410 ft. in diabase.

Iron Cap—At the Copper Hill mine, drifting is being done on the 650-ft. level, from the Williams shaft, on what is believed to be a continuation of the Old Dominion vein. The west drift is in 310 ft. and the east drift 95 ft. On the 800-ft. level the drift is being continued west and is 110 ft. in.

Sleeping Beauty—Jones & Danum have leased the claims of the Sleeping Beauty Copper Co. in the Sleeping Beauty Mountains, seven miles northwest of Globe. There are 20 claims in the group and the ore contains gold, silver and copper.

Graham County

Arizona Copper Co. — For the six months ended Mar. 31, 1912, the profit from copper, stores and rents was £170,043. The deductions against this profit amounted to £19,447; revenue from holdings in other companies was £36,351. After deducting interest on debentures and dividends £164,180 surplus remained.

Mohave County

Mocking Bird—The mill is practically completed and a trial run will soon be made. A. F. Muter will be in charge of the cyanide plant.

Banner—It is reported that the lessees working over the dumps of this Stockton Hill mine, have about a carload each of lead and zinc ore ready for shipment to the smelters.

Boundary Cone—R. C. Jacobson has just completed a survey of the mine, the primary purpose of which is to provide for a raise from the 450-ft. level to surface. This raise is necessitated by a provision of the new mining code which requires two outlets to surface in a mine having a shaft over 100 ft. deep with 200 ft. or more of drifts. It is expected that the new raise will be used as a working shaft.

Gold Road—Six carloads of lumber for this mine have been received at Kingman. This is a portion of the amount required for the addition to the mill. It is stated that this addition will be completed and ready for operation before Jan. 1, 1913, and that the mill at that time will have more than twice its present capacity.

Mitchell—It is reported that ore, worth several thousand dollars per ton, has been found on the 350-ft. level. The oreshoot is the full width of the drift. Milling and some high-grade ore has been found wherever the vein has been cut from the 100-ft. level down to the present depth. S. R. Porter, manager.

De la Fontaine—A carload of lead ore is being mined for shipment. The ore is rich in lead, contains some silver and a little gold.

Tom Reed—An extra cleanup at the mill netted the company bullion worth $75,000. This makes the total shipments for July about $154,000. Charles Grimes, president of the company, was a recent visitor to Kingman.

Arizona-Southwestern Copper Co.—The new seven-ton Saurer motor truck has been received and has been put in commission hauling supplies for the new mill from Yucca to Copperville. J. H. Hoffman, secretary of the company, is at the mine.

PINAL COUNTY

Magma—This company, at Superior, has just finished the installation of the last two boilers in the power plant and as soon as the compressor is erected, operations will be conducted on a more extensive scale than formerly.

American Smelting & Refining Co.—This company is repairing the power plant at the Lake Superior & Arizona mine at Superior. Unwatering and examination of the mine will be started soon.

Calumet & Arizona—It is reported that this company has taken an option on the Cobre-Verde group of 81 claims at Superior one mile south of the Magma mine, the option calling for a total payment of $500,000.

Ray Consolidated—Five sections of the mill are now in operation, and 4500 tons of ore are being milled daily; the sixth section will soon be placed in commission.

California

AMADOR COUNTY

Hardenberg—Crosscutting from the 1000-ft. level of the new vertical shaft is in progress. It is expected to cut the vein at about 200 ft. from the shaft.

Lincoln—The drift at the 1950-ft. level is being advanced rapidly toward the Wildman vein, making 94 ft. in the week ended July 13. This drift will cut the Wildman several hundred feet below the lowest Wildman workings. Andrew Noce, of Sutter Creek, superintendent.

Newman—The mine at West Point has been bonded and development is in progress. A compressor and machine drill have been installed.

Defender—This mine near West Point is being unwatered with a steam pump preparatory to resuming development.

Lockwood—A new hoist has been installed, and the 325-ft. shaft is being unwatered.

Billy Williams—Prospecting and preparation for placing the stamp mill in commission again are in progress. T. S. Jenkins of West Point, owner.

CALAVERAS COUNTY

Comet—A strike of high-grade ore is reported at this mine at Railroad Flat.

Dolling—A vein of good ore is reported in the development of the drift of the 400-ft. level. Good ore has also been disclosed on the 800-ft. level. The mill was closed down in the spring and development undertaken at and below the 400-ft. level. The prospects now are that the mill can be started with the prospect of a large supply of ore blocked out and ready for extraction. D. G. Overall, of Angels Camp, superintendent.

ELDORADO COUNTY

Karpendar—The shaft has been deepened to 160 ft. and good pay gravel disclosed. E. N. Walker, Smith Flat, superindent.

Chile Ravine—This gravel mine at Placerville has been sold by A. W. Tennant to the Atwood Mines Syndicate, of San Francisco; 20 men will be employed. W. A. Sanders, superintendent.

HUMBOLDT COUNTY

Coronade Oro—Dr. F. H. Ottmer and others, of Eureka, have filed on 15,000 in. of water in Cedar Creek to be used in operating two giants to be installed at this hydraulic mine. The gravel has been developed by tunnels. Water has also been secured from Hawkins Creek.

Horse Mountain Copper Mining Co.—Five additional claims have been purchased. A deposit of copper-bearing sulphides was recently disclosed.

INYO COUNTY

Skidoo Mines Co.—During the month of June, in which ten days were lost, 1186 tons of ore were milled from which was produced; amalgamation bullion, $11,349; cyanide bullion, $5604, making total receipts of $16,953. The costs were:—For development, $1399; for operation $7,819; a total of $9218, leaving net profits for the month of $7734.

Loretta—A contract has been made with the Nevada-California Power Co. for the construction of an electric power line from the Goldfield wires at Gilbert Hill to the mine which is on the west side of Eureka Valley, 18 miles from the summit of the White mountains. The foot wall has recently been cut in the vertical shaft at 865 ft. While awaiting the installation of a new hoist prospecting is being done. A crosscut has been driven 110 ft. without finding the hanging wall. It is the purpose to deepen deposits of solid sulphide ore will be ensolid deposits of sulphide ore will be encountered at that depth. The ore so far developed has shown some rich sulphides in small bunches carrying gold and copper. The mine was discovered by William Eva in 1879; was acquired by the Schwab interests and the Loretta company was organized in 1896. Should development warrant it is the intention to build a smeltery and construct a railroad from the mine to Coaldale, a distance of about 60 miles.

MODOC COUNTY

Fort Bidwell Consolidated—High-grade ore is reported to have been disclosed at 200 ft. depth. The 10-stamp mill is again in commission. At a recent meeting of the stockholders the management of the company was taken over by a new board of directors. A. J. Cummings, general manager.

SIERRA COUNTY

Brown Bear—At this gravel mine, near Goodyear Bar, a steam plant for pumping and hoisting has just been installed. J. G. Jackson, of Oakland, is operating under bond.

Kate Hardy—New machinery of a heavier type for sinking and hoisting by electric power is being installed at this Forest mine. W. M. Beggs, of San Jose, and associates are owners.

Bellevue—At this La Porte mine gravel rich in coarse gold is being taken out. A large force of men is at work extending a wagon road to the mine from Little Grass Valley.

Sierra del Oro—At this old property, once known as the Ironsides, at the head of Jim Crow Cañon, southeast of Downieville, a rich strike has just been made, more than $3000 having been hand mortared from less than a wheelbarrow load of quartz, and $10,000 having been obtained by amalgamation from less than two tons of ore milled at Alleghany. A large percentage of the gold is in very rich arsenical sulphurets. A tunnel has developed 100 ft. of payshoot, with 60 ft. of backs in the face. The vein averages four feet in width. This rich ore was taken from a stringer near its contact with the main vein. The formation is slate and porphyry. The property is owned by District Attorney W. I. Redding and John Mayer, of Downieville, and Hugh McCormick, of Forest.

Keystone—At this old Sierra City mine a vein of high-grade ore has just been struck. The drift has been run on this shoot over 30 ft., with 1200 ft. of backs. S. W. Van Syckle, of Newark, N. J., is operating under bond.

Colorado

BOULDER COUNTY

Boulder Tungsten Production Co.—This company is installing an electric hoist and pumping plant preparatory to sinking a shaft to a depth of 500 ft. Systematic prospecting has been done which has developed several large tungsten veins. The company is considering the erection of a concentrating mill in the near future. The property is at Nederland near the dam of the Central Colorado Power Co. J. G. Clark, of Boulder, manager.

Colorado Tungsten Mines Co.—This company at Carrie Nation Park, has developed a new vein. During the last six months 1200 ft. of drifts and crosscuts have been driven with satisfactory results. The mill is running full time making a high recovery.

Silliman & Lively—These men, lessees on the Argo at Jamestown, have developed a wide silver-lead vein upon which they have driven 60 ft. The property is developed by tunnel and all work is done by hand. The lessees are shipping a car of ore per week. The property is owned by McIntosh & Clemens of Boulder.

Clear Creek and Gilpin Counties

American—It is reported that money has been raised to resume the development of this property on Democrat mountain, where five men are now employed on preliminary work. Plans include driving a new main working tunnel and construction of four buildings, bunkhouse, blacksmith shop, storehouse and manager's cottage.

Portland—Development of this property on Democrat mountain has been resumed. The crosscut tunnel will be advanced to intersect the Portland vein, upon which drifts will be driven. Arthur Roberts, manager.

Centennial—This mine in Hukill Gulch is being developed by lessees. The shaft is being sunk and is now 16 ft. below the tunnel level. The vein is 4 ft. wide and contains a band of rich ore. A small shipment has just been made.

San Juan District

Control of the Telluride Power Co., capitalized at $20,000,000, and owning six large hydro-electric power plants in Colorado and Utah, has passed into the hands of New York, Boston, and Cleveland capitalists. J. R. Nutt of Cleveland, acting for the Eastern men, bought $5,000,000 worth of the company's stock. It was announced that the bonds would be taken over on Oct. 1. The stock was sold at 25c. per share.

Morning Star—Development and operation will soon be resumed. The water-power compressor plant, has been repaired and placed in working order. A new boarding house will be built at the portal of the Sunshine tunnel. The plans are to advance this tunnel 800 ft. W. R. Vanderveer, manager.

San Bernardo—This property near Ophir Loop is being examined and milling tests are being made to determine the advisability of reconstructing the mill and operating the mine.

Lewis—The mine and mill are in operation. The mill will treat 60 tons of silver-lead ore per day throughout the remainder of the open season. Concentration is about 5:1. The mill is at an altitude of about 12,000 ft., and on account of the heavy snowfall during the severe winters the mill can operate only during summer and autumn. Development work is continued during the winter. The main shaft is 500 ft. deep.

Silver Bell—The breast of the crosscut is now 1800 ft. from the portal. The tunnel is 6x7 ft. in the clear. Two blind veins have been cut, one of which is 13 ft. wide. The pay ore contains copper sulphides and lead, with gold and silver. The crosscut is being extended at the rate of 4 ft. per shift to cut the Ida vein. The equipment includes an Ingersoll compressor and air drills.

Saguache County

Rawley Mining Co.—During July, the development and drainage tunnel at Bonanza was advanced 555 ft. On Aug. 1, the bore was in 5239 ft. The advance of 555 ft. in July was made in 26 days' actual working time in the heading, five days having been lost during the Independence Day period and in timbering. It is anticipated that the remaining 1000 ft. of the proposed bore will be completed within 60 days; 50 men are now employed.

Teller County—Cripple Creek

Portland—Shaft No. 2 is now 88 ft. below the floor of the 1500-ft. level and it is expected to encounter water at about the 1600-ft. level. Laterals will then be driven to open the ore now being stoped on the 1500 level.

Vindicator—On the 1500 level there are four machines working in ore and Superintendent Nagel reports that five veins opened at this depth are as good as found above. All the lessees, as well as those on the Hull City, have been successful during the last two months.

Free Coinage Estate—From the fourth level of the Pinto shaft 2- to 3-oz. ore has been sent out by Walker & Co., lessees.

Dead Pine—It is reported that the output from this and the Crown Point mine by lessees Duncan & Carnduff will reach about one carload per day of rich ore, and that this ore has been opened for a length of 100 ft. on three levels.

Idaho

Idaho County

Parr—A rich strike was recently made on this property, which led to the bonding of the group. A shaft has been sunk 65 ft., from which drifting has been started.

Jumbo—This property will be running at full capacity in about 10 days. The mill has recently been overhauled and put into good shape.

Revenue—A strike of high-grade silver ore is reported from this property.

Brown Bear—During the last year much development work has been done on this property; a large quantity of ore being opened up. The owners are now contemplating the erection of a 10-stamp mill before the beginning of winter.

Gold Point—The mine and mill recently acquired by W. W. Seaver and associates of Grangeville are being put in running condition. The properties are under the management of A. L. Flagg, of Spokane.

South Fork—The mine and mill are being operated steadily. The company has begun to ship concentrates to the Tacoma smeltery.

Kansas

Crawford and Cherokee Counties

The litigation over the Katy and the White Eagle properties, near Baxter, has been settled and both properties are being reopened under one management.

Pittsburg Zinc Co.—At the smeltery at Pittsburg, 65 men are on strike for 25c. more per day. Four blocks of retorts are now on a dead fire and the company states that it will pull the fires rather than increase wages, as the margin between the price of ore and the price of spelter is too small to permit it. This company has been taking 350,000 lb. of "jack" per week from the Joplin district, and extensive improvements, including the installation of a mechanical roaster, have been made lately.

Louisiana

Gulf Refining Co.—A well has been brought in by this company about 14 miles northeast of Mansfield. The Standard Oil Co. has brought suit to enjoin the Gulf company from sinking any wells on its land or lands upon which it holds mineral leases; individuals have also filed a suit against the same defendant enjoining it from tresspassing on their land.

Big Ten Oil Co.—This company brought in a gusher in the Vincent oil field, west of the city of Vincent, which is now producing between 800 and 1200 bbl. per day. The flow was reached at a depth of more than 2100 feet.

Maryland

It is reported that the Pittsburgh Steel Co. has secured extensive limestone deposits near Williamsburg, Md., just off the main line of the new Western Maryland extension, between Cumberland, Md. and Connellsville, Penn. It is planned to have a spur of this line built through the property, which the company secured for the purpose of supplying its future blast furnace requirements at Monesson, Penn.

Michigan

Copper

Mass Consolidated—Shipments are now being made at the rate of about 450 tons per day. The trestle on the Mineral Range R.R., which was expected to be ready about a week ago, has prevented increased shipments. It is now stated by railroad officials that this trestle will be in order within another week.

Osceola—Water in the No. 4 North Kearsarge shaft has been lowered to about 30 ft. above the 15th level. Drifting on the 10th and 12th levels north, which are now in close to the Allouez boundary, has been stopped, because of the possibility of running into quicksand. Shipments have recently declined on account of water troubles, and are now about 300 tons daily.

Isle Royale—A new test pipe is being sunk at the site where it is proposed to sink the new No. 7 Isle Royale shaft. The overburden is 120 ft. deep.

Allouez—Shipments from No. 2 shaft now exceed 700 tons daily. Sinking has been stopped temporarily, but will be resumed in short order; the shaft is now between the 21 and 22 levels. Sinking has been resumed at No. 1 shaft; the new rock-house at shaft No. 2 is practically completed.

Iron

Lake shipments of iron ore continue large, and for 1912 will establish a new record.

Stephenson Charcoal Iron Co.—The charcoal iron furnace of this recently organized company was recently blown in at Wells.

Negaunee—Contracts have been let to Lipsett & Sinclair, of Marquette, for the erection of a combination shop building, 33x134 ft., divided into blacksmith, machine and carpenter shops; and for the erection of a warehouse, 30x56 ft. The buildings will be of white brick and steel, and will be erected near the mouth of a tunnel leading to the shaft, through which electric-tram cars will run to convey timber, tools and supplies.

Montana

Butte District

Butte & Superior—It is stated that D. C. Jackling, has been appointed manager of this company, and that the stockholders may be given an opportunity to subscribe to stock of a new company, which will be formed to take over numerous claims nearby and adjoining the Butte & Superior property.

Butte & London—It is understood that engineers are now at work on a report on the property and that it will include the results of the crosscut which is now being driven by the Anaconda eastward to the Green Leaf and Anaconda property, east of the Butte & London, which has been partially developed by a 1000-ft. shaft. The crosscut is said to pass directly through the Butte & London ground. The report will be forwarded to Eastern men who are negotiating for control of the mine.

Anaconda—This mine, which has been closed since September, 1908, on account of an old fire, has again been reopened. During the long shutdown the fire zone has been thoroughly walled in with cement and bulkheads. The entire shaft from the surface to the 2400-ft. level has been retimbered. Some portions of the mine have been worked through the St. Lawrence.

Hidden Lake—Negotiations for the sale of this group of claims in the Georgetown mining district have been made, and recently representatives of Eastern men have been making an inspection of the property. The prospective purchasers secured a short-time option.

Madison County

Montana-Illinois — The Montana-Illinois Copper Mining Co. recently held its annual meeting and elected as a board of directors Del Clark, B. W. Wilson, J. W. Brown, W. G. McCornack, J. C. Oberon, L. H. Stanhope, and Alexander Mackel. The company owns 11 patented claims 20 miles south of Jefferson Island in the Tobacco Root mountains. Development work is being done with a force of 18 men in the Bismarck and First Extension claims, and a 100-ton mill now in the course of erection will be completed in about two months. A good grade of copper ore has been discovered in the end of the lower tunnel in the Bismarck, and a motor traction engine has been acquired to haul the concentrates from the mill to the railroad at Jefferson Island. The mill will be operated by water power, and machine drills are now in use.

Nevada

Churchill County

Nevada Hills—The report of the company for the month of June states that 3450 tons of ore was milled of the gross average value of $34.48 per ton; net profit, $71,102, or $20.61 per ton. Operating costs were reduced from $11.06 per ton in May to $9.70 per ton. From the net profits the sum of $8000 was deducted for depreciation of buildings and equipment. The total recovery was 87.9 per cent.

Clark County

Bullion—Tursick & Munzeberg, lessees of this property, recently shipped two cars of lead ore to Salt Lake smelters, which netted over $2500. They have opened a vein of galena, and as their lease expires in November, the ore is being extracted with all haste. The property is seven miles from Jean, on the San Pedro railroad.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended July 25, are as follows:

Mines	Week	Year to Date
Tonopah Mining....	3,400	99,769
Tonopah Belmont	2,450	61,476
Montana Tonopah	1,053	30,585
Tonopah Extension.......	1,065	29,348
West End	800	21,349
Midway		300
MacNamara		10,935
North Star		80
Totals	8,768	253,842
Estimated value	$219,200	

Tonopah Mining Co.—The report for the quarter ending May 31 shows that during that period, ore of the gross value of $832,075 was milled and that the net income amounted to $453,796. Dividends to the amount of $400,000 were paid and $15,239 was spent on exploration work. The cash balance and quick assets amount to $1,875,212.

Tonopah-Belmont—A test of the first tailings from the new 500-ton mill indicates that 96.66% of the gold and silver were recovered.

Tonopah Extension—A new block of good milling ore has been opened on the 500-ft. level, which is believed to be an entirely new vein.

MacNamara—Two new shoots of high-grade ore have been opened on the 275- and 300-ft. levels.

White Pine County

Copper Mines Co.—This company recently shipped about 300 tons of high-grade copper ore to the Steptoe smeltery. The shipment came from the Minnesota claim of the Butcher Boy group.

Nevada Consolidated—Five new settling reservoirs have been completed at the Steptoe concentrator, thus enabling a total water saving of 50% to be made. The five reservoirs have a total settling surface of about 90,000 square feet. The water is returned to the mill at the rate of about 5000 gal. per min. The work of building these reservoirs involved the removal of 18,000 cu.yd. of earth. Before the tanks were installed muddy water caused valve trouble and frequent shut downs.

New Jersey

Diamond drilling of the magnetite orebodies at Ringwood, will soon be started by the Charles Gravey Diamond Drilling Co., of Mineville, N. Y. A magnetometric survey of these deposits was recently completed by S. H. Hamilton.

United Zinc Co.—The United Zinc Companies of Maine have brought suit against the former directors and their associates of the United Zinc Companies of New Jersey. The plaintiff is the assignee of the New Jersey company. It charges that the defendant conspired to purchase certain properties and to sell them to the company at exorbitant prices. Damages are placed at $500,000.

New Mexico

Grant County

Doc Walsh—J. C. McKee, of Hanover, has leased this claim and has drifted into a new shoot of lead-carbonate ore.

Empire Zinc Co.—This company, operating in the Hanover district, recently found a rich zinc deposit, and at a place where no surface indications could be seen. This discovery is important, as it seems to confirm the belief that in this district large deposits occur at depth The work in the past has been largely near the surface. The shipments are made regularly to Mineral Point, Wis.

Silver Cell—The work of developing this mine, near Pinos Altos, recently acquired by G. L. Rule, and associates, of Oklahoma, has been going steadily forward. While retimbering the old shaft, a small shoot was noticed, which was sampled and was found to be rich in silver. A drift was started at once on the shoot which has widened to 17 in. and now shows as a distinct vein.

Cleveland—The new mill has been doing satisfactory work. It is expected that the total shipments for the week ended Aug. 1 will be four cars. George Utter, owner.

Chemung Copper Co.—Phelps-Dodge & Co. have secured control of this property, in the Burro mountain district. It is reported that about 2,000,000 tons of low-grade ore is blocked out.

Chino—The present treatment capacity of the mill is approximately 3000 tons of ore per day in the sections now in operation.

SANTE FÉ COUNTY

Sunset Mining & Smelting Co.—The first car of zinc concentrates was recently shipped by this company, of which W. H. Staley is president. Mr. Staley states that there is another car of zinc concentrates and one car of high-grade lead concentrates on the mill floor ready for shipment.

New State Smelting Co.—The smeltery on the site of the old stamp mill in the southern part of the city of Socorro has been completed, and now is in blast. W. H. Case, of El Paso, is the promoter of this enterprise.

SOCORRO COUNTY

Ernestine Mining Co.—The output for the last ten days of July amounted to 1000 lb. of gold and silver bullion and 5½ tons of concentrates.

New York

Hudson Iron Ore Co.—This company has leased a tract of land adjoining its present workings at Fort Montgomery, on the Hudson River near West Point, and is preparing to sink a new shaft on the property.

Pennsylvania

Jones & Laughlin Co.—During August this company will begin the operation of the first duplex steel process in the Pittsburgh district at its Aliquippa plant. The process is designed to reduce to a minimum the amount of scrap material necessary in making openhearth steel. When this process is started the company will be practically out of the market as a consumer of scrap. The No. 4 stack will be blown in for the first time; then all the 10 stacks of the company will be in operation.

Oregon

DOUGLAS COUNTY

Independent—The Tonopah Mining Co., has taken an option on this copper property near Riddle.

Utah

JUAB COUNTY

Tintic shipments for the week ended July 26 were 189 cars.

Yankee—The development of zinc ore between the 100- and 200-ft. levels continues, and the ore appears to be making in the direction of the May Day, where ore of a similar character is being developed. About six cars of dump ore weekly are being shipped.

Eagle & Blue Bell—The third car of ore from the new find on the 700 level has been shipped. For every car mined on the 1300 level three cars are being developed, and more ore is being opened on the 1200. It is thought that the ore opened on each of these levels will be found to belong to the same orebody.

May Day—The new electric hoist will soon be in running order, and shipments of zinc ore will begin as soon as freight rates have been adjusted.

Richmond-Anaconda—A notice has been sent to stockholders of a meeting to be held Aug. 6, for the purpose of voting on the proposition of bringing the affairs of the company to an end and transferring its property to the Uncle Sam company for the 250,000 shares to be provided by the increase in the capitalization of the latter company from 500,000 to 750,000 shares. The Uncle Sam owns 400,000 of the 500,000 shares, at which the Richmond-Anaconda is capitalized.

Iron Blossom—This company shipped 36 cars during the week ended July 26, the output coming about equally from the No. 1 and No. 3 workings.

SALT LAKE COUNTY

Work is being done at the Brandborg Contention, Reed's Peak, and Tar Baby, in Big Cottonwood Cañon.

Bingham-New Haven—This company has entered into an agreement with the Utah Consolidated, according to which its ores and concentrates are to be shipped to the International smeltery, at Tooele, by way of the Utah Consolidated tramline. New bins are being built at the Utah Consolidated mill station to accommodate this ore. The Bingham-New Haven adjoins the Utah Consolidated on the south.

Alta Consolidated—Five cars of rich ore are on the way to the market.

Cardiff—The south drift from the upper-tunnel level is producing 40 to 45 tons of rich ore weekly, and the north drift is being driven through mineralized quartz. The winze, which is being sunk from the upper tunnel, is down 85 ft., with 150 ft. more to go to reach the lower tunnel level. The lower tunnel is in about 530 ft., and the contact is looked for at any time.

Utah Copper Co.—All the units of the Magna plant are in operation, as are also 11 of the 13 units of the Arthur mill.

SUMMIT COUNTY

Thompson-Quincy—The quartzite-limestone contact has been reached, and ore has been opened. The ore contains silver, some lead, copper and zinc, and a trace of gold. There are rich streaks in the vein.

TOOELE COUNTY

International—E. P. Mathewson has asked for an appropriation for two more lead furnaces, making six in all. Material for four furnaces has been ordered and with these completed the plant will have capacity only for ores now being received. Contracts signed and negotiations under way for lead ore will require two more furnaces.

UTAH COUNTY

Ore is being hauled from the Yankee, and the Dutchman is preparing the second shipment of the season, at these American Fork mines.

Eva—About 300 tons monthly of rich ore is being shipped. A gasoline hoist and aërial tramway recently installed will make an increase in the output possible.

Miller Mill—A car of ore was shipped recently from this American Fork mine, and conditions are promising.

Pacific—A car of ore from this American Fork mine has been shipped. Several men are working and another car will soon be ready for shipment.

Washington

A.A. 1—At this mine on Snake River a rich strike at the 600-ft. level has been reported.

Canada

ALBERTA

Oil has been discovered near Okotokox, about 30 miles southwest of Calgary.

NOVA SCOTIA

Cape Breton Coal, Iron and R.R. Co.—The company recently floated a first mortgage bond issue of £300,000, and will reopen the colliery.

ONTARIO

An engineer has been investigating the Sudbury district for the American Smelting & Refining Co., and has under option, a number of nickel properties upon which development work will soon be started. It is the first time that this company has made any real effort to enter the district, but it has resulted already in a marked move on the part of the other companies to secure more nickel mines.

Dominion Nickel Copper Co.—This company has two drills at work on the Murry mine, and the same number will soon be at work on the Cochrane and McVittie, Blue Lake claims recently secured on a working bond.

Colonial Nickel Co.—This subsidiary of the International Nickel Co. has acquired options on the Strathcona, Little Bobs, and other nickel properties in the townships of Levack, Morgan, Bowell, Cascaden and others along the North Range, in the Sudbury district. About 8 or 10 diamond drills will be put in operation on these properties before the end of August.

Canadian Copper Co.—This company is to operate two diamond drills on the Tam O'Shanter property on the Algoma Eastern R.R., about half way between Copper Cliff and Creighton. This will be the first real development work to be done on the property.

Mond Nickel Co.—The company is pushing work on the Coniston smeltery, and many houses are being built. The Canadian Pacific Ry. has just completed a station for the town.

American Cyanamid Co.—This company, of Niagara Falls, has made a contract with a construction company of Boston, Mass., to double its capacity, at a cost of $500,000. The company is operating by the Frank & Caro process (German), which produces a nitrogenous fertilizing material, the nitrogen of which is derived from the atmosphere.

ONTARIO—COBALT

Right of Way—This company has dropped its options on the properties it has been working in the Silver Mountain district near Port Arthur.

La Rose—The financial statement as of July 1 showed cash in the bank and ore on hand, in transit and at the smelteries, to the value of $1,717,710.

Nipissing—The statement of July 1 showed cash in the bank and ore on hand and at the smelteries, to the value of $1,493,283.

Coniagas—The old shaft in the northeast corner of the property, in the center of the town of Cobalt, will be re-opened and deepened for an exploration of this portion of the property.

Dominion Reduction Co.—This company, which is operating the Nova Scotia mill, has made its first shipment of bullion, consisting of 23,603 oz. fine silver, from Crown Reserve ore.

ONTARIO—GOWGANDA

South Bay—This Gowganda company has started work and to date four veins carrying silver have been uncovered.

Millerette—Good ore is being taken from the lower levels. The small concentrator is handling 45 tons per day.

Miller Lake-O'Brien—The main shaft is down 250 ft., and drifting has been begun. A shot drill has proved the vein to another 100 ft. and the shaft will be sunk to that depth.

Mann—This company recently acquired the Boyd-Gordon mine.

McIntyre—On information furnished by the inspector of mines, this company was fined $100 for negligence resulting in the death of an electrician.

Preston-East Dome—This company has closed its Porcupine property, and still having some money to spend, will try leasing in Cobalt.

Hollinger—Trouble is still being experienced with the mill, and the bullion output for the month will probably be low.

ONTARIO—PORCUPINE

Swastika—Plans for the mill have been prepared and work started on the foundations. The mill will have a capacity of about 60 tons per day. The amalgamating process will be adopted and should conditions warrant it later, a cyanide plant will be installed.

Kamascotia Lake—The Detroit men who have purchased 25 claims in Turnbull and Robb townships, have started work with Thomas Rogers, formerly with the Pearl Lake company, as superintendent in charge. They are making a townsite at Kamascotia Lake, 15 miles northwest of the town of Timmins.

QUEBEC

East Canada Smelting—The new 19,400-ft. Bleichert tramway was put in operation on July 26, carrying as high as 30 tons per hr. though 20 tons is the rated capacity. The tramway was constructed in record time, which is the more noteworthy when it is considered that for two miles of the distance, piles had to be driven for foundations for the towers in crossing a low swampy stretch of land. About 150 tons of 4½% copper ore are being sent out daily by the tram; shortage of labor has up to the present prevented the shipment of 200 tons per day, as planned. A new Canadian Rand 10x12 hoist has been ordered. In cutting No. 4 station, the best grade of ore yet disclosed in the mine was recently encountered.

Mexico

JALISCO

Mezquital Del Oro—This gold mine north of Guadalajara is under option to an American syndicate. It was extensively developed and operated by an English company, but has been idle except at intervals, for several years.

Africa

RHODESIA

Gold production for the month of June was 53,875 oz., or 1789 oz. less than in May. For the half-year ended June 30 the total was 306,269 oz. in 1911, and 314,037 oz.—or $6,491,145—in 1912; an increase of 7768 oz. this year. Other mineral production for the half-year was 86,461 oz. silver, 298 tons lead, 28,935 tons chrome ore and 1.35 tons tungsten ore. The coal mined was 99,482 tons, all from the Wankie colliery.

TRANSVAAL

Owing to recent attention having been drawn to the accident rate. the government is appointing four additional mine inspectors for the Rand. Now that so many mines are sufficiently developed to enable the breaking of ore to be confined to the day shift only, it is probable that an effort will be made to introduce the blasting gang which will load and fire all holes when the mine is deserted, thus it is hoped to develop better efficiency in the use of explosives and avoiding accidents. There are, however, many objections to this scheme owing to local conditions.

Victoria Falls Power Co.—The issue of £1,000,000 debentures was not a success, as the guarantors had themselves to take up the bulk of the issue. This money is to complete the supply stations in the neighborhood of Johannesburg, and there is no intention of reverting to the original scheme for obtaining power from the Victoria Falls.

State Mines—The vein intersected by the shaft proved 31 in. in width, assaying 7.15 dwt. This value is considered quite satisfactory, and gives evidence of the existence of another large mine between, the New Modderfontein, Geduld and Brakpan. The reef was also intersected at 1800 ft. in the Rand Klip mine on the east of Modder B; it assayed 2.18 dwt. over 54 in.

Consolidated Langlaagte—The new 100-stamp mill is ready to start when electric current is available from the Victoria Falls Power Co's new stations.

Asia

CHOSEN

Oriental Consolidated Mining Co.—The clean-up for July was $135,000. At present grinding is being done to finer size than formerly; 90% of the material now passes a 200-mesh screen. The circulation pumps for the Merrill precipitation presses have been speeded up and by the addition of another Pachuca agitator the time of agitation can be increased 20%, thereby increasing the extraction, which even now is high. It is thought that a recovery of 95% of the gold can be effected eventually.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Aug. 7.—There is practically no change in coal trade conditions in the West. A gradual improvement in general business is going on. Lake trade is better, as coal is moving more freely.

The seaboard bituminous trade shows a little better demand and corresponding firmness in prices. Coastwise trade is improving.

Anthracite trade continues active and the collieries are busy making up the deficit caused by the stoppage of mining in April and May. July and August shipments are expected to be heavy.

United States Foreign Trade—Imports of coal and coke into the United States six months ended June 30, long tons:

	1911	1912	Changes
Anthracite	... .	23	I. 23
Bituminous	693,271	754,645	I. 61,374
Coke	44,945	41,127	D. 3,818
Total	738,216	795,795	I. 57,579

Canada furnished this year 669,697 tons of coal and nearly all the coke; Australia, 76,476 tons of coal.

Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, six months ended June 30, long tons:

	1911	1912	Changes
Anthracite	1,706,134	1,131,453	D. 574,681
Bituminous	5,577,567	6,405,519	I. 827,952
Coke	512,271	500,048	D. 12,223
Bunker coal	3,296,617	3,718,480	I. 421,863
Total	11,092,589	11,755,500	I. 662,911

The bunker or steamship coal is practically all bituminous. Canada took this year 5,098,055 tons of coal; Cuba and the West Indies, 956,111; Mexico, 190,843; Panama, 239,879 tons.

IRON TRADE REVIEW

New York, Aug. 7—The position of the iron and steel markets remains much the same. Business is remarkably active for the season and the mills generally are so full that deliveries are getting to be quite an important question. Some of the structural and plate mills, for instance, talk about three or four months on new deliveries. Prices are working up gradually and advances do not seem to check new business.

In the pig-iron market the chief incident has been the placing of some large orders for bessemer pig with merchant furnaces by the Steel Corporation and by some independent concerns. One contract is reported to be for 100,000 tons. Outside of this there have been some large sales of basic pig, and fair orders for foundry iron. Sellers are firmer in their views, especially for deliveries running into the third quarter of the year.

Weather conditions have lately been quite favorable to steel-mill operations, but the labor supply is as poor as ever, and there is universal complaint. At many points the shortage is cutting into production, although probably only by a few per cent. July was relatively a poor month for shipments, as a number of mills were closed for various periods for repairs, and a very hot spell early in the month affected production seriously. It may be estimated that shipments of steel products averaged 15 per cent. less in July than in June, but this is a small decrease compared with what usually occurs in July. A few interests maintained shipments, but some experienced a decrease of fully 20 per cent. August shipments will be larger, and if weather conditions are favorable they will probably equal the rate in June. The realized prices on shipments are gradually increasing, but at rather a slow rate. The mills really have a large tonnage of low-priced business on books, and while they have been making sales right along as prices advanced, the additional tonnages sold are relatively small.

The Stanley Committee, which has been investigating the Steel Corporation, has presented its report—or rather its reports, for there are two minority statements. The majority report recommends legislation to restrain trust operation in various ways; one minority report adopts Judge Gary's views, including some government regulation of prices. It is not likely that Congress will take any action on the reports at this session.

Alloy Steel Rails—The quantity of alloy steel rails made in 1911, as reported by the American Iron & Steel Association, was 153,898 tons, of which 115,450 tons were bessemer and 37,540 tons open-hearth titanium steel. The remaining 998 tons were nickel and manganese steel. The total quantity was 103,426 tons less than in 1910. Alloy steel rails were 5.4% of all rails made in 1911. There were 462 tons of rails made from steel refined in the electric furnace.

Baltimore

Aug. 5—Exports for the week included 44,693 lb. lead, 295,540 lb. steel rails and 100,824 lb. angles and bars to Belfast; 788,990 lb. steel billets and 440,310 lb. scrap steel to Glasgow. Imports included 11,650 tons iron ore from Cuba.

Birmingham

Aug. 5—Southern pig-iron sales right now equal about the make if not a little more. Preparations are under way for an increased iron make, one furnace to be blown in during the next two weeks by the Sloss-Sheffield Steel & Iron Co. and another to be ready by the end of the month. The Sloss-Sheffield Co. is pushing the work on a second furnace and will have it ready before long.

Pig iron quotations are around $12 per ton, No. 2 foundry. While the prices for third-quarter delivery are stated at $11.50, there is very little iron selling at that price. Much care is being exercised in the sale of low-grade iron, the furnace companies not caring to stock up too strongly on this kind of business. A few sales in lots of 500 and more tons have been booked recently. Southern cast-iron pipe makers will need considerable iron for the balance of the year. The Central Foundry Co. will have its new pipe foundry at Holt in operation in the next few days while the United States Cast Iron Pipe & Foundry Co. will have its Dimmick plant at North Birmingham in full operation soon also.

There is a steady demand for steel rails, fabricated steel and wire goods. The plants of the Tennessee Co. at Ensley and Bessemer and the plant of the Southern Iron & Steel Co. at Gadsden, are doing well.

Chicago

Aug. 5—Sales of pig iron have been light in the last week, compared with the previous week, but have amounted to a fair tonnage for midsummer. Most of the buying has been in small lots—of less than 1000 tons each—though inquiries continue concerning some larger amounts. Prices held firm, Northern No. 2 selling at $15.50 furnace, which means about $15.90 delivered, and Southern at $12 Birmingham, or $16.35 Chicago.

Most of the users of large amounts of pig iron seem now to be well supplied for the last half and they are looking more anxiously than the furnace agents to first-quarter requirements. At current prices much tonnage for the first quarter no doubt could be placed, but the sellers demand a premium and the melters are unwilling to pay it. Hence there seems likely to be a pause in buying until contracting generally for 1913 needs begins. The local furnaces are well sold up for this year's output and are not seeking much new business at current prices.

The market for iron and steel products continues active, despite further advances in prices. Some 28,000 tons of standard rails have been bought by railroads within the week and the demand for track fastenings is heavy. Building material continues in large demand over a wide territory and bars, plates and sheets sell heavily without effort of the producers. It is a strong market all around and one that seems destined to continue strong.

Cleveland

Aug. 5—A few small sales of ore are reported, but no large business is expected now.

Pig Iron—Business is active and the market is stronger. For the moment there is an unusually wide range on prices, but the tendency is towards the higher limit. Quotations, Cleveland delivery, are $15.15@15.50 for bessemer, $13.75@14 for basic, $13.75@14.25 for No. 2 foundry, and $16.25@16.50 for Lake Superior charcoal.

Finished Material—Specifications are heavy and the question of deliveries is coming up with many mills. There is no hunting for orders. The recent advances in price are generally well maintained.

Philadelphia

Aug. 7—The exceptionally strong position of the pig-iron market continues, notwithstanding demand has subsided somewhat. Some business would be done were furnace interests disposed to accept contracts for 1913 delivery. Makers are satisfied with the condition of their order books and see no occasion to sacrifice chances for higher prices later on by loading up at present figures. The larger consumers throughout the territory buying from eastern Pennsylvania are too well supplied for most of this year to bother over what course the market may take. Consumption requirements are increasing steadily. In low-grade irons for pipe-making purposes, several round lots were purchased for forward delivery as a protection against an impending advance. Southern furnace interests are in no position to make any trouble at present. Basic pig is nominally higher than a week ago and is hard to order. No. 2 X foundry is also quoted higher in response to a few large consumers, who are only sounding the market. The sentiment in crude-iron circles here is to let things drift, and to stand by outside quotations. No. 2 X foundry is $15.75@16.25; forge, $15.25; basic, $16; phosphorus, $20 per ton.

Steel Billets—Openhearth is quoted at $25.40, forging, $29.40, with probability of an advance.

Bars—All reporting mills are booking business faster than deliveries are made. The advance rather stimulates than retards business.

Sheets—An advance on loose-rolled sheets has been made and the volume of business is increasing.

Pipes and Tubes—The advance has served to quicken the activities of several consumers, who have been buying in a hand-to-mouth way.

Plates—The rush of enterprise in all lines of work calling for plates is overtaxing mill capacity. Some more orders for Western delivery have come to Eastern mills. In increasing instances premiums are offered.

Structural Material—It seems to be the rule rather than the exception to offer premiums, especially on the general run of orders floating in and calling for delivery this fall. Unlooked-for business is springing up.

Scrap—There is a decided scarcity of scrap for steel mills and orders are now in hand to be filled as soon as the stuff can be gathered together.

Pittsburgh

Aug. 6—The market on bars, plates and shapes is quotable at the $1 a ton advance stated as being in progress at the date of last report. Bars are now 1.30c. and plates and shapes 1.35c., Pittsburgh. While the steel mills do not admit that there is anything but an open market in steel products, the circumstantial evidence is that there is knowledge in certain quarters of these advances before they occur, and that when one interest makes an advance in its own prices, all others follow the advance within 48 hours.

Under date of Aug. 1 two of the principal producers of wrought-iron pipe in this district advanced their prices one point, and as another producer had already made an advance this may be considered general, although a large eastern Pennsylvania producer did not advance with the central western interests. The card discount on wrought-iron pipe, ¾ to 1½-in., inclusive, is now 73% off on black and 62% off on galvanied, advances in iron pipe corresponding to the two successive advances in steel pipe, July 24 being the date of the second advance.

Pig Iron—The Youngstown Sheet & Tube Co. has bought a large tonnage of bessemer pig iron, reported in some quarters as 50,000 tons and in others as 100,000 tons, details being carefully withheld. The purchases have served to stiffen the market, but prices were arranged before the advance from $14.25 to $14.50, Valley, reported last week. In addition, the company bought 20,000 tons of gray forge. The purchases of the Westinghouse Air Brake Co., referred to in last report, are now stated to have totaled 22,000 tons, of No. 2 foundry, forge and malleable. The Standard Sanitary Manufacturing Co. has since purchased 13,000 tons, for fourth quarter, 9000 tons of No. 2 foundry at $13.50, 1000 tons of the same at $13.25, 1500 tons of No. 3 at $13.25 and 1500 tons of forge at $13, prices named being f.o.b. furnace, one in the Valleys and one outside. It is doubtful whether much more foundry or forge iron can be secured at these figures. Sales of basic are reported, in some cases at higher than $13.50, Valley, but the sales are not fully identified and it is a question whether the market is yet quotable above this figure, although indications are that it shortly will be. The pig-iron averages, compiled by a trade interest from actual transactions, are given out for July as $14.25 on bessemer and $13.48 on openhearth, at Valley furnaces. We quote: Bessemer, $14.50; basic, $13.50@13.75; No. 2 foundry and malleable, $13.50; forge, $13@13.25, all at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The ferromanganese market has been relatively quiet since the $2.50 advance, and we quote prompt and forward at $51, Baltimore.

Steel—Transactions have been light and prices are not closely quotable because producers are so well sold up for the current quarter. For fourth quarter a few sales appear to have been made, at advances over third-quarter figures. We quote as follows for prompt and third quarter, with the observation that it might be difficult to secure any delivery desired: Bessemer billets, $21.50@22; bessemer sheet bars, $21.75@22; openhearth billets, $22@22.50; openhearth sheet bars, $22.50@23, all f.o.b. maker's mill, Pittsburgh or Valley.

Sheets—Specifications are coming in at a heavy rate, fully as well as in June, and prices are stiffening. Mills are running better than early in July, repairs having been pretty well completed. We quote: Black sheets, 28-gage, 2@2.05c.; galvanized, 28-gage, 3.05@3.15c.; blue annealed, 10-gage, 1.45@1.50c.; painted corrugated, 28-gage, 2.20@2.25c.; galvanized, 3.10@3.20c. per lb., Pittsburgh.

Connellsville Coke—The tone of the market has improved. There have been sales of prompt at $2.25, and one sale of 15,000 tons for August and September shipment at $2.30, while there is fairly large inquiry this week, much larger than in immediately preceding weeks. While certain of the operators still have an arrangement which has the appearance of artificial control, the market is really an open one, there being several other sellers, who are holding prices more firmly than formerly and expect the market to move upward as sales are made. We quote prompt furnace at $2.25@2.30; contract furnace at $2.30@2.35; prompt foundry at $2.40@2.50; contract foundry at $2.40@2.75, all at ovens.

St. Louis

Aug. 5—Business in pig iron is quite active, with a number of sales and more inquiries. Southern No. 2 foundry is quoted $11.50@12, Birmingham—$15.25@15.75, St. Louis—the tendency being to the higher figure. Northern No. 2 foundry is quoted $15.75, St. Louis. Sales of finished products are good.

Coke is firm, good foundry bringing $5.65 per ton, St. Louis.

Iron Ore Trade

Exports and imports of iron and manganese ores in the United States, six months ended June 30, long tons:

	1911	1912	Changes
Iron ore, imp......	801,868	994,476	I. 192,608
Iron ore, exp............	232,004	294,604	I. 62,600
Manganese, imp	84,325	104,432	I. 20,107

Iron-ore imports this year included 59,341 tons from Spain, 50,140 from Newfoundland, 200,606 from Sweden and 661,390 tons from Cuba.

Foreign Iron Trade

Chinese Iron and Steel—The Han-yeh-ping Iron & Coal Co. reports for 1911 a production of 93,327 tons of pig iron. Sales in China were 9824 tons. Shipments abroad were to Saigon, 40; Australia, 5765; United States, 4465; Japan, 58,535 tons. Production of steel bars were 1250 tons and of rails, 24,216 tons, all sold in China.

United States Foreign Trade

Exports and imports of iron and steel and of machinery in the United States for six months ended June 30, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1911	1912	Changes
Exports..	$124,733,874	$143,364,185	I.$18,630,311
Imports.. ...	15,928,432	13,475,783	D. 2,442,649
Excess, exp.	$108,805,442	$129,888,402	I.$16,187,662

Increase in exports, 14.9%; decrease in imports, 15.3%. The leading articles of iron and steel were, in long tons:

	Exports 1911	Exports 1912	Imports 1911	Imports 1912
Pig iron.	77,129	131,649	88,988	55,918
Scrap	15,518	55,280	11,656	8,120
Billets, blooms, etc	155,941	135,955	18,944	9,279
Bars	73,146	93,476	19,748	10,880
Rails	218,880	225,563		1,056
Sheets and plates.	165,217	200,366	1,242	1,330
Structural steel....	104,378	132,478		920
Wire-rods.........	8,189	32,788	8,817	7,262
Wire.................	107,269	114,423	.....	
Nails and spikes	36,150	50,502		.....
Tinplates	24,579	15,776	12,069	1,002
Pipe and fittings..	86,128	121,249	.....	

Imports of wire are not reported in quantities; values were $420,970 in 1911 and $420,714 in 1912. Exports of mining machinery in 1912 were valued at $3,343,963, a decrease of $192,769 from last year.

METAL MARKETS

New York, Aug. 7—The metal markets show only moderate activity, but there have been some fluctuations in prices. Lead is lower.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
June 1912..	$ 7,149,035	$ 5,611,057	Exp. $1,537,978
" 1911..	3,074,755	4,767,714	Imp. 1,692,959
Year 1912..	33,374,836	25,264,342	Exp. 8,110,494
" 1911..	13,251,562	33,773,026	Imp. 20,521,464
Silver			
June 1912..	5,045,944	4,879,485	Exp. 166,459
" 1911..	5,777,703	3,506,446	Exp. 2,271,257
Year 1912..	33,668,972	25,264,249	Exp. 8,404,723
" 1911..	34,443,203	21,960,601	Exp. 12,482,602

Exports from the port of New York, week ended Aug. 3: Gold, $686, silver, $1,294,299, chiefly to London. Imports: Gold, $79,434; silver, $144,825, from Mexico, Central and South America.

Gold—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. There was no special demand.

Iridium—The price for pure metal is a little higher at $63.50 per oz., New York.

Platinum—The market remains rather quiet, but there is no change. Dealers still ask $45.50 per oz. for refined platinum, and $48 per oz. for hard metal.

Silver—The silver market during the past week has been exceedingly quiet, the prices fluctuating between 27 11/16 and 27 9/16d. in London. Moonsoon reports from India continue favorable and the market closes steady with higher tendency.

SILVER AND STERLING EXCHANGE

Aug.	1	2	3	5	6	7
New York....	59⅞	60	59⅞	59⅞	60	60⅛
London.....	27 9/16	27⅝	27 9/16	..	27⅝	27 11/16
Sterling Ex..	4.8715	4.8710	4.8685	4.8700	4.8705	4.8710

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to July 25, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India..	£4,895,300	£4,068,200	D. £ 827,100
China	890,400	933,500	I. 43,100
Total ..	£5,785,700	£5,001,700	D. £ 784,000

Copper, Tin, Lead and Zinc

Copper—During the last week the market has been extraordinarily dull. European consumers seem to be feeding on the stocks accumulated over there and consequently refraining from buying in this market, especially inasmuch as they are supplied on favorable terms by interests holding copper who desire to realize. American consumers seem to be well provided for the time being and buy sporadically only. The largest agencies are standing pat for their price of 17¾c., delivered, usual terms, and claim to have made some sales thereat, but such take place manifestly under special conditions, copper being offered liberally at 17⅝c. by other agencies, some of whom report transactions at that price and others reporting failure to draw orders. Lake copper has sold at 17½@17⅝c., cash, New York, in lots of fair size. At the close Lake copper is quoted 17½@17¾c., electrolytic in cakes, wirebars or ingots, 17.45@17.50c. Casting copper is quoted nominally at 17¼@17⅜c., as an average for the week.

The London market for standard has fluctuated within narrow limits, and as a whole transactions were not large and there was no decided trend to the mar-

NEW YORK

Aug.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
1	17½ @17¾	17.45 @17.50	45	4.70	4.52½ @4.55	7.00 @7.10	6.85 @6.95
2	17½ @17¾	17.45 @17.50	44½	4.67 @4.70	4.52½ @4.55	7.00 @7.10	6.85 @6.95
3	17½ @17¾	17.45 @17.50	44½	4.67 @4.70	4.52½ @4.55	7.00 @7.10	6.85 @6.95
5	17½ @17¾	17.45 @17.50	44⅝	4.50	4.35 @4.37½	6.90 @7.00	6.75 @6.85
6	17½ @17¾	17.45 @17.50	45¼	4.50	4.35 @4.37½	6.90 @7.00	6.75 @6.85
7	17½ @17¾	17.45 @17.50	45⅛	4.50	4.35 @4.37½	6.90 @7.00	6.75 @6.85

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Aug.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
1	77⅞	78⅛	83	204	201¾	18 15/16	26⅛
2	78⅜	78⅝	83	202¼	199¾	19	26⅛
3						.	....
5	.					....	....
6	78⅜	78¾	83¼	204	202¼	19¼	26¼
7	78	78⅛	83¼	204	201⅛	19⅜	26¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

ket. On Aug. 1, spot closed at £77 17s. 6d. and three months at £78 2s. 6d.; on Aug. 2, it was 10s. higher. There was no exchange on Aug. 5, and on Aug. 6 the market was a trifle better at £78 10s. for spot and £78 15s. for three months. On Aug. 7 the bears were again in evidence, and the market closes lower at £78 for spot and £78 2s. 6d. for three months.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Visible stocks of copper in Europe on July 31 are reported as follows: Great Britain, 28,620; France, 7480; Rotterdam, 750; Hamburg, 4830; afloat from Chile, 2900; afloat from Australia, 6000; total, 50,580 long tons, or 113,299,200 lb.; an increase of 1490 tons over the July 15 report.

Tin—The market has been without special feature. After the Banka sale, the London market declined, and as the London exchange was closed from Friday afternoon until Tuesday, on account of the bank holiday, business here was practically at a standstill during that time. The market was weak on Aug. 1 and 2, but when on Aug. 3 London opened higher, our market followed suit, and closes at about 45⅛c. for this month's delivery.

On Aug. 1, the London market closed at £204 for spot and £201 15s. for three months, declined the next day to £202 5s. for spot and £199 15s. for three months. On Aug. 6 it advanced over £2 spot closing at £204 10s. and three months at £202 5s., closing on Aug. 7 at £204 spot and £201 2s. 6d. for three months.

Lead—On Monday, Aug. 5, the American Smelting & Refining Co. reduced its price ¼c., to 4.50c., and at this level there has been a better demand. At the close, St. Louis is quoted 4.35@4.37½c., and New York 4.50 cents.

The London market is firm. The scarcity of prompt material continues, and good Spanish lead has advanced to £19 7s. 6d. for prompt delivery. English lead is held at £19 10s. It is also noteworthy that there is a good demand for lead at the present level for forward delivery. The market closes at £19 17s. 6d. for Spanish lead, with English 2s. 6d. higher.

Spelter—The market has been quiet and somewhat easier. Some of the smelters have been desirous of marketing, having accumulated near-by spelter and have pressed this for sale. There has also been a disposition to take orders for the fourth quarter of the year. Prices are slightly lower, and at the close St. Louis is quoted 6.75@6.85c.; New York 6.90@7 cents.

The London market is firm, good ordinaries being quoted £26 5s. and specials £27 per ton.

Base price of zinc sheets is $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—The market has been a little more active, with fair sales. Prices are firmer at 24¼@24½c. per lb. for No. 1 ingots, New York.

Antimony—Business continues active and prices are firm. Cookson's is held at 8.60c. per lb. for spot and early deliveries and 8.50c. for September and forward. Hallett's and U. S. are 8c. for spot, while 7.50@7.75c. per lb. is asked for Hungarian, Chinese and other outside brands. All prices are ex-dock, New York.

Quicksilver—Business is fair and prices here are unchanged. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London price has been reduced 5s. and is now £8 5s. per flask, with the same price named from second hands.

Imports and Exports of Metals

Exports and imports of metals in the United States, six months ended June 30, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess	
Copper, long tons	171,312	93,044	Exp.	78,268
Copper, 1911....	170,541	77,855	Exp.	92,686
Tin, long tons....	332	26,075	Imp.	25,743
Tin, 1911........	763	20,687	Imp.	19,924
Lead, short tons.	37,574	48,802	Exp.	11,228
Lead, 1911......	57,332	46,169	Imp.	11,163
Zinc, short tons..	5,367	3,078	Exp.	2,289
Zinc, 1911......	3,238	1,166	Exp.	2,072
Nickel, lb........	12,618,669	15,735,845	Imp.	3,117,176
Nickel, 1911....	11,156,865	14,379,710	Imp.	3,222,845
Antimony, lb.....	51,132	8,207,650	Imp.	8,156,518
Antimony, 1911.	150,704	5,246,330	Imp.	5,095,626
Platinum, oz.....	....	49,431	Imp.	49,431
Platinum, 1911.	47	53,400	Imp.	53,353
Aluminum, lb..	9,656	10,660,688	Imp.	10,651,032
Aluminum, 1911	....	....	....	
Ores, etc.				
Zinc in ore, lb...	13,344,407	14,283,936	Imp.	939,529
In ore 1911....	12,300,655	16,369,122	Imp.	4,068,467
Zinc oxide, lb. ..	18,153,842	....	Exp.	18,153,842
Zinc oxide, '11..	17,797,759	....	Exp.	17,797,759
Zinc dross, lb....	384,695	....	Exp.	384,695
Zinc dross, '11..	4,991,630	....	Exp.	4,991,630
Chrome ore, l.t..	....	31,566	Imp.	31,566
Chrome ore, '11	5	22,868	Imp.	22,863

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Quantity of zinc ore imported in 1912 was 25,829 tons; exported, 12,240. Imports of aluminum were not reported previous to July 1, 1911. The metal exports given above include reexports of foreign materials.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 3—The base price paid this week for 60% zinc ore was $60. The base price paid for lead was $58@59 per ton.

SHIPMENTS, WEEK ENDED AUG. 3

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Shullsburg............	890,000	....	....
Mineral Point.... ...	774,180	....	....
Galena	551,000	....	....
Platteville	486,000	....	294,700
Hazel Green..........	440,000	....	....
Benton................	378,500	....	758,200
Cuba City............	252,320	....	231,600
Harker................	171,870	....	....
Highland...	113,600	....	....
Linden	63,910	....	60,000
Total........	4,121,380	....	1,344,500
Year to date..........	121,777,980	5,181,290	19,178,370

Shipped during week to separating plants, 2,415,880 lb. zinc ore.

Joplin, Mo., Aug. 3—The high price of zinc sulphide ore this week is $65.50, the base per ton of 60% zinc was $56@62.50. Zinc silicate sold for $32@34 per ton of 40% zinc. The average price all grades was $57.68. The high price of lead ore was $62 and the average price, all grades, was $59.80 per ton.

The zinc market took a slump this week and the high base went down to $62.50 and had it not been for the heavy buying of one company it would probably not have been that high. The demand eased up on the part of two of the other companies that have been buying heavily the past few weeks and by Thursday it was seen that the prices were

SHIPMENTS, WEEK ENDED AUG. 3

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,234,770	.....	966,800	$156,047
Joplin	2,599,850	......	255,130	85,521
Galena.	688,510	......	156,830	24,964
Alba-Neck....	777,760	......	13,440	24,124
Duenweg.....	740,280	......	24,460	22,941
Miami.	420,480	......	131,220	14,868
Oronogo.....	539,090	......	......	13,809
Granby	322,600	324,580	7,060	12,970
Cave Springs.	113,960	......	317,540	12,830
Carl Junction	318,340	.....	......	9,710
Spurgeon	152,600	193,310	31,480	8,623
Wentworth...	218,730	.....	......	6,342
Lawton.	189,400	.....	......	5,492
Carthage.. ..	143,000	.....	.....	4,147
Springfield....	88,000	.....	......	2,550
Sarcoxie	62,320	.....	......	1,806
Totals .. .	11,609,690	517,890	1,903,960	$406,744
31 weeks...	316,344,230	19,066,010	54,143,340	$9,953,132

Blende val., the week, $341,914; 31 weeks, $8,168,215
Calamine, the week, 7,886; 31 weeks, 285,732
Lead value, the week, 56,944; 31 weeks, 1,499,185

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January...	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February..	40.21	45.75	39.16	43.31	54.46	52.39
March. ..	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July. ...	40.75	58.85	38.56	56.59	58.81	58.83
August ..	42.50	..	41.28	.	60.74	..
September	42.63	...	41.29		59.3.	....
October.....	42.38	..	40.89	.	54.72	....
November.	45.40	.	43.27	.	57.19	....
December.	44.13	..	40.76	...	62.03	......
Year.	$41.45	.	$39.90		$56.76	......

NOTE Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold Lead ore prices are the average for all ores sold going to be lower. Mine operators are having considerable trouble by strikes for higher wages, but the strikes are of short duration as the demands of the strikers are met on account of the high price of ore.

Chemicals

New York, Aug. 7—The general market is quiet, with only a midsummer business forward.

Arsenic—Material for early delivery is still scarce and prices are irregular. Spot is quoted at $4.50@5 per 100 lb. Futures are $3.75@4.25, with little doing.

Nitrate of Soda—Spot price is unchanged at 2.45c. per lb. Futures are higher at 2.47½c. for September, 2.50c. for October-December, and 2.52½c. for January positions.

Current Wholesale Prices

Ammonium sulphate	cwt	3.25@3.28
Arsenic, white	lb.	0.03¾@0.05
Barytes, ground	sh. ton	12.50@14.00
" floated	sh. ton	16.00@17.00
Calcium acetate, gray	cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls	sh. ton	70.00
Carbons, good drill quality	carat	85.00
Cement, Port., Am.	400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburg	M.	175.00
ore, 50%, ex-ship, N. Y.,	lg. ton	14.00@16.00
Copperas, bulk	cwt.	0.55
bbl.	cwt	0.65@0.85
Copper sulphate	cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg	ton	8.00@9.00
Magnesite, crude, 95%,	lg. ton	9.00@11.00
calcined, powdered		30.00@35.00
brick, dom., f.o.b. Pittsburg	M	160@180
Paints, litharge, Am. powd	lb.	0.07@0.07½
red lead, American	lb.	0.07@0.07½
white lead, Am., dry	lb.	0.05¾@0.06¼
zinc white, Am., dry	lb.	0.05⅛@0.06¼
Phosphates, acid:		
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75
Potassium cyanide, 98@99%	lb.	0.19
Pyrite:		
Domestic, non-arsenical, furnace size, f.o.b. R. R. per unit		0.12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit		0.13½
Imported, arsenical, furnace size, size, ex-ship, per unit		0.12¾@0.13
Imported, fines, arsenical, ex-ship.		0.11@0.12
Imported, fines non-arsenical, ex-ship, per unit		0.12½

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

Sodium cyanide, 120 to 130% KCN (per 100%)	lb.	0.18
nitrate 95%, spot	cwt	2.15
95% future	cwt.	2.47½@2.52½
Sulphur, Louisiana prime, N. Y,	lg. ton	22.00@22.50
roll	cwt	1.85@2.15
flour	cwt.	2.00@2.40
flowers, sublimed	cwt.	2.20@2.60
pow. com., bags	cwt	1.50
Sicilian, crude brimstone	lg. ton	22.50
Zinc chloride, granular	lb.	0.04¼@0.04½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discount. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

Exports of mineral oils from the United States in June were 147,859,275 gal. For the six months ended June 30 the total exports were 826,578,486 gal. in 1911, and 842,083,490 gal. in 1912; an increase of 15,505,004 gal., or 1.9%, this year.

Mining Stocks

New York, Aug. 7—On Aug. 1 the Exchange was fairly active, with a general upward movement in prices. The Curb was active, but rather irregular. El Paso Consolidated and Stewart Mining advanced, but Tonopah Merger and West End Extension declined. Copper shares were dull and generally off a fraction.

Aug. 2 saw a few reactions but general firmness on the Exchange. The Curb was again rather irregular, the copper stocks showing most activity. Standard Oil, old stock, changed hands at $1040 per share.

Aug. 3, business on the Exchange was broader and more active, with moderate advances. The Curb trading was rather limited by the short day. Coppers were firm, business in other mining stocks being light.

Aug. 5 there was a slight reaction on the Exchange, followed by an increasing firmness. The Curb was broader and more active. Copper stocks were firm and there were good sales of other mining stocks. Standard Oil securities were in special request.

Aug. 6 and 7 business on the Exchange was on a moderate scale, with few changes and general firmness. The Curb was rather dull and interest in mining stocks was narrow, sales being few and price changes unimportant.

Sales of stock on the New York Exchange in July made up a total of 7,119,008 shares, which was 56,433 shares more than in June and 1,457,458 more than in July, 1911. Sales of bonds amounted to $51,198,000, being $5.684.000 more than in June, but $12,246,500 less than in July of last year.

Boston, Aug. 6—Mining shares do not do much either one way or the other. The market for these issues is at a low ebb, yet at the same time there is an undeniable strong tone. Butte & Superior has proven an exception to this, for not only has it been the most active stock on the list, but its fluctuations have been violent during the week. After breaking almost $6 to $38.25 it is back to $45.25. The development of this property into a zinc mine has created quite a furore for adjacent properties and the company itself, or its representatives, have options on several of them.

Lake Copper stock broke $4.25 to $33.75 but it has recovered all but $1 of the decline. This was largely a case of short selling and enforced covering.

The Calumet & Hecla management in the issuance of half-yearly reports of its subsidiary companies deserves warm words of praise. For the first half of this year Superior has earned $1.27 per share,

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	May	June	July
Alaska shipments	1,720,391	4,134,569	....
Anaconda	25,800,000	......	....
Arizona, Ltd.	3,500,000	3,300,000	......
Copper Queen	7,024,087	7,622,730	7,708,147
Calumet & Ariz.	4,424,000	4,160,000	4,748,000
Chino	1,275,850	1,474,979	...
Detroit	2,092,478	1,959,634	2,191,090
East Butte	1,445,000	......	......
Mammoth	1,760,000	......	......
Mason Valley	1,520,000	....	......
Nevada Con.	6,063,462	5,913,832	......
Ohio	685,000	...	......
Old Dominion	2,180,000	2,130,000	....
Ray	2,924,913	2,992,500	....
Shannon	1,464,000	1,270,000	1,446,000
South Utah	236,884	....	....
United Verde*	2,500,000	....	....
Utah Copper Co.	9,564,919	8,772,742	....
Lake Superior*	21,250,000	15,600,000	....
Non-rep. mines*	8,400,000	8,300,000	....
Total production	105,830,984	......	....
Imports, bars, etc.	25,836,519	24,262,292	....
Total blister	131,697,503	......	....
Imp. in ore & matte	6,410,226	8,404,936	....
Total American	138,107,729	....	....
Miami†	2,676,702	2,683,310	3,027,710
Brit. Col. Cos.:			
British Col. Copper	875,000	996,000	....
Granby	1,914,460	1,888,400	....
Mexican Cos.:			
Boleo†	2,260,160	1,851,920	......
Cananea	4,600,000	4,310,000	4,000,000
Moctezuma	2,892,521	3,176,819	3,094,016
Other Foreign:			
Cape Cop., S. Africa	754,880	....	....
Kyshtim, Russia	......	....	....
Spassky, Russia	694,400	757,120	....
Famatina, Argen.	....	....	....
Tilt Cove, Newf'd	123,087	....	....
Exports from:			
Chile	3,696,000	9,856,000	....
Australia	7,840,000	8,176,000	....
Arrivals in Europe‡	9,976,860	12,667,200	....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VII, 1911	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,412	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,313,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	....	....	....

Visible Stocks

	United States	Europe	Total
VIII, 1911	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	111,142,400	174,082,388
IV	62,367,554	136,819,200	199,186,754
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	107,417,232
VII	44,335,004	108,186,000	152,521,047
VIII		113,299,200	......

the Centennial 30.8c. and the Allouez 61c. per share.

Curb trading has been quiet while price movements have been unimportant. Butte Central is strong around $7.50 while Nevada-Douglas is off 50c per share.

Assessments

Company	Delinq.	Sale	Amt.
Belcher, Nev	Aug. 15	Aug. 30	$0.10
Belmont, Ida	July 22	Aug. 22	0.002
Confidence, Nev	July 15	Aug. 9	0.20
Con. Imperial, Nev	July 28	Aug. 21	0.01
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Conqueror, Ida	July 20	Aug. 10	0.001½
Dalmatia, Ida	Aug. 24	Sept. 21	0.002
Dennemora, Ida	July 20	Aug. 20	0.002
Eagle Mt., Ida	July 31	Aug. 22	0.001½
Gould & Curry, Nev	July 19	Aug. 12	0.05
Horseshoe Ida	Aug. 8	Aug. 30	0.002
Hypotheek, Ida	July 19	Aug. 14	0.005
Laclede, Ida	Aug. 1	Aug. 24	0.003
Lone Star, Nev	July 20	...	0.02
Manhattan Red Top, Nev.	July 12	....	0.01½
Mineral Farm, Ida	July 15	Aug. 15	0.002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
National Copper, Ida	July 15	Aug. 15	0.01
New Reliance, S. Dak.	....	....	0.01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida.	July 18	Aug. 19	0.001
Sandstorm-Kendall, Nev.	July 8	.....	0.01
Seven Troughs Mon'h, Utah	Aug. 10	Aug. 30	0.0[illegible]
Silver Mt., Ida	July 15	Aug. 15	0.002
Springfield, Ida	July 30	Aug 31	0.002
Tonopah North Star, Nev.	July 15	.....	0.02
Twin Star, Ida	Aug 31	Sept 28	0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	...	24.428	24.082	
September	53.295	52.440		24.567	24.209	
October	55.490	53.340	...	25.596	24.594	
November	55.635	55.719		25.680	25.649	
December	54.428	54.905	..	25.160	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.8[illegible]
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405		12.634		56.266	
September	12.201		12.508		55.25[illegible]	
October	12.189	.	12.370		55.170	
November	12.616		12.769		57.25[illegible]	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.97[illegible]	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	[illegible]	July	42.400	44.519
February	[illegible]	42.962	August	43.319	.
March	40.157	42.577	September	39.755	
April	[illegible]	43.923	October	41.185	.
May	43.115	46.053	November	43.125	...
June	[illegible]	45.815	December	44.655	
			Av. Year	42.281	..

Prices are in cents per pound

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	.	4.406	...	14.260	
September	4.485	.	4.356	......	14.744	. .
October	4.265	...	4.139	......	15.332	.
November	4.298	..	4.181	......	15.821	
December	4.450	...	4.332	....	15.648	...
Year	4.420	...	4.286	......	13.970	...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953		5.803		26.801	.
September	5.869		5.719		27.750	.
October	6.102	...	5.951	..	27.256	.
November	6.380	...	6.223	.....	26.795	. .
December	6.301	...	6.151	.	26.849	.
Year	5.758	...	5.608	. .	25.281	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	....	14.00	.	14.47	
September	15.90		13.57		14.40	.
October	15.43	......	13.44		14.34	
November	14.92	..	13.30	....	14.25	
December	15.15		13.10	. ..	13.90	
Year	$15.72		$13.94	.....	$14.49	.

STOCK QUOTATIONS

COLO SPRINGS Aug. 6

Name of Comp.	Bid.
Acacia	.05
Cripple Cr'k Con.	.01½
C. K. & N	.17
Doctor Jack Pot	.06
Elkton Con	.67½
El Paso	1.12
Findlay	.05
Gold Dollar	.18¼
Gold Sovereign	.03
Isabella	.15
Jack Pot	.04
Jennie Sample	.05
Lexington	.008
Moon Anchor	‡.085
Old Gold	.03½
Mary McKinney.	.71
Pharmacist	‡.01
Portland	.92
Vindicator	.85
Work	.01

SALT LAKE Aug. 6

Name of Comp.	Bid.
Beck Tunnel	.07½
Black Jack	.14
Cedar Talisman	.01½
Colorado Mining.	.23½
Columbus Con	‡.35
Crown Point	.02½
Daly-Judge	5.60
Grand Central	.62
Iron Blossom	1.22½
Little Bell	‡.35
Lower Mammoth	‡.13½
Mason Valley	12.00
May Day	.14
Nevada Hills	1.90
New York	.01
Prince Con	1.55
Silver King Coal'n	2.50
Sioux Con	.04½
Uncle Sam	.16
Yankee	‡.07

TORONTO Aug. 6

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.40	Hollinger	12.95
Hudson Bay	69.00	Imperial	.02
Temiskaming	.37	Pearl Lake	.17
Wettlaufer-Lor	.40	Porcu. Gold	.28
Apex	.02	Porcu. Tisdale	.01
Central	‡5.56	Preston E. D.	.01
Crown Chartered	.09	Rea	.20
Dobie	.40	Standard	.00¾
Dome Exten	.15	Swastika	.09
Foley O'Brien	.14	West Dome	.05

SAN FRANCISCO Aug. 6

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.06	Belmont	9.40
Belcher	.36	Jim Butler	.65
Best & Belcher	.08	MacNamara	.22
Caledonia	1.25	Midway	.57
Challenge Con	.12	Mont.-Tonopah	2.15
Chollar	.10	North Star	.17
Confidence	.70	West End Con.	1.70
Con. Virginia	.38	Atlanta	.27
Crown Point	.45	Booth	.08
Gould & Curry	.05	C. O. D. Con	.11
Hale & Norcross	.12	Comb. Frac	.16
Mexican	2.70	Jumbo Extension	.40
Occidental	.50	Pitts.-Silver Peak	.98
Ophir	.99	Silver Pick	.12
Overman	.65	St. Ives	.30
Potosi	.04	Tramp Con	‡.02
Savage	.10	Argonaut	‡2.60
Sierra Nevada	.23	Bunker Hill	‡4.50
Union Con	.66	Cent. Eureka	.40
Yellow Jacket	.59	So. Eureka	‡2.90

N. Y. EXCH. Aug. 6

Name of Comp.	Clg.
Amalgamated	82¾
Am. Agri. Chem	59½
Am.Sm.&Ref.,com	83¾
Am. Sm. & Ref., pf.	108½
Am. Sm. Sec., pf. B	87¾
Anaconda	41⅝
Batopilas Min	1⅝
BethlehemSteelpf	70
Chino	34
Comstock Tunnel	‡10½
FederalM.&S.,pf.	43
Goldfield Con	3⅞
GreatNor.,ore.,ctf.	43½
Guggen. Exp	‡54½
Homestake	95
Inspiration Con.	18¾
Miami Copper	30
Nat'nalLead,com.	59
National Lead, pf.	108½
Nev. Consol	21¾
Pittsburg Coal, pf.	91[illegible]
Ray Con	20⅞
RepublicI&S,com.	28
Republic I & S, pf.	87½
SlossSheffi'd.com.	55
Sloss Sheffield, pf	100
Tennessee Copper	42⅜
Utah Copper	62
U. S. Steel, com	71[illegible]
U. S. Steel, pf.	112¾
Va. Car. Chem	48

BOSTON EXCH. Aug. 6

Name of Comp.	Clg.
Adventure	8¼
Ahmeek	‡350
Algomah	6
Allouez	47
Am. Zinc	31¼
Ariz. Com., ctfs.	5⅝
Bonanza	‡.40
Boston & Corbin	7
Butte & Balak	3¼
Calumet & Ariz	75½
Calumet & Hecla	529
Centennial	22½
Con. Mercur	.03
Copper Range	57½
Daly West	5⅛
East Butte	13⅞
Franklin	11¾
Granby	54
Hancock	29
Hedley Gold	17
Helvetia	1 1/16
Indiana	18¼
Island Cr'k, com.	56
Island Cr'k, pfd.	91
Isle Royale	35
Keweenaw	1½
Lake	36½
La Salle	6¾
Mass	6⅞
Michigan	2½
Mohawk	68
New Arcadian	4
New Idria Quick	‡6⅞
North Butte	30
North Lake	6
Ojibway	4
Old Dominion	57¼
Osceola	‡116
Quincy	92
Shannon	17¼
Shattuck-Ariz.	20
Superior	47½
Superior & Bost	1½
Tamarack	44
Trinity	6½
Tuolumne	3⅛
U. S. Smelting	46⅛
U. S. Smelt'g, pf.	49⅝
Utah Apex	1⅛
Utah Con	12¼
Victoria	3
Winona	5½
Wolverine	107
Wyandot	‡2

N. Y. CURB July 30

Name of Comp.	Clg.
Barnes King	.40
Beaver Con	.45
Braden Copper	6⅞
B. C. Copper	5½
Buffalo Mines	1.40
Caledonia	.40
Con. Ariz. Sm.	⅝
Davis-Daly	2¼
Diam'field-Daisy	9
Ely Con.	22
Florence	92
Giroux	5¼
Gold Hill Con.	⅜
Greene Cananea	10⅛
Greenwater	06
Internat. S. & R.	‡124
Kerr Lake	2⅞
Keystone	2⅝
La Rose	3
McKinley-Dar-Sa.	1¾
Min. Co. of A. new	2⅞
Motherlode Gold.	1
Nev. Utah M. & S.	02
Nipissing Mines	7⅞
Ohio Copper	15/16
Pacific Sm. & M.	7/32
South Live Oak	2
South Utah M. & S.	⅝
Standard Oil (Old)	1040
Stand'd Oil of N.J	419
Stand'd Oil Subs.	525
Stewart	1⅝
Tonopah	6⅞
Tonopah Ex.	2 11/16
Tri-Bullion	½
Tularosa	⅞
Union Mines	5/16
United Cop., pfd.	10
Yukon Gold	3⅞

LONDON Aug. 7

Name of Com	Clg.
Camp Bird	£1 7s 6d
Dolores	1 10 0
El Oro	0 14 3
Esperanza	1 10 0
Mexico Mines	7 0 0
Oroville	0 5 3
Stratton's Ind.	0 3 1½
Tomboy	1 5 3

BOSTON CURB Aug. 6

Name of Comp.	Last
Bingham Mines	3½
Boston Ely	1
Boswyocolo	02
Butte Central	7½
Cactus	08
Calaveras	2¼
Chief Cons	1
Corbin	1 1/16
Cortez	1
Crown Reserve	3 3/16
First Nat. Cop.	2 1/16
Majestic	46
Mazatan	‡½
Moneta Porc	05
Nevada-Douglas	3½
New Baltic	2
Oneco	1⅞
Raven Copper	.29
Rhode Island Coal	21
San Antonio	‡3
S. W. Miami	5½
South Lake	9½
Trethewey	11
United Verde Ext.	40
Vulture	‡5

‡ Last quotation

The Engineering and Mining Journal

Vol. 94. AUGUST 17, 1912 No. 7

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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A Concert of Powers

The copper market as organized by Mr. Ryan is quite different from what it used to be. This may be freely admitted by everyone, as may be also the brilliant success of the producing interests under his leadership during the last year. Just how he has managed things is known only to himself and a few others, and they are not going to say anything about it.

Let us make haste to say that it is far from our thought that the rise in the price of copper to 17½c. has been wholly the result of manipulation. No, Mr. Ryan has not learned to lift himself by his bootstraps any more than anyone else, but he had the discernment of a favorable trend of conditions before anyone else did and was quick to direct himself accordingly. Manipulation no doubt played some part in the early stages of the advance in copper, but after awhile it became unnecessary; at least we think so, although the shadow of the delayed mine output always rises perplexingly.

But as to the altered conditions marketwise. The Amalgamated no longer holds an umbrella. The Guggenheims no longer become nervous and cut prices when their order book is not filled to their satisfaction. Other persons no longer pretend to be firm while they are furtively making concessions to sell their copper. These agencies now name their price asked and stick to it. If buyers don't want to pay it they may wait until they have to, picking up in the meanwhile such supplies as they can get from the independent agencies. The big ones are unconcerned.

This unity of action looks like a combination, but it isn't; undoubtedly it isn't. It is more like a concert of powers. There are not any treaties, but simply a working together because it is to the common interest. There seems to be a friendliness which formerly there was not, and a spirit of "one for all, all for one" that prompts an exchange of information and a unanimity in expression of opinion that was not of yore.

This is very fine, but of course not even such a concert of powers, if it exists, can buck successfully against economic conditions, as Judge Gary, among others, has learned. Even copper in process can not be indefinitely delayed. We shall be curious to see what will happen when stocks begin to accumulate again and it is desired to sell copper in large blocks, which condition is surely going to be witnessed at some time as the years roll on. Will the concert then cease and the most discerning interest snatch the market in the first of its downward course, or will altruism prevail and everybody cut together and while they are about it make some good slashing cuts like the Steel Corporation used to do? We confess to a feeling of curiosity.

The Sense of Proportion

How many times has the engineer gone to some mine offered for sale, possessing "an immense quantity of ore," and found only a tub-full, so to speak. The vendor may have been quite honest. The misunderstanding may have been due to his absence of sense of proportion. Never having seen a mine of a million tons of ore developed he had no conception of what such a mine looks like, of what amount of work such an ore development implies. That his few hundred feet of shafting and drifting could not possibly expose such a quantity of ore never occurred to him; nor did it to figure with pencil and paper that at 12½ cu.ft. to the ton there must be 12,500,000 cu.ft., or say a block of ore 25 ft. thick, 1000 ft. long and 500 ft. deep if it were all solid payable stuff; no horses or lean spots.

In prospecting and preliminary exploration the same absence of sense of proportion is equally likely to lead to disappointment. This was indicated in the extraordinarily lucid and valuable paper on "Geology Applied to Mine Examination," by Ira B. Joralemon, geologist for the Calumet & Arizona Mining Co., which was published in the JOURNAL of Aug. 10.

Speaking of copper deposits, Mr. Joralemon said:

> When examining an undeveloped copper district, the first thing to look for is a widespread and thorough mineralization. Where there has been mineralizing action strong enough to form important orebodies, it is almost certain that this action will have had a great effect on the rocks over a large area. In the greater part of this area the mineralization is usually too slight to make commercial ore. It may take the form of pyritization with surface iron staining of a large mass of igneous rock or schist; of seams of copper-stained iron oxides in limestone; of interlacing or parallel veinlets far from a large vein, or many other forms. However promising the smaller outcrops may be, I consider it very unlikely that they will develop into great mines unless there is some such general mineralization. The Southwest is strewn with outcrops of rich ore or of fine gossan on which fortunes have been spent only to prove them gash veins or shallow surface deposits which have not paid the cost of development. There may be important vein deposits accompanied by comparatively little mineralization of the walls, with no smaller veins leading from the great one. In the case of copper deposits at least, it is safer to let someone else pay for developing such solitary veins. In all the great mining districts of the Southwest, the mineralization extends with decreasing strength for several miles from the center of the district. Without such general and thorough mineralization, I do not consider a copper property worth developing.

This has undoubtedly been the case of most of the great copper deposits. Consider Butte, Bingham, Ely, Morenci, Bisbee, Cananea, Miami, Ray, Santa Rita and many others.—All have displayed widespread evidences of mineralization by copper. Incidentally, let us remark that Mr. Joralemon's paper is one of the most practical contributions to the literature of geology as a guide to the prospecting for copper ore whereof we know.

Analysis with Rotating Electrodes

In the article on analysis with rotating anodes in this week's JOURNAL will be found complete drawings and specifications for a four-cell cabinet for quick analysis. To those chemists who have not adopted rotating electrodes, we advise consideration of the article. Rotating anodes will not save the chemist's time; as a matter of fact, it takes a little longer to hook up the analyses on a rotating case than on a plain. Nor is there any saving in power. Quite the contrary, but this item is negligible anyway in laboratory expense.

But what rotating electrodes will do is to get assays out with electrolytic accuracy, and wet-method speed, and more assays can be made per day on the same amount of platinum, no inconsiderable item considering the present price of that metal and the temptation it offers to thieves.

Cyanide Immunity

A generally credited belief is that those accustomed to the operation of cyanide works become more or less immune to cyanide poisoning. It is much more likely that one unaccustomed to cyanide gases would notice their presence sooner than one used to their presence, but it seems unlikely, in view of the known effects of hydrocyanic acid upon the human system, that any amount of accustoming would alter or lessen its action. The odor of cyanide, characteristic of cyanide works, is usually not sufficient to cause any great inconvenience or damage and it seems probable that one might get used to this odor and fail to notice it while one unaccustomed to it might find it disagreeable. At the same time, an excessive amount of this gas will be the cause of discomfort or actual illness even with one fully used to it.

The greatest inconvenience experienced in working about cyanide plants is occasioned by handling the zinc in precipitation boxes. This is likely to cause minute abrasions of the skin, and the entry of the cyanide solutions directly to the blood is likely to cause trouble either as sick stomach, headache or the appearance of the eruption known as "cyanide rash." The appearance of this trouble, however, has nothing to do with one's familiarity with cyanide but depends upon and varies with the individual. Some feel the effects quickly while others resist it for a longer time, but all eventually experience it when subjection to the influence has been sufficient to overcome the natural resistance. It is probable that there is no such thing as immunity, as hydrocyanic acid is believed by chemists to be one of those poisons to which immunity cannot be acquired.

The Copper Statistics for July

The copper statistics for July are particularly of interest inasmuch as for the first time this year they disclose somewhat of the real economic conditions. Several months ago we remarked that the refinery statistics would be a useless index of the situation until they began to show a monthly production of 135 to 140 million pounds. July showed 137,000,000 lb. production and an increase of about 6,000,000 lb. in the stock. This means simply that it has been useless or impracticable to delay the mine production any longer; and that the present American production is in excess of the demand for it at the present level of price.

The July production as reported dispels much nonsense that has been spouted, including the following:

1. That the refineries had been operated to the limit of their capacity.
2. That the hot weather prevented strenuous operation.
3. That the labor difficulties were still a disturbing factor.

Of course there was always an awkwardness in the discrepancy of the selling agencies telling their customers that the refineries were turning out every pound possible and the mine managers telling their stockholders of their magnificent increases in production, the additional dividends to come, etc.

The producers have profited greatly, but now find themselves confronted with an overloaded European market, a grumbling among consumers everywhere at the high price they have to pay, an increasing surplus both in Europe and America, an advance in the wage scale and the stimulation of many small producers that would have remained dormant if the price for the metal had culminated lower down. All of these are, of course, simply the natural concomitants of a boom.

Few have any conception of the amount of rock breaking that is always in progress within the city limits of Greater New York; just at present there is an unusual amount of such work in connection with the new underground roads and the new Catskill Aqueduct tunnel.

By the Way

"Plumbers and gasfitters have risen to the dignity of sanitary engineer," says the *Canadian Engineer*, "and the advance guard, who prepare the ground for a circus, class themselves as circus engineers. The profession is ever broadening."

A subscriber reports having received the following in the course of some correspondence regarding a position with a new smelting company: "We do not want a mettalurgust, we want a man who can smelt ores." The most peculiar point about a company so "practically" managed is that its shares, which formerly sold at about $1, are now worth 1½ cents.

No recent mining report has been so much discussed as J. R. Finlay's appraisal of the iron and copper mines of Michigan. It is still a favorite pastime of the mine valuers associated with brokerage houses to show how erroneous he was in his estimates of the copper mines. It is a matter of business among the owners of iron mines to show that he was erroneous about them also.

The soya bean crop is gradually ceasing to be a factor in the silver market. Formerly the crop was financed through Chinese sources and paid for chiefly in silver. Within the last two or three years the business has passed largely into Russian hands, and the crop is paid for in ruble notes, which now circulate freely in Manchuria. As the soya-bean crop this year is valued at nearly $40,000,000, the relation between beans and silver was fairly important.

The reason that window panes are whitened in a building not yet completed, is explained by a building contractor as reported in the New York *Times*. "We don't plaster them over with chalk to prevent the public from seeing the unfinished condition of the interior, but to keep the workmen from battering out the glass. Transparent glass looks just about as transparent as air to the man who is moving a wooden or iron beam in a hurry, and he is likely to ram the end of it through an expensive window, but when the glass is coated with white it becomes visible, and the workmen hand their material in through the door."

We do not anticipate any serious disturbance in the copper statistics from the wrecking expedition reported by one of our Canadian contemporaries. It states that a force is now at work over the hull of the old ship "Pewabic," which sank in Thunder Bay nearly 50 years ago. The vessel is 160 ft. below the surface and the divers are to work in what is referred to as an "iron man"—a steel chamber with projecting arms. The "Pewabic" carried in its cargo over 400 tons of copper; it is planned to bring this to the surface a few hundred pounds at a time on days when Lake Huron is quiet. Thus the "iron man's" job does not promise to be a very steady one, even if he prove competent to do the work.

A curious complaint was recently made to the Rhodesia Chamber of Mines. It was that in several cases negro laborers, who had worked on the mines and returned to their homes in Nyassaland, had taken with them cyanide of potassium which they had stolen and which they used to dispose of their enemies. In one case, seven persons had been poisoned in one village. Correspondence with the authorities produced no result, the members of the Chamber of Mines considering it impossible to prevent thefts of small quantities of cyanide, of which so much is used at the mines. So it will still be easy to settle one's enemies, and an invitation to drink from a returned miner will be accepted with caution in Nyassaland.

We noticed recently that a contemporary listed among its mining patents, one relating to a submarine mine. This presumably was for the benefit of its Turkish readers who are more in need of this sort of a mine than the rest of the world. There are submarine metalliferous mines in Cornwall, Newfoundland and elsewhere, but this was not the kind referred to in the patent specification, nor was it any of those that are struggling along under a great burden of water in their capital. Our contemporary now prints in its list of metallurgical patents a stamping machine. This we assume is for the information of its readers who wear top boots. The patent for the stamping machine is assigned to the United Shoe Machinery Company.

Wall Street people, not very easily surprised at the company men keep in speculation, have recently been staring at the strangest trio that perhaps ever came together in a joint account in the stock market, says the *Evening Post*. One is Baron Herman Jones, who named himself so in a Hoboken emergency and is much better known to New Street by his real name; the second is a proprietor of patent remedies, who, in his widely advertised pictures, holds up a finger and says, "There is hope," and the third is the man who led the army of tramps to Washington during the first Bryan campaign. They lunch and walk and trade together. They trade only in one stock, which is a copper stock. New Street thinks it knows which two will lose their money.

In a recent publication of the Bureau of Commerce and Labor is a reference to some "petroleum springs in Zante, mentioned by a Greek historian about four centuries before Christ." Reference to Herodotus shows the following: "I myself have seen pitch drawn up out of the water from a lake in Zacyntus. At the place I speak of there are a number of lakes, but one is larger than the rest, being 70 ft. every way, and two fathoms in depth. Here they let down a pole into the water, with a bunch of myrtle tied to one end, and when they raise it again, there is pitch sticking to the myrtle, which in smell is like to bitumen, but in all else is better than the pitch of Pieria. This they pour into a trench dug by the lake's side; and when a good deal has thus been got together, they draw it off and put it up in jars. Whatever falls into the lake passes underground and comes up in the sea, which is no less than four furlongs distant."

"One of the best informed men in the United States on the copper situation," according to the daily press, says: "Consumers of copper in this country are loaded up with business. Every mill that I know of is working to its utmost capacity, having not only all the business it can take care of, but more than it can handle, and from what I can understand this condition is practically the same abroad. There is no longer competition between the mills, for they could not take any more business if same were offered and consequently all competition is eliminated." It follows from this, of course, that if the manufacturers of copper are at 100% capacity and can't take any more business, it is useless for the refineries to increase their output. It is satisfactory to have one fixed point from which to figure. This is a warning to the little mines, just starting up to get a piece of the pie, to keep out. Your copper is not wanted, consumption being already at 100% of the possible.

With the heated season, comes this account of placer mining along the Jersey shore. An Asbury Park dispatch to the *Times* reports "a recovery of 90% of the assay value of the jewelry lost by guests of the Dunes Hotel which was destroyed by fire last month. Guests who suffered in the fire retained Edward F. Smith, a New York mining engineer, to search among the ruins. A sluiceway was rigged up, and Franklyn Hardcastle, Edward C. Miller, and John Carroll, sons of guests who were losers in the fire, were posted as watchers. Miss Schultz, a daughter of the proprietor, also volunteered as a watcher. The ruins were washed through three screenings. Several silver meshbags were recovered in which there was money, damaged but redeemable. Today a lavalliere valued at $1400 was recovered. Three days ago a diamond cuff pin was found, and yesterday its mate was washed out. Most of the ground has now been worked over, but there is still one corner to be searched." New York jewelers, it is said, have appraised the property recovered at $25,000. This, we presume, is a "sight" assay, or it may be that some of the jewelry belonged to an actress.

Utah Copper Co.

The Utah Copper Co., in its report for the second quarter of 1912, shows a copper production of 9,069,237 lb. for April; 10,068,336 lb. for May; and 9,234,465 lb. for June, a total of 28,372,038 lb. for the three months, as compared with 24,929,550 lb. for the first quarter. During the second quarter 1,503,884 tons of ore averaging 1.42% copper was treated, as compared with 1,299,315 tons of 1.435% copper for the first quarter. The Magna plant handled about 70%, the Arthur about 30, and the cost of production, after allowing for smelter deductions, and not crediting miscellaneous income, is given as 8.127c. per lb. The milling profit was $2,237,485, Nevada Consolidated dividends $375,188, and miscellaneous income $10,026, a total net profit of $2,622,699. Dividends of $375,188 were paid, leaving a net surplus for the quarter of $1,441,351. At the close of the quarter, no copper due for delivery from the refinery remained unsold.

During April the coarse-crushing departments worked at a disadvantage, owing to wet ore, and in June the tonnage of the Arthur plant was reduced, owing to installation of new and heavier machinery in the coarse-crushing department. The tenth section of the Arthur plant was placed in operation in May, the eleventh in June. All thirteen should be complete by the middle of August, when the heavy construction expense will be over. It is purposed to enlarge both coarse-crushing plants, to insure sufficient capacity in winter and wet weather to keep the plants running at full capacity.

During the quarter 1,589,648 cu.yd. of capping was removed. The Bingham & Garfield Railway hauled 10,203 tons of ore per day from mines to mill, and 1265 tons of other freight.

Spokane A. I. M. E. Section Meets at Republic, Wash.

Special Correspondence

The fourth quarterly meeting of the Spokane local section of the American Institute of Mining Engineers was held at Republic, Wash., July 26 to 28, 1912. A party of 17 or 18 men left Spokane, July 26, and upon arrival at Curlew, Wash., were met by H. S. Richardson and W. D. Timm, superintendent of the Morning Glory mine near Republic. After a dinner, a meeting was held which was largely attended. Prof. Francis A. Thomson, head of the mining-engineering department of the Washington State College, at Pullman, Wash., delivered an address on mining conditions in Republic, with which he had become familiar during several visits for the purpose of making examinations of the mines and mills. Edward C. Morse read a paper giving much information relative to the recently completed San Poil mill and this aroused instructive discussion, particular interest being shown in the work of the Williams chain-hammer pulverizer, the first to be tried in the West. On the morning of July 27 a trip was made up Eureka gulch. The San Poil mine and mill were visited first, and then the Knob Hill mine. Luncheon were served at the "little boarding house in the gulch." In the afternoon the Surprise, Quilp, Lone Pine and other properties were inspected, some of the visitors descending to the 700-ft. level of the Surprise. On July 28 a visit was made to the Rathfon Reduction Co.'s small mill and later the Old Republic mine was visited, as was also the Princess-Republic mine. After a luncheon, a resolution was recommended for changing the name of the section to the "Northwest" section. In the evening the North Washington Power & Reduction Co.'s mill was inspected. On the morning of July 29, the party returned to Spokane.

Carnotite in Utah

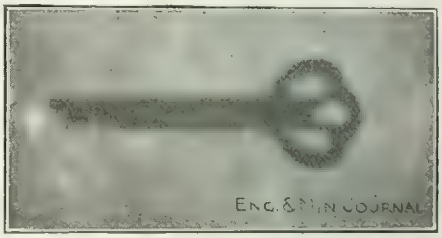
Salt Lake Correspondence

There has been much interest during the last year in the deposits of carnotite ore in Emery and Grand Counties. The industry is, however, still in the prospective stage, most of the deposits being undeveloped, and their size and value undetermined. So far there has been one producing property. Some development has been done on the Cisco group, near Richardson, on the Rio Grande Western R.R., and one car of ore has been shipped and sold to David Taylor, of Salt Lake City. The analysis of this shipment is not known. The property is not operating at present. Four men are being worked on a property owned by the Vanadium Ore Mining & Milling Co., 20 miles southeast of Thompsons. No shipments have been made. Rogers & Wade, of Moab, own a property near there, from which several tons of ore have been sacked. The assays are not known.

There are five groups of claims in the Green River district, one of which is owned by a syndicate, composed of Messrs. Lorimer and associates, of Philadelphia, and Angus Cameron, of Baltimore. This group is 10 miles southwest of Green River along the San Rafael Reefs, extending six miles. The property, operating steadily since Jan. 1, with 15 men, has produced 500 tons of shipping ore, a large part of which has been shipped and sold.

This ore is sold in Europe through David Taylor, of Salt Lake City, who has charge of all ore sales for the syndicate. No statement of analysis is given, except that the ore runs high in uranium and is highly radio-active. The ore occurs in lenses in Jurassic sandstone, and is mined by opencuts. The ore zone lies from 1 to 10 ft. below the surface, which dips nearly east about 15°. There is a well equipped laboratory on the ground, with offices, bunk house, dining rooms, etc., known as camp Vanura.

The Forsman-Ward group, the pioneer group of Utah, adjoins the Lorimer group on the south, and continues several miles to the San Rafael River. There has been practically no development. About 20 tons of ore have been shipped during the last three years, assaying about 1% U_3O_8 and 1% V_2O_5. No work is being done at present. The property is said to be controlled by the Philadelphia syndicate. The Morris property, consisting of a group of six claims, two miles south of San Rafael post office, is not operating at present. It has a surface showing, but no development has been done and no assays have been made. A car of ore has been shipped from the Lovelass group, to Doctor Van Arsdale, of New York. The property consists of a number of claims with small showings on several of them. No work is being done at present. The Temple Rock property, owned by Messrs. Beebe and Browning, of Castledale, Utah, is about 45 miles south of Green River, between Wild Horse Cañon and Temple Wash, about 15 miles from Hanksville. Ore carrying uranium and vanadium outcrops on the east and north for several hundred feet. Practically no development has been done here. Further around the mountain to the west an outcrop on the same horizon has been prospected by a 30-ft. tunnel, which shows 16 in. of ore at the portal, gradually pinching down to 3 in. at the face. On the west several iron blowouts, containing kidneys of a black ore carrying both metals, have been found. No development has been done here. Some samples are said to have been taken in the past, showing 1 to 3% U_3O_8 and 1 to 5% V_2O_5. This property is under long option to Angus Cameron and associates, and a part of the purchase price is said to have been paid. No shipments have been made, except for testing purposes. The ore occurs in Jurassic sandstone, and probably only in lenses.



Radiograph Made with Utah Carnotite Ore

(The photographic plate was not exposed to daylight, but was wrapped in brown paper with the envelope containing the pulp sample of Lot No. —, and thus exposed for 111 hours.)

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Mining on Forest Reserves

I have just had brought to my attention a letter published in the Journal of July 13, under the heading "Mining on Forest Reserves." The writer speaks of "The stupid and illegal interference of the Forest Service with legitimate prospecting." He then goes on to say:

"On heavily timbered land the Service should be careful to investigate fully and refuse patent, if there is a lack of good faith. On ground barren of timber or with scattering trees the prospector should have full swing so long as he has discovered a vein, no matter whether it is thin and of low assay value. This is the true interpretation of the law and there is no reason whatever why the claim should be protested, because he can show no deposit of actual value."

This is precisely the principle and the method applied by the Forest Service. In my annual report for 1911 I said with regard to this subject:

"On notification that patent to National Forest land is sought under the mining laws a forest officer makes an examination and, if he finds that the claim is apparently held in good faith for mining purposes and its location is such that the issuance of patent will not prejudice National Forest interests, his recommendation is favorable. When he finds that the claim is located on land valuable for its timber, or which has a high value for purposes other than mining, an examination is made by a mining expert to determine whether the mineral law has been fully complied with. Adverse recommendations are never made to the General Land Office except upon the report of such mineral experts."

If your correspondent can inform me of any cases in which the course which he advocates is not now being carried out, I shall be glad to learn of them. He says that "the mining papers should hammer away until relief is found"; but he sets up a man of straw to be hammered.

H. S. Graves,
Forester.

Washington, D. C., Aug. 7, 1912.

Rio Tinto Pyrites

In the Journal of July 20, 1912, there appears a statement that leaching Rio Tinto pyrites cinder for copper is a departure in this country. Is not this what has been done for many years at Greenwich Point, Philadelphia, by the Pennsylvania Salt Co.?

In this connection it is interesting to recall that the plant of the American Copper Extraction Co., at Garwood, N. J., also leached pyrites cinder, although whether it treated only Newfoundland pyrites cinder or took in some Spanish pyrites I do not remember. This plant roasted the ground pyrites cinder in reverberatories with salt, leached, precipitated the copper on iron, and briquetted the leached residue for use in iron furnaces. The cement copper carried 80 to 87% Cu. The plant closed several years ago, but it is my impression that this was because of the effluent from the precipitation tanks polluting the nearby streams, and not because of any technical difficulties.

Reverting again to the Pennsylvania Salt Co., I believe that the leaching of pyrites cinder was regarded by it as so great an asset that most of the Spanish pyrites sold in the Baltimore to New York coast district for many years, carried the stipulation that the cinder should be returned to the Salt company, although this may be a piece of ancient history.

S. P. Dayton.

Sudbury, Ont., July 27, 1912.

Melting Points of the Elements

There is a table of melting points of the elements in the Journal of July 13, 1912, which is very interesting, but its arrangement (in ascending order of melting points) renders it difficult to use. I have recast it for my own use in alphabetical order, which is much more convenient. (The order is that of the chemical symbols, not of the fully spelled names).

MELTING POINTS (C°) OF THE ELEMENTS

A	188	Gl	1800	Ra	900(?)
Ag	961	H	—259	Rb	38
Al	658.7	He	271	Rh	1940
As	850	Hg	-38.7	Ru	1950
Au	1063	I	114	S	116.5
B	2350	In	154.5	Sa	1350
Ba	850	Ir	2300	Sb	630
Be	1800	K	62.3	Sc	1200(?)
Bi	270	Kr	—169	Se	218.5
Br	7.3	La	810	Si	1420
C	3600	Li	186	Sn	231.9
Ca	810	Lu	not given	Sr	> Ca, < Ba
Cb	2200	Mg	651	Ta	2850
Cd	320.9	Mn	1225	Tb	not given
Ce	640	Mo	2500	Te	451
Cl	—101.5	N	—210.5	Th	>1700, < Pt
Co	1490	Na	97.5	Ti	1900(?)
Cr	1510	Nd	840	Tl	302
Cs	26	Ne	253	Tm	not given
Cu	1083	Ni	1452	U	near Mo
Dy	not given	Nt	not given	V	1730
Er	not given	O	—218	W	3000
Eu	not given	Os	2700	Xe	—140
F	—223	P	44.1	Yb	1800(?)
Fe	1520	Pb	327.4	Yt	1200(?)
Ga	30.1	Pd	1550	Zn	419.3
Gd	not given	Pr	940	Zr	1700(?)
Ge	958	Pt	1755		

For certain elements, As, C, Ca, Ce, Cr, Ge, He, Ni, O, Rh, Ti, and Zr, I have substituted values differing considerably from those in your table. These were taken from *Circ.* No. 35, Bureau of Standards, June 15, 1912. There are also a few minor changes of a few tenths of a degree taken from the same source.

A. A. Nason.

New York, July 29, 1912.

Efficiency Underground

Judging from observation and experience in different mines and from the small ability displayed by many miners and foremen, the mine offers a large field for the so called efficiency engineer. There was a time when I believed, like a great many other engineers, that the underground technique should be left largely to the practical mine foremen, and of course all such foremen agreed with us. They were jealous of "their rights," and I have often heard them severely criticize the manager or superintendent who would deign to tell them how to manage a drill, place a hole, or even say in what manner the cap should be inserted.

UNDERGROUND BOSS MUST BE TRAINED IN HIS DUTIES

There are some splendid mine captains, and to them we give due credit, and sympathize with them in all the problems that they have to face; for he who goes down into the mine, knows and appreciates the hard and arduous work of the conscientious and able foreman or shift boss. But if we are to get the same degree of efficiency in the mine that we get in other occupations, we must have our underground boss educated in his special duties just as thoroughly as the members of the technical staff are in theirs. It will no longer do to select as boss or foreman the man whose father and grandfather were bosses, because he was taught their methods. Certain of their methods were good, but many of them may be improved upon, and it is up to the technical man to go underground and teach the practical man, and not be taught by him. Of course, the technical man must be able to teach, and must have made a study of the particular problem in hand. He will have a hard task set for him and woe betide the scientifically trained man who cannot prove that his method is better than the one in vogue, or who shows awkwardness with drill, tamping rod or fuse. He must make a study of such an apparently simple operation as mucking, or pushing a car.

Many bosses and superintendents will not care to take this seriously. Let them pause and reflect. Have they any muckers or carmen that they would not part with? Why? Study their methods, rather than their results, and the reason will be plain. They are naturally efficient, and when their methods have been adopted by other men of the same class, that is, the method of a naturally efficient shoveler adopted by the other shovelers, the method of a naturally efficient carman adopted by the other carmen, etc., the result will be greatly increased efficiency.

I have seen foremen and superintendents who would discharge a good man because he displayed some ignorance rather than try to correct his fault. One of my foremen, who is now superintendent of a large mine in California, and is supposedly a capable man, said once, in speaking of a workman, "Why, that man said he was a miner, but he does not pull his ground." The miner in question was a hard, conscientious worker. Why didn't he pull his ground? Simply because no one had ever taught him how to put in a cut, and if this foreman had spent a few minutes with him every day he would have made a good miner of him. But no! Someone else must educate all his miners for him, it was his place to find fault. The trouble with such foremen and shift bosses is, that the end of the shift, one of the most important times to be underground if you really want to see what is going on, or see where so much of your powder is going, finds him at the mine entrance washing up or tallying the men or cars. A good underground man should know not only what men are underground, but where they are and what they are doing, and this he cannot learn from the outside. On one occasion, when I caught my foreman in the blacksmith shop at the end of a shift waiting for the men to come out, I went on into the mine and found the men just within waiting for the whistle. If the law prescribes an eight-hour day at the face, as it does in California for instance, let it be at the face and not at the mine mouth. Too many of us wink at this. Above all, whether at face or mouth, do not let your men wait after their work is finished. If by good workmanship they can finish their round satisfactorily half an hour before quitting time, let them do it and go home, but have them understand that the rule works both ways, and if they have trouble they must remedy it even if they have to work an extra half hour. When they understand the stint work it will usually bring good results.

THE MINE OFTEN NEGLECTED

This desire to get out of the mine is not confined to bosses. How many superintendents or managers stay in their mines to the last hour, even occasionally? Many of us, consciously or unconsciously, evade this duty, for what we have considered more important ones, such as looking over reports, hearing complaints, giving instructions, etc., at the end of the day. Some of us have gone to an extreme in our bookkeeping department, and a great many reports are altogether too complicated for the practical underground man; he usually gets around it by filling in the blanks with what he thinks you want to see, regardless of its accuracy. I know of instances of this at one of the largest mines in the country, one at which the bookkeeping and reports are considered perfect. A simple form, well checked by different men, will secure the most practical results with the least labor.

It has been my experience that the best system of reports is the one that enables the man in charge to see from the reports, placed upon his desk the first thing in the morning, just what his departments have done the day before and where any weakness has been shown, so that he can go or send immediately to that place to correct the trouble, and these reports to be gotten out in such a form that they can, during the day, be tabulated by the clerks, for the books, daily, weekly, monthly and annual reports.

If the man in charge has to spend his time looking over reports at the end of the day, he will never think that he can break away for that last look underground. At this type of mine, the last hour of the day will see the whole executive force, from superintendent to shift boss, busy with paper and pencil, with no one underground to see how the miner is loading his holes, or how many feet he has drilled. It is much easier to write in some office, and if one's memory is rather tricky, who is to know?

A MINE CANNOT BE MANAGED FROM AN OFFICE CHAIR

We have men in the profession who think it perfectly feasible to run a mine from the office chair, and some of them have lived and died without knowing of the gross inefficiency that this system breeds, especially when it is applied to underground work.

I knew of two millmen at one of the big mines who kept tab of the not too frequent appearances of the "old man;" they left notes for each other, telling in detail of his movements and actions in reference to that department, they felt that he was neglecting it, but undoubtedly they were not aware of the demands made upon him. Perhaps some of these demands had better have been lopped off. The visits of his assistants did not call forth the same zeal from these workmen. The point is this, that it is well for even the "old man" to appear interested in the work of each man, and show himself occasionally. How will he keep his subordinates up to the work if his trips around are infrequent or more or less routine?

Is it certain that we cannot afford to have our good man right on the ground, instead of in some distant office? Are we sure that, if he is, he cannot save the cost of a good salary right out of his powder bill, or the extra efficiency of his men? If the mine under his management is organized as a great many of our mines are, always excepting those which have such splendid organization and efficiency that we all endeavor to imitate them, he will be a poor man if he cannot go into the mine and, by study, persistent effort and courage, save the cost of his own salary. Strong language, but it has been done; not once, but often, and I see no reason why it could not be done in more mines. In one mine that I visited they were burning carloads of dynamite bulldozing broken pieces of ore, which were as large as a small cottage. Yes, they had heard of the hammer drill, in fact had tried one, but did not think much of it. I will have to be shown why these same pieces of ore did not furnish an ideal field for a high-grade hammer drill.

WANTED CARTRIDGES A FOOT APART

One meets with many queer experiences, and many interesting men, when going underground; some splendid men spend their lives there, but the freak is not unknown. Just the other day when I was criticizing a miner for leaving an air space between the bottom of the hole and the powder, and also for not getting his sticks of dynamite in close contact, he told me that a foreman at Angels Camp directed him to place his sticks of dynamite 18 in. apart in the same hole. Was this a grim joke of that foreman or was there really such an ignorant man in such a responsible position? I have at times seen and read of such ignorance displayed underground, that I am almost inclined to believe this foreman was a true character.

We pride ourselves on our milling, our inventions, our resourcefulness, and our mining work in general. Have we brought our underground work up to the same standard? From what I have observed I think not and it is my endeavor in this discussion, to make the engineer think harder, and look more closely, not to the machinery or equipment of this department, but to how the men handle this machinery and themselves.

A probable remedy for the lack of efficiency so often shown is to put a number of young technical men underground under a capable instructor and also under the supervision of the real man in charge. Let them get the knowledge. Let them make the efficiency studies. And then let them apply their studies, either by instructing the miners, or directing and educating such foremen as are willing to learn. S. H. BROCKUNIER.

Gaston, Calif., July 8, 1912.

Rapid Mine Tunneling in Arizona

By Norman Carmichael*

At the property of the Arizona Copper Co. at Clifton, Ariz., the problem of transporting ore from mine to mill is being solved by driving a haulage adit, the two legs of which are about 9000 ft. long and are connected by a mile of track crossing a flat between two ranges of hills.

Practical data relating to the driving of tunnels for various purposes and in different places are always of interest and many valuable papers have been published describing the driving of long tunnels for railroad, aqueduct, or power-canal purposes, where special appliances were adopted, specially trained workmen employed, and great speed attained as a result.

The following notes upon the driving of a mine tunnel may be of interest, not because of its length, for it was comparatively short, but for the reason that the results were attained in the ordinary course of development, without any special preparation or training of men and with none but the usual mine appliances. The object of pushing the work was to obtain data upon which to base estimates for the driving of a much longer tunnel in the same district.

LAYOUT OF PROPERTY

The Arizona Copper Co. operates the Coronado mine in the Clifton-Morenci district of Arizona. The mine is on the south flank of Coronado Mountain at an elevation of 5800 ft., and situated two miles from the Metcalf terminus of the Coronado R.R., a narrow-gage road seven miles long, with heavy grades, connecting Metcalf with Clifton, and operated by the Arizona Copper Co. for the purpose of transporting its ores from the Metcalf district to its works at Clifton. The Coronado mine yields principally low-grade sulphide ores, which are concentrated at Clifton. Transportation by the present methods constitutes a heavy item in the total charges.

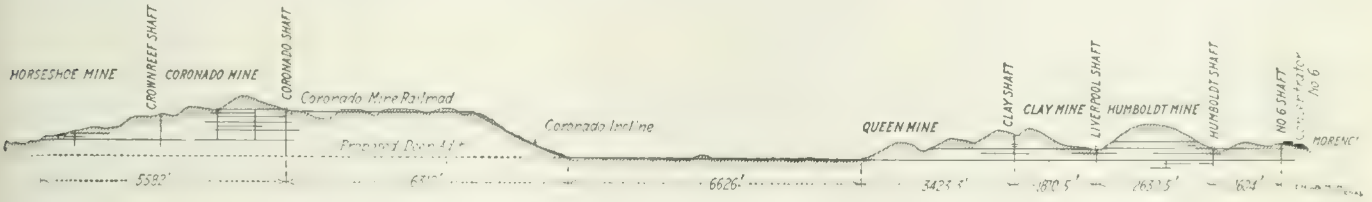


FIG. 1. PROFILE OF HAULAGE TUNNEL OF THE ARIZONA COPPER CO.

The company also operates a concentrator at Morenci, with a capacity of 1500 tons per day. This was built to treat the ores of the Longfellow group, of which the Humboldt mine is the largest producer. The capacity of this mill will be increased to treat the Coronado ores, and the Clifton plant will be shut down.

The concentrator stands at an elevation of 5000 ft. The Coronado mine is situated three miles distant in direct line, and the Humboldt and Clay mines lie between these two places. The main, underground, haulage level connecting the Humboldt and Clay mines with the concentrator is at an elevation of 4660 ft., and a two-compartment shaft, 450 ft. deep, equipped with 5-ton skips, is used to raise the ore from this level to the crushing plant at the concentrator. By connecting this level with Coronado mine, a depth of 1140 ft. below the present adit level or 440 ft. below the present bottom level of the mine can be attained, and the transportation problem simplified.

This work, consisting of 9000 ft. of tunnel and 5000 ft. of surface grading, is now in progress and the work herein described forms one leg of the course, which is not in direct line, but commencing at the concentrator shaft passes north under the Humboldt and Clay mines and comes to daylight at the Queen mine (an oxide mine not at present worked) overlooking Chase Creek, thence following round the contour of the hills swings west and enters Coronado Mountain at a point near the foot of the incline over which the ores are at present transported from the mine. From this point there will be 6000 ft. of driving to connect with the mine shaft, and at least 6000 ft. more of tunnel to completely develop the ore shoots now being worked in this mine.

TUNNEL DRIVEN AT 0.4% GRADE

In Fig. 1 is shown a longitudinal section of the ground passed through and a profile of the line; the grade is 0.4% in favor of the load. At the commencement of the period under review, regular mine development had connected No. 6 shaft with Clay shaft on the second level and the tunnel was being driven out toward the Queen mine and had reached a point 992 ft. from the shaft. As in most of our mine development, two shifts were worked, one for drilling, the other for mucking. The incoming heading from the portal of the Queen mine was being driven by hand, no power being available at that point; about 2400 ft. of ground remained to be driven through to make connection.

During December, it was decided to put on three shifts in the Clay heading and see what could be done in rapid driving. On December 26, the force was increased and warming up went on till the end of the month. The figures in Table I show the results obtained in this heading for the ensuing three months.

The best results for 31 consecutive days were obtained the last two days of February and the first 29 days of March, during which period 799 ft. of advance was recorded. Connection was made with the opposing heading at 6 p.m. on March 29. The nature of the ground was, on the whole, favorable, granite porphyry sufficiently hard to make good drilling and, for the greater part, to stand well without timber, only one shift's drilling being lost on account of having to stop to timber. Occasionally the ground would be tough and spongy and difficult to break. The best speed was made in the harder ground.

TUNNEL 8x8 FT. IN SECTION

The size of tunnel is 8x8 ft. in the clear, or a little more with the arching of the roof, the average section measured every 50 ft. giving 70.4 sq.ft. While the mines are supplied with compressed air from a central plant at the Humboldt shaft, the main compressor there is operated but one shift, and rather than operate it continuously for the sake of

TABLE I—PROGRESS IN THREE MONTHS DRIVING OF TUNNEL OF ARIZONA COPPER CO.

Month	Days	Feet	Average per day	Maximum day's work, feet
Jan.	31	582	18.8	24
Feb.	29	664	22.9	26
Mar.	29½	762	25.8	35
Total..	89½	2008	21.3	..

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*General manager, Arizona Copper Co., Clifton, Ariz.

one heading, we decided to install a small Sullivan compressor we already had, with a capacity of 332 cu.ft. of free air per min. at 5000 ft. elevation, and devote it exclusively to the purpose of driving this heading. This, we placed at the collar of the Liverpool shaft, 2500 ft. from the heading, and being supplied with steam from the hoist boiler there and attended to by the regular hoisting engineer, the arrangement was economical and satisfactory.

From the receiver at the compressor the air was conducted through a 3-in. reduced to 2-in. pipe to the face, and at a place near the face a small receiver was installed; thus, a constant pressure of 100 lb. was available for the drills; it rarely fell below 95 lb. when full drilling was in progress. The drills used were the Ingersoll-Rand No. C-110, size 2¾ in., weight 130 lb. Only three were used, one of which was always held in reserve near the face. The steel used was 1-1⅛-, and 1¼-in., with bits from 2¼-in. for starters down to 1½-in. for longs.

Although the air pressure was high, the repairs on the drills were light. Two of them were new and one had been in service for several months. The total cost for renewal of parts amounted to $210.14, or charge of 10c. per ft. of tunnel driven.

SHORT ROUNDS BETTER THAN DEEP ONES

Comparatively deep rounds were tried at first, but it soon became evident that the nature of the ground and the powder used (40% Hercules) favored shorter rounds and more of them. Thus, it became the practice to put in the back and breast holes about 4½ ft. and the cut holes and lifters about 5 ft. deep, breaking a full 4 ft. of ground each round. On some days when there was an opportunity to drill a seventh round the drillers would make the holes a little shorter. The number of holes drilled per round ranged from 12 to 16, as conditions required, the total number of rounds drilled being 499, with a total number of 7041 holes, giving an average of 14.1 holes per round.

Drilling was done from a cross bar with two machines, the first set-up being made on top of the muck pile from which the back holes, breast holes and cut holes would be drilled. This set-up was made about six feet above the floor of the tunnel. The bar would then be lowered and set up at about two feet above the floor and the lifters put in. On an average, about 175 pieces of steel were dulled per day.

BLOWER AND EXHAUST FAN USED FOR VENTILATING

Ventilation was secured first by using a No. 6 Buffalo blower, electrically driven, placed near the Clay ventilating shaft, blowing fresh air into the face through 12-in. diameter galvanized pipe with joints wrapped with tarred muslin. This gave fair satisfaction, the men getting back to the face in from 15 to 20 min. after blasting. Later, when the heading reached about 1400 ft. from the blower, an arrangement was tried which proved successful; it is shown in Fig. 3. The blower remained as at first, a 12-in. suction fan was installed in the tunnel about 100 ft. back of the delivery end of the blower pipe which was arranged to draw the air from as near the face as possible through a 12-in. pipe and deliver it in the tunnel about 100 ft. back of the fan, or about 200 ft. back of the delivery end of the blower pipe, the delivery end of the blower and the suction end of the exhaust fan being, of course, extended as the face advanced. Had the tunnel been longer, the exhaust fan would have been moved forward occasionally rather than carry so much double pipe. The capacity of each of these fans was 950 cu.ft. per min. This arrangement facilitated the removal of the smoke and enabled the men to get back to the face in from 7 to 10 min. after blasting, thus cutting down the lost time 50%. In fact, I found it possible to return to the face immediately after the last hole had gone and remain there till the muckers had removed all the dirt, without feeling any bad effects. In 20 min. the tunnel would be clear of smoke back to the delivery of the 12-in. exhaust pipe, or from 1000 to 1200 ft. from the face, as the case might be. The fans were usually run for not more than one hour after blasting. The temperature near the face, when the machines were running, was about 75° F., and when not running, 80° Fahrenheit.

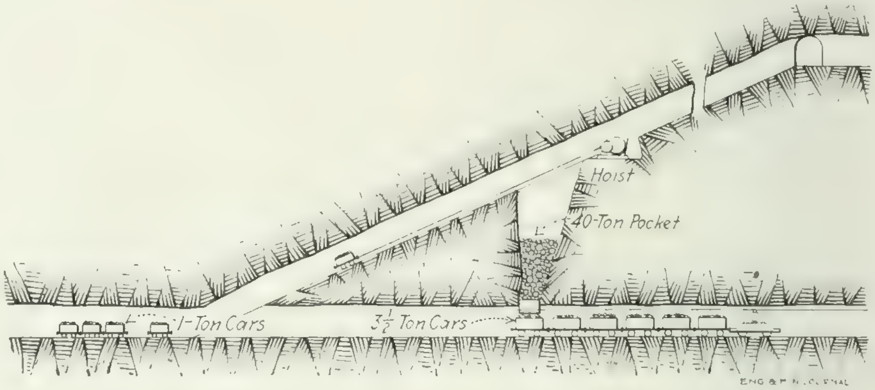


FIG. 2. METHOD OF TRANSFERRING ROCK FROM SMALL TO LARGE CARS

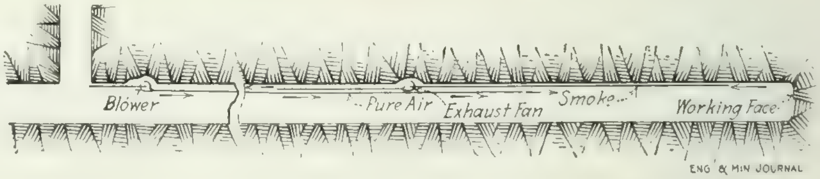


FIG. 3. METHOD OF INDUCING DRAFT TO DRAW OFF POWDER FUMES

MUCK HANDLED IN SMALL CARS

Handling of the muck was accomplished by using small cars of 20 cu.ft. capacity, 30 in. wide over-all, the narrowness enabling us to keep double tracks close up to the face with six inches clearance between the cars and plenty of room to get around between the cars and the sides of the tunnel. Five or six hundred feet of double track was carried along, the switch occasionally being moved forward. Only temporary tracks of 12-lb. rails laid on 4x8-in. ties spaced five feet apart were used during construction; gage 20 in., as is in use throughout all our mines. Before blasting, four steel plates 4x10 ft. were laid in the face to receive the muck, these plates being held in place by a steel pin driven into the floor. These plates would overlap the ends of the tracks.

In practice, all the empty cars were run in on the left-hand track (looking toward the breast), and all the loaded cars were placed on the right-hand track; one empty would be run on to the plate and swung over to the right-hand side in line with the right-hand track; three muckers would then proceed to fill it, using short-handle, scoop shovels holding about 25 lb., the man in the middle throwing the muck over his shoulder, very little interference with one another being noticeable when work was in full swing. It required 80 shovel loads to the car, the car being filled in two minutes. An additional mucker stood on the muck pile and loosened and picked down the dirt so that the shovelers could easily get a full shovel, while a fifth man stood by the cars to clean the spills from under the wheels and to assist in pulling away the full car and to bring forward the next empty.

Cars Loaded at Rate of One in Five Minutes

These five muckers formed the regular crew, and changed off with one another in rotation, each taking his turn at the shovel. An average of one car filled and switched every five minutes was easily kept up, and often bettered. The total number of rounds blasted was 499, and the total cars of muck run out was 13,477, giving an average of about 27 cars per round. Thus, little more than two hours each round was required to get the dirt away. Six cars being filled, they would be hauled away by the mule; we had 20 cars in service so that no delay would occur.

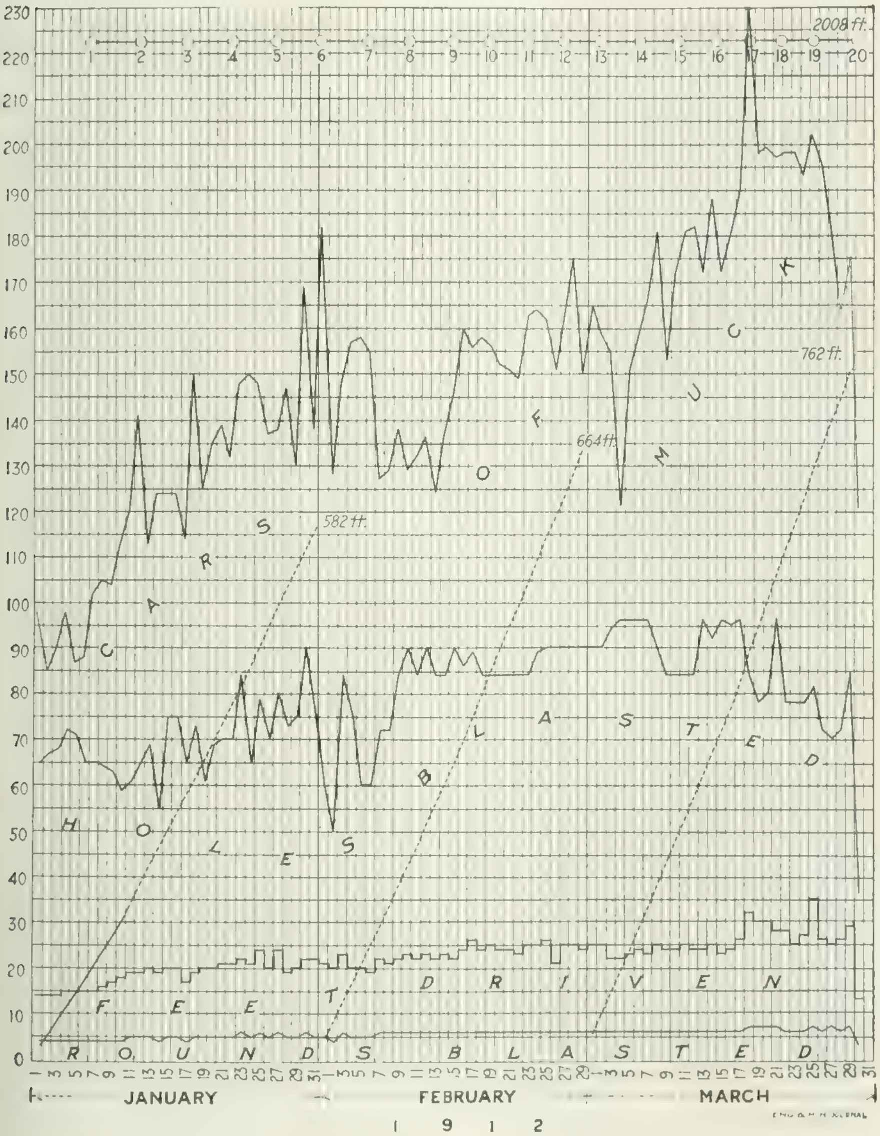


Fig. 4. Chart of Progress in Boring Tunnel

To facilitate the disposal of the muck, an expedient was resorted to which proved a great convenience. Our regular electric mine locomotives haul trains of 3½-ton cars and operate to a place near the Clay shaft. Mules and motors do not always agree, and we have sometimes found it to be disastrous for the former to mix them up in the same tunnel, and as it was not convenient for the motors to handle so small a car, nor was it desirable to have the small cars hauled too far from their place of service, an old incline raise and chute of 40 tons capacity was pressed into service and by a little alteration was converted into a convenient transfer, as shown in Fig. 3. A 5-hp. electric hoist was used to haul the small cars up the incline, and the hoistman attended to the hoisting, dumping and lowering of the cars. This transfer was 480 ft. from the face at Jan. 1 and 2487 ft. on March 30, giving an average haul for the mule and small cars of 1483 feet. When the muck was dumped into this chute the charges against the operation ceased, the waste being subsequently hauled away by the mine motor at such times as might be convenient and used to fill stopes or made use of where required.

The organization consisted of the following labor in the tunnel:

Shift	1	2	3	Total
Foreman				1
Miners	2	2	2	6
Machine helpers..	2	2	2	6
Muckers	5	5	5	15
Mule Men	1	1	1	3
Transfer Men.....	2	2	2	6
Timbermen pipemen, trackmen..	2			2
Sundry Labor....	1			1
Total	15	12	12	40

The following is taken from the daily log kept by the foreman, and represents the routine followed during the putting in of one round:

March 20, p.m.

2.00 Blasting of previous round finished.
2.10 Returned to face, miners picking down loose ground.
2.12 Muckers started, cleaning up track behind plate.
2.17 Picking down finished. Machines and bar brought to face by helpers.
2.18 Started setting up cross bar.
2.20 Tracks cleaned up to shoveling plate.
2.21 Second car being loaded from plate.
2.25 Second car loaded. Air and water hose brought to face by helpers.
2.27 Center taken.
2.30 Bar set up and machines prepared for mounting.
2.38 Machines mounted and first holes started.
3.00 Shift changed; 100 cars loaded.
4.00 Top round of nine holes finished. Still some muck left in face. All hands turned in to throw back the muck.
4.14 Muck all cleaned up; 27 cars loaded. Muckers prepare to lay track and extend pipe and lay mucking plates for next round, etc. Miners take down machines.
4.16 Miners setting up bar for lifters.
4.26 Miners started to drill lifters.
4.52 Lifters finished. Tearing down machines and bar.
4.55 Started blowing out holes.
5.13 Holes loaded by two miners and fuses spit.
5.15 Air valve opened.
5.20 Blasting finished.

Total time, blast to blast, 3 hr. 20 min.

In the above round there were but 12 holes drilled as follows:—Three back holes, average depth 48 in., 144 in.; three breast holes, average depth 50 in., 150 in.; three cut holes, average depth 60 in., 180 in.; and three lifter holes, average depth 52 in., 156 in.; a total depth of holes of 630 in. or 52½ ft. The time of drilling the top round was 1 hr. 22 min.; the time of drilling the bottom round was 26 min.; total time actually drilling 1 hr. 48 min.

It required nearly a box of powder to the round, or 10.3 lb. of powder per ft. of advance. Comet fuse was used with 5X caps, and as the ground was dry, single fuse only was required, and missed holes were rare. The total time required to muck 27 cars was two hours two minutes, or an average of 4½ min. per car.

Muck Not Thrown Far by Shooting

As a general rule, little of the muck was thrown back of the plates, or more than 20 ft. from the face, by the shooting. In the above case only one carload had to be shoveled off the track, and rarely was the pile more than 4 or 4½ ft. deep at the face. In the event of the muckers having cleaned up all the muck before the miners had finished drilling from the top set up, the machine men would sit on the cross bar while completing the holes.

The air and water hose were carried over the heads of the muckers on four 6-in. cross pieces temporarily wedged in place. One helper acted as chuck tender for both machines, while a second looked after the supply of steel, bringing in sharp steel and removing the dull. In changing shift, no time was lost; the men were not allowed to throw down their tools, but handed them to the next man and the machine men likewise kept on cranking their machines till the new man relieved them.

A spare miner was employed to do odd jobs, such as drilling holes for the plugs carrying the ventilating pipes, cutting hitches, attending the surveyors, etc. Grade was set every 75 ft.; the foreman gave the miners center and adjusted the track to grade every time fresh rails were laid.

The accompanying chart, Fig. 4, gives the daily record of the work done. The survey for projecting the tunnel was done under the personal supervision of John Kiddie, the mine engineer. A closed survey was made by triangulation over the surface connecting the Clay and Liverpool shafts, carrying lines down to the level of the tunnel 600 ft. below the collar of the Clay shaft and 250 ft. below the collar of the Liverpool shaft, and meandering the tunnel; similarly over the surface to the portal at the Queen mine, from which survey the resultant course was calculated.

At the time of connection the heading from surface was in 400 ft., while the heading from the Clay shaft was in 3000 ft. from that shaft. The error in calculation of resultant course was negligible (approximately two seconds). The survey lines in the opposing headings projected to the point of connection showed a divergence of only ¼ in. at point of connection, while the grade was found to be correct.

Cost of Driving

In the costs given I think the present purposes will be served by including only the actual cost of driving and that of such temporary work as was incidentally necessary. About 300 ft. of the ground requires timbering permanently, and this work is now being done. The laying of the permanent track and equipping for electric haulage will follow, the cost of which will not be ascertained for some time.

The bonus system was employed, the men receiving regular wages and for every foot of advance made over 350 ft. per month a bonus of $7 was divided. This test was, as explained, largely experimental. The bonus was found to be excessive, but the duration of the test being short it was not reduced. The average earnings of the miners for the three months was $5.77 per day, and for the muckers $4.30 per day.

Effect of Bonus

With the results obtained, the following shows how the incentive furnished the men by giving them a bonus worth working for affected the labor cost per foot of tunnel:—350 ft. with no bonus earned, $10.78; 582 ft. in January, $9.131; 664 ft. in February, $8.739; and 762 ft. in March, $8.627.

The following is a statement in detail of the cost of the work, and in this connection it should be explained that the driving of this tunnel was merely part of the ordinary work of the mine and that while the labor performed in the heading itself and up to the point where the muck was dumped into the transfer chute was all chargeable to the job, there was much of the incidental labor on surface which through the card system was apportioned over other accounts in addition to the particular job under review:—

Labor:	Cost per Foot	
Foreman	$0.475	
Machine miners	1.651	
Machine helpers	1.063	
Muckers	2.814	
Mule trammers	0.862	
Transfer men	0.300	
Tracks and pipes	0.338	
Timbering	0.024	
Compressor, installing	0.135	
Compressor, operating	0.298	
Air drill repairs	0.044	
Shop labor	0.117	
Blacksmith and tool sharpener	0.238	
Installing and operating fans	0.135	
Surveying	0.149	
General	0.214	$8.857
Equipment and supplies:		
Air compressors, fuel	0.402	
Air compressors, water	0.030	
Air drills	0.072	
Air drill parts	0.100	
Air hose	0.021	
Air pipe and fittings	0.068	
Water pipe and fittings	0.062	
Water hose	0.014	
Ventilation, blower	0.031	
Electric fan	0.035	
Installation	0.106	
Galvanized pipe	0.086	
Power operating fans	0.052	
Explosives, powder	1.324	
fuse	0.088	
caps	0.032	
Candles	0.107	
Timber	0.126	
Hoist power	0.024	
Temporary track material	0.071	
Mules, depreciation	0.034	
Mules, feed	0.067	
Mules, harness	0.069	
Water	0.004	
Tools	0.008	
Lubricants	0.032	
Waste	0.006	
Muslin	0.002	
Sundry	0.007	$3.008
Total labor, equipment and supplies		$11.937

In connection with the matter of labor costs shown above, it may be well to state that since the work was charged in the regular way to mine development, there are a number of apportioned charges shown; for instance, one-fourth of the general mine foreman's wages is included in the charge for foremen. The wages for shop labor, compressor, air drill repairs, blacksmith and tool shop men and general were all apportioned by the regular card system.

The direct-labor cost against the work in the tunnel, consisting of machine miners, machine helpers, muckers, mule trammers, and transfer men, amounted to $6.89 per ft. (this included the breaking of the ground, mucking, tramming and transferring the waste to the chute), all the other work being accessory. Labor for timbering included above represents only temporary work.

In the foregoing equipment and supplies charges, in the case of air drills, 25% of their original cost was charged to the tunnel, and the whole of the cost for repairs. Similarly, 25% of the cost of both air pipe and galvanized pipe was charged to the tunnel, and 10% of the cost for fans. In the case of track material, a uniform charge of 10% of the value of the rails, spikes, bolts, splicings, etc., was charged, and 75% of the cost of the ties; 25c. per day per mule was charged for depreciation.

All the men employed, except the foreman, were non-English speaking Mexicans, Italians and Spaniards. No accidents of any kind occurred, with the exception of a slight one in the case of a Mexican, who was told by his compatriots to *"andale"* out of the way; that they were going to drop one of the mucking plates in place. He did not *"andale"* with sufficient alacrity and received the corner of the plate on his toe, which incapacitated him for a few days.

W. G. Scott, foreman of the Clay mine, was in charge of the operations above described, and the results attained were largely due to his careful planning of the work and the interest he took in every detail.

U. S. Arsenic Production

The production of white arsenic in the United States in 1911 was 3132 tons, valued at $73,408, against 1497 tons, valued at $52,305, in 1910, according to the U. S. Geological Survey. The arsenic was obtained as a byproduct of smelting operations. This output is much the largest ever made in this country, but owing to the low price and the distance of the smelters from New York, the freight charges absorbed a large proportion of the profit.

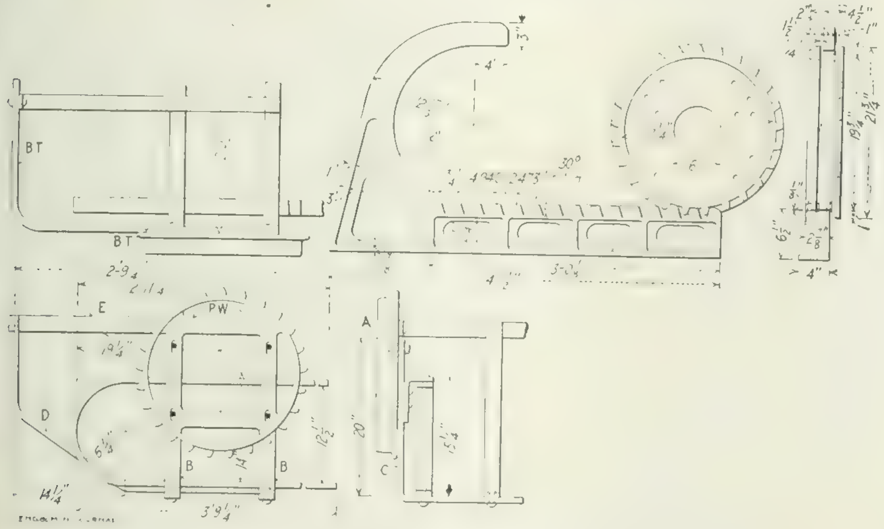
During the year 4996 tons of white arsenic, metallic arsenic, and arsenic sulphides were imported. Of this amount 1921 tons was white arsenic. The total production and importation in 1911 of arsenic and all arsenic compounds amounted to 16,256,000 lb. The principal uses of arsenic are in glass making, in pigments, and in insecticides.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Dump for Mine Cars

In the accompanying drawings are shown the details of construction of the dump or tipple that is used at the mines of the St. Louis Smelting & Refining Co. in the southeastern Missouri lead district, for dumping cars made with the wheels fastened rigidly to the body. This tipple is of the traveling-cradle type in that the cradle rides ahead on the framework before it dumps the car. The frame pieces on which the cradle travels end in hooks that catch the cradle and keep the car from going clear over; consequently, no reliance has to be placed upon a chain fastened to a crossbar of the cradle and anchored to a tie of the track or fastened in some other way to solid ground. This type of dump is somewhat more expensive than the type in which the cradle swings on its axle and does not travel forward.



DUMP FOR CARS WITH WHEELS RIGIDLY ATTACHED TO BODY

The frame on which the cradle travels is made up of two castings that are bolted to timbers running out across the chute into which the ore is to be dumped. The frame castings are made with horns that come up and hook over the wheels of the cradle so that it cannot turn any farther than desired, owing to the teeth of the wheels, which also mesh with teeth on the frame castings. These teeth do not carry the weight of the cradle, but simply mesh with each other, for the casting extends up to form a track ledge slightly higher than the tops of the teeth on which the wheels of the cradle roll. The function of the teeth is only to regulate the forward motion of the cradle wheels and keep them even as they go forward, as well as to limit the end of the dump when the wheels come flush with the hooks of the frame pieces.

The cradle is made up of the cradle proper and the cradle wheels which are bolted to it and on which the cradle rides forward and back as the car dumps and rights itself again. These dump wheels *A* are fastened by bolts that pass through slots in the cross arms of the wheels. In this way it is possible to level the cradle frame with respect to the dump wheels.

The cradle frame is composed of the two cross braces *B* to which the wheels are bolted and to which the track straps and wheel-catching loops *C* are riveted, as is also the center strap *D* which goes forward to fasten to the bridle strap *E*, that extends forward to catch the front of the car and take part of the strain that would otherwise come down to the track loops *C*, while the car is dumping. In case the cars will not right themselves after they have dumped, it is customary to fasten weights to the back cross strap *B* so as to remedy this. The track straps *C*, of course, extend back farther than the rest of the dump so as to join with the rails of the track leading up to the tipple. When the car has righted itself and the cradle has run back to its proper position on the frame, these drop down upon a cross piece of iron so that they just come level with the tops of the rails of the approach.

The dump that has been described is designed for a one-ton car of the usual type used in hand tramming at mines. The drawing gives the manner of proportioning the different members of the cradle and frame so that they will stand up to the strain of the work, but the dimensions of the cradle have to be changed, of course, to suit the dimensions of the individual car that they are to serve. The tipple shown in the drawing is made of cast steel, and has been in use for several years; it works satisfactorily. Some trouble has been experienced owing to the occasional breaking of a hook leg when a car has been run into the dump with more than ordinary force.

Hoisting on Inclines

By Arthur O. Gates*

In hoisting with skips from deep inclined shafts or hauling trains of cars from flatter inclines, the effect of the inclination is to make the pull on the rope less than the total weight handled. This reduction in rope pull allows greater loads to be handled, and the accompanying diagrams are for the purpose of determining at a glance the rope pull due to a weight of 1000 lb. gross when operating on the various angles and grades shown.

When a load W is supported on an incline, the actual support consists of two components, a normal force N at right angles to the track, and a force P, parallel to the track. The resultant of these two being, of course, equal and opposite to W.

The circle diagram developed from this relation is rather interesting, depending on a simple geometrical law which can be stated in several ways. Given a series of right triangles with a common hypotenuse, the intersection of the right angles will lie on the circle the diameter of which is the hypotenuse. Stated another way: If from any point on a circle, straight lines be drawn to the opposite ends of a diameter, the included angle is a right angle.

It will be noted that the gross weight W-1000 lb. has been plotted as the vertical diameter of the circle and is the pull P when the angle of inclination is 90°. At any other angle then 90° the pull P is measured by the distance from the lower end of the diameter to the intersection of the circle and the line drawn at the true angle, measured of course on the same scale as the vertical diameter. Thus with a gross load of 1000 lb. on an incline 47° from the horizontal the rope pull due to weight alone is 730 pounds.

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*Mining engineer, 1017 State St., Lafayette, Ind.

On inclines the effect of friction of the wheels on the rails is to increase the rope pull when hoisting, and to decrease the rope pull when lowering. This friction or "traction" varies between certain limits; from 15 to 20 lb. per ton normal pressure on the track when track and skip or car are in the best of condition, up to 40 and 60 lb. and even more under bad conditions. This traction is proportional to the normal force on the rails and its value can be shown graphically by another circle diagram, this time with the diameter horizontal and equal to the traction on level grade as shown at the bottom of the circle diagram, the traction of 50 lb. for the 1000 lb. gross load (100 lb. per ton) has been laid off horizontally and the circle drawn. The length from the corner to the intersection of this circle and the angle line measures the traction for this inclination.

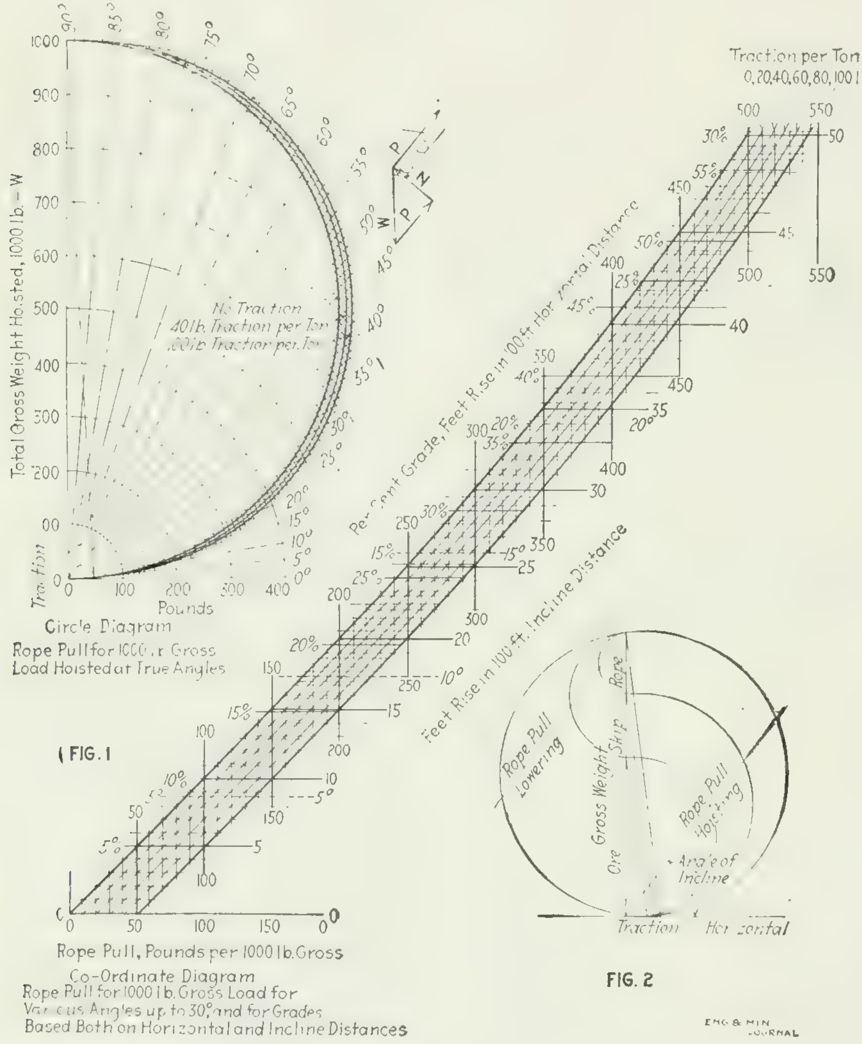


Chart for Solution of Forces in Hoisting on Inclines

The combined rope pull due to load and traction is obtained by laying off a new circle on the hypotenuse connecting the ends of the vertical, gross-load line and horizontal, traction line, the incline angles being laid off from the bottom of the vertical, gross-load line. For the rope pull when lowering lay off the inclination from the upper end of the vertical, gross-load line.

The lengths of these lines to their intersection with the circle gives the rope pull hoisting and lowering as in Fig. 2, which figure also shows the partial loads due to ore only, skip or cars only, and rope. The circles for lowering rope-pulls of rope and combined rope and skip have their centers on the diameter of the big circle.

For a specific problem, lay off the different gross loads vertically as in Fig. 2, and the corresponding tractions horizontally, and the exact rope pulls may be read off directly to scale. In case the incline changes its direction, the rope must be divided into several parts, the weight of the section of rope nearest the skip and on the same inclination, together with skip and ore are combined on the circle diagram, and the pull of the rope on other inclines added. There are several ways that this may be diagrammed, but anyone familiar with the schemes as outlined need have no difficulty in determining rope pulls for any combination of inclines.

On the flatter grades, the effect of traction is more marked, so for purposes of accuracy that part of the circle diagram under 30° has been plotted to cöordinate on a greater scale and which, we will call the cöordinate diagram. Horizontal distances represent rope pulls when the gross load is 1000 lb., vertical distance marked above the curve indicating per cent. grade or rise in feet per 100 ft. horizontal distance; vertical distances marked below the curves, feet rise per 100 ft. along the incline. The angles every 5° are shown by dashed lines; intermediate angle may be found by interpolation.

The simplicity of the circle diagram and the ease with which it can be remembered makes one wonder if this method has not been used before, although no previous use of it has come to my observation. At any rate the curve shows how nicely the graphical method often gives a physical conception of the effect of variation.

Telephone Receivers

The application of the electric telephone to mining practice has been a distinct gain in saving of time and clearance in transmitting orders, and there is no doubt that owing to the promptness with which messages can be transmitted from one part of the mine to another, and to the surface, a good deal of value in money and in some cases, in lives, has been saved. It should not, however, be forgotten that for mining practice, especially in the heated atmosphere which is generally found in mines, working in the tropics, a certain amount of extra attention is necessary in order to adapt the design of the telephone receivers to the peculiar conditions under which they are operated. The miner is not always so careful as he might be, and there is great danger of damage due to rough usage being occasioned unless the instruments are made in a very sound and substantial manner. In addition to this a large number of telephone receivers have been scrapped or have become a nuisance, owing to the fact that the cases were made of ebonite or other composition. In the case of high temperatures they shrink so badly as to cause the cap to fall off. In some instances, it is found that the cap is taped on with adhesive tape, after which wax has been run in. Such methods of construction are of no use whatever, when applied to mining conditions. It should be noted by manufacturers of apparatus for mines that the case should be made of metal which should be protected externally by means of an insulated sheath in order that should the receiver be handled when ringing is taking place, the operator may be saved from the unpleasant shock which would otherwise be experienced.

Details of Metallurgical Practice

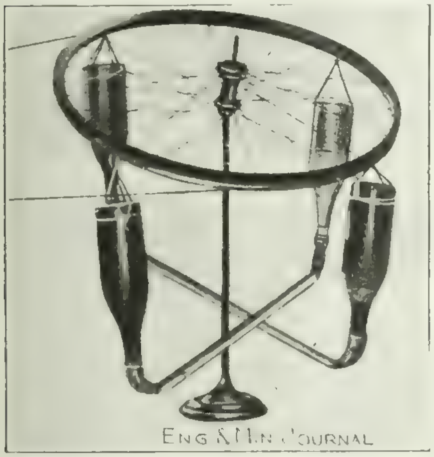
Records of Experience in Ore Dressing, Cyaniding and Smelting

Laboratory Agitating Apparatus

By Will H. Coghill[*]

Accurate laboratory cyanide tests can often be made in closed jars, but there are cases in which the results are misleading because the conditions are not similar to those in large-scale work.

Agitation by means of compressed air is also popular. Here again are weak points; the first is that the air is fouled in the compressor cylinder, and the second is that an unavoidable excess of air is used.



Laboratory Agitation Apparatus

Though air filters have worked successfully in the air line on a commercial scale between the compressor and the agitator, they would be found cumberous in a testing laboratory. The evil effects of CO_2 where an unavoidable excess of air was used is shown by the accompanying table. A barren solution was placed in an inverted wine bottle with the bottom knocked out and air was forced in at the bottom (neck end) in an amount that would be necessary to keep pulp in suspension. The table shows how the protective alkalinity is gradually neutralized until the point is reached where the KCN begins to decompose, and the accumulation of K_2CO_3, one of the decomposition products of KCN under such conditions, indicates an increase in the protective alkalinity.

The KCN dropped from 4.8 to 2.7 in five days. In a duplicate test the air was passed through milk of lime, which proved to be a decided benefit. I next reconstructed the apparatus so that aëration and agitation was secured by means of a home-made air-lift pump. This consisted of a rubber hose leading from the bottom of the bottle to the top on the outside, this being connected by means of another hose to an air line carrying 25-lb. pressure in such a way as to make an air-lift pump. The pumping was at such a rate that the pulp would make a complete cycle every three minutes. This air-lift pump has worked nicely in practice, handling a four-to-one pulp. The deterioration of the cyanide solution in this apparatus was much less than in the apparatus previously mentioned.

RESULTS OF AGITATION BY AIR JET

	KCN %	Protective Alkalinity %
Mon.	4.8	1.1
Tue	4.7	0.5
Wed	4.5	0.1
Thu	3.7	0.3
Fri	3.1	0.5
Sat.	2.7	0.6

Wishing to get away entirely from the use of compressed air, I designed the apparatus shown in the annexed cut. I think that it is the only laboratory apparatus, except one patented and manufactured by Hendryx, in which there is combined aëration and agitation without the use of compressed air. Anyone can make one out of an abandoned bicycle wheel, some wine bottles, glass tubing, and a few inches of rubber tubing. The wheel is tipped about 15° from horizontal and geared to rotate at 6 r.p.m., thus dashing the solution from one bottle to the one opposite, 12 times per minute. The opening at the top of the bottles admits an ample amount of air for aëration and the agitation is thorough.

False Mortar Bottom for Increasing Height of Discharge

As the dies in a stamp mortar become worn, the height of the discharge is gradually increased, until it may amount to as much as a few inches less than the height of a new die. In order to compensate for the gradual increase in height of discharge, it is the practice in some mills to use a series of chuck-blocks. These are provided for each battery in sets of three or four, each being a little lower than the other, then as the die becomes worn a shallower chuck block is substituted; when the die becomes further worn, the third and still shallower chuck block is used, and so on until the lowest chuck block is used, when the die is nearly worn out.

In certain stamp mills on the Rand, instead of using chuck blocks of different heights, false bottoms are used in the mortars for raising the dies. These false bottoms, described by G. O. Smart, in "A Textbook of Rand Metallurgical Practice," consist of a steel plate about 3 in. deep, which is placed under the die in the bottom of the mortar-box cavity. As the dies become still more worn, another false bottom may be used, or coarse gravel may be placed under the false bottom, and thus both false bottom and dies may be raised.

The use of a false bottom necessitates the removal of all the dies, while if the chuck blocks of different types are used, it is not necessary to delay crushing for so long a time, when compensating for the increase in discharge height.

Nevada Consolidated Canvas Tables

The accompanying illustrations show the double-deck canvas slime tables now being used in the Steptoe Valley concentrator of the Nevada Consolidated company at McGill, Nev. The speed of the belt of this machine is approximately 7 ft. per min. and in the double-deck type of table, the low-grade concentrates of the upper deck are passed to the lower deck for retreatment. It is the intention of the management to work these slimers in decks of three; to take the low-grade concentrates from each deck and retreat it on a finishing machine. It is hoped thereby to get an insoluble in the concentrates of 50% as against the present average total insoluble of 65 per cent.

The machines are about 8 ft. wide and 13 ft. long and have a capacity of about 8 tons of solids per belt per machine per day. The feed to the tables assays approximately 1% copper and carries 18% in solids and the material is all finer than 200 mesh. The feed is material all of which has been discarded by the mill. The product of the machines treating daily 80 tons of solids containing 1% copper, has been amounting to approximately 14,000 lb. of copper per month, the concentrates having the following analysis: Gold, 0.073 oz.; silver, 0.21 oz.; copper, 5.7%; silica, 56.9%; iron, 9.2%; lime, 0.8%; alumina, 9.1%; and sulphur, 8.3%. The extraction is approximately 30% on a table of this type.

The material is used exclusively in claying up the reverberatories and as a smelter and converter flux and if, with some changes anticipated in cleaning the

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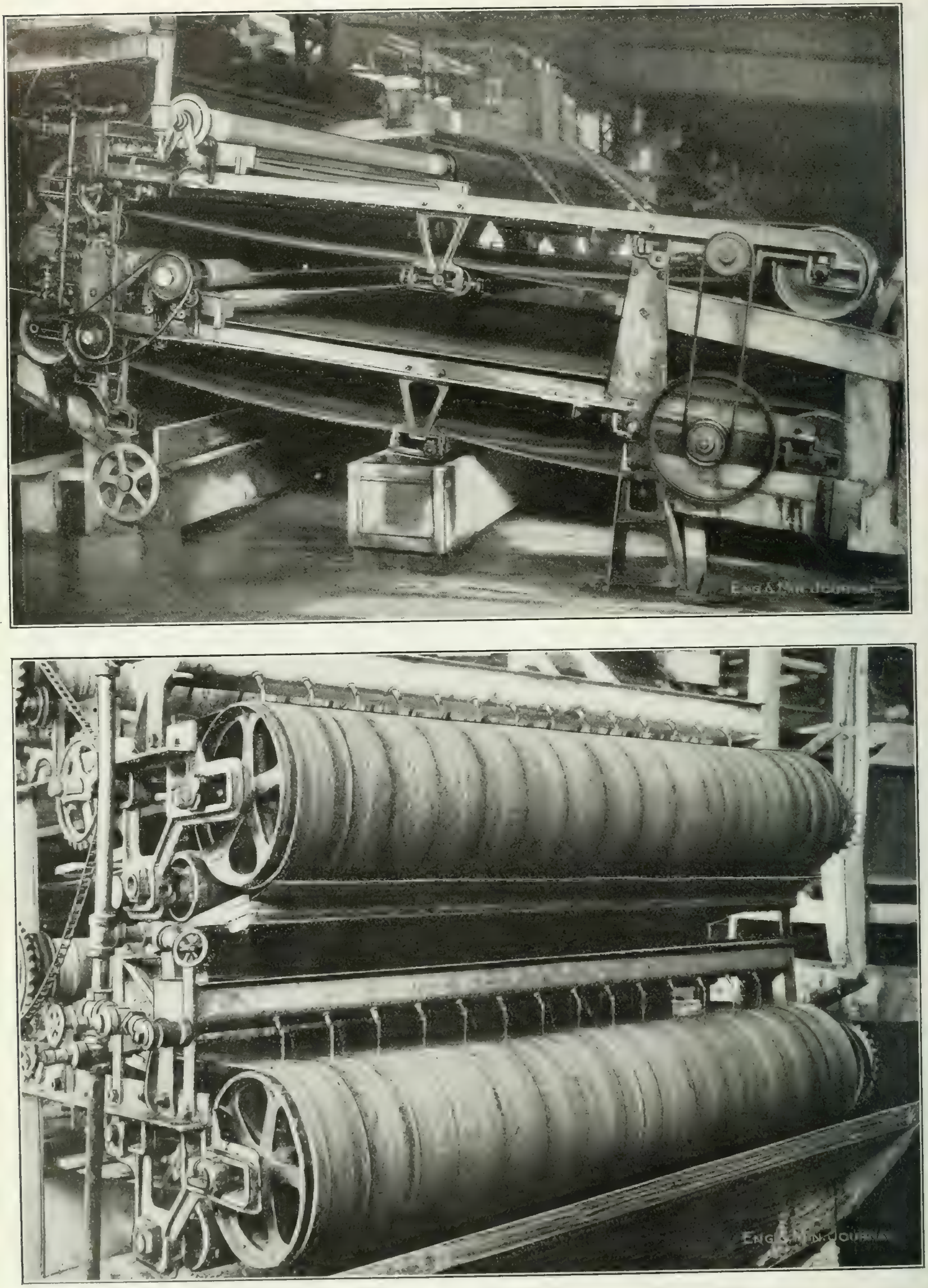
[*] Ore testing laboratory, Northwestern University, Evanston, Ill.



Side and End View of Nevada Consolidated Double-deck Canvas Table rough product, a reasonable extraction can be obtained with an insoluble of 50% or less, this material can go with the other concentrates through the roasting department.

Improved Teeter-Box Sampler

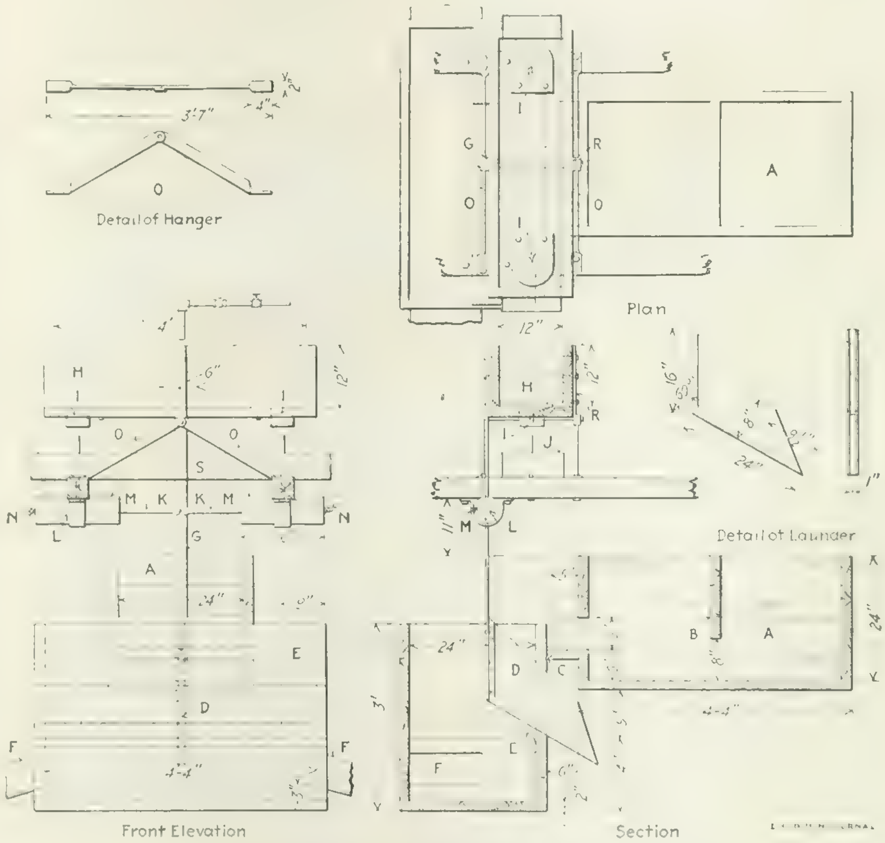
In the accompanying drawing are shown the details of construction of the teeter-box samplers that are to be used to sample tailings at the mill of the St. Louis Smelting & Refining Co., in the southeastern Missouri lead district. It was designed by G. A. Overstrom, the inventor of the Overstrom system of classification and the designer of the concentrating tables bearing his name. This teeter sampler is conspicuous in the refinements that have been added so as to insure the obtaining of a perfect sample. In the first place it has the retarding plungers and cylinders first used by William Carkeek, now dead, but formerly the mill superintendent of the Colorado smeltery at Butte, Mont., who was the first man to appreciate the importance of retarding the tilting of the teeter-box so as to insure the sampling spout traveling evenly through the whole section of the stream of tailings. This idea was transmitted to Mr. Burch and used by him in the design of the tailings samplers for the Nacozari mill of Phelps, Dodge & Co., in Sonora, Mexico.

In the tailings feed box *A*, baffles *B* are put in so as to break up the surface currents, while the feed is drawn off through a slot in the front of the feed box so as to insure a more even distribution as to depth of stream of the overflowing tailings. To the front of the discharge spout is fastened an angle iron that extends up high eough to dam back a layer of tailings on the spout and cause the tailings to discharge with a slight upward swirl at the bottom so as to mix the heavier particles with the feed while, by the angle iron, the discharge spout can be leveled so as to insure the same thickness across the issuing stream that is to be cut by the sampling spout.

This sampling spout *D* is made one inch wide so as to insure that it will take a reliable sample, less affected by impingement of particles upon the walls of the spout than is the case when the sample spout is made only about ½ in wide, as is so often the practice, although another reason for using the wide spout is that the minimum trommel opening in the mills is 3 mm. The sides of the spout are made high above the top of the pulp stream so that there can be no flowing of the sample over the sides and loss of some of the slime. This is an important point that is not always considered in building teeter-box samplers. Below the sample spout, and on the near side of the catch box that catches the tailings so that they can be taken away without spilling in launders after passing the sampler, is nailed a piece of sheet iron arranged to prevent any splashing back of the tailings when they strike the bottom of the catch box. The tailings from the catch box are drawn off into the tailings launder through a slot *F* in the side of the catch box so that there is less liability of spilling tailings than if the tailings were drawn off from an overflowing lip.

The sampling spout is carried on the end of a long iron arm extending down from the teeter box. The teeter box *H* is supported from two timbers by the iron rests *O* that carry the bolt *P* that goes through both the hole in the spout arm *G* and that in the strap *R*, which is bolted to the teeter box by three bolts passing through the block that serves as the middle partition in the teeter box. In each compartment of the teeter box is placed a valve *I*. This, as the box falls, drops on the pin *J*. This pin then lifts the valve and lets the water run out of the box. The water discharges into the launder *S*, and is taken away.

Linked to the spout arm *G* are the two plunger rods *K* that connect with plungers *L*, in the cylinders *M* that are strapped to the underside of the cross beams that carry the supports *O*. On the ends of these cylinders are the pet cocks *N*. It is by the amount that these pet cocks are opened that the speed with which the spout cuts through the stream of tailings is regulated. The frequency with which the sample is taken depends upon the stream of water that is fed to the teeter box.



IMPROVED TEETER-BOX SAMPLER

Dust Determination by Filtration through Sugar

In testing air in the mines of South Africa, A. McArthur Johnston tried various filtering media, and after comparison it was decided that better results could be obtained with cane sugar than with cotton wool, glass wool, or water (*Journ.* Chem. Met. and Min. Soc. of So. Africa, May, 1912). The filter bed is obtained by coarsely crushing lump sugar, and using that which fails to pass a 90-mesh (0.006-in. aperture) sieve. The filtering layer is made about two inches thick and may require a copper or brass gauze to hold it in place. It should be slightly moistened, to aid in the retention of dust, but not sufficiently to cause caking. This point has to be guessed at.

To estimate the dust, after the air is aspirated through the sugar, the sugar is dissolved in distilled water, and then the solution filtered through a tared filter paper or on asbestos in a gooch. The weight found represents the total dust present. Incineration will then give a difference, organic matter.

The drill explorations in the Cuyuna district has disclosed what appears to be an extensive deposit of graphitic slate running upward of 20% in graphite by analysis. Experiments are being made to treat this material so as to save the graphite or to utilize the material for special purposes.

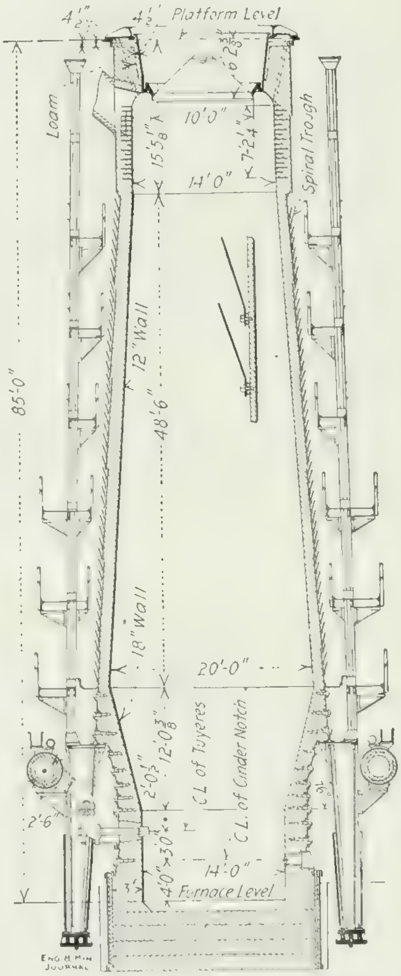
A New Thin-lined Blast Furnace

The construction of a blast furnace of the new thin-lined water-cooled type, which has recently been put in operation, is described in the Cleveland *Iron Trade Review*. This furnace was built for the Eastern Steel Co.—formerly Warwick Iron & Steel Co.—at Pottstown, Penn., by F. C. Roberts & Co., of Philadelphia. It is the third of a group of furnaces owned by the company, and is arranged to be used with the stoves and power equipment of either No. 1 or No. 2 stacks.

The stack is 85x20 ft. The framework, including the columns, is of wrought steel. The top platform, charging apparatus, etc., are supported independently of the furnace shell by columns resting upon the main columns which support the furnace. Platforms are provided at various levels so that all parts of the furnace casing may be readily accessible. The lower portions of the furnace columns are enclosed in cast-iron casings filled with concrete. The inwall is cooled by water carried and distributed by a spiral trough of the Roberts type. The waste water from the tuyeres and bosh-plates is delivered by different points in the spiral trough by an electrically driven pump. This trough is connected to the furnace shell by top bolts, which do not pass through the shell, thereby avoiding the possibility of water entering the furnace around the bolts. A washer is provided around each bolt and between the trough and the shell. As a result, there is an opening between the bottom of the spiral trough and the shell which is continuous, except for the interference of the bolts.

At the lower end of the spiral trough the water is discharged into a horizontal trough which in turn is connected to the drainage system. The construction and operation of the spiral trough is such that while some of the water circulates around the spiral a large quantity passes through the openings at the bottom to the courses of the spiral trough below and continues its flow to the horizontal trough at the lower end of the spiral. In passing from one course of the spiral to that underneath, the water is in immediate contact with the furnace shell, thereby forming a thin film over all of the plates. The effect of a well-distributed spray is thereby secured with the additional advantages that the side of the spiral trough prevents the wind from interfering with the distribution of the water.

The bosh is enclosed entirely in a wrought steel casing having openings for the insertion of the bosh-plates. The construction is of the Farrell-Roberts type. The bosh-plates are held securely in position by angles on the inside and outside of the steel casing, the former angles being above and the latter below the bosh-plates. The steel casing enclosing the bosh extends downwards to a point below the top of the hearth jacket and is provided with openings for the tuyeres, cinder notch and the row of bosh-plates below the tuyeres. The hearth jacket is made of wrought steel plates which enclose a series of water-cooled cast-iron plates. The furnace mantel is simple in construction and a continuous wrought iron casing is provided which extends from the top of the hearth jacket to the top of the furnace. The hopper is supported by an annular ring, the construction being such that the leakage of gas around the furnace top is rendered impossible. The furnace is equipped with 10 tuyeres and two cinder notches.



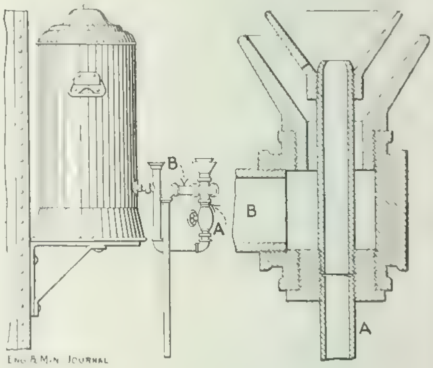
THIN-LINED BLAST FURNACE

The brickwork of the stock line is protected by Cook high-carbon steel plates. The downcomer is connected to the furnace top by four branches equally spaced around the furnace, each connection being provided with a vertical pipe extending 22 ft. above the furnace platform and is equipped with a Roberts relief valve. In the event of a slip these valves permit the escape of gas, but prevent the discharge of ore, coke, etc. The furnace charging apparatus is of the Roberts skip hoist design connecting below with the stock transfer system, which supplies all the furnaces.

This stack has now been in operation about two months, with results entirely satisfactory.

A Sanitary Water Cooler

In recent issues of the JOURNAL, several types of sanitary water coolers for use in mines have been described. All of these depended upon there being a supply of potable water under pressure in the mine; they could not be used where such water was not piped. A form of sanitary water cooler, as described by C. A. Harrington in the *American Machinist*, is shown in the accompanying illustration. It consists of an ordinary water cooler to which a bubbling device or sanitary cup is attached. As will be apparent from the illustration, the water from the cooler enters at *A* and bubbles up through the center cone. The waste water is collected in the outer cone and is conducted through the pipe *B* to a drain bucket situated in any convenient place. The height of the bubble may be easily governed by the distance from *A* to the surface of the water in the cooler, the height of three feet giving good results. Such a cooler can be used anywhere in a mine where it is convenient to support it upon a bracket. It can also be installed conveniently in mills or in other buildings on the surface.



WATER COOLER WITH BUBBLING CUP

Stirring Solutions by Solenoids

The objection to stirring solutions by solenoids in electrolytic analysis is that the beaker is down inside the solenoid and cannot be seen, and that the solution becomes overheated, due to lack of radiation. Knote and Work, at the Pittsburgh Testing Laboratory, put an iron core in the solenoid, and set the beaker on top of this core (*Journ. Ind. and Eng. Chem.*, July, 1912). While most of the work done by the solenoid is at the bottom of the beaker, owing to free circulation, the entire solution will be found sufficiently stirred.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Labor for Hauling and Hoisting Ore

The Arizona Copper Co's. No. 6 shaft, as stated in its annual report for year ended Sept. 30, 1911, is 460 ft. deep and has three compartments; two, 6x5 ft. in the clear, in each of which a skip of 5 tons capacity works in balance; and one manway 4x5 ft. in the clear. The gallows frame is 90 ft. high and a Humboldt hoisting engine was being used until electric power should be available.

The skips in the shaft are filled by means of a steel loading hopper, holding exactly one skip load. This is operated by one man, who, while the skip is being hoisted, draws the ore from the chute into the measuring hopper ready to be dumped into the next skip the moment it is lowered to him. The operation of loading the skip from the time of stop to time of start, does not occupy more than five seconds.

At the top the skips automatically dump into the crusher bins. The rate of hoisting with this equipment is 300 tons per hour, which indicates that one skip is loaded, hoisted, and dumped per minute. The only labor required for this operation is one hoisting engineer and one skip tender. A new haulage system was installed and connected with the shaft. It consists of a train of 20 cars which dump their load into the chutes, with but two movements of the train, in from three to four minutes. Two brakemen perform this operation.

Cinderella Gold Mines

The annual report for 1911, of the Cinderella Consolidated Gold Mines, Transvaal, South Africa, states that the company mined 222,487 tons of ore, from which 30,196 tons of waste were sorted, or about 13.6% of the tonnage mined. The mill crushed 192,341 tons of ore with an average of 70 stamps and three tube mills in 331 days, equal to a stamp duty of 8.29 tons per stamp per 24 hours. Of the ore milled 126,253 tons were treated as sand and 65,768 tons of slime were treated in the cyanide department; the gold recovered by the latter treatment was equivalent to 41.57% of the total recovered from all sources. The total cost of production was $5.81 per ton, of which $3.37 was for mining; 12c. for sorting, crushing and transportation; 48c. for milling; 48c. for cyaniding; 54c. for general mine expenses; 49c. for mine development and 34c. for head-office expenditures. The net recovery of gold equaled $6.69 per ton, leaving a profit of 88c. after deducting working expenses. An average of 686 men was employed underground, which indicates an average of about 324 tons per year per man employed underground.

Notes on New Zealand Mining

The Waihi Gold Mining Co., Ltd., Waihi, New Zealand, as shown by the official report for 1911, mined 381,873 tons of ore at a cost of approximately $1.90 per ton for stoping, general mining expenses and development. Based upon 350,699 dry tons of ore milled the total expenditures of all kinds equaled about $4.45 per ton and gross receipts from gold and silver averaged approximately $9.50 per ton milled.

At the Waihi mill, 90 stamps and 5 tube mills, an average of 72.736 stamps was operated 297 days and crushed 5.139 dry metric tons per stamp per day; an average of 3.864 tube mills was operated. The proportion of ore treated was 34.17% sand, 63.85% slime, and 1.98% concentrate. An extraction of 91.5% was made on the gold contents and 78.1% of the silver contents or a total extraction of 89.3% of the total metal contents.

An experiment was made during the year to determine what advantage, if any, could be derived by the use of cocoanut matting in place of corrugated iron in the vacuum filters. The results, taken over a period of several weeks, showed absolutely the same tonnage efficiency and completeness of wash with either the matting or corrugated iron; the matting filter has the disadvantage that it is liable to become choked with slime over a greater or lesser area if the filter cloth is torn, and it is liable to become choked with lime deposit, necessitating cleaning with acid or sand blast. It was decided to continue the use of corrugated iron as it was free from these disadvantages. Another test at this mill was made to decide the economy in using "ton cap" battery screens. The report states that an eight weeks' test showed that while the life of the "ton cap" screen was greater than that of the standard 10-mesh screen, the cost was so much greater it was decided to continue the use of the standard screen.

The Victoria mill, 200 stamps and 11 tube mills, ran 297 days and crushed 4.943 dry metric tons per stamp per day with 10-mesh screens on mortars; an average of 8.209 tube mills was in operation. Of the total ore treated, 18.63% was sand, 80.09% slime and 1.28% concentrate. The total extraction of gold and silver contents amounted to 89.2%, 91.6% of the gold and 74.8% of the silver. Referring to experiments at the Victoria mill the report states that experiments have proved conclusively that prolonged agitation is necessary on comparatively high silver assays, a profitable amount of silver being dissolved up to seven days. It is unprofitable to allow the agitation time to fall below four to five days on the regular ores.

At the Union mill, 40 stamps and one tube mill, the run was for 26 days and the extraction 89.1% of gold and silver contents, or 91.4% of the gold and 73% of the silver. The average number of stamps running at all the mills was 236.85; tube mills on ore, 12.16 and on concentrates 1.66. The tube mills make 26 revolutions per minute. The average stamp duty at all mills was 4.985 dry metric tons per day; stamps are about 1000 lb. weight; the standard screen used is 10-mesh (aperture 1.78 mm.); the residue shows about 4% of the sand + 120 mesh the value of which is too low for treatment.

All concentrates produced at the mills were treated at the concentrate-treatment plant at the Victoria mill, and equaled 1.53% of the total ore crushed. The average grade was about $105 per ton and the extraction of gold and silver in concentrate was 95% in 1911, compared with 94.9% in 1910. In 1911, 95.1% of the gold and 94.6% of the silver was recovered against 95.4% and 92.9% respectively in 1910. The cost was approximately $6.10 per ton of concentrate treated or 5.22c. per ton of ore milled.

In the cleanup and melting department 145,568 lb. of zinc-gold slime were treated in three producer gas-fired crucible furnaces (No. 200 crucible) at a cost of 8c. per furnace hour. The amalgam retorts were also fired with producer gas at a cost of 4c. per hour. The total number of assays including bullion, mine and mill samples amounted to 17,475 or approximately one assay for every 20 tons of ore treated. Stamp dies were made at the works out of old scrap steel, and while not equal to the imported dies, resulted in a 44% saving.

Some interesting data are given on the life of machinery in the water-power plant. A 200-b.hp. vortex turbine, through which an enormous amount of tailing has passed, was in excellent condition after 12 years continuous service, the only wear noticeable being in the packing boxes and glands and a little slackness in a few of the motor vanes. No. 1 turbine, 200 hp. running for about 15 years., was in about the same condition and No. 3, 100 hp. running for 11 years, did not require anything in the way of repairs. After 15 years' service a locomotive boiler was taken out for repairs on account of corrosion inside the shell. A 24-in. conveyor belt, elevating the product at Waihi mill from a No. 5 Gates crusher to a height of 40 ft., has been in use for 25 months and it is estimated that it will last another 12 months. Up to the present it has handled 252,000 tons of wet quartz.

The company is constructing a hydroelectrical works at the Hora Hora rapids. In removing a boulder bed consisting of gravel and boulders cemented together with clay and iron oxide, it was found impossible to work it by sluicing or with excavators. It was therefore worked with picks; large boulders were drilled and blasted and the spoil removed with 2-cu.yd. horse trucks. The cost for breaking, loading, and tipping the material at Hora Hora was as follows: Sand, 2c. per cu.yd.; boulder bed, 36c., and rock 24c. per cu.yd. In making foundations 9600 cu.yd. of concrete material put through the mixer represented 6400 cu.yd. in place, a shrinkage of about one-third. Where a watertight concrete was required the mixture was: 1 cement, 2 sand, and 4 stone, by weight, or approximately 5 of sand and stone to 1 of cement by measure. Where watertightness was not required the mixture was 1-3-6, or about 7 of sand and stone to 1 of cement by measure.

Labor Data, Alaska-Treadwell

During the year ended May 31, 1911, an average of 740 men were employed per day at the Alaska-Treadwell Gold Mining Co., Douglas Island, Alaska, according to the annual report. The average wage paid was $3.39 and the various rates of wages were as follows: Machine drillers, $3.50 per day; machine-drill helpers, $3.25; mine laborers, $3; amalgamators, $120 per month; feeders, $100 per month; vannermen $95 to $130 per month; machinists and helpers in machine shops, $3 to $7 per day; blacksmiths, $5 to $6; tool sharpeners, $4.50 and blacksmith helpers, $3 per day.

The total tonnage treated during the year amounted to 770,084 tons which indicated that approximately 1040 tons per man per year were mined and treated. The report states that there were 19 accidents, comprising 11 fatal, 6 slight and 2 serious accidents. Falling of rock was the common cause, six having been killed in this manner and three slightly injured or 54.5% of the killed and 50% of the slight accidents or 47.4% of all the accidents were caused by falling rock.

Cost of Producing Lake Superior Copper

The Lake Superior copper mines are credited with producing over one billion pounds of copper during the five years, 1906-1910. The production by years is given in the accompanying table.

PRODUCTION OF COPPER FROM LAKE SUPERIOR MINES

	Lb.
1906	229,632,608
1907	216,116,747
1908	222,674,918
1909	231,870,496
1910	221,826,255
Total	1,122,121,024

Almost 98% of this copper was produced by companies issuing reports of expenditures or by companies whose costs it has been possible to obtain from published data. The table given herewith accounts for 1,097,032,151 lb. of copper produced at a total cost of $116,972,394 or an average of 10.7c. per lb. It is probable that this cost would be raised to 11c., or a little over, if one could get all the expenditures of companies or individuals doing exploration or development work during this period. This list, however, includes many unprofitable mines and companies that were making preparations to produce on a larger scale; for this reason the cost of 10.7c. may be considered a fair average cost of producing Lake copper during the last few years.

SUMMARY OF EXPENDITURES AND PRODUCTION OF LAKE SUPERIOR COPPER MINES 1906-1910 INCLUSIVE

Company	Copper Produced, Lb.	Total Expenditures	Cost per Lb.	Yield per Ton Ore Lb.
Ahmeek	35,911,797	$4,786,018	13.3	20.9
Adventure	1,335,744	504,388	38.0	8 to 18
Allouez	17,355,301	2,942,996	17.0	15.6
Baltic	84,194,877	7,479,162	8.9	22.3
Calumet & Hecla	410,614,189	36,662,696	8.95	31.2
Centennial	10,979,323	2,074,002	18.9	13.1
Champion	88,460,380	8,155,488	9.25	24.2
Franklin	15,258,148	2,529,088	16.6	10.76
Isle Royale	21,902,821	3,906,542	17.8	14.6
Mass Cons	6,890,928	1,259,389	18.3	11.3
Mohawk	52,415,939	5,940,141	11.35	14.7
Michigan	5,016,193	1,071,043	21.4	14.7
Osceola	98,617,221	10,228,103	10.35	17.2
Quincy	101,620,225	11,433,086	11.3	about 16
Tamarack	58,314,188	8,862,878	15.2	20.9
Tri-Mountain	34,710,824	4,458,417	12.8	18.0
Victoria	5,270,393	1,003,439	19.0	10.9
Wolverine	48,163,660	3,675,518	7.65	26.7
Total	1,097,032,151	116,972,394	10.7	..

During 1911 the principal copper producers of Lake Superior produced copper for the following cost: Ahmeek 7.17c. per lb., Allouez 13.3c., Baltic 9.1c., Calumet & Hecla 8.52c., Centennial 12.69c., Champion 9.6c., Isle Royale 10.85c., Mass Consolidated 15.5c., Mohawk 10.4c., Osceola 9.28c., Quincy 11.45c., Tamarack 15.56c., Tri-Mountain 11.55c. and Wolverine 7.54c. per lb. It will be noted that with the exception of the Ahmeek, Allouez, and Isle Royale, none of the important producers made any material change in the cost of production, so that including 1911 figures with those shown in the table would hardly affect the general average given.

The real question to consider when figuring on the cost of copper is not what it costs all the producers but what it costs the profitable concerns. The copper produced by the non-dividend payers is only an incident in an attempt to create a profitable enterprise. Fully 16.5% of copper produced in the Lake district has been the result of such operations. Since 1849 about 30% of the mining companies operating have paid dividends, the remaining 70% either suspending operations or continued operations on the assessment plan.

The dividend payers in the last few years have produced fully 83.5% of the copper at a cost of about 9.5c. per lb., which represents the cost to produce copper in the Lake Superior district if only profitable operations are considered. Some of the larger and older companies have paid such enormous dividends that as a whole the profits of the district, based upon the money originally invested, are large and have been at least 340% on the assessments paid in by the shareholders in various companies.

Smelting and Refining Lead

The following facts were taken from the 13th United States census returns. In 1909 there were 28 establishments engaged in smelting and refining lead, all owned by corporations. In 1904 there were 32 concerns, 87.5% being owned by corporations, and producing 99.8% of the total production. In 1909, 75% of the concerns reported products amounting to $1,000,000 or over, compared with 56.2% in 1904 and their production amounted to 99.2% and 97.4% of the total. The expense of smelting and refining lead according to the figures given was: 0.9% of the whole for salaries; 3.4% for wages; 94.8% for materials; and 0.9% for miscellaneous expenses.

According to the annual report for the year ended June 30, 1911, of Gen. William H. Bixby, Chief of Engineers, U. S. A., the United States government maintains a fleet of 855 vessels for harbor and river improvement work. In this fleet there are 23 sea-going hopper dredges, 53 hydraulic pipe-line dredges, 61 bucket and dipper dredges, and 718 auxiliary dredges. Some dredging was done at a cost of 1¾c. per cu.yd.; the average cost for the year was 5.4c. per cu.yd. for hopper dredges and 7.18c. for pipe-line dredges. The cost of dredging the Ambrose Channel in New York Harbor was 6.05c. per cubic yard.

Mining Copper at Lake Superior—V

By Claude T. Rice

Mining amygdaloid ore is less expensive and complicated than the conglomerate. Ore is run out of the stopes either over the foot wall or through iron chutes, and what is left on the floor is recovered by scraping or shoveling. Round pillars are generally left about 25 ft. apart on the amygdaloid and in poor ore when possible. At the Mohawk, long, narrow pillars, called "dead-ends" are left at the ends of stopes. Stoping is done retreating, when possible.

Mining the amygdaloid ore at Lake Superior is less expensive and less complicated than the conglomerate, as the hanging wall is strong. The roof will often stand over areas 60 ft. square, with only a pilar at each corner, and the ore is tenacious enough to form good, stout pillars in stopes 16 to 20 ft. high, when the pillars have a diameter of 8 to 12 ft. The slope of the lode is such that the broken ore runs out of the stope readily except for the small percentage that clings to the floor on account of irregularities, and which forms a covering that hides the rough places and permits the ore to flow down. The slope is not so great but that the men can easily set up their machines in the open, unfilled stopes. The percentage of the ore that clings on the floor of the stope varies greatly with the different mines, being dependent mainly upon the amount of copper that makes along the foot wall and into the top of the underlying rock.

There are two methods of breaking the ore. One is to follow the hanging up with only a profitable width of ore, and afterwards come back and bench out all the ore that has formed irregular pockets below this arbitrary foot chosen for the first stope. The other way is to mine the ore clean from foot to hanging as stoping progresses. In this method the foot wall is followed. The method of cleaning the ore from foot to hanging as the stope is put up is used in the Mohawk and Wolverine mines, while in the other mines the policy of returning to get the ore along and in the foot is favored. It should be said, however, that only in the last two years or so have the costs been low enough in any of the mines, other than the Osceola workings of the Calumet & Hecla company, to permit coming back after ore in the foot wall. At the time the stoping was done, the supposition was that all the minable ore was being taken. In the Wolverine no great attempt is being made at present to find ore in the foot wall. It is possible that there is none, as the ore in the mine is must richer than in its neighbors.

Ore in the Foot Wall

While the foot-wall ore was mined in the Osceola Consolidated workings on the Osceola amygdaloid lode, in the earlier days, the Mohawk mine was one of the first that attempted to mine this foot-wall ore systematically; the Mohawk had always had to contend with low-grade ore and so was willing to try to obtain this leaner ore in the foot, leaving the intervening poorer areas untouched. It was this seeking after the foot-wall ore and the rough floor resulting from it in the stope, as much as the flattening of the dip with depth, that caused the Mohawk to adopt the method of cleaning its stopes by shoveling the ore into iron chutes.

The principal disadvantage in following the ore from foot to hanging, in stopes 16 to 18 ft. wide, is the difficulty in reaching the roof. In such stopes it is difficult to bar down loose rock from the hanging and the trimming of the back is apt to be neglected. There is also the possibility that, even though the copper in the ore can be seen more clearly on a fresh face, the pot-holes of ore can be skimmed out and followed better by coming back on them rather than by taking them as the main stope is carried up. It is a matter of personal opinion whether it is better to follow up the foot wall, taking all the ore at one time, or to cling to the hanging wall, taking a regular width of stope, such as is found to be rich enough to pay, and then to come back to clean up the ore in the floor; the solution depends largely upon conditions as they are found in the mine. If the ore in the floor of the stope is mined by going back over the foot, this benching begins at the top of the stope, so as to blast the ore ahead on the fairly smooth floor that has been carried up in the mining of the first stope. In this way less ore is left behind to be shoveled out of the stope than if the ore in the footwall was cleaned up, commencing at the bottom and working upward.

Cleaning the Stope Floors

In the Mohawk mine, the ore remaining on the floor after stoping is finished, is cleaned up by shoveling it into a line of sheet-iron chutes. These chutes are made from short lengths of sheet-iron plates, bent into a half circle on a diameter of 32 in. They are laid on top of the pile of muck and the men shovel into them from both sides, working up along them. At the bottom the troughs are carried on saw horses so that a car can be placed under them, and the ore is run directly into a car on the level without further handling. After the ore on the sides of the chute has been cleaned up, the chute is moved over to the clean place between the pile of muck on which the troughs were resting and the part of the stope not yet reached, and shoveling commences again. In this way the floor is cleaned with one handling of the ore and independent of the distance between levels, for when the ore is once in one of these chutes, it makes little difference whether it is shot down 30 ft. or 150 ft. to the car on the level.

In the other mines, the ore remaining on the floor of the stope is either scraped and shoveled down to the level, or, when much ore is to be handled, a rigging is installed whereby with a small air hoist, a scraper of special design can be hauled up and down the stope to work the ore down to the level. If the bottom is not too jagged, such a scraper works well and a stope can be cleaned with it much more cheaply than by hand, but even with it working at its best the ore in the roughest places must be shoveled out on a smoother part of the floor, after which it must be taken to the level by the scraper. In the conglomerate mines this cleaning down of the stope is done by the timbermen while in the amygdaloid mines the stemmers and underground laborers do the work. In cleaning up the stopes at the Mohawk mine, six men, four shoveling and two tramming, will get out 42 tons. This makes the cost for shoveling 18c., and tramming 10c., a total of 28c. per ton of rock cleaned from the floor.

Stope Pillars

The distance between pillars in the stopes depends largely upon the amount of fissuring that the hanging wall has undergone. Most of the small cracks are filled with calcite, but considerable laumonite also occurs in them. The latter has no binding power and crumbles almost immediately upon contact with the air. The size of the pillars also depends upon the number of seams and cracks passing through them; if they are broken up to any extent they dribble away rapidly under pressure. The pillars, of course, are cut out at right angles to the walls and it is advisable to permit them to belly out slightly at the top and bottom, as that has a tendency to cause them to stand better under weight and decreases the tendency to dribble away. In some of the mines the distance between the pillars is not more than 25 ft., but probably an average would be about 40 ft. apart on the strike and about the same, or somewhat less, on the dip.

The second line of pillars in the stope is generally, but not always, staggered with respect to those below. In leaving these pillars, as poor ground as possible is selected and those places are chosen where the width of the lode is small, because less copper is left in the mines in that way and also a stronger pillar results. The upper sides of these pillars are generally shaped to shed the ore as much as possible. Probably about 6 or 7% of the ore is left as pillars in a stope. It is planned by some operators to save much of the ore in these pillars, but that is only a hope, as up to date not a single pillar has been robbed in one of these amygdaloid mines, although a number of stopes in the Mohawk, Allouez and other mines on the Kearsarge lode have already caved and practically all the upper-level stopes in the Osceola Consolidated workings on the Osceola lode, have been closed for several years.

Pillars Cut in Lower-Grade Ore

The general method of mining the ore is to put up a raise-stope as far out from the shaft as possible and to begin stoping from that, generally slicing across the top of the stope, parallel to the level, leaving as many pillars as it is judged necessary to hold up the back, but always providing ample support to the hanging. It takes three holes to break the ore from foot to hanging in one of these stopes, regardless of the width, whether 9 or 12 ft. These holes are all drilled to carry water, and a column 8 to 10 ft. long is used. In lifting the machine and arm up on this post for drilling the top hole, a chain and drill are generally used. The men work on a stage of 2-in. planks, carried on a drill or a piece of 1½- or 2-in. gas pipe that rests at one end either on the foot wall or in a niche in the face, and at the other end is tied by a chain either to a piece of gas pipe or a long drill that rests against some shoulder of rock in the hanging wall. With the chain, the height of the cross-piece can be changed quickly so as to vary the height of the stage as desired. It is surprising how firm a stage can be made in this manner.

To the Western miner, a peculiarity of the set-up is the small amount of top blocking used, generally only a wedge. A large top blocking is not necessary in order to get a firm set-up, as the ground is firm instead of somewhat yielding, as are many of the Western stopes; a 2-screw jack is used instead of a one screw post, as in the West, where seldom is a bar over 6 or 6½ ft. long, necessary. The post part of the bar is a 4-in. gas pipe. This size, with a 2-screw jack, gives a fairly firm bar with a 10-ft. post, but with a 12-ft. post it is somewhat wabbly. However, such a long post is occasionally necessary.

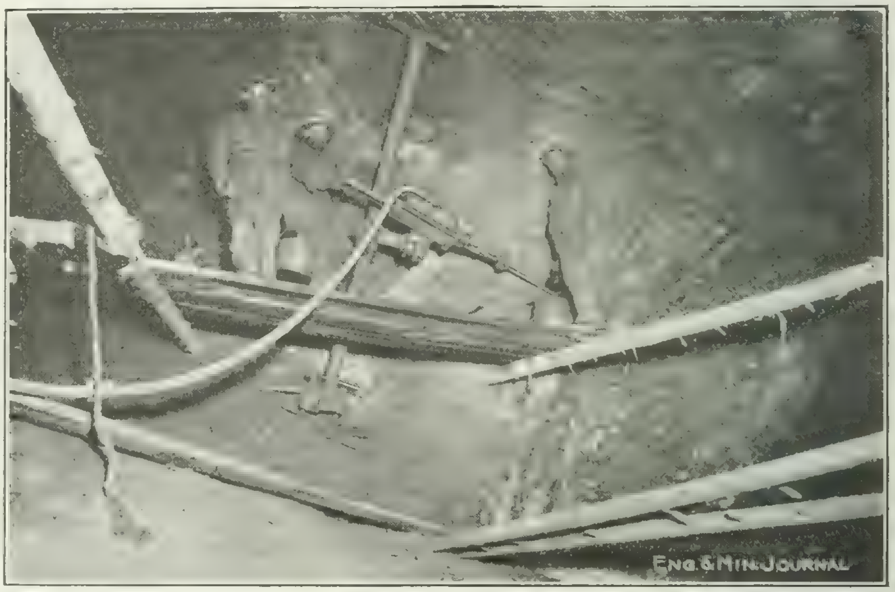
Drilling With Long Posts

An accompanying halftone shows a machine set up in a stope at the Tamarack mine. The number of wedges used in the top header of the post is somewhat more than usual because of the irregularity of the roof at that particular point, but the picture shows to good advantage some of the difficulties of the drilling when such a long post must be used. It is because of the small amount of blocking that is generally used in the set-up and because of the fact that the bottom blocking is generally placed on the solid rock of the floor of the stope, that it is possible to drill with such long posts. The bar used is one of the old fashioned Rand, two-piece type, but this is not used as much now in the mines of the section under discussion, although it is still used almost exclusively in the Copper Range mines. Instead, the Osceola type of two-piece bar, which has already been described in the Journal, is rapidly replacing other types. In the conglomerate mines, owing to the proximity of timbers to the face, the men stage up on planks or poles braced at their far ends against the battery timbers, as it is easier and better than the gas-pipe staging used in the amygdaloid stopes, where there are no timbers to aid in the carrying of the drilling stage.

Because of the long distances that the miners must go to get protection from the blasts, the Calumet system of firing blasts with a candle snuff, arranged to burn through the fuse and set fire to the powder train, is demanded of the men in the Calumet & Hecla mines, but in the other mines the men take their chances and generally spit the holes. In most of the mines 45% ammonia dynamite is used and a 5-X cap, but in some only 40% dynamite is employed. The powder cap and fuse are issued to the taker on each contract and they are stored under lock and key in individual sheet-iron magazines near the stope that the miner has a contract on. The dynamite is in one mazagine while the cap and fuse are in another, supposedly about 30 ft distant.

Handling the Ore in the Stopes

The stopes in the amygdaloid mines are generally from 100 to 200 ft. long with an average between 120 and 150 ft. But the length of the stope is unimportant in its mining as there is not the necessity for finishing a stope within a certain length of time, that exists in the heavy ground of the conglomerate workings, and the length is determined largely by the ore occurrence. Generally it is arranged so that a stope will be worked through from level to level in from six to eight months with one drill running on each shift.



A Set-up in a Tamarack Stope

The ore runs down the stope fairly well and at the bottom rolls on a plank sollar or a portion of one, for in some of the mines only a plank or two is placed between the foot and the foot-wall rail of the track, as there is a large breakage of timber owing to boulders that come out of the stopes. Hardwood, generally maple, is used for sollar planks. In some of the mines the plan has been tried of putting in stulls and lacing them up, so that the ore piles up and can be drawn off into cars without shoveling, but the upkeep of these and the first cost makes their use more expensive, it seems, than to shovel the ore from a sollar into the cars. In other mines a raised sollar was put in at about the height of the top of the car, so that the ore was almost scraped into the cars, but such a sollar was also too expensive to maintain. In one of the mines the plan is being tried now, of carrying a series of triangular pillars over the level with chute mouths in between, so that ore can either be drawn or pushed out of them into the cars. It is doubtful, however, whether owing to narrowness of the lodes, the saving per ton in the cost of handling the ore from them will be sufficient to pay for the cost of cutting and maintaining them, although they have the advantage of permitting stoping to be concentrated on fewer levels.

Stoping in the North Kearsarge and Allouez Mines

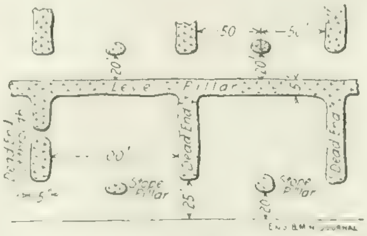
In the North Kearsarge mine the stopes are enlarged by vertical slicing along the side of the stope. In that mine the level interval is 125 ft. This stoping is arranged, as to width, so that a stope will be finished in a month. The stopes, therefore, are carried up 20 ft. wide and half the level interval, or 62 ft. high from the rails of the track on the level below, when finished. A pillar is left at the top of the drift-stope and also one at the bottom of the second stope in about every other of these stopes, but the distance between pillars in the direction of the strike depends upon the condition of the hanging wall in that part of the mine. Generally several of the first stopes are mined before the upper or second stopes are taken. These second stopes are also sliced up from below parallel to the shaft, and if stoping is finished in that part of the ground on the level above, the level pillar is cut out. Generally a level pillar from 8 to 10 ft. thick is left to be cut out later. In the Allouez, as the levels are 125 ft. apart, the ground between them is worked out in three series of stopes, each 40 ft. high. At the bottom of each stope a pillar is left, while along the strike they are kept as far apart as possible. But because the hanging wall is much broken up, the pillars are left quite close together along the strike; often within 25 ft. of one another.

Osceola Workings of the Calumet & Hecla Company

In the Osceola workings of the Calumet & Hecla company, the stopes are carried from 100 to 200 ft. long, according to the ground, and about 32 ft. high with the breast running more angling with the strike than in the other mines. When the lower stope has been carried through to its length by this diagonal slicing, drilling begins in the block of the stope directly above, and this block is also worked out by diagonal slicing. Because of the poor hanging in the Osceola lode, pillars about 8 ft. in diameter are left about every 30 ft. along the strike, but of course this varies with the condition of the hanging wall. It is in the Osceola workings that the most copper is obtained from the floor of the stopes, for while the regular streak of ore along the hanging has generally an average width of only about 9 ft., ore will often make off into the floor for a distance of 15 ft. or more. It is frequently the practice, in the wider stopes, to follow the ore in on the level so as to protect the trammers, while they are loading their cars, from any boulders that may come from the roof where the ore is being benched down.

Stoping in the Mohawk Mine

In the Mohawk mine stoping is done on an entirely different plan. The stopes there are 100 ft. long and the level interval is also 100 ft. In the center of each stope and even with the top of the drift stope, as can be seen in an accompanying sketch, a pillar is left having a diameter of about 13 ft., as the width of the lode in this mine, which averages about 20 ft., necessitates leaving larger pillars than in the narrower stopes in the other mines. Along each end of the stope a pillar about 15 ft. wide is left, called locally a "dead-end", extending from the top of the drift-stope, or possibly commencing a few feet above where the back of the drift-stope came, to the pillar that supports the level above. This requires that a sort of raise-stope shall be carried up at one end of the stope, from which slicing begins each time that the stope is carried up with a breast parallel to the strike, as is characteristic with the slicing in the other mines. The foot wall is followed and, because of the width of the ore, a brow is carried at the top of the stope, under which the machine can be set up as the slice is carried across. With a dry hole looking down the stope the brow of the previous slice is blasted down and the ore is stripped clean from the hanging wall.



Method of Leaving Pillars at the Mohawk Mine

The drawback to this method of carrying the pillars for supporting the roof, is that it requires the stoping to be done with poor ventilation prevailing after the stopes have been carried up halfway to the level above; also, in taking each slice across the roof, a cut must be worked in before efficient slicing can begin. It would seem also that the roof could be better supported with the same amount of ground left in the stope, were it distributed in several pillars, as is the practice at the other mines. By concentrating the support to the hanging wall in a few pillars, and leaving those larger, there is less dribbling away of the ore in them, but the placing of the pillars in such an arbitrary manner along the strike prevents the selection of the ground that is left to form the pillars and, good or bad, the ore must go into the "dead-end" when it happens to be where one of these must be left. It seems likely, therefore, that this arrangement of pillars, although now quite characteristic of stoping at the Mohawk, will be abandoned in time, for already these "dead-ends" are occasionally cut through and the continuity broken.

MOHAWK AND WOLVERINE COSTS

	Mohawk	Wolverine
Milling per ton of ore stamped	$0 207	$0.253
Transportation, per ton of ore stamped*	0.120	0 143
Beneficiating one ton of ore	1 43	1 64
Total cost per ton of ore and waste hoisted	1 27	1.59
Tons hoisted, 1910	906,423	400,296
Tons stamped, 1910	802,537	388,476
Tons sorted	103,886	11,820
Percentage sorted	11 46	2.95

*For Mohawk, 15 miles; Wolverine, 18 miles.

AVERAGE COST OF STOPING AT THE MOHAWK MINE IN 1909 AND 1910

	Per Ton of Ore Broken	Per cubic Fathom Mined
Labor		
Machine men	23 8c	$4 01
Drill boys	1 2c	
Shoveling*	14.0c.	2 52
Supplies†	7.8c.	1 26
Totals	46 8c.	$7.79

*16 6 tons per man per $2 30 shift

†Dynamite, 40%, costs 12c per lb., delivered underground.

Stoping by Retreating

In all this stoping the work commences as near the boundary as possible. It should, of course, always begin at the boundary and does at all the Calumet & Hecla company's mines, but at almost all the other mines in the district, except the Ahmeek, it is necessary to start stoping before the drift-stope has reached the boundary. At the Allouez, where the ground between levels is being mined in three stopes, the company hopes to be able to get the drifts to the boundaries before it becomes necessary to mine more than the first series of stopes. In other mines a stope is put up from level to level as far out from the shaft as possible and when that is finished the miners jump out as far as they can towards the boundary before they commence stoping again. The greatest troubles that come from this practice of stoping before the boundaries are reached, are that the blasting greatly injures the tracks so that tramming from the stopes that are put up later nearer the boundary, is interfered with, while the mucking in the stopes hampers considerably the tramming from the driftstope within.

Further, a stope occasionally caves and ties in the ground so that the ore has to be slid down to a level below to be taken to the shaft; neither is it as safe for the trammers, because slabs are likely to fall from the roof of the former driftstope, and boulders may drop from the roofs of the stopes and roll down and catch the trammers as they pass. Again, if the rock that falls is not large, small pieces may roll down on the track and throw off a loaded car, causing delay. These disadvantages may seem small and trivial but they are the things that count when it is attempted to pay dividends on ore that yields only 14 or 15 lb. of copper per ton of ore, with low prices for copper. It must be remembered also that anything that interferes with tramming in these mines is of much greater importance than at Western mines where skip chutes or stations are used; anything that holds up tramming on one level not only delays hoisting but even affects tramming to some extent on other levels, as the cars may be filled before the skip reaches those levels.

MINING COSTS AT MOHAWK AND WOLVERINE MINES

	Mohawk		Wolverine	
	Per Ton of Rock Hoisted	Per Ton of Rock Stamped	Per Ton of Rock Hoisted	Per Ton of Rock Stamped
Supplies, breaking ground	$0.089	$0.100	$0.117	$0.121
Labor, drilling	0.298	0.337	0.316	0.326
Underground superintendence	0.014	0.016	0.008	0.008
Timbering labor	0.010	0.012	0.021	0.022
Tramming labor	0.162	0.183	0.175	0.180
All company account labor*	0.094	0.106	0.090	0.093
Carpenters, blacksmiths, masons, machinists and teaming	0.022	0.025	0.034	0.035
Hoisting and pumping	0.032	0.036	0.058	0.060
Air compressors and drill maintenance	0.072	0.081	0.088	0.091
Supplies and electric light	0.040	0.045	0.005	0.006
Rock house	0.064	0.071	0.052	0.053
Miscellaneous surface expense, with rents credited	0.017	0.019	0.028	0.029
Office and incidentals, assaying, surveying, marketing, mineral tax and insurance	0.056	0.064	0.152	0.160

*Cleaning stopes, 55 per cent.

It is not the breaking of the ore so much as it is the getting of the ore out of the mine that is the problem at these amygdaloid mines with a low dip.

In the stopes the machines broke 45.6 tons per two-shift day and the machine men earned $2.72 per shift. The total cost per ton of ore stamped at the Mohawk mine in 1910 was $1.433 when 802,537 tons were crushed at the mill, while the total cost per ton of ore hoisted was $1.27 as 108,886 tons out of 906,423 tons were sorted out at surface. The average number of tons obtained per man underground was 4.15 and there was 0.61 lb. of 40% dynamite used per ton of total ore broken.

(To be continued)

Tests of Refractory Material

The U. S. Bureau of Standards has been investigating clay refractories, and has made the following suggestions (*Technologic Paper No.* 7, Bureau of Standards). The No. 1 clay refractories are divided into two classes, *A* and *B*. The first includes those materials for which both refractoriness and load-carrying ability is required; the second, those where refractoriness is demanded, but compressive strength is not a main requisite.

No. 1 *A*—Materials of this class should show, when heated at a rate such that the final temperature is obtained in not less than one hour, a softening temperature of not less than cone 31, approximately 1690° C. When subjected to the load test at 1350° c. and under a load of 50 lb. per sq.in., a standard firebrick tested on end should show no serious deformation and should not be compressed more than one inch, referred to the standard length of 9 in. When tested on end, at atmospheric temperature, the compressive strength should not be less than 1000 lb. per sq.in. The product in its manufacture should not be fired to a maximum temperature lower than corresponding to cone 12, or approximately 1350° C. Upon chemical analysis, the empirical calculated formula from the composition should show a total RO content of not more than 0.22 molecular equivalent, including the iron oxide as FeO.

No. 1 *B*—The average softening point of this class of products should correspond to a temperature of not less than cone 31, about 1690° C. In the load test it should show no serious deformation or a contraction of more than one inch, referred to the standard length of 9 in., at a temperature of 1350° C. and a load of 30 lb. per sq.in. When tested for compressive strength, on end, at atmospheric temperature, the crushing strength should not be less than 800 lb. per sq.in. The product should not have been fired to a maximum temperature lower than that represented by cone 10, about 1300° C. The chemical formula calculated from the analysis should show a content of RO fluxes of not more than 0.22 equivalent. One important point has been left unconsidered in these specifications, namely, the question of shrinkage or expansion upon heating firebricks to higher temperatures. It was thought that the data at hand were insufficient to suggest any requirements.

No. 2—The softening point of this class of refractories should not be lower than the temperatures corresponding to cone 28, approximately 1630° C. In the load test the materials of this classification should be able to carry a load of 25 lb. per sq.in. at 1300° C. without serious deformation or a contraction greater than one inch, referred to the standard length of 9 in. The chemical formula, as calculated from the analysis, should not show a content of more than 0.32 equivalent to fluxes.

The general conclusion is that mere tests for refractoriness are not sufficient, and that the bearing test must be added. Also, that American brick comsumers will find it advantageous to be willing to pay high prices for brick which will stand up to test, rather than low prices for what will not.

Laurium Mines, Greece

The annual report of the Laurium Mines Co. states (*Min. Journ.*, June 22, 1912) that 30,000 tons of zinc ores, 10,253 of argentiferous lead, and 63,000 of iron and manganese ores, a total of 103,316 tons, were sold, showing a diminution of 24,000 in comparison with 1910. Zinc ores maintained their output, but that of lead was 1070 tons less. The value of the silver in the lead decreased 3 oz. per ton. The fall in the production of manganiferous iron ores was due to higher freights and the disinclination of the smelters to purchase low-grade ores.

Notwithstanding, the high price of metals during 1911 has permitted the attaining a gross profit of £82,461, an excess of £17,401 over that obtained in the preceding year. The briquetting plant, started at the commencement of the year, has proved successful, and the last of the roasting furnaces will be at work in August. It is proposed to put up works for the utilization of arsenical byproducts. Toward the termination of the current year it is intended to begin the examination of the third contact deposits in the north of the concession, one of the great geological problems of Laurium. The balance, £26,080, permitted a distribution of 16s. per share.

Cyaniding Troubles and Remedies—I

By Herbert A. Megraw

Both mechanical and chemical difficulties occur in cyanidation. Variation in the size of crushed ore causes trouble in subsequent treatment. Water for preparing cyanide solution often contains cyanicides. Some salts unsuspected cyanicides. Solutions fouled by long use should be regenerated or discarded. Use of lime should be accompanied by care for several reasons. Other coagulants may be used at times.

In the regular course of operation of all metallurgical works there appear from time to time conditions which result in erratic and unsatisfactory results. The cyanide plant is no exception to this rule. Being, as it is, a process depending upon both mechanical and chemical principles, error in either of which will result in failure to secure a satisfactory ending of the operation, it may be said to be one of the most delicately balanced processes to be found in the field of metallurgy. The fact that many cyaniding installations are proving financially successful in the hands of operators who may be lacking in one or both of the departments mentioned, is no proof of error in my statement, for it may be said with certainty that any plant which is not operated under the direct supervision of skilled mechanical and chemical ability, is not delivering the maximum satisfaction which might be obtained under such skilled direction.

Trouble both Mechanical and Chemical

The troubles and difficulties which may occur in the operation of cyanide plants are legion, and he would be bold indeed who essayed to name them all. However, experience in the operation of many plants of the kind has shown that certain of these difficulties are most common and it will be my object, in this paper, to call attention to these and to suggest, where possible, the remedy best suited to the occasion. As both chemical and mechanical difficulties occur, both will be mentioned, as they are of equal importance.

Crushing and Grinding

A great many of the difficulties in cyanidation originate in the department of crushing and grinding, but this department is usually given scant attention and the trouble is almost always ascribed to some other cause. The original treatment scheme for an ore is invaribly based on some definite degree of fineness, and it ought to be perfectly clear that a variation of this degree of fineness will result in a variation of the effect of the operations which follow. If, for instance, in the leaching of sand, the economical maximum was designed to be attained by the treatment of a product, all of which will pass an 80-mesh screen, then means should be adopted to be certain that all the product will reach that degree of subdivision. If a portion remains on a 60-mesh screen, the same results can not and should not be expected. It is equally true that if, in a plant designed for all-slime treatment, with say 85% through a 200-mesh screen, then the regular daily product should be known to conform to that requirement or the results will not be those expected. It is not at all unusual for some variation of the grinding to occur, and the cyanide man, if his experience has not led him to realize the chance for trouble in this department, will be most likely to look for it in the cyanide plant proper and will be accordingly surprised when he fails to find the cause of the trouble.

The causes from which variations in crushing and grinding may arise are such items as the breaking and wearing of screens in the grinding machines, lack of proper attention to tube mills, bad condition of the tube mills or other grinding machinery, or overfeeding of such machines. Also it may occur that the classifying machinery is in bad condition, or that it is being overfed. All these points must receive their due share of attention if satisfactory results are to be obtained. It often occurs that mill superintendents will force grinding machines far beyond their capacities, either to induce a reduction of the cost per ton, or to make up for time lost in repairing, or for other similar reasons. This procedure is only justifiable after it has been clearly shown that the ultimate profit is greater than that obtained by following out the original scheme of treatment. A reduction of the recovery per ton is certain, and a more than proportional reduction of working costs must be definitely shown. Even if this is sure, it is an open question whether or not a waste of the resources of a mine in this way can be justified, and such questions should be decided by persons upon whom entire responsibility can be placed, and should never be undertaken by the mill man.

Crush in Water or Solution?

Crushing and grinding are performed either in water or in solution. Crushing in water is the older method, and was followed for years before metallurgists convinced themselves that no exorbitant loss of cyanide was incurred by performing the crushing and grinding operation in solution of low cyanide content. There are still some conditions under which it is better practice to crush in water, as difficulties are avoided by so doing, and afterward to separate the water as closely as possible in order to avoid unduly diluting the treatment solutions which are subsequently used. Such cases are usually those where the ore contains cyanides in such quantity that any cyanide contained in a crushing solution would be totally destroyed. When such cyanides consist of organic matter, or reducing elements, it is good practice to crush in water which contains compounds calculated to rectify the objectionable contents of the ores. Such compounds as lime, caustic soda or potash, bleaching powder, etc., may be used with good effect.

Separate Oxidizing Circuit

I had occasion, at one time, when considering the treatment of a large accumulation of slime resulting from ancient patio treatment, to recommend the pulping of the slime in an alkaline oxidizing solution, giving appreciable time for the agitation of the pulp, and then separating the water closely and carefully by means of pulp thickeners, delivering to the cyanide plant a product containing less than 50% moisture. The objectionable content of this slime consisted of decayed organic matter, sewage, etc. and the direct pulping of the material in cyanide solution would have entailed a consumption of cyanide so great that there would have been no profit in the treatment. By pulping in solution as I have above stated, the consuming tendency of the slime was so reduced that cyanidation proceeded in a perfectly normal manner. In this particular case, the alkaline water was contained in a circuit separate from the cyanide solutions and used repeatedly until it became too foul to be of further use. The consumption of water was not exceedingly great.

Grinding in water has some disadvantages which must always be taken into account when such practice is under consideration. Where the whole product is reduced to such a point that it may be treated as slime, that is, making a total slime product, the whole reducing system of operation must be carried out in water. This is likely to introduce mechanical complications requiring extra tanks, pumps, etc., and in addition reduces greatly the time of contact of the ore and cyanide solutions. The latter is an important consideration, for it has been clearly proved that the intimate contact and agitation induced by the grinding machinery, stamps, chilean mills, etc., and particularly tube mills, results in a better extraction, in proportion to the time of contact, than in any other subsequent operations. The loss of this efficiency is an item worthy of the most serious consideration.

PRELIMINARY WASH FOR ACCUMULATED TAILING

In such cases as the treatment of accumulated sands which are to be leached in order to recover the precious metals, it is often quite necessary to give the material a wash with clear water, or water containing lime or some other agent calculated to reduce or to obviate entirely the cyanide consuming power of the tailing. Such accumulated sand tailing usually contains some cyanicides such as more or less decayed vegetable matter or elements introduced during the old processes of treatment. It is always advisable, and often essential, that the objectionable elements be altogether eliminated or else so changed chemically that their ill effect upon solutions used in subsequent treatment be lessened or avoided entirely.

A case of this kind came up in Mexico where it was proposed to re-treat by leaching an accumulation of tailing from old patio treatment. This tailing consisted largely of sand of various degrees of fineness, mixed with perhaps 15 to 20% of slime. The tailing had been thrown out for many years and was covered with a growth of vegetable matter which introduced an element of cyanide-consuming effect. In addition, the chemicals which had been used in the former treatment, such as copper sulphate and mercury, also introduced disturbing factors. It was found that a preliminary water wash, and subsequently a highly alkaline water wash removed most of the difficulties and permitted profitable treatment, although the contained metals in the tailing, largely silver, were exceedingly small. The water washes were run to waste, as it was found economical to do so. Of course these washes had little effect on the mercury or copper, which had to be handled along with the silver and gold extracted. It did, however, destroy the ill effect of the organic matter and removed an appreciable portion of the soluble copper.

In this connection an interesting case is that of the cyaniding of the dump of the Lady Gladys Co., Mulline, Western Australia, cited by H. R. Edmands.[1] According to the description this dump contained marcasite, blende, arsenical pyrite and the decomposition products of these minerals. It was exposed to the weather for three or four years and was, naturally, exceedingly acid. The average acidity was 12.2 lb. CaO and the total acidity 35.2 lb. per ton. The treatment, as described by Mr. Edmands, was as follows:

> The main features in the successful treatment consist in first adding about 50 lb. of slaked lime per ton, which had to be thoroughly mixed, and then passing the mixture through a ¼-in. screen, all the slime lumps being broken up. After charging the vat with this mixture, the next step was to wash with water or barren solution. The first wash always came off slightly alkaline. The original sand contained about 3.3 lb. Fe_2SO_4 per ton, which was now converted into ferrous hydrate. It was necessary to thoroughly oxidize this to ferric state, otherwise the destruction of 8.1 lb. of KCN would result. Oxidation was accomplished by giving a succession of washes and draining between each wash. All wash water was well aerated, air being admitted into the suction of the centrifugal pump used, but the greater part of the oxygen supplied was contained in the drained sand, which was for the most part, forced downward through the charge by each succeeding wash. It was estimated that a wash of 31 tons would contain about 0.4 lb. oxygen in solution, but the drained sand would contain about 14 lb oxygen, most of which would be forced downward through the charge. The washing occupied four to five days, about ½ ton of solution per ton sand being used. In some cases, 1 lb. of lead acetate was added to the wash water, but without marked benefit.

After describing the subsequent cyanide treatment, Mr. Edmands notes the importance of this preliminary washing as follows:

> Before the treatment described was adopted, the first charges treated threatened total failure. To these vats only 16 lb. of lime were added, the mixture was imperfect, and it was not screened. The idea was to wash out some of the soluble acidity and then complete the neutralization with caustic soda. The first wash came off showing soluble acidity equal to about 7.6 lb. Na_2O per ton of solution; this with succeeding washes was thrown away until the acidity had fallen to 1.5 lb. Na_2O. The wash was then neutralized with lime, soda added and the solution returned to the vats. A large amount of pumping was required; much time was expended, an additional 34 lb. of lime and 34 lb. of caustic soda were consumed per ton, bringing the total amount of lime up to 50 lb. and of soda to 34 lb., which was more than twice the amount called for by the "total acidity" test.

This case is a good example of the type where preliminary treatment in water is of prime importance, and gives some idea of the necessity of careful study in each case.

Another instance along the same line is the problem of treating dumps of tailing in the mining district of Santa Rosa de Osos, department of Antioquia, Columbia, explained by R. W. Perry.[2] The tailings were the accumulation of the last 70 years and were in great part derived from sulphide ores. Mr. Perry says:

> The charges first received several water washes and as a rule no cyanide was added until the solutions showed an alkaline reaction, when a weak solution from the sump was run on. The treatment of this deposit was entirely by leaching, as is usually the case when only a comparatively small quantity of the material is available for treatment.

CRUSHING IN SOLUTION GENERAL

Crushing in cyanide solution is now generally practiced. It took some time to convince metallurgists generally that cyanides were compounds of sufficient stability to resist the agitation and long exposure to air that had to be undergone in crushing operations without decomposition, but it is now quite evident that if the strength of the solution is kept within reasonable limits, there is no danger on the side of decomposition. The first mills to adopt the system held the strength of solution down to a low point, but at the present time some mills are using solutions as high as 0.18% KCN for milling without any sign of deterioration.

One of the points of special interest in crushing in cyanide solutions is the fact that all solution lines and passages must be cared for in such a manner that leaking is avoided. A great many cases of excessive cyanide consumption may be traced to leakages which have escaped notice. In one case I encountered a case of leakage that was curious. The solution storage tank was a large receptacle of concrete built with its bottom below the ground level. In building the tank every care had been taken to prepare a solid, tight foundation, and for some time there was no difficulty with it. After the plant had been running about eight months, it was found that the consumption of cyanide was increasing slowly but regularly and no chemical reason could be found for it. A close investigation brought to light the fact that the bulk of solution was also decreasing and this led to suspecting a leak somewhere. The bottom of the tank was examined carefully, and although no decided cracks or openings could be found, still it was discovered that the tank bottom had become porous and a gradually increasing quantity of solution was being lost by percolation into the ground. A thorough waterproofing of the tank bottom remedied the difficulty and avoided the loss of solution and cyanide.

KEEP CLASSIFIERS ADJUSTED

In the realm of classification there is little that can be said of troubles. It is only necessary to call attention to the adjustment of the machinery used for the purpose, when, provided the original design of the system is efficient, there is not likely to be any serious difficulty with results. Classification machinery needs constant attention in order that any change in the quantity or quality of the pulp may be taken care of by a corresponding change in the adjustment of the classifying machine. For reasons which have already been mentioned it is not good practice to permit a change of the sizing of the material delivered from or to classifying machinery, whether it consists of cones, screens or mechanical types, and these must be watched carefully in order to make sure that adjustment is always maintained. When this is attended to there is not likely to be any trouble in this department.

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[1] Eng. and Min. Journ., Mar. 23, 1912.

[2] Eng. and Min. Journ., Mar. 9, 1912.

The solutions used in cyaniding are perhaps the most important single factor in the whole operation. The preparation and use of these solutions is an application of purely chemical laws, and any infringement of them will be penalized by a loss of efficiency. This fact is not generally given sufficient attention in plant operation. The control of a chemical process as delicate as the solution of gold and silver in alkaline cyanides, with all the complications which result from the presence of a great number of elements foreign to the desired result, should be always under the control of one familiar with the basic chemistry of the process and mentally equipped to meet the emergencies which are sure to arise as the result of conditions which may be temporary and extraordinary.

EXAMINE WATER FOR CYANICIDES

As a primary step, the water which is used in cyanidation, and from which solutions are made, should be examined to be sure that there are no factors which might disturb the balance of future operations. A great many cases of undue consumption of cyanide may be traced to the use of bad water. Mine water which contains acid is of frequent occurrence and when solutions are made from such water there will result an important loss of cyanide. Water which contains sulphuric acid, the result of the oxidation of pyrite and other sulphides may be rendered fit for use in cyanidation by treatment with lime, by which means the sulphuric acid is changed into the insoluble sulphate of calcium and removed from the water by settling or filtration.

Acids are not the only undesirable elements which may exist in water designed for cyanidation. Water which carries organic compounds will destroy appreciable quantities of cyanide and care should be taken to avoid the use of such water or to correct its cyanide-consuming tendencies before putting it into the plant. Water which contains organic compounds is generally reducing in tendency and any treatment which tends toward oxidation is to be commended. This result may be reached by the use of chemicals such as bleaching powder, potassium permanganate, and others well known for the purpose, or it may be accomplished by mechanical means. A thorough oxidation by aeration is often sufficient to satisfactorily correct a water that is not thoroughly bad. The electric current may also be successfully used to correct unsuitable water.

METHODS OF REGENERATION

Solutions which have been in use for a long time become foul and fail to render the satisfactory results which have been obtained from fresh and first class solutions. There are a good many reasons for this action, as it is readily seen that accumulations of various elements prejudical to good results, will result from the use of solutions over extended lengths of time. When it is seen that solutions are no longer efficient, it is best to dispose of them and use new solutions, or adopt some one of the methods of rejuvenating them. Perhaps the simple discarding of an old solution is the best and most satisfactory recourse, especially when the contained cyanide can be recovered by one of the methods of regeneration.

A satisfactory method of regeneration has been proposed by Mr. A. F. Crosse. In this method the zinc-potassium cyanide, resulting from the action of cyanide solutions on the zinc used in precipitation is acted upon by sodium sulphide at about 65° C. as follows:

$$K_2Zn(CN)_4 + Na_2S = ZnS + 2\,KCN + 2\,NaCN$$

The zinc sulphide is coagulated by the addition of a little lime, causing it to settle rapidly. To prevent accumulation of caustic alkali in solution, Mr. Crosse collects the ZnS and uses it to generate H_2S, which he passes through the solution after treatment with Na_2S. The two following reactions result:

$$K_2Zn(CN)_4 + Na_2S = ZnS + 2\,KCN + 2\,NaCN$$
$$HCN + KOH = KCN + H_2O$$

Mr, Crosse reported high extractions on Transvaal gold ores by the use of solutions regenerated in this way.

Acid regeneration of solutions, as described by R. P. Wheelock,[3] offers good methods for recovering cyanide from solutions partially exhausted, and this method can readily be applied so as to save considerable money in operation.

A satisfactory way to deal with foul solutions is not to make them. This end may be arrived at by using a form of electrical precipitation, partially or wholly, which tends to remove from the solution all elements combined with the cyanide and to liberate the latter. As long as there is available alkali in solution, the cyanide liberated will combine with it to form alkaline cyanides, which are ready for further use. It has been suggested, and the method is quite feasible, that the addition of one or two electrical precipitation boxes to follow the use of zinc, either as shavings or dust, will remove troublesome elements from solution, act to regenerate the cyanide which was in combination with those elements, and also tend to aerate and enliven the solutions, putting them in first class condition for further work.

Electrolytic regeneration presents a simple and efficient method of accomplishing good work. A good method was presented by T. H. Aldrich, Jr., but as this method was devised principally as an aid to extraction, I will refer to it under that head.

REDUCERS FOUL SOLUTIONS

Foul solutions are a source of much trouble in cyaniding operations, a great deal of deficient extraction being traceable to their account. Any solution which has been used, wholly or in part, for any length of time, may justly be placed under suspicion, and at the first hint of trouble in extraction, it is wise policy to investigate these solutions. In order to detect the presence of reducing compounds, in which is included organic matter, a simple expedient is to acidulate a measured quantity of the solution under test, with sulphuric acid. Assured of the presence of a small quantity of free sulphuric acid, add from a burette a standard solution of potassium permanganate as long as the color disappears. As soon as a permanent pink or reddish color remains in the solution, the reducing elements have been satisfied and the amount of oxygen required to accomplish the result is readily calculated from the permanganate used. Clennell[4] suggests a better method, which although more complicated, is more accurate. This is as follows:

Acidulate the solution under test with sulphuric acid and add a slight excess of standard permanganate solution. After allowing this to stand for some time, add an excess of potassium iodide to the pink solution, until the color changes to brownish yellow. Iodine is liberated in proportion to the excess of permanganate present. This iodine is then to be determined by means of standard thiosulphate using a starch indicator. Deducting the equivalent of the iodine found, in terms of standard permanganate, from the total quantity of permanganate used in the solution originally, the quantity of permanganate equal to the reducing agents in solution is found. Clennell notes that instead of using potassium iodide and the thiosulphate, the excess of permanganate may be determined directly by means of standard oxalic acid.

Mineral sulphates in solution have been found to act as cyanicides and while the recognition of the fact is not altogether general, most operators recognize it to a certain extent. It has been brought to my notice several times that a sensible consumption of cyanide was taking place in the operation of the plants; much more than the conditions would seem to justify. After investigation of all possible sources of error, and making sure that the solutions contained sufficient protective alkali,

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Min. and Sci. Press, Dec. 18, 1909.

[4] "Chemistry of Cyanide Solutions," p. 71

there was no other conclusion possible but that there was a loss from some cause not yet determined. In such cases I have always gradually lessened the amount of lime in use and have generally found that it makes a difference.

Lately A. F. Crosse, in a paper read before the Chemical, Metallurgical and Mining Society of South Africa, showed that the sulphates of lime, magnesium and aluminum are sources of cyanide consumption. Mr. Crosse suggests that the use of sodium carbonate might act beneficially in such cases, but does not recommend any decided or known remedy. It would be good practice to make sure that the water used contains no sulphuric acid when it goes to the cyanide plant. If an acid water is the only thing available, the correction should be made before the water is used in the plant and the calcium sulphate removed by decantation or filtration. For the treatment of acids developed in the ores during the process of beneficiation, however, the remedy is not so simple and it seems that it would be wise to experiment with the sodium carbonate, as recommended by Mr. Crosse, or with some other alkali which would avoid the formation of salts which might act as cyanicides.

In the same paper, Mr. Crosse calls attention to the fact that arsenates also act as cyanicides. Arsenic occurs often enough in ores containing gold and silver, and is usually in iron compounds. In reference to the matter Mr. Crosse says:

> I have made many experiments in order to discover a method to overcome the injurious action of arsenates on cyanide solutions, and have found out how to counteract the solution of arsenate in cyanide solution by the following method: A solution of sodium arsenate and calcium hydrate gives the following reaction:
>
> $$2\ Na_3AsO_4 + 3\ CaO + 3\ H_2O = Ca_3(AsO_4)_2 + 6\ NaOH$$
>
> The calcium arsenate is insoluble and the sodium hydrate is regenerated. I found by a series of experiments that using an excess of lime and a small quantity of sodium hydrate, all the arsenate that was possible to dissolve was taken up by the sodium hydrate, then precipitated as calcium arsenate, no arsenic being left in the solution. The cyanide of sodium was unaffected by this reaction. The method used to determine the amount of lime required was as follows: 200 grams of finely powdered ore were shaken up every now and then for seven or eight hours with 200 c.c. of 1% NaOH solution; the amount of NaOH used up was determined in the usual way, and for every pound of NaOH required per ton, 0.7 lb. of CaO is required in actual practice, but, of course, some sodium hydrate must be present in addition to act as a solvent or carrier.

In order that best results should be had and to avoid a great deal of trouble that might occur, solutions should be the subject of frequent tests, and any lowering of efficiency should be followed up immediately by its proper remedy. Thus the solutions are kept at all times at a point of maximum efficiency.

Lime the Universal Neutralizer

The use of lime in connection with cyanidation is universal. The lime is supposed to serve a double purpose generally, that is it is used primarily to protect solutions against acids present in ores or those which may be developed during treatment. The action of the lime here is perfectly clear, in that it forms with sulphuric acid, which is the acid most generally present or developed in silver or gold ores, the insoluble sulphate of calcium, thus removing the acid radical from solution. In connection with this action, attention is called to the preceding article on solutions in which the ill effect of calcium sulphate on cyanide solutions is called to light. As has been noted, this action and the remedy for it have not been thoroughly worked out so that definite information can not be given at this time, but it is well to bear the matter in mind and institute special experiments at any plant where such trouble is experienced.

The second use of lime is as a coagulant to induce the settling of slime. Many slimes will not settle satisfactorily without the use of a coagulant, and lime has been generally used for that purpose. It is, however, true that the precise action of the lime used to assist in settling has not been accurately determined. In most cyanide plants the lime is used as a matter of course, its action in any particular circumstance being assumed and not determined through experiment. It is a certain fact that many slimes settle better without any lime at all, and equally certain that some slimes will settle better in acid or neutral solution. This is one of the points which needs to be decided for every particular ore. It might be said here that, contrary to the general idea, a trace of acidity in treatment solutions will not necessarily tend toward decomposition of cyanide to any great extent and in many cases such condition of solution tends toward better settlement as well as improved extraction. I am aware that this opinion has not been voiced to any great extent, but personal experience has shown it to be a fact and its recognizance may aid in many cases in improving working results.

There are other substances than lime which are useful for coagulating purposes, but there are likely to be other reasons which make objections to their use. Some of these agents have chemical properties which make them objectionable, or it may be that the cost is the limiting feature. Some of these agents have more effect as coagulating agents than lime, the accompanying table, compiled by Julian and Smart as results of their experiments, showing that alum has about five times the settling power of lime in equal weights.

COMPARISON OF COAGULANTS

	Weight to Produce Equal Effect
Aluminum sulphate	100
Potash alum	143
Lime	654
Magnesia	748
Calcium chloride	1,095
Calcium carbonate	1,215
Calcium sulphate	2,870
Magnesium sulphate	3,460
Sodium chloride	45,900
Sodium sulphate	61,700

In my opinion this sequence varies with different ores and it is not a bad practice to make thorough experiments on settling effects along this line and determine the scale for each ore under consideration. There are conceivable circumstances where it would pay well indeed to use some other settling agent than lime.

Methods of Adding Lime Vary

When lime is to be used there are many ways of applying it and each authority seems to differ somewhat in opinion in this regard. The usual way to apply it is to put the finely ground lime directly into the solution, either in the grinding apparatus, stamps or tube mills, or into the treatment tanks, and perhaps in both places. This, of course, seems to be the most simple and direct way to counteract acidity where it exists or is developed. Other authorities recommend the careful slaking of lime gradually with a spray of warm water and finally making a solution of calcium hydrate as strong as possible. This solution is kept in a special tank and is added to the treatment circulation by allowing a small stream to trickle in through a suitable pipe at the point where it will do the most good. This is undoubtedly the best way to secure maximum efficiency from the lime, as careful slaking and solution recovers the greatest amount of CaO available in the lime used. It has the disadvantage, however, that the hydrate is used up immediately and no provision is made for taking care of acidity which might be developed later in the treatment. The only way of taking care of this item would be to provide for the introduction of other streams of alkaline solution at points where it might be necessary. It would not be satisfactory to add a large excess at the original point of introduction, for, as has been noted, a large excess of alkali is to be avoided as detrimental to treatment.

The method of adding powdered lime in the dry state to the cold treatment solution is faulty in that only a small percentage of the CaO contained is put into solution. It has the advantage, though, that the solution of the contained CaO is not rapid, but proceeds slowly, so that the acidity as developed during treatment is more or less automatically counteracted by the continued entrance into solution of the lime required to counteract it. It is undoubtedly true that in this procedure an appreciable portion of the lime goes through the treatment without being dissolved at all and is discharged with the residues, therefore wasted.

Some time ago a series of experiments was made by W. J. Sharwood with the object of determining what was the best condition of the lime for general all round results. The conclusion was that the most desirable condition in which to have the lime was in particles of about 30-mesh size. Particles coarser than 20-mesh will go through the treatment without being dissolved, while the extremely fine powder of lime gives up its available alkalinity too rapidly to be of maximum efficiency.

Another significant and highly important result of Doctor Sharwood's experiments was to demonstrate that a protective lime alkali higher than 0.3 lb. per ton of solution was actually detrimental to the extraction of gold. This is also true, to a less extent, of silver. I have personally tested this statement in practice many times and it has always been demonstrated that a highly alkaline solution is detrimental to extraction.

DETERMINATION OF AVAILABLE LIME

The determination of the calcium oxide in lime used for cyanidation is the subject of an extensive paper relating to the study on the subject by Luther W. Bahney, read before the San Francisco meeting of the American Institute of Mining Engineers. In the paper, Mr. Bahney recommends the use of oxalic acid as the titrating solution. The oxalic acid is made up by dissolving 14.6068 grams of oxalic acid in distilled water and making the volume up to 1 liter. The weight of lime to be taken for this study may be calculated so that each cubic centimeter of oxalic acid solution would represent 1% CaO, according to the formula

$$\begin{array}{ccccccc} \text{Lime} & & \text{Lime} & & \text{Oxalic} & & \text{Oxalic} \\ 56.09 & : & X & :: & 126.048 & : & 1.46068 \end{array}$$

in which $X = 650$

Taking, therefore, 650 mg. of the lime under study and dissolving it in 50 c.c. of distilled water, the percentage of CaO determined can be read directly from the titration. Phenolphtalein is used as the indicator.

The determination by this means may be made so that the error is less than 1%, quite accurate enough for technical work of the kind. Silica, present in practically all lime, does not interfere. Magnesia, almost always present, is slightly soluble in water and will show a faint color with the indicator. Magnesia, however, is of no use in cyanide work and should not be estimated as lime, so that it is fortunate that it is easy for the operator to distinguish the point between the lime and magnesia and no special method is necessary to divide them. Iron oxide, when present in large amount, may mask the color of the indicator, but by allowing the precipitate to settle, the titration may be carried out to within 1%. The following method of determining the amount of carbonate present in an imperfectly burned lime is given by Mr. Bahney.

Grind the sample to pass 200 mesh, weigh out 650 mg. and make the titration in the usual manner. Call this result the available CaO. Ignite 650 mg. of the finely ground sample in a muffle or over a blast lamp and make second determination. Subtract the second result from the first, divide by 1.78 and the result will be the carbonate present.

The lime used for cyanidation should always be carefully examined and analyzed for it may contain organic matter or other elements prejudicial to proper work. A careful examination of the lime will often throw light on poor results that have otherwise defied detection. The use of lime as a settling agent has largely lost its point since the general adoption of the treatment by continuous agitation. In such cases the lime is used merely as a protection for the cyanide.

(To be concluded)

Malayan Tin Mining in 1911

The report of the Senior Warden of Mines for the Federated Malay States show an increase of laborers from 170,361 to 196,427 between 1910 and 1911, and an increase in mechanical horsepower of about 2000, or 10%. Of the 196,427 miners about 189,010 are Chinamen. The tin output for the year was 44,149 tons, as compared with 43,863 in 1911. There was a surprising increase in the labor employed in opencast mining, from 122,686 to 150,439 men.

Some of the lode-mine productions are of interest. The Pahang Consolidated treated 78,448 tons of ore, and produced 18,181 piculs of tin; the Raman mined 49,886 tons, and produced 4069 piculs of tin (one picul equals 133½ lb., usually).

New Jersey Mineral Production

The value of the New Jersey mineral output for 1911 is given at $37,716,411, of which 50% ($18,837,103) consists of clay and clay products. About 25% of the total ($8,828,781) is attributed to the New Jersey Zinc Co.'s mine, which produced 341,543 tons of ore, and $1,158,271 was from 359,721 long tons of iron ore, according to State Geologist Kümmel's report.

Copper Determination with Revolving Anodes

BY FRANK H. PROBERT*

The following notes and detailed drawings describe the apparatus at the Ray Central Copper Co.'s laboratory, for the rapid and accurate determination of the copper contents of ore. It represents many advantages over the stationary-anode method. A similar outfit is used by the Miami Copper Co. At Ray Central, there is one unit of four stands, using direct current at 250 volts. At Miami, there are two units of eight stands, each using current at 110 volts. The specifications call for:

SPECIFICATIONS FOR THE RAY CENTRAL'S FOUR-CELL UNIT

Motor, Eck Dynamo & Motor Co., Belleville, N. J.; $\frac{1}{10}$-hp. inclosed motor for —— volt, direct current; speed, 745 r.p.m.; arranged complete with rail base for bolting to wall to run in vertical position with pulley-end down and to start without starting rheostat; pulley to be grooved for ¼-in. round leather belting and to be 1⅝-in. diameter at base of groove.

Rheostat, Ward Leonard Electric Co., Bronxville, N. Y., or H. Ward Leonard Co., Milwaukee, Wis.; 15-in. back-of-board-type rheostat for continuous duty; 2:1 taper in ampere capacity, to pass a maximum current of 6 amp. on the last step.

Ammeter, Watson Electric Instrument Co., Newark, N. J.; round pattern F for switchboard; 10-amp. direct-current combined shunt; scale, 100 divisions of $\frac{1}{10}$ amp., each readable to $^1/_{100}$ ampere.

Anode and cathode holders, M. H. Treadwell Co., 140 Cedar St., New York; four sets each of cathode and anode holders as per detailed drawings. One pair required for each stand.

Cathodes and anodes, J. Bishop & Co., Malvern, Penn.; 4 platinum anodes, 8 platinum cathodes, as per detailed drawing; 1 anode and 2 cathodes required for each stand.

Belt shall consist of narrow rawhide belt lacing.

Other material (for a four-stand outfit): 4 single-pole, 10-amp. snap switches; 2 double-pole, 10-amp. snap switches; 2 straight-line, double-pole cutouts for 10-amp. cartridge fuses.

Panel, slate or wood, 1½ in. thick by 24x50 in., with shelf 1½x16x50 in. Shelf should be 40 in. above floor, and from center line of anode holders to shelf should be 12 in. Wooden blocks for beakers are 5 in. high.

Wire as shown in accompanying sketch. Before turning on current throw most of resistance in. Test to see that current is flowing from the anode to the cathode holder, before putting platinum electrodes on, otherwise part of gold solder will be dissolved from cathode and deposited on the anode. If the ammeter is wrongly connected it will show no reading, in which case, reverse the connections.

Special Supplies: 8 battery jars, 5x6 in.; 3 doz. 250-c.c. Jena beakers, Griffin form; 2 doz. casseroles, 8-oz.; 1 crystal-

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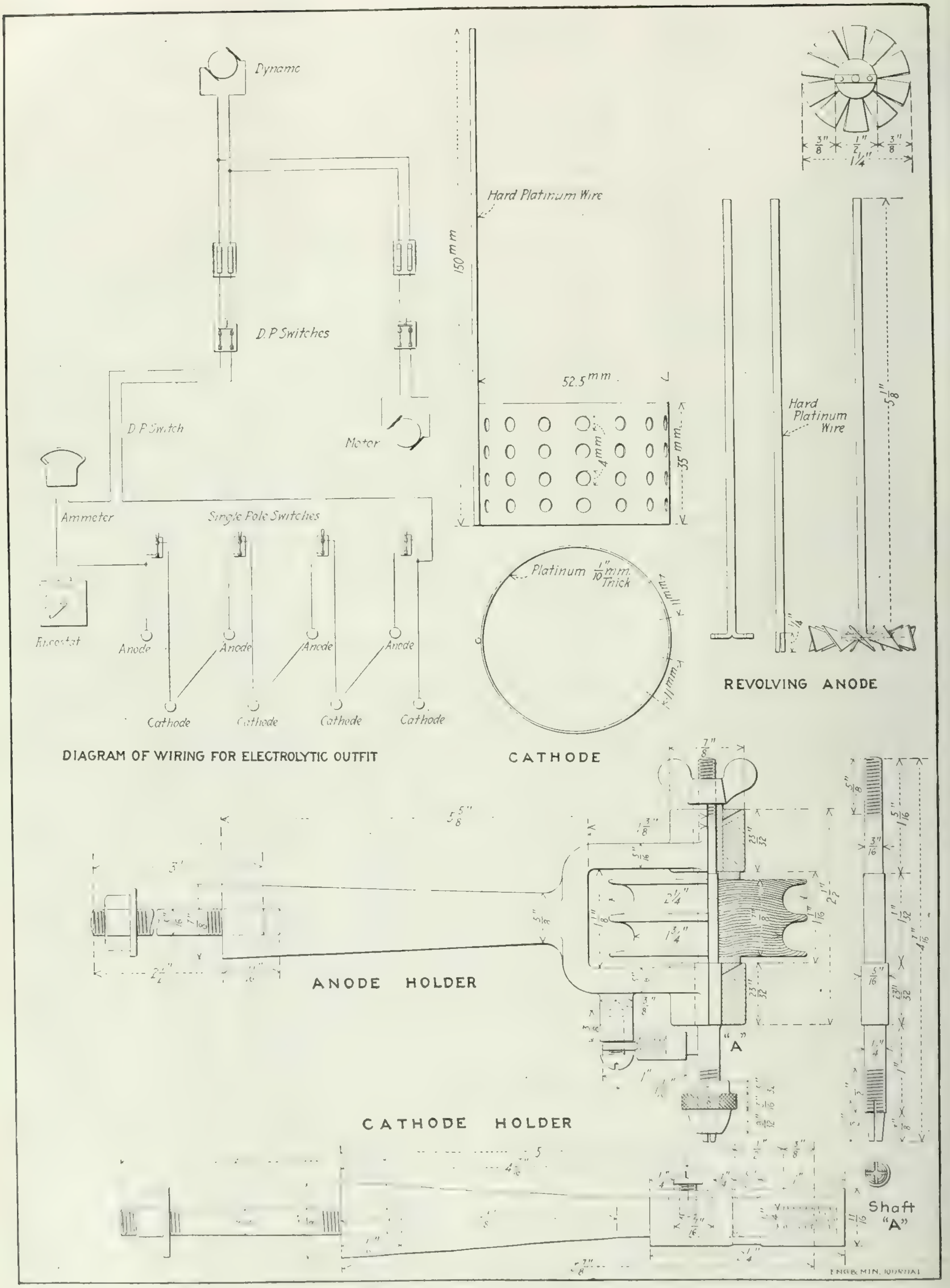
*Mining engineer, Central Building, Los Angeles, Calif.



Details of Electrode Construction for Rapid Copper Analysis llzing dish, $8\frac{1}{2}$ oz., 1000 S. & S. filters 11 cm.; 1000 S. & S. filters, 24 cm.; 1 doz. $2\frac{1}{2}$-in. funnels; 1 alcohol lamp; 1 Kipp generator, 1-pt. size; 2 doz. 4-in. watch glasses; 1 good analytical balance for weighing cathodes.

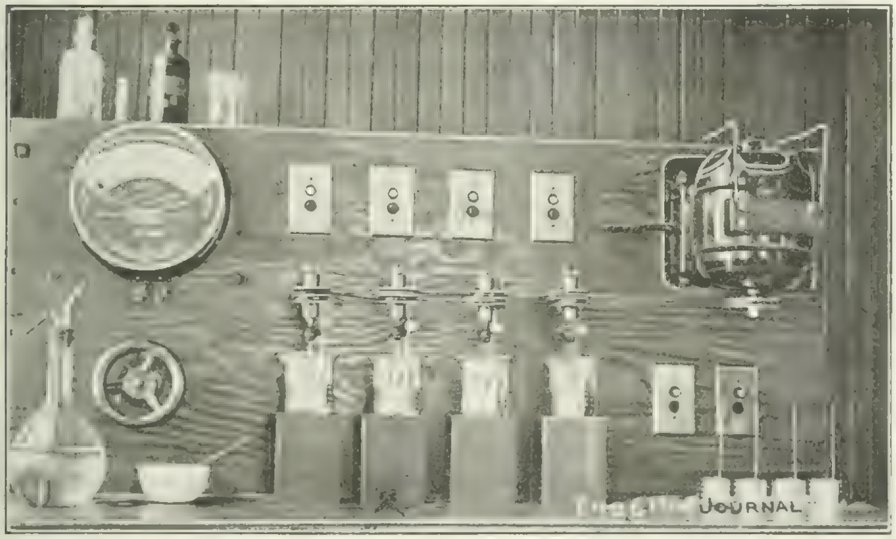
Using a 1⅝-in. pulley on the motor, the time for complete precipitation is too long. We substituted a 3¼-in. pulley, which is the maximum practical size. Using this pulley, the agitation is so violent that the electrolyte is raised nearly to the rim of the beaker and there is a possibility of loss.

With the large pulley on the motor, a 2.0 gram sample containing 10% copper may be precipitated in 20 min. and one containing 2% in 12 min. For low-grade ore a current of 2½ to 3 amp. is used, which may safely be increased to 6 or 7 amp. for high-grade.

Method

Weigh out 2.0 grams of ore in an 8-oz. casserole. Add 5 c.c. concentrated HNO_3 and 3 c.c. concentrated HCl. Cover with watch glass. Digest. Add 5 c.c. concentrated H_2SO_4. Heat until dense white SO_3 fumes appear. Cool. Add 25 c.c. warm water and 2½ c.c. strong HNO_3. Heat to boiling. Filter and wash well. Add 5 c.c. ammonia (1 to 4 parts water), and dilute to about 175 c.c. in a tall beaker. Electrolyze until a drop of electrolyte gives no precipitate when tested with H_2S solution. Remove cathode, wash with water, dip in alcohol and dry quickly by ignition. Weigh. Immerse in bath of nitric acid to remove copper. Wash and dry with alcohol. Weigh. Difference in weights in grams $\times \frac{100}{2}$ gives percentage of copper.

The 4-cell unit at Ray Central has a capacity of 75 to 80 determinations per day. I am indebted to R. B. Earling, of the Ray Central Copper Co., for the detailed drawings of the apparatus.



Stand for Rapid Electrolytic Work Ray Central Laboratory

Proposed Treatment of Rand Tailings

A proposed method of recovering at a profit the gold contained in the older dumps of the Rand, is reviewed by the Johannesburg correspondent of the *Aust. Min. Stand.,* June 6, 1912. There are several million tons of mill tailings existing at present which were made before metallurgical practice had reached its present degree of perfection. This material contains 1 dwt. and upward per ton, the great number of tons available making the subject interesting, even if the profit obtainable per ton is very small. Previous efforts to profitably recover this gold have not met with success. Concentration has been principally relied upon but has failed in every instance to produce profits.

The subject has been given much attention by Rand metallurgists and of late Messrs. Macdonald and Pollock, working in conjunction with Professor Stanley, of the South African School of Mines, have evolved a method which, after trials on an extensive scale, seems to promise success. The process involves the use of the device brought out by Professor Stanley, known as the Stanley classifier. This is described as a hydraulic classifier with a shaking screen attached to the fine overflow, with the object of preventing the loss of coarse material of low specific gravity carrying gold, such as usually escapes and is lost with the ordinary classifier. The material retained by this screen is combined with the heavy, coarse material which is separated by the classifier for regrinding.

The operation of this classifier is to divide the tailings constituting the dumps into three classes, each of which may be treated according to its requirements, or discarded if the contained metal is not sufficient to ensure a profit upon the operation. The products delivered by the classifier are, first the concentrate which is usually plus 60-mesh material together with whatever fine pyrite the tailing may carry. This is said to represent 25 to 45% of the bulk of the tailing and to carry about half the total gold. Then follows the minus 60-mesh material, and finally the slime.

On 14 tests when the content of the tailing was 1.25 dwt. gold, the average content of the concentrate was 1.80 dwt. and of the fines 0.77 dwt. gold. The separate products of this classfication were subjected to cyaniding tests and it was found that the concentrate, after thorough regrinding, gave a minimum extraction of 80% after 8-hr. treatment. The fine or minus 60-mesh material gave an extraction of 67% in 6 hr., while from the slime, 90 to 95% was recovered. It is considered that a recovery of 75% can be relied upon and the actual working costs of the treatment are estimated at approximately 50c. per ton. This estimation includes such items as transportation of the tailing to the classifier, classifying, regrinding, cyaniding, etc.—essentially operating costs, while there is usually to be added the royalty to the owner of the tailing and the overhead expenses.

Due to the small amount of profit obtainable from tailing containing approximately only 1 dwt. of gold per ton, the scale of operations will have to be large to ensure a satisfactory return. One engineer who has estimated the probabilities recommends that on this grade of material not less than 2500 tons per day should be handled. At this rate he estimates a monthly gross profit of $20,000, which figure does not allow for any royalty or administration expenses.

It is calculated that there are about 70,000,000 tons of tailing of grade sufficiently high to allow profitable treatment by this process now existing on the Rand. This tailing is the material accumulated before the introduction of tube mills, and also the accumulations up to date of those plants where tube mills have never been installed.

A company known as Sands Limited has already been formed to acquire all the rights for the classifier and is reported to have secured options to treat several million tons of tailing on the Rand and elsewhere in the Transvaal.

Benzoic Acid in Acidimetry

The use of benzoic acid as a primary standard in acidimetry is urged by G. W. Morey, of the Bureau of Standards (*Journ.* Am. Chem. Soc., Aug., 1912), because of its high molecular weight, which permits the use of large samples, its stability, its nonhygroscopic character, and the ease with which it is obtained in a high state of purity.

Inspection at Beaver Consolidated

At this mine in the Cobalt district, an inspector is employed who examines the workings twice daily, makes a report of conditions and orders such repairs and changes as he deems necessary for the safety of the men. Miners report their time, blasting records and the number of missed holes to him. Men reporting missed holes must return and fire them.

The Beaver Consolidated Mines, Ltd., Cobalt, Ont., has an excellent system of mine inspection, due to an earnest desire on the part of its president and general manager, Frank L. Culver, to protect its employees from all unnecessary dangers of mine work. Mr. Culver stated that the idea of installing a system of mine inspection originated in a conversation he had with a friend while on one of his trips to the mine. He was so impressed with the merits of mine inspection by the company itself that upon his arrival at the mine he immediately appointed an inspector. Up to that time he had thought that the mine was in a safe condition, but after receiving the reports of the inspector it was evident that there were many improvements to be made.

INSPECTOR ORDERS REPAIRS MADE

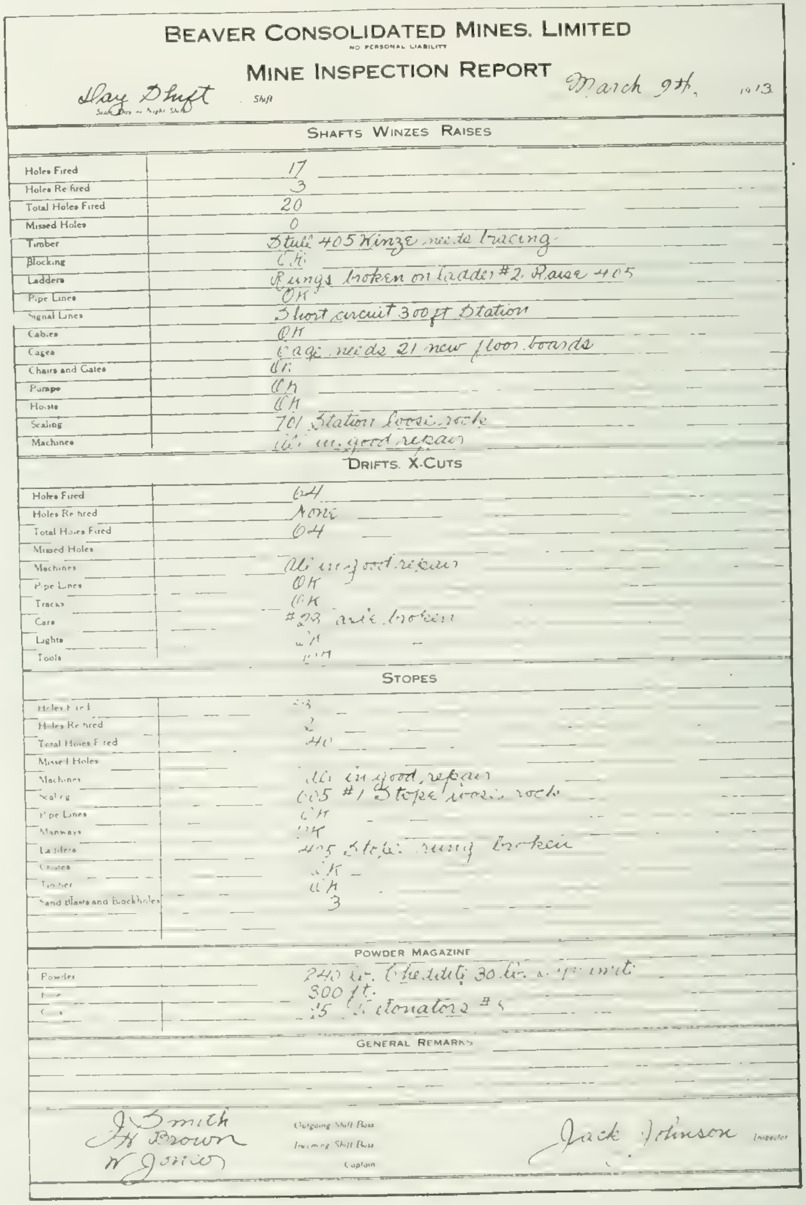
It is apparent that Mr. Culver, at the first, solved the most important question relative to mine inspection, the authority and power to be invested in the inspector. The inspector at the Beaver Consolidated mine was given the power to issue orders to any department to make any repairs or changes he deemed necessary for the safety of the men, or to discharge anyone failing to comply with the rules or regulations of the inspection department, and is responsible only to the superintendent. No matter how competent the official or how excellent the rules and work of any department, the greatest efficiency and best results cannot be obtained unless its orders are obeyed. This is particularly true with inspection work, which is apt to meet with opposition from heads of departments and other subofficials. The work at the Beaver has met with the hearty coöperation of the entire organization and all are interested in keeping the workings in a safe condition and enforcing the rules and regulations of the inspection department.

The Beaver No. 1 shaft is about 600 ft. in depth and the lowest working level 530 ft. No. 2 shaft, about 300 ft. from No. 1, is connected at a depth of 200 ft. with workings from No. 1. The property hoists approximately 35,000 tons of ore per year and employs between 130 and 140 men.

Form No. 1, a sheet 17x10 in., is a mine-inspection report filled out by the inspector twice every 24 hr. The data and names in the form are, of course, fictitious. At present two 10-hr. shifts are worked at the mine and the inspector is on duty from 5 to 9:30 a.m. and 5 to 9:30 p.m. All miners coming off shift report to him and all machine-drill men, in order to get credit for a shift's work, have to report their time and make a blasting report, stating the number of missed holes in their working. All men reporting missed holes are required to return and fire them before leaving shift. This is done in the belief that being more familiar with the face, as drilled, he is less likely to meet with an accident than the man following on the next shift, which is certainly true and such a procedure is a good safeguard against a common cause of serious accidents.

MINE INSPECTED TWICE DAILY

The mine-inspection report, as reproduced herewith, outlines the regular inspection made twice every 24 hr. Under the heading timber in shafts, winzes, raises and stopes, any repairs to timbering or new timbers to be placed immediately to insure safety are noted. Any repairs made to cables, cages, hoists, machines, etc., are noted opposite these headings. This report is signed by the inspector, mine captain, and outgoing and incoming shift bosses, which is sufficient to show that all are advised of the condition of the works and machinery.



BEAVER CONSOLIDATED MINES, LIMITED
NO PERSONAL LIABILITY

MINE INSPECTION REPORT

Day Shift Shift
State Day or Night Shift

March 9th, 1913

SHAFTS WINZES RAISES

Holes Fired	17
Holes Re-fired	3
Total Holes Fired	20
Missed Holes	0
Timber	Stull 405 Winze needs bracing
Blocking	OK
Ladders	Rungs broken on ladder #2 Raise 405
Pipe Lines	OK
Signal Lines	Short circuit 300 ft Station
Cables	OK
Cages	Cage needs 21 new floor boards
Chairs and Gates	OK
Pumps	OK
Hoists	OK
Scaling	701 Station loose rock
Machines	All in good repair

DRIFTS, X-CUTS

Holes Fired	64
Holes Re-fired	None
Total Holes Fired	64
Missed Holes	
Machines	All in good repair
Pipe Lines	OK
Tracks	OK
Cars	#28 axle broken
Lights	OK
Tools	OK

STOPES

Holes Fired	[illegible]
Holes Re-fired	2
Total Holes Fired	40
Missed Holes	
Machines	All in good repair
Scaling	605 #1 Stope loose rock
Pipe Lines	OK
Manways	OK
Ladders	405 Stope rung broken
Chutes	OK
Timber	OK
Sand Blasts and Blockholes	3

POWDER MAGAZINE

Powder	240 lb. Cheddite 30 lb. [illegible]
Fuse	300 ft.
Caps	25 Detonators # [illegible]

GENERAL REMARKS

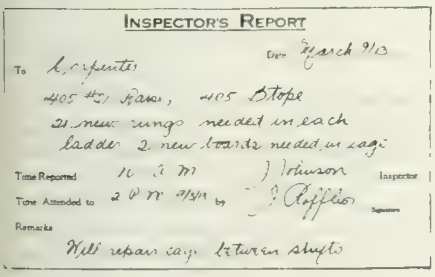
J Smith Outgoing Shift Boss
J H Brown Incoming Shift Boss
W Jones Captain
Jack Johnson Inspector

SAMPLE FORM USED BY PRIVATE INSPECTORS OF THE BEAVER MINE, AT COBALT

Form No. 2 is a sheet 8½x5½ in. and is used as an order by the inspector, to either the mine captain, master mechanic, or carpenter as the case may be, to have any repairs made as indicated by the mine-inspection report. The person to whom this order is made is required to state the time when repairs were made and to sign three copies of the order; one for the mine office, one for the inspector and one for his own record. The superintendent sees that all such orders are promptly obeyed.

The men are lowered and raised on a cage, not over 10 being allowed on the cage at one time. A Stephen Humble hook to prevent overwinding has been installed at the shaft house and the cages are equipped with dogs to prevent any sudden drop. The safety devices and cables are tested regularly to insure that they are in good working order. It is the duty of the cage tender, before starting with men on the cage, to warn all to keep arms and body clear of timbers. Shafts are also provided with manways in case hoists are out of commission.

An electric-signal system for hoisting is operated direct from the electric-power current without the aid of batteries. The wires are lead covered to protect them from moisture and as no batteries are used there is little danger of the system getting out of commission. In case the hoisting engineer fails to understand any signal he rings a bell for signals to be repeated. All rock hoisted is brought up in cars on cages and to guard against rock falling into the shaft they are never filled to the top. The danger from mine fires is slight, owing to the small amount of timber used in the mine, other than shaft timbers, which are usually so wet that there is little danger of them getting on fire. In case of fire, shaft No. 2 could be used as an exit for the men.



INSPECTOR'S REPORT

Date March 9/13

To Carpenter

405 #2 Raise, 405 Stope
21 new rungs needed in each
ladder 2 new boards needed in cage

Time Reported 11 A M J Johnson Inspector

Time Attended to 2 P M 3/9/13 by J. Roffles Signature

Remarks

Will repair cage between shifts

FORM NO. 2, USED BY INSPECTORS AT BEAVER CONSOLIDATED MINES

The Ontario mine laws will only permit a 24-hr. supply of explosives to be stored underground, which is all that the company keeps in the mine. The underground magazine is in a drift some distance from the rest of the workings and the storage magazine on surface is situated quite a distance from the works. An emergency case is kept at the mine office for the treatment of wounds and if needed a doctor is called at once in case of accidents. Before the system of inspection was started at the Beaver there were several serious accidents, but since then only minor accidents have occurred and they have been confined mostly to the surface works.

The men at the Beaver appreciate the efforts of the company to protect them and several have stated that they had never worked in a mine where protection was as complete as at the Beaver. Mine inspection has received much attention of late and has been discussed by the JOURNAL from time to time. Mr. Culver is to be complimented on the example he is setting at the Beaver and it is certain that other mine officials will continue to take up the question of better protection for employees and thus reduce the number of accidents.

Gypsum Mines of England

LONDON CORRESPONDENCE

The gypsum mines of England are situated principally in Nottinghamshire, Leicestershire and Derbyshire in the Midlands, and in the North, Yorkshire, Westmoreland and Cumberland. Nottinghamshire is the principal producer both in new mines and quarries, as it produces fully one-half of the total of over 250,000 tons. From Chellaston about five miles south of Derby in Derbyshire, the gypsum bed follows an irregular winding southeast course, not unlike the course of a river, through Gotham, into Leicestershire, a distance of fully 30 miles and is found in the Keuper Marl. In this bed there are many million tons blocked out, and many more millions of tons have been proved by holes.

WORKINGS INDIVIDUALISTIC

Not many of the mines or quarries are worked at high pressure, although there is no combination or amalgamation as to price or output and there is but little interchange of opinion between the owners or managers of the respective works. Every one is an individual. A manager may occasionally visit an adjoining mine, but rarely visits the mill. Visitors are rarely shown through the mills, as usually there is a patent or "secret process" connected with them, therefore every mill is superior to every other mill.

There is a bed of gypsum, from four to 12 miles northeast from Appleby, the capital of Westmoreland, but only one mine is actively worked, which has a mill for grinding the rock. This mill has been at work about two years, and is quite modern, and there is a good demand for the product. The rock is hauled over an incline in side-tipping cars, and it is fed by hand into a Blake crusher. This crusher is on the ground floor, and the crushings are raised by means of a vertical belt elevator, to pass through a coffee-mill grinder, then to two sets of rolls, from the rolls to a covered screw conveyor to a second belt elevator, situated in another part of the building, to the vertical drier and mixer (made in Kansas). From the brick-encased drier three different grades are produced, which fall into the proper chutes, and discharge into 2-cwt. bags ready for the market. There is little dust. The power is supplied by a suction gas producer, and the mill is well lit by electricity.

This district has been worked for 50 years for gypsum, but the above mill is the only one at work; the other mines sell the gypsum to glass and other manufacturers, to whom it is sent by rail. One of the mines has been at work for 30 years, but only on a limited scale, prior to that it was worked as a quarry. It seems that 20 ft. is the maximum overburden which can be removed to quarry an ordinary bed. A greater depth is too expensive, as the marl or clay which overlies the bed is easily "crumbled" by heavy rains, and washes to the bottom—and covers the tracks—even if the slopes have an angle of 20°. The men cannot work during the winter six days a week, —although during February of 1911 the men worked full time in some parts of the North, which was the first time on record.

Levels have been driven in all directions to the extent of the working bed, and when the gypsum has been taken out, the roof is allowed to fall. The present working face is 120 ft. from the portal, the depth of bed 4½ ft. and the roof has to be broken to make room for the one-ton car. Here there is a "cobble roof," that is, a roof which does not let the water permeate into the gypsum; whereas with a clay roof, the rain or the water of early days carried the sand and soil in the bed and "pot holes" of varying sizes and capacities, holding from a few hundredweight to as many tons, are always found. This waste is useful to support the roofs after the gypsum has been mined.

PRACTICALLY NO TIMBER USED

In one of the mines, the overburden was 25 ft. deep, and all attempts to quarry the bed were futile. The top dirt was principally earth and fine pebbles. The bed varied from 6 to 12 ft. thick, 8 ft. were being worked in places, and a roof three feet thick supports the overburden. The mine is worked on the "pillar system," the pillars being nine feet square. The ground stands well and scarcely a stick of timber is used. A small steam pump fixed near the mouth of the tunnel working two hours a day keeps the water from the mine on ordinary occasions.

The principal mills are in the district around Nottingham. In the largest mill a special dust chamber has been built which saves the finest dust, which commands the best price. There is a large mill also at Kegworth. Around Gotham there are three mines and mills at work, and the mines are wet. At Rushcliffe about two miles east there is scarcely any water.

A feature that surprises one is the uniformity of the bed, one of the mines had been opened on for over 1000 yd., and yet in that distance there was not a dip or rise of 12 in.; plainly showing that at the time of formation, there was a total absence of disturbances of any and every kind. This bed is about 6 ft. thick, and worked on the pillar system. In one of the mines, the roof was hard, and if it had to be taken down, explosives were necessary although unsupported for 22 yd. This bed was favored with rock faults which served as supports to the roof. The drives through these faults were just large enough to admit a one-ton car.

Labor Done by Contract

The method of working was simple; the miners are all worked on contract, 50 hours constituting a week's work, and in groups of four or six, and men paid so much a car. The contractors, in addition to taking the cars to and from the incline, filling them, and mining the gypsum, have to drive through the faults. The waste from the faults is thrown into an adjoining chamber. The mines visited were all well ventilated naturally, by a shaft or shafts sunk some distance from the opening. There are times, no doubt, when the air currents travel a little sluggishly.

In the sinking of one of the inclines to the bed, water was encountered to such an extent as to make the continuation impossible, without the use of plenty of capital; it was then decided to drive over the subterranean water course, and in the driving, test holes were sunk to the water at given distances, and as long as water was found the level was extended. Eventually the water was not found, and a second incline was sunk until the bed was found. A brick dam was built in the side of the level to prevent the water from flowing to the bed, and neither the dam or the water has given any trouble, and the workings are dry.

In another mine there was a circular brick-lined shaft, sunk 100 ft. to the bed, and equipped with cage, electrically hoisted, and cars hauled to the shaft by horses. The bed was 12 ft. thick, and the reserves amount to 3,000,000 tons. No mining has been done near the shaft. The pillars are 12 ft. square, and but little timber is necessary.

The miners use an auger bit ½ to ⅝ in. in diameter, which is easily held in position. The holes are not deep, seldom extending more than three feet, and usually a set of three drills is all that is necessary; these require to be sent to the blacksmiths but once a week, the miners sharpening the bits by means of a file. Water is not used to facilitate drilling, even in cutting-in holes.

Straws Used For Fuse

It was interesting to a miner, accustomed to fuses, both tape and electrical, and to high explosives, to see only black powder used, and the straw of grandfather's days substituted for the fuse. These miners are experts in the way that they can place the powder, whether in vertical, inclined or horizontal holes by means of a spoon scraper, then level it by means of a copper ramrod, then insert a copper pin in the hole until it reaches just below the level of the powder, next, tamp the drillings, which came from the hole, into the hole, with the ramrod, to the collar of the hole; then lightly tap the pin on the head with the handle of the ramrod, pull it out, and in its place insert the straw filled with black powder, which is now ready for the torch, match or end of a candle. It convinces one that charging holes with such material is skilled work.

In the selection of the straw, the miners select the wheaten sheaf, as the joints are larger than the barley or oaten sheaf; the bottom joints are the best. A sheaf costs practically nothing as the farmers do not make a charge as a rule, but the mine owners give the preference to these farmers to remove the ashes to improve their roads. In filling the straw with powder, one end is placed in a glass bottle filled or partially filled with powder, the other end of the straw is a joint, the bottle is turned upside down, and the reed is filled. The miners charge the holes as they are drilled, but do not fire them until the usual time. The death rate due to explosions in these mines is very low.

The gypsum is all sold, there are enough grades and varieties to suit all purchasers and as a rule, heavy stocks are not carried. The uses to which gypsum is applied are many; some of the lowest grades are used to weight the heavy brown papers.

Alabaster

There is a small quarry of gypsum worked as alabaster, near Chellaston, during the last 2½ years. This place had been tested several times during the last 300 years or more,—in all probability before the use of gunpowder, which was adopted first by the Derbyshire miners in 1575, as the marks of oblong holes can be seen, and small chips of alabaster are plentiful on the bed. In one place there were indications that the "ripper and feather" system on a limited scale was used. The overburden has been removed from a block of land about an acre in extent, the depth of soil was from four to eight feet. The surface of the bed is irregular, due, in part to the attempt of the former workers. Pot or mud holes of two feet diameter and less are plentiful and extend to the floor. The method of working is to clear among the debris from the pot holes, and to make an opening in the bed to erect a frame suitable to carry a light adjustable pulley, over which passes an endless triple steel wire. This wire passes over a fixed pulley, placed on a movable frame, adjoining a small engine. In the quarry, the pulley is weighted so that the wire when set in motion cuts into the alabaster. The cutting is assisted by sharp sand and water. This wire is not so successful or as effective as the wire and diamond saws used in the slate quarries. A length of 40 ft. is usually cut to the bottom of the bed which is less than 7 ft. Blocks of alabaster, eight tons weight, have been taken out and dressed. This alabaster takes a beautiful polish, and is used for interior church work and decorations, and is cheap compared with Italian marble.

Calumet & Hecla Holdings

The recent report of the Calumet & Hecla Mining Co. gives a list of the companies holdings, as at Dec. 31, 1911:

CALUMET & HECLA HOLDINGS

Company	Held by C & H	Authorized
Ahmeek	24,800	50,000
Allouez	43,000	100,000
Centennial	43,500	90,000
Cliff	19,400	60,000
Dana*	36,500	40,000
Frontenac*	20,000	20,000
Gratiot*	50,100	100,000
Isle Royale	27,500	150,000
La Salle*	152,977	302,977
Laurium*	33,500	40,000
Manitou*	18,000	20,000
Osceola	32,750	96,150
St. Louis*	35,450	40,000
Seneca*	11,207	20,000
Superior*	50,100	100,000
Tamarack	19,400	60,000
White Pine, pfd.*	3,792	3,792
White Pine, com.*	43,202	85,320

The asterisk (*) indicates stock majority is held by the Calumet & Hecla

A Galician Oil Consolidation

A merger of Galician oil companies has been arranged in London. The Premier Oil & Pipe-Line Co. is to purchase the Amalgamated Oil Pipe Lines, of Galicia, the Central Carpathian Oil Co., the Alpha Petroleum Co. and some large tracts of land owned by individual operators. The capital stock of the consolidation will be £3,750,000, divided into 1,200,000 preference and 2,500,000 ordinary shares. There seems to be a movement to merge the important Galician producers under Standard control.

Alumina in Copper Slags

In his presidential address before the Australasian Institute of Mining Engineers, H. C. Bellinger takes up the question of the rôle of alumina in the copper slags made at various smelting works (*Min. and Eng. Rev.*, June 5, 1912).

The first results instanced were obtained in smelting the ores of the Rossland district, British Columbia. Concerning these Kemp states: "The orebodies exist at or near the contact of gabbro and porphyry, the extent of the mineralized zone being about four miles long by one mile wide. The contact is not abrupt, but the gabbro passes gradually into augite, porphyrites and diabases." The gangue analyzed approximately: Al_2O_3, 14 to 18%; CaO, 10 to 12%; K_2O and Na_2O, 2½ to 3%; SiO_2, 40 to 46%. The first attempts to smelt this figured Al_2O_3 as an acid, and a great excess of lime was added. After twice freezing the furnace the charge was recalculated with alumina as a base, and the furnaces worked satisfactorily on this assumption for several years.

At Butte, however, the oxygen ratio shows a bisilicate slag even calculating alumina as a base, the slag having the composition SiO_2, 45.4%; FeO, 24.0; CaO, 18.5; Al_2O_3, 7.9%. If it be attempted to consider alumina as an acid, the ratio is 2.6:1. At Northport, Wash., the slags have the following composition: SiO_2, 43.5%; FeO, 20.0; CaO, 16.0; MgO, 4.5; Al_2O_3, 14.5%. If the alumina were considered as an acid, the ratio would be 2.8:1. At the Britannia plant, Vancouver Island, a two weeks' run gave: SiO_2, 50.4%; FeO, 20.5; CaO, 22.22; Al_2O_3, 6.5%. Were this alumina considered as acid the ratio of acid to base would be 3:1, which seems unreasonable.

At Crofton, British Columbia, Mr. Bellinger was engaged in smelting a baryta ore carrying 40 to 50% barium sulphate, and 8 to 9% zinc. Here both alumina and silica were added on account of the low formation point of the slag from the ore. At times the slags, which carried 5 to 12% of Al_2O_3, apparently contained alumina as an acid, at other times it was necessary completely to disregard it. Again, at Cobar, Australia, such a slag as: Cu, 0.3%; FeO, 51.4; SiO_2, 39.2; Al_2O_3, 6.5; CaO, 0.6, seems to contain the alumina as an acid, such an assumption giving very close to a bisilicate slag; while in the slag: Cu, 0.2%; FeO, 49.2; SiO_2, 41.4; Al_2O_3, 5.8; CaO, 1.0, if the alumina be completely ignored, the slag will be found to conform closely to the bisilicate ratio.

Attention is called to the many different forms in which alumina occurs in nature, in view of which it is scarcely surprising that alumina refuses to take any definite place in slag formation. Many engineers have found that calculating acid-soluble alumina as an acid, and insoluble alumina as basic or neutral, good results were obtained. While Peters says this has no scientific foundation, the fact remains this method of calculation often leads to success.

The Baldwin Candle Lamp

A new light for use in metal mines to replace candles is a kerosene lamp which slips into the regular miners' candlestick. The lamp weighs only four ounces when filled, and as one-eighth of a pint of oil affords fuel for 10 hr., the manufacturer claims a cent's worth of oil will supply more light for 35 hr. than a candle gives.

The lamp is strongly constructed; no parts are screwed together. The burner fits into the neck with a long sleeve, which is practically tight. The long, thin neck prevents any oil from slopping over when the lamp is being carried or jabbed into a prop. A larger size is also made, weighing eight ounces when filled. This gives a three-candlepower light 17½ hr. for a cent. It is marketed as the "Baldwin Candle Lamp" by the F. E. Baldwin Manufacturing Co., 320 Broadway, New York.

The Baldwin Candle Lamp

Census Bureau's Report on Mines

Washington Correspondence

The bulletin on mines and mining, in preparation by the Census Bureau, will contain a complete survey of the results of its investigations during the last two years and will present the statistics for producing mines, quarries, petroleum wells, etc. A distinction is drawn between producing and nonproducing mines and the data are given geographically. An interesting phase of the report, it is understood, will deal with the acreage of lands operated and the character of their ownership, whether by individuals or by corporations. Congress is likely to undertake some important legislation with reference to mining questions at the next session and the bulletin is expected to furnish some of the necessary data for determining certain phases of the legislation to be adopted.

Changes at Porcupine Mills

Porcupine Correspondence

At present throughout the Porcupine district, interest seems to be centered largely upon milling practice. The Hollinger is having trouble and it is probable that changes will soon be made. The ore is stamped in cyanide solution, the pulp passing to the tube mills, amalgamating pans, Deister concentrating tables and the cyanide plant. In practice it is found that about 60% of the gold goes into solution before the ore is concentrated and amalgamated. The solution produces a bad effect upon the concentrating tables and the management is considering the idea of discarding them and the amalgamating pans; and treating the ore only by cyanidation. At present 30-mesh screens are used on the batteries. It is the intention to reduce these to possibly 10-mesh, and the proposed changes in the mill will not be made until the effect of this coarser crushing has been determined. Indications, however, point to the fact that the cyanide process only will be used.

At the McIntyre it has been found that certain of the ores are not amenable to amalgamation and concentration treatment only, so it has been decided to install a 150-ton cyanide plant. The additional crushing capacity will be gained by using a chilean mill and tube mills. It is understood that the Traylor Engineering & Mfg. Co. has the contract for the work.

The work being done at the Vipond mill where rolls and Hardinge ball mills are used instead of stamps, seems to be coming up to expectations. In this mill the gold is saved by amalgamation only, and a high recovery is obtained by using a large area of plates and by careful amalgamation. The tailings are being impounded in case the company should desire to build a cyanide plant. Despite the excellent results obtained by the small mills, it now seems to have been proved that the best results from Porcupine ores can only be obtained by cyanide treatment, and it is only a matter of time when cyanide plants will be installed in all the mills of the district.

Work has been started on the Dome Lake mill which will have an initial installation of 10 stamps. The process will consist of amalgamation and concentration.

At the Dome mill the results are quite up to the expectations of the management.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their move-

Henry Kaeding is spending a few weeks in Chicago.

Fred T. Williams, of Park City, Utah, left there on July 9, on his way to Alaska.

John G. Worth is on professional business in New Mexico, Arizona, Nevada, Utah, Montana and Colorado.

H. W. Hardinge has just returned to New York from a mining investigation in Lapland, north of the Arctic Circle.

Percy E. Barbour, manager of the Uwarra mine, Candor, N. C., is spending the month of August in New England.

W. H. Storms, state mineralogist of California, visited the Highgrade district in that state in the first part of August.

James L. Bruce, general manager of the Continental Zinc Co., Joplin, Mo., is traveling on the Pacific Coast, on a vacation trip.

Michael Hacket, a prospector, who has spent a year in the Ungava district, has returned without having made any discoveries.

W. S. Tangier Smith has removed from Reno, Nev., to Berkeley, Calif., and will devote his time to general consulting work in geology.

H. F. Widdicombe, general superintendent of the Day-Bristol Consolidated Mining Co., Pioche, Nev., was married, July 29, at Salt Lake City.

Frank M. Estes, of the Exploration Co. of London, is at present manager for the Santa Rosa Mining Co., Ltd., at Concepción del Ore, Zacatecas.

E. Gybbon Spilsbury, consulting engineer of the Southwestern Steel Co., is on a visit of inspection to the company's iron-ore properties in Texas.

J. M. Drake, mining engineer with the Oliver Iron Mining Co., at North Freedom, Wis., has been spending a week in the Michigan copper country.

Prof. Heinrich Ries, of Cornell, was on the British Columbia coast lately, continuing his investigation of the clay deposits of western Canada, for the Canada Department of Mines.

R. G. Davis, in charge of the Pacific division of the topographical branch of the U. S. Geological Survey, has returned to his office at Sacramento, from an official visit to Washington.

J. M. Boutwell is engaged in geological study at Morenci, Ariz. He had recently the misfortune to break his arm, but reports that it is mending rapidly and he will soon be at work again.

H. W. Turner passed through New York this week on his way to California. Mr. Turner has been engaged for a long time in Siberia and the Urals, but expects now to remain in this country.

G. A. Young, of the Canadian Geological Survey, is traveling in the Maritime Provinces in connection with the preparations for the world's convention of geologists, to be held in Toronto in 1913.

David Baker, of Philadelphia, has gone to Australia to act as advisor to the Broken Hill Proprietary Co., in relation to the large iron and steel works, which is to be erected at Newcastle, N. S. W., by that company.

Arthur N. Talbot, professor of municipal and sanitary engineering, University of Illinois, Urbana, Ill., has been appointed second vice-president of the American Society for Testing Materials, to fill a vacancy.

Robert T. Hill and Seth S. Langley announce that they have opened an office in Los Angeles, Calif., for the practice of applied geology and mining engineering. Temporary offices will be in the Hellman Building.

Herbert A. Megraw, late consulting engineer in the City of Mexico, and previously in charge of operations for the Cia. Minera Augustias, Dolores y Anexas, San Luis de la Paz, Guanajuato, has joined the editorial staff of the JOURNAL.

A. L. Carnahan, of the statistical department of Gay & Sturgis, bankers and brokers, Boston, arrived in Houghton, Mich., recently, to spend about six weeks. He will prepare an illustrated guide for the use of the Lake Superior Mining Institute.

Prof. H. N. Herrick has resigned his position as assistant in the mining department of the University of California, and undertaken the construction of equipment for the Craig Mining Co., at Dedrick, Trinity County, Calif. The equipment includes a 40-stamp mill.

George L. Holmes, of San Francisco, consulting engineer for the Union Dredging Co., of Philadelphia, recently visited Merced County, Calif., on professional work for B. C. Warnick, of Philadelphia, who has taken up a tract of land which is being prospected with a view to dredging.

Douglas Lay, superintendent of the Van-Roi Mining Co.'s mine and concentrating mill, in Fourmile camp, Slocan district, B. C., has gone to England on a three months' holiday trip. During his absence D. J. Browne, of the staff of the Le Roi No. 2, Ltd., Rossland, is acting superintendent at the Van-Roi.

F. G. Cottrell, of the San Francisco branch of the U. S. Bureau of Mines, is *en route* to Washington and New York. Doctor Cottrell left San Francisco July 28, and will arrive at New York Aug. 30, and at Washington the following day, returning to New York Sept. 5, remaining there until Sept. 15 or longer. The following places are included in his itinerary: Portland, Tacoma, Butte, Anaconda, Helena, Great Falls, St. Paul, Madison, Chicago, Houghton, Ann Arbor, Detroit, Cleveland, Buffalo, Schenectady and Ithaca.

OBITUARY

William Pollard, head mining captain at the Wolverine mine, was instantly killed by a fall of earth at Hancock, Mich., Aug. 13. He was working about 3700 ft. underground at the time.

Giselli Jesse Liguari died at Redwood City, Calif., Aug. 1, aged 50 years. He had been interested in mining in Mexico for about five years, but is reported to have been driven out by insurgents. He was engaged in the recovery of salt from the waters of the bay at Redwood City, where he had resided for many years. His death resulted from an accident caused by falling timber.

B. H. Burr, president of the Belfont Iron Works Co., Ironton, Ohio, and of the Ashland Steel Co., Ashland, Ky., died in Ironton, Aug. 2. He had been president of the Ashland Steel Co. since the death of J. A. Kelly, a year ago. Mr. Burr was born at Madison, Ohio, 1835, receiving his education in the common schools and a local seminary. In 1857 he went to Ironton and worked at various charcoal blast furnaces in that locality, becoming connected with the Belfont Iron Works in 1866, and gradually rising to become president. He was general manager of the Belfont works for many years. He leaves a widow and two married daughters.

Societies and Technical Schools

Verein Deutscher Chemiker, New York Section—In commemoration of the twenty-fifth anniversary of the parent society, the New York Section will hold a special meeting on Sept. 2, which will also be a reception to members from abroad who will arrive here to attend the International Congress. The meeting will include a business session at which papers will be read by Dr. F. W. Frerichs and Dr. F. Raschig; a luncheon; a theater party for the ladies, and a *Kommers* for the gentlemen at the Arion Club.

University of Washington—Henry Landis, professor of geology at the University of Washington, Seattle, Wash., with a party of nearly 30 students, including the young ladies of his geological class, spent four weeks in June and July camping in Yellowstone National Park, studying the geology of that vicinity. Going thence to Butte, the party was entertained by the Butte chamber of commerce; afterward Spokane, Wash., was visited, and then the journey was continued to Oregon, where, during August, Mt. Hood was to be ascended before the return to Seattle was made.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Aug. 7—The net production of petroleum in California in the first half of 1912, including 182 days, was 41,216,702 bbl., a daily average of 226,355 bbl. In the last half of 1911 the net production was 40,025,720 in 184 days, a daily average of 217,531. This shows an increase in total production in the first half of 1912 over the last half of 1911 of 1,190,982 bbl., and an increase of 8824 bbl. in the daily average production. The total shipments in the first half of 1912 were 36,753,281 bbl., a daily average of 201,941 for 182 days. In the last half of 1911 the total shipments were 35,973,728 bbl., a daily average for 184 days of 195,510; an increase of 779,453 bbl. in the total shipments and 5431 in daily average. This rate of production, with probable increase, continuing for the last half of 1912 should show a total net production of 85,000,000 bbl. for the year. These figures do not include petroleum consumed as field fuel, which is approximately 5,000,000 bbl. per year; nor do they include other hydro-carbon substances. In the first half of 1912 the stocks of petroleum have steadily increased to nearly 45,000,000, at the end of June, 1912. But this is not a serious condition considering the necessary preparation for future markets, though evidence of overproduction. The increase in production for the first half of 1912 may be credited principally to the Lost Hills, Coalinga and McKittrick, the first named being the largest gainer in proportion to the whole gain. In Kern River, Maricopa and Midway fields there were some losses. Santa Maria and other fields in Santa Barbra County show some decline. There was a gain of 250,000 bbl. in La Habra-Coyotes. These wells which gained are operated by the Amalgamated Oil Co. The La Habra-Coyotes came in as a new field this year. Formerly the Murphy production in this field was included with the Whittier report.

Denver

Aug. 7—It has long been inexplicable to those conversant with coal and railway matters how it is that for eight years no purchases of coal tracts have been made in the Yampa coal field, although hundreds of options have been given and hundreds of examinations made. There are 1200 square miles of fine bituminous-coal deposits reported on by engineers and by the U. S. Geological Survey in Bulletin 297; yet no big sales have been made. Though railway facilities are not of the best for immediate operation, 50 ft. of workable seams is equal to about 50,000 tons per acre, and at 1c. per ton in the ground, it would be worth $500 per acre, and during the last eight years it could have been bought for about $100 per acre. Of course the hostility of railroads and their affiliated coal companies with whom this field would come in competition has had its share in preventing sales, but it does not explain why it has not been bought for investment, if not for immediate operation, lying as it does in the exact geographical center of the western states and most of them devoid of good steam coal. However, it is reported here on excellent authority that the first sale of any magnitude in the Yampa coal field of Routt County has just been consumated. Ten thousand acres of bituminous coal have been sold, the purchasers being, it is understood, the McNeill-Penrose interests, whose engineers made a careful examination of the property some three years ago. While the price is not given, the owners have held it for over two years at $75 per acre. The deeds are in escrow and a substantial sum has been paid on account of purchase. The lands are situated, 5000 acres about six miles southeast of Hayden, near what used to be known as the Yellow Jacket section, and 5000 acres about eight miles southwest of Hayden, in the Sage and Dry Creek section. This transaction involves a sum of about $750,000. The leading spirit in the sale is Albert Allen, of Colorado City.

The co-operative pumping plan organized last year at Leadville, and chronicled at the time in the columns of the JOURNAL, seems to hang fire. The Leadville Mines Pumping Co., through its directors, has advised the owners of mines on east Fryer Hill that unless contracts are signed by Aug. 1, the plan to drain the district by pumping will be abandoned. A circular letter to that effect has been sent out by the Central Colorado Power Co. These contracts provide for the mine owners resuming operations upon their properties or leasing them or giving the company the right to lease them. The company was organized last year by a subsidiary of the Central Colorado Power Co. for the purpose of bringing about coöperation between the east Fryer Hill mine owners in a plan to unwater the district. The company proposes to drain the water basin and thereafter to maintain permanent pumps.

It is reported that nickel-sulphide ore has been discovered near Kremmling in Grand County on the Moffat Road. Much copper float has been found from time to time near Kremmling on the Grand River. The discoverers were having the ore tested for copper with no results, but one of the assayers reported that the ore was millerite.

Butte

Aug. 7—With a view to increase the efficiency and to effect a further saving in the operation of the Great Falls smeltery of the Anaconda Copper Mining Co., a new converter, undoubtedly the largest ever built, has just been blown in as an experiment. The converter was made at Great Falls; the castings at the Great Falls Iron Works, the plate and metal work at the shops of the smeltery. The diameter is 20 ft., the bearings each weigh 13 tons and the wind box is 7 ft. high. The converter weighs 65 tons, not including the gears and bearings. Forty tons of copper was produced at its first trial, and it is figured that with a full load it will produce about 50 tons. B. B. Thayer, president of the Anaconda company, and C. W. Goodale, general manager of the smeltery, arrived at Great Falls from Butte, Aug. 4, and spent the following day observing the operation of the converter, which thus far has been entirely satisfactory.

The Anaconda company's recently-made offer of an increase in wages to the Anaconda and Great Falls smeltermen has been accepted by both organizations, and a three-year contract has been entered into between the company and these unions, calling for the payment of 25c. per day increase over the old scale, as long as copper remains at or more than 15c. per lb. An offer of wage increase, identical in every respect to that made the smeltermen, has been made to, and accepted by, the members of the machinists, structural-iron workers, boiler makers, electrical workers, carpenters, plasterers, blacksmiths, molders and pattern-makers' unions. About 300 employees will receive the increase.

As a further proceeding in the deficiency judgment for $89,000, held by Shirley Jenks, of London, against the British Butte Mining Co., the placer claims of the company, eight in number, were sold at a sheriff's sale July 22, for $5000, to

an attorney for Jenks. Recently the company's dredge, valued at $100,000, was sold to Jenks for $1000 in the same manner.

Kingman, Ariz.

Aug. 7—The supreme court dismissed the appeal by the plaintiff in the case of Peachy against the Frisco Mines & Power Co. and others, thereby sustaining the ruling of Judge Doe of the lower court. The property involved was formerly known as the Gold Crown group and was owned by O. D. M. Gaddis and associates from whom it was purchased by the company named. The recent legal action arose from the fact that the former owners, during the period of their ownership, had relocated a portion of the ground held by location. Peachy, the plaintiff in the suit, subsequently located upon the same area, contending that one could not make a valid relocation of his own claim; that the action of Gaddis and associates in doing so was tantamount to an abandonment of the property. The Frisco Mines & Power Co. had spent about $150,000 on the development and improvement of the property, as a result of which, the value of the mine was estimated at about $3,000,000 before Mr. Peachy brought action seeking to have the company restrained from further work and a receiver appointed. Judge Doe decided in favor of the defendants, the Frisco Mines Power Co., and, as stated, the supreme court of Arizona has sustained his decision.

Salt Lake City

Aug. 8—At a meeting of Utah mine operators and mining men, held at the Commercial Club, Aug. 2, resolutions were adopted, urging the Secretary of the Interior to grant a rehearing of the East Tintic case. Other resolutions, urging a revision of the mineral-land laws, were passed, and a resolution was also adopted requesting the Secretary of the Interior to make Salt Lake City the headquarters for government inspectors in the mineral-land department, operating in Nevada camps, instead of Denver or San Francisco. The resolution regarding the East Tintic case was as follows:

> "Whereas, the recent ruling by the Department of the Interior in the matter of the mineral entry by the East Tintic Consolidated Mining Company establishes a precedent that will have a tendency to discourage prospecting, to unsettle mining titles, and retard development of latent mineral resources; therefore be it resolved, by the mining interests of the State of Utah, that an appeal be made to the Honorable Secretary of the Interior that he be and is hereby memorialized to grant a rehearing of the East Tintic case, and to formulate a ruling that shall reiterate the policy of granting patents on lands known to be more valuable for mining than for other purposes to all entry men, who have occupied claims in good faith, and who have otherwise complied with the law and with local customs and regulations."

This resolution was adopted, and copies of it sent to the Secretary of the Interior and to Utah's delegation in Congress. A second resolution presented by the committee to the effect that inasmuch as the mineral-land laws of the United States are inadequate in their details and need revision in order to promote the welfare and development of the mineral industry, the mining interests of Utah favored the creation by the Federal government of a commission of mining men, whose duty it would be to ascertain what changes in the laws should be made, and that legal applications for patent by citizens acting in good faith be granted by the government. Speeches were made by E. L. Wolcott, John Dern, G. W. Riter and others, calling attention to the adverse conditions now prevailing, and to the necessity of Utah mining men completing an organization that will give care and attention to the needs of the industry. The question of supporting the American Mining Congress or of forming an independent Utah association was discussed, and will be further considered.

Negaunee, Mich.

Aug. 9—The new steel and concrete ore dock has been completed at Marquette by the Lake Superior & Ishpeming Ry., which corporation is controlled by the Cleveland-Cliffs Iron Co. and the Jones & Laughlin interests. Construction was started Mar. 1, 1911. The cost is estimated at $1,250,000; 60,000 bbl. of cement and 5000 tons of iron and steel were used. The ore spouts will be lowered and raised by electric motors. There are more than 100 double ore pockets. The new dock is situated next to the old wooden dock of the company north of Marquette, near Presque Isle. Shipping from the new dock has started, although only one-half of the pockets will be used for the first week or two.

The recent strike of the dockmen at the Lake Superior & Ishpeming Ry., and Duluth, South Shore & Atlantic Ry. docks, has been settled by allowing the men a raise from $2.25 to $2.50 for day-shift men, and from $2.35 to $2.65 for night-shift men.

The mines in the Iron River district have now an opportunity to buy cheap electrical power from the Peninsula Power Co., of Iron Mountain, a corporation composed of Michigan and Wisconsin men, with O. C. Davidson, president. A temporary steam power house has been erected at Iron River and power is being furnished to the Wickwire mine and the Davidson mine. The water-power plant on the Menominee River, near Iron Mountain, is being hurried to completion. Three turbines, of 1250 kw. each, are being installed and two more will be put in later, when there is a demand for them. The head is 40 ft. The current generated at 6600 volts will be stepped up to 66,000 volts for transmission to Iron River, 30 miles away. There will be two sets of three wires each, strung on 40-ft. steel towers, set 500 ft. apart. The wires are standard aluminum, with a steel-wire center. The right-of-way has been secured by Hon. L. T. Sterling, of Iron Mountain, and the concrete bases for the towers are being put in. A permanent station will be erected at Iron River, and when the water-power current is ready for delivery, the present steam plant will be used only in case of emergency. The steam plant is equipped with a 625-kw. turbine generator unit and three Morrison 150-hp. boilers; current is generated and distributed at 6600 volts.

Toronto

Aug. 10—The mining interests of British Columbia have been bringing strong pressure to bear on the Canadian government for the establishment of a department of mines, separate from the Department of the Interior, of which the present Department of Mines is an adjunct. It is proposed to create a new portfolio, as the work of the Department of the Interior has so largely increased, that mining matters cannot be efficiently looked after in connection with it. The position of Minister of Mines will almost certainly be given to a Western man.

A shipment of 44 ingots of pure silver from the Cobalt mines, each weighing 80 lb. Troy, the consignment being valued at about $24,000, was made from Montreal today by the White Star liner "Teutonic" to the Bank of England. It will go to the British mint for coinage.

At Cobalt, John McLean and Frank Gilmour were convicted, on Aug. 8, of stealing bullion from the Nipissing mine and sentenced to two years' imprisonment each. The method employed was ingenious: One of the prisoners who worked in the refinery where bullion was melted would dip a cold, steel bar into the molten metal, when some of the silver would congeal around the bar. Several pounds at a time were obtained in this way. A quantity of bullion was found secreted in the houses occupied by the prisoners.

There bids fair to be a rush of prospectors for the portion of the Gillies Limit, south of Cobalt, when it is opened Aug. 20. About 20 parties have already gone there in readiness, and some have anticipated the official opening, by surveying claims to be staked as soon as the day arrives. Some doubt exists, however, as to whether the output of the Gillies Limit mines will be subject to royalty, and many are awaiting a definite statement from the Department of the Interior on this subject before taking action. A statement as to the conditions on which claims in this field may be taken up, will shortly be issued.

The Mining News

The Current History of Mining

Alaska

Alaska-Mexican—During the month of June the mill ran 30 days, crushing 19,299 tons of ore, from which $64,259 was recovered at an operating expense of $28,399. The estimated operating profit is $35,860, the construction expenses $7705, the estimated net profit $28,155. The yield was $3.36 per ton of ore milled.

Alaska-United—During June the mill ran 30 days, in which time 18,018 tons of ore was crushed from the Ready Bullion Claim mine, from which $49,786 was produced at an operating expense of $24,735, leaving an operating profit of $25,051. Construction expense amounted to $1871, leaving the estimated net profit as $23,180. On the 700-foot Claim mine, 19,236 tons of ore was crushed, which yielded $52,586 at an operating expense of $23,036. The estimated operating profit was therefore $29,550; the construction expenses $4016, leaving $25,534 net profit.

Arizona

GILA COUNTY

Arizona Commercial—Development at this mine is proceeding as rapidly as is possible until the new equipment shall have been installed at the Copper Hill shaft, which will be in two or three months. The enlargement of the shaft to three compartments continues above the fourth level, and some repair work is being done on that level. The compressor at the Eureka shaft has been moved to the Old Dominion power house, and a 5-in. pipe line is being laid from that point to the Copper Hill shaft for the transmission of compressed air.

Miami—The production for July was a little over 3,000,000 lb. of fine copper, the highest monthly production in the history of the mine. There was mined during the month 96,403 tons, and 4942 ft. of drifts and raises were driven. A third 8-ft. Hardinge pebble-mill has been added to the equipment of the fourth unit of the concentrator, affording a slight increase of capacity. It is believed that monthly production will hereafter be maintained close to the 3,000,000 mark. A large proportion of the ore mined comes from square-set mining next to the capping and from development work; the rest from the shrinkage stopes and from the dump at No. 2 shaft. The new machine shop at No. 4, or main shaft, is finished and is being equipped, and a building to contain the mine office and the engineering office is nearing completion. Also a contract has been let for the steel work for a large new change house, 57x90 ft., two stories high, and designed to accommodate 650 men. Exploration by diamond drilling continues on the 570-ft. level, but considerable difficulty is experienced in obtaining a core. The northeastern territory is being explored with two churn drills. About 1000 men are employed, of whom 550 are underground.

Inspiration Consolidated—The contract for railroad construction has been let to McArthur Bros. and ground should be broken within the next two or three weeks. The development of the mine is proceeding at the rate of 4500 ft. per month. The two main working shafts are being sunk. The first haulage level is being opened at many places, the ore being hoisted through the Joe Bush shaft. Stations and ore pockets are being cut at the first haulage level in the Scorpion and the Colorado shafts, and an incline is being driven from the main tunnel to the surface. After that is finished, a hoist will be erected and the incline will be sunk to the haulage levels and will be used exclusively for men and timbers. At the Live Oak mine, a pumping station is being cut at the 1160-ft. level in No. 2 shaft and a steel headframe is being erected at No. 1 shaft, after which the sinking of that shaft will be resumed. The Sulphide tunnel is being widened to 7½ ft. and will be equipped with double track for electric haulage.

South Live Oak—Churn-drill hole No. 2 has been discontinued at a depth of 755 ft. in the granite porphyry without discovering chalcocite, although silicates and carbonates of copper were noted at various times. The drill is being moved to the hill on the schist area at the northern end of the property adjoining the Needles group and it is expected that hole No. 3 will be started within a week.

Old Dominion—This mine produced 1106 short tons of blister copper in July. Engineers under H. Kenyon Burch are working on the plans for the concentrator. Proposals for steel work and machinery are in, but no contracts have yet been made. Construction will probably be started within two or three months. The concreting of the last section of the Kingdon shaft has just been started and the job should be finished in about two weeks. The section is 135 ft. deep and the last three weeks have been spent in enlarging it from one to two compartments. The work is being done by Michaelson & Weideman, construction engineers and contractors. A change is to be made in the management, which will be announced in a few days.

PIMA COUNTY

Calumet & Arizona—The steam-shovel property which this company is developing was taken under option from the New Cornelia Copper Co. in the Ajo district, and includes some land adjoining the claims of that company. The district is 42 miles south of the station of Gila on the Southern Pacific R.R. The surface showing is copper-stained monzonite. The preliminary prospect holes showed siliceous carbonate ore to a depth of 30 to 100 ft. below the surface. Below this low-grade surface ore disseminated ore of good grade has been found. The ground is now being drilled systematically to explore for concentrating ore.

California

AMADOR COUNTY

Mountain King—A 13-ft. shaft has been sunk on this prospect at Pine Grove, disclosing high-grade ore. A large amount of gold was taken from the property a few weeks ago, and attracted attention to this section.

Kennedy—Underground work through the east shaft has been suspended in order to make repairs to engine and hoist. The underground work is in progress through the north shaft. The 100-stamp mill is running at full capacity on accumulated ore.

BUTTE COUNTY

Oro Electric Corporation—One hundred men are employed in Humbug Valley at road construction preparatory to the initial work on the power plant to be constructed. Feather River will be bridged at Belden with a bridge ¾ mile long. The construction camps will be built this summer. The plant when completed will extend power to the mining districts in Butte and adjoining counties.

CALAVERAS COUNTY

Christensen—The shaft on Stockton Hill is being unwatered. This shaft was sunk to a depth of 145 ft. in 1852. The work was abandoned on account of heavy flow of water. The property was reopened a year ago, but work was suspended on account of a cave-in. A rich shoot of ore is reported to have been disclosed. C. G. Nuner, manager.

Waterman—Machinery and materials are being shipped to this mine at Angels Camp, with a view to systematic operating. The property was recently purchased from W. W. Waterman by Los Angeles men. It was once a producer.

Kern County

The Sierra electric-power line has been completed to Randsburg. The majority of the mines in the district will install electric power.

Blackhawk—This mine has installed electric power and is one of the first in the district to do so. Ore is being blocked out on the 60-ft. level and several tons of smelting ore are on the dump. D. A. Blue, owner.

King Solomon—Thirty-five tons of high-grade ore has just been shipped to the Red Dog mill. The new shaft on the Teagle-Lamberson lease on this mine has been completed to the 75-ft. level, and the necessary equipment has been installed for continuing the work of exploration. The drift on the 75-ft. level shows a strengthening of the vein as the drifting advances. Ed Shipsey, owner.

Butte—Fifty tons of ore has been extracted ready for shipment to the Red Dog mill. The new lease on the west end has been taken and drifting begun on 120-ft. level.

Parallel—Machinery and parts for construction of a 3-stamp mill has been received.

Modoc County

Sunshine—The first shipment of ore from the Highgrade district was sent in July from this mine to Selby. The returns from the carload showed $238 per ton on 28,498 lb., a total of $3392. Freight on 30,000 lb. at $13.20, was $198, leaving a net value of $3194. An assay showed gold 12.095 oz., silver 21.13 oz. per ton.

Bidwell Consolidated—Suit has been brought against this company by the Mountain View owners, who claim that the Bidwell is working in Mountain View ground.

Nevada County

Pittsburgh—Development has been completed to the 1500-ft. level. The 20-stamp mill is running steadily on reserve ore. The shaft will be deepened to 2000 ft. M. B. Kerr, manager.

Mountaineer—Development is in progress on the south 400-ft. level. The drift is in ore all the way. F. J. Sloat, of Nevada City, superintendent.

California-Montana—Electric power is being extended from the Pittsburgh mine to this property. The line will also serve the Murchie. There are other mines along the line that will no doubt substitute electric for water power. Some good ore has recently been taken from the mine, which is being operated by Eastern men.

Maryland—Richard Morcom and John Bawden were imprisoned in the west 700-ft. level from Saturday afternoon till Sunday morning, Aug. 4. They were shut in by a cave-in at the mouth of the stope. The accident was not discovered until 9 p.m., Saturday, when Supt. Robert Nye discovered the change clothes of the men in the dryroom. The men were uninjured, and were in good air.

Colorado

Clear Creek & Gilpin Counties

Humming Bird—The workings of this Soda Creek property are being cleaned out and repaired preparatory to further development..

Tennessee—This company is developing a group of eight claims in Chicago Creek. The main tunnel is 516 ft. long.

Silver Horn—Operations have been resumed at this property in Ute Creek. A narrow streak of gold and silver ore has been struck on the 100-ft. level. The shaft will be unwatered to the bottom of the 200-ft. level.

Idaho Bride Mining & Milling Co.—This company will develop the Bride property on Seaton Mountain near Idaho Springs. The company is now actively engaged in sinking a two-compartment shaft on the Bride vein west of the Idaho tunnel. John J. Hoban, president and manager.

Anamosa and Bellevue-Hudson—These two properties are on Columbia Mountain, near Empire, and both are controlled and operated by G. W. Boyce, of Denver. The Anamosa is opened by a tunnel 1000 ft. in length, which has opened a vein of silver-lead ore. An air compressor and machine drills have just been installed. The Bellevue-Hudson is opened by a tunnel 1200 ft. in length and in a shaft 200 ft. below the tunnel level a streak of silver-lead ore has been opened, on which stoping has been commenced.

Comet—This mine, on Griffith Mountain, credited with a production from the surface down to 400 ft. of 500,000 tons, is reported sold to Dr. Charles Rowlands, of Syracuse, N. Y. It will now be developed at depth by a crosscut tunnel.

Lake County—Leadville

The output from Leadville during the last two months has been curtailed by the wet summer and an enormous amount of surface water, which filled many shafts that were not equipped with pumping plants, closing down many of the smaller properties and causing much trouble and expense to the mining industry in general.

Little Miami—Shipments of lead ore, which had just been opened in this mine on Fryer Hill, have been temporarily suspended, owing to the accumulation of water in the shaft.

Belle of Granite—This property is about 18 miles from Leadville, and is owned by the Loyal Mining & Milling Co. The mine is now being unwatered, smelting and milling ore being produced. The property has a 25-stamp mill and milling will be begun about Aug. 15. It is operated by Smith & McKirahan.

San Juan District

Tomboy—During July the mill was in operation for 20 days crushing 10,000 tons of ore, that yielded bullion worth $18,500 and concentrates worth $80,500. The expenses for the month were $42,500, the profit $56,500, and the amount of $16,603 was spent on permanent improvements.

Teller County—Cripple Creek

It is reported that the Eclipse claim has been sold to the El Oro Gold Mining Co., of which Robert Mullen is president and manager. It is planned to buy the Rex mill on the Homestake mine and move it to the new site.

El Paso—There is said to be more ore in sight now than in many years, as rich ore was opened at the Roosevelt tunnel level, which extends upward for several lifts. The output for July is 125 carloads by lessees and on company account, the net profits being given as $40,000. The yield in gold is greater than usual on account of the high grade of the ore from the 1000-ft. level. The shoot has been opened for 350 ft.

Ajax—The Colburn mill, using the Clancy-Moore process, which was closed two months ago for alteration and repairs, will be started again about September 1, and the mine is to be reopened to lessees this week.

Stratton's Independence—During June, 2967 tons of ore of an average grade of 13¾ dwt. was produced, and 10,800 tons low-grade, mine and dump ore was milled. The working profit was $23,275.

Louisiana

Eureka Oil & Gas Co.—This corporation has made arrangements to bore for oil on Point au Barrée, about 16 miles south of Houma. A contract is being negotiated to commence boring immediately.

Michigan

Copper

Naumkeag—Drilling with two diamond drills is in progress. One is at the north and the other at the south end of the company's property. This work has been underway for some time, but results are withheld.

Franklin—The Western Federation of Miners is reported to have been intimately connected with the recent labor troubles at this mine. Work has been resumed and conditions are now satisfactory.

Victoria—The company is erecting houses for trammers, of whom there is a great scarcity in this district.

Hancock—This company's shaft is again bottomed in copper at a depth of about 3775 ft. The shaft has been in a mineralized zone for several hundred feet and it is believed by many that the Quincy-Pewabic series of lodes has been reached, but the management is reluctant about making any statements regarding this and plans are to continue sinking to a depth of about 4000 ft. when drifting will be started and the various formations developed.

South Lake—This company has finished the concrete work from the mouth of the shaft down to the vein, a distance of about 80 ft., and sinking can now go forward without interruption. The shaft will go down to a depth of about 600 ft., when a crosscut will be driven to reach the lodes encountered in drilling.

Ojibway—This company is developing some ground tributary to No. 1 shaft at the 1500-, 1600- and 1700-ft. levels. At No. 2 shaft a crosscut is being driven to explore the territory to the west of the shaft.

Copper Range Consolidated—The production of the Baltic, Champion and Trimountain for July and for the first seven months for the year 1912, were in copper mineral, respectively as follows: 926 and 6568 tons; 1245 and 8155 tons; 423 and 3864 tons.

Mohawk Mining Co.—The July production was 601 tons of mineral, making the total for the year 3584 tons.

Wolverine Mining Co.—The production for July was 401 tons of mineral, making the total production for 1912, 3443 tons.

Ahmeek—A plat has been cut, and drifting is now underway on the 18 level at No. 2 shaft. The concrete shipway is now being laid to the 19 level.

Franklin—The output for July was 79 tons of mineral, making the total to date for the year 927 tons. The stamp mill was closed down all but nine days during the month, on account of a strike of employees.

Quincy—The output of mineral in July was 1252 tons, making the total for the year 8821 tons, which compares with 1300 and 9292 tons for the same period in 1911.

Adventure—It is reported that a new lode on the 1500-ft. level was recently discovered in a crosscut which is being driven to the southward. The new lode was cut at a distance of 1220 ft. from the shaft, just beyond No. 3 lode, and the crosscut has been advanced a distance of 12 ft. into the lode.

IRON

American—The machinery for the concentrator, which is being erected by the Denver Engineering Works Co., near Marquette, has been received, and will be put in place as soon as possible. If the concentrator proves to be a success in treating the low-grade ores at this property, similar structures will undoubtedly be installed at other mines in the district where there are large deposits of ore containing about 40% iron.

Republic Iron & Steel Co.—It is announced in Negaunee that operations are gradually to be increased at this company's Hartford, Cambria and Lilly mines on Teal Lake. The Hartford shaft will be sunk 350 ft., or below the 975-ft., level, and 1400 ft. of crosscutting and drifting will be done to develop lower levels. In about two months, the management expects to take on several hundred men; the present force numbers 50. The Hartford mine was taken over two years ago from the Oliver Iron Mining Co., principally for the use of its shaft and steel headframe for hoisting from the adjoining Cambria and Lilly mines. It has been closed since May, 1911, when seven men were killed by an underground fire, but has been kept pumped out. The Lilly is the only one of the three which has been operated this season, and that only in a small way. Considerable diamond-drilling has been done at the Cambria and altogether the three mines are estimated to contain about 1,000,000 tons of ore. They have produced a total of 7,000,000 tons of hard, non-bessemer ore of about 58% iron and 0.09% phosphorus.

Minnesota

CUYUNA RANGE

According to the director, the U. S. Geological Survey will coöperate with the state of Minnesota to make a complete topographic survey of practically all of Crow Wing County except the extreme northern part.

MESABI RANGE

Mines in the Hibbing and Canisteo districts have been hampered by a shortage of cars due to the fact that the boat dispatch at the Head of the Lakes has not been up to the usual standard.

Great Northern—The present plans of this company include stripping three iron-bearing tracts and bringing them into the producing stage as soon as possible. The most important of these tracts lies directly east of the Monroe, a stripped property of the Steel Corporation, and south of two small tracts of Great Northern property. The Monroe is stripped to the line of the section and a slight amount of overburden has been removed so that the Great Northern will benefit somewhat by the development of the adjoining property of the corporation. Contracts for the stripping of 5,000,000 yd. have been let. The property is owned in fee by the estate of J. S. Pillsbury, of Minneapolis. There is a royalty of 25c. per ton to the fee owners with a minimum annual output of 100,000 tons. Contracts are to be let for the stripping of the Woodbridge or second tract. A portion of this land is held in fee by the public-school fund of the State of Minnesota, and the state will receive a royalty of 25c. per ton on the ore. A third tract, belonging to the state, adjoins the Mahoning property and likewise will pay a royalty of 25c. per ton to the school fund.

Missouri

JOPLIN DISTRICT

Aurora—A pumping campaign is being started at this mine by the United Zinc and the Boston-Aurora companies to redeem flooded ground. Two 5-in. Texas Wonder pumps have been installed.

Lincoln—This mine at Duenweg, southeast of Webb City, is in operation, after a year of idleness. The mine is in thin sheet ground and has been handicapped by a heavy flow of water from a large cavern. The mine is equipped with a complete concentrating plant.

Coahuila — One-man machines have just been installed at this mine, near Porto Rico. They are of the latest Sullivan type and take the place of the heavy two-men machines. The new machines will be kept in the headings, two heavy machines being used to drill the stope. This is the first large installation of one-man machines in the district and their work will be regarded with much interest.

Little Mary Mining Co.—This company, in the Alba, Neck City, Purcell district, is now producing 10 tons of blende per week.

Happy New Year — This mine, at Granby, is being reworked, good milling ore being found in the heading. The mine was worked in the early days when only the rich ore was gouged out.

Granby Mining & Smelting Co. — A new mine is being opened up and worked by this company. A shaft known as the Ida M., one mile southwest of the custom mill, has been sunk 81 ft., where a 10-ft. face of blende is found. Thirteen drill holes have been sunk on the property.

Hartford—At this mine, south of Galena, plans are being made to remodel the concentrating plant and increase its capacity. Electrical drive will supersede steam power. Harlan H. White, manager.

Sunrise—A rich discovery of lead and zinc ore has been made on Pierson Creek near this mine at Springfield. It is reported that the ore is found at a depth of 70 feet.

Montana

BUTTE DISTRICT

Bullwhacker—It is reported that negotiations are being made for control of the property between Patrick Clark, owner of the Bullwhacker mine just west of the Brundy group of claims recently bonded to Capt. Wolvin and associates, and Eastern men. If the deal is made, it is planned to sink to the 1000-ft. level in order to go below the carbonate into the sulphide zone.

Silver King—At a distance of 220 ft. from the shaft on the 300-ft. level, in the heart of the city of Butte, a block of ore has been discovered. The mine is part of the Davis-Daly property, and is being operated on a lease. It is thought that the crosscut being driven from the Gagnon mine, to develop this ground, will intersect the same vein at a depth of 1800 feet.

Tramway—This mine, which has been closed for the last two months for the purpose of equipping it with compressed air, has been placed in commission, while the Pennsylvania has been closed to receive the same treatment, which will require about six months. The underground electric haulage system will soon be in general use throughout the Mountain View mine. Some horses are yet in use, but within another month it is expected that all haulage will be done by electrically operated cars.

Davis-Daly—Developments of the last few days on the 1900-ft. level are reported to be especially encouraging. It is said that the stringers indicate that the crosscut being driven to the north vein is approaching another orebody. This crosscut has intersected two orebodies already; the main vein lies ahead.

East Butte—It is not probable that any increase in copper production will be made for a month or more, because of the delay in the delivery of steel for the extensions of the blast furnaces. The recently installed improvements have resulted in many economies and it is probable that the company will be able to liquidate the indebtedness incurred by the purchase of the Pittsmont mine and smeltery, in little more than a year. The ore now blocked out between the 800- and 1000-ft. levels should be sufficient to maintain double the present production for several years.

Butte & Superior—The second unit of the mill has been completed, and the company is in a position to treat more than 1200 tons of ore per day. The first unit has been successfully operated for two or three months, and the second unit has been found to be fully as satisfactory. The mill is now treating about 600 tons of ore per day, and this amount will be maintained until the new surface plant now under construction, has been completed, which should be about Oct. 1. A high recovery of the zinc is being made, and a little more than 200 tons of concentrate is being shipped daily to Bartlesville, Okla., for smelting. Development work is going ahead steadily, and it is figured that ore enough is blocked out to keep the concentrator going at full capacity for several years.

BROADWATER COUNTY

Irish Syndicate—A strike of high-grade silver-lead ore was made recently in the Syndicate tunnel, which has been advancing on the vein for a year. The property is seven miles south of Winston.

JEFFERSON COUNTY

Charles Dungess, and the Ballard brothers, are operating gold properties east of the Yellow Jacket property, and making occasional shipments of ore to the East Helena smeltery. The Ballards have a large, low-grade vein in which are shoots of rich gold ore.

King Solomon—At this mine in the Lump-Clancy district, a crew of men is drifting on the vein.

Sheep Mountain—A new shaft is being sunk on this property in the Lump-Clancy district, to open workings known to contain rich silver ore. The old shaft sunk many years ago is unsafe.

Yellow Jacket—A crosscut tunnel is being driven on this property, south of Helena, to intersect eight known veins at a depth of approximately 800 ft. Machine drills operated with power furnished by the Missouri River Power Co., are being used to drive the tunnel.

Nevada

COMSTOCK LODE

Mexican—The new mill is now producing bullion at the rate of about $50,000 per month, and has practically wiped out its floating indebtedness. Funds will now be accumulated in the treasury for dividend purposes. The 2500-ft. level of the mine is producing the highest grade ore, while rich ore is being stoped from two places on the 2400-ft. level.

Ophir—Run 38 on second-class ore at the Kinkead mill has been completed, and a clean-up made. Concrete foundations are now completed for the 100-ton cyanide plant, and the framework of the building put in place. On the 2500-ft. level, the west crosscut from the main southwest drift is in vein porphyry.

Consolidated Virginia—Understoping is underway on the 2400-ft. level below the sill floor sets of the three-compartment raise. The vein, eight feet below the sills, dips more to the east than it does above.

C. & C. Shaft—It is announced that in about two weeks, the new temporary pumping plant will be in operation, tests on the new 2300 station pumps, showing them to be in excellent condition for regular service. A vertical centrifugal pump will be lowered to the sump and will pump to the 2300, from which level the water will be relayed to the 2000 and from there to the Sutro tunnel at the 1600-ft. level. The sump pump will replace the hydraulic elevator temporarily, until the main hydraulics are installed on the 2500 station.

Combination Shaft—This shaft has now been retimbered and placed in good condition from the surface to 60 ft. above the present water level just below the 1700-ft. level.

ELKO COUNTY—JARBIDGE

Bluster—Work on both the 100- and 250-tunnel levels is progressing favorably. One crosscut on the upper level shows milling ore. On the lower level the oreshoot to the north of the tunnel is being drifted on and continues to carry fine gold.

Buckeye—A new adit has been started on the vein about 150 ft. below the former adit and close to the side line of the claim. It is probable that with the Last Chance a common tunnel on the latter property will be run by which about 1000 ft. greater depth can be obtained.

Alpha—The vein has been picked up beyond the break and is beginning to show gold again. A 6-hp. Fairbanks & Morse gasoline hoist has been erected at the shaft and sinking has been in progress for over a week. The showing in the bottom of the shaft is good.

HUMBOLDT COUNTY

Mazuma Hills—This mill was destroyed by fire July 29; water protection was not available on account of the recent cloudburst.

LYON COUNTY

Mason Valley—The work of enlarging the No. 2 furnace at Thompson, is proceeding steadily and should be completed soon. When this work is finished the No. 2 furnace will be blown in, while No. 1, which is now in operation, will be blown out, and the work of lengthening and enlarging it will begin. When these alterations have been completed, the two furnaces will have a capacity of 1850 tons per day, as against an original rated capacity of 400 tons each, or a total original capacity of 800 tons.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Aug. 1, are as follows:

Mines	Week	Year to Date
Tonopah Mining	4,100	103,869
Tonopah Belmont	3,755	65,231
Montana-Tonopah	981	31,566
Tonopah Extension	1,055	30,103
West End.....	820	22,169
Midway	40	340
MacNamara		10,935
North Star	50	130
Totals	10,801	264,643
Estimated value	$270,025	...

Tonopah Extension—The clean-up at the mill for the month of July shows that 4503 tons of ore was treated for 5611 lb. of bullion valued at $63,200, the extraction being 92 to 94% of the assay value. The new vein on the 500-ft. level is in a contact between rhyolite and breccia and is geologically, the deepest vein in the western ore zone.

Jim Butler—Shipments to the old Belmont mill were commenced Aug. 10.

New Mexico

Grant County

Chino—The production for July amounted to 3,100,000 lb. and the cost is stated to be 6.23c. per lb. The ore contained about 44 lb. copper per ton of which about 30 lb. was recovered.

Burro Mountain Copper Co.—This company is again operating, having a force of 50 men employed to which it is adding daily. It is sinking the main working shaft.

Socorro County

Deadwood—At this mine good time was made in the erection of the new headframe and the resetting of the hoisting engine. The new 50-hp. auxiliary engine for the mill is about ready for operation.

Oaks—The development on the Pacific and Johnson mines of this company produced 70 tons of ore, which was sent to Deadwood mill, recently.

Deep Down—Lessees continue to send a good tonnage of ore to the custom mill.

Socorro—This company has recently completed special ore bins and is now receiving custom ore regularly. A large flow of water was recently encountered in the 500-ft. level on the Queen vein, flooding the 700- and 800-ft. levels; a concrete bulkhead is being put in to stop the flow.

Ernestine—For the last 20 days of July 17,760 oz. of gold and silver bullion was smelted, with a concentrate product of over 8½ tons. The total output for the month was 27,460 oz. of bullion and 14 tons high-grade concentrates. Ore treated during the last week was 590 tons, the low figure occasioned by reconstruction work on old battery of 20 stamps, which will be completed about the end of the month.

Iron Group—About 75 tons of ore has been delivered to the Deadwood for treatment. Several men are at work on the property and as it is large, and as good results have already been obtained, it promises to become an important factor in the district's growth and production.

Mogollon Gold & Copper Co.—The Little Charlie mine continues its shipments to the custom mill and the grade is probably the best of any ore now being milled in camp.

Pennsylvania

It is reported that it is almost impossible to secure manganese for prompt shipment for Pittsburgh consumption. Foreign production is behind contracts because of the impossibility to make shipments due to the blockade of the Dardanelles.

Cambria Steel Co.—During July the plant at Johnstown turned out 25% more steel than in any previous month in its history. All the blast furnaces are now in blast and three additional openhearth furnaces now under construction, will be fired about October 1. These furnaces have a capacity of 75 tons each and will make a total of 28 openhearth furnaces.

South Dakota

Lawrence County

Black Hills Standard—This company has been organized to take over the property of the Deadwood-Standard, Spearfish and Slavonian mines. The Deadwood-Standard had a small cyanide mill, which has been refitted and is now in operation. The ore occurs in the carboniferous limestone and yields readily to simple cyanidation. The officers are: John Gray, president and general manager; Paul Rewman, secretary and treasurer; Edward Manion, superintendent. All of the officers are Black Hills men.

Ruby Mining Co.—At a meeting of the stockholders of this company, the following directors were elected: Mrs. James Conzette, president; Arthur M. Hanna, vice-president; Norman T. Mason, secretary, and Rollin Maxam, treasurer. The company owns property in Ruby Gulch, near Galena, which is equipped with a small mill.

Homestake—Doing away with steam power, a 150-hp. Ingersoll-Rand air compressor has been installed in the machine shop to operate the many machines which have heretofore been operated by steam engines. This is another application of the power generated at the hydro-electric plant on the Spearfish River. A crew of men has been sent out to replace the old, worn-out flume from Little Elk Creek with a new installation, constructed to withstand the action of the elements. The work of construction is in charge of George Northland.

Golden Reward—At the annual meeting of the company, held at Deadwood, the following directors were elected: A. G. Hackstaff, C. C. Tegethoff, O. H. Kahn, Harris Franklin, Robert W. Goelet, George G. DeWitt, Henry W. DeForrest, W. B. Devereux and Walter Luttgen. Work is progressing favorably on the roasting plant, and the leasing system lately introduced at the mines on the north end of the property is proving satisfactory to the management.

Hidden Treasure—The annual meeting of this company, held at Deadwood, resulted in the election of the following officers: S. T. Cochran, president; J. N. Andrews, vice-president; R. S. Grimes, secretary; Banks Stewart, treasurer and general manager. It was decided at the meeting to continue the main tunnel to cut a vein which was also the objective point of a shaft, but no work will be done there at present.

Pennington County

Forest City—W. J. Blake, of Hill City, who is operating this property, has just started the 10-stamp mill, after installing a gasoline pumping plant on Palmer Gulch, 2000 ft. distant, to secure water for milling, the mine workings failing to furnish the necessary water. The mine shows an ore shoot of free-milling ore.

Deadwood Zinc & Lead Co.—This company intends building a reduction plant and will try electric furnaces for the treatment of complex ores.

Utah

Juab County

Tintic shipments for the week ended Aug. 2 amounted to 193 cars. This is 200 tons more than for the week preceding, and is above the average. Increase in shipments was made by the Centennial-Eureka, Iron Blossom, and Grand Central.

Chief Consolidated—A report dated July 23 covering operations for the first half of the year has been issued. There was marketed 7968 tons of ore, which brought net returns of $202,182. This ore assayed gold, 0.24 oz.; silver, 46.22 oz.; lead, 3.73%, having an average gross value of $34.25 per ton. Smelting, freight, and sampling charges amounted to $8.88, making the average net value $25.37 per ton. The net profits for the period were $148,604. On July 1 there was a balance of $152,108 in the treasury. Development consisted of 1115 ft. of drifts and 149 ft. of winzes, or a total of 1264 feet.

Salt Lake County

Ohio Copper—The newly organized company still has a majority of Heinze directors on the board, but it is stated that the Allison interests will eventually have three of the five directors.

Bingham Amalgamated—The 1200-ft. Montana-Bingham tunnel which is being driven toward this ground is now within 50 ft. of Amalgamated lines.

Summit County

Park City shipments for the week ended Aug. 3 were: Silver King Coalition, 1,290,260; Daily West, 870,000; Daily-Judge, 567,000; Barry-Coxe, 51,000; total, 2,797,260 lb. For the week preceding 2,221,520 lb. were shipped. During July Park City shipments amounted to 7572 tons, which is an increase of 390 tons over June. The largest shippers were the Silver King Coalition, Daly-Judge, and Daly West.

Daly-Judge—The quarterly report for the period ended June 30 has been issued. During the quarter 16,017 dry tons of concentrating ore was mined and 652 tons of shipping ore. There were 2785 tons of lead and 2250 tons of zinc concentrates produced. The former was valued at $36.72 per ton and the latter at $25.60. The net earnings as shown by the report were $77,201, which is in excess of the $45,000 dividend requirement. On July 1 there was a balance of $501,980 in the treasury.

Snake Creek Drain Tunnel—Trouble has been experienced here, on account of loose ground, which is considered dangerous by the men. They have demanded that it be timbered, refusing to work until this be done.

Ontario—There has been a delay in the arrival of machinery which is to be installed in the remodeled mill by the new leasing company.

Wisconsin

PLATTEVILLE DISTRICT

Betsy—A mill will be built at this mine on the John Weinschump farm, by J. H. Billingsley and associates.

Little Dad—A mill is being built of 50 tons capacity at this mine, adjoining the Kennedy mine to the south.

Wisconsin Zinc Co.—This company is removing the mill from the Drum to the East End mine, which it purchased recently. Shaft No. 2 has been started and a 10-in. well will be driven 500 ft. to supply milling water.

Schrier Mining Co.—This company is removing the mill to the old Sally Waters mine, which has recently been unwatered. Pitches to the southwest will be worked.

Lucky Five Mining Co.—This mine, at Dodgeville, has declared a second dividend this year of $70 per share; the first dividend of $100 was paid early in the year.

Dawson—After a long shut-down, work is being resumed at this mine, at Benton.

Vinegar Hill—This company is reopening the Brown-Croft mine, at Schullsburg. The company has also leased the adjoining Little Giant tract. The company has also started a new shaft on the Scrabble Creek property, at Hazel Green, which adjoins the Cleveland mine.

Hodge—Leases to this property have been renewed and operations will be resumed.

Highland Park—The main shaft will be cleaned out and prospecting commenced on this ground, formerly known as the West Empire.

Winskill—This mine, at Schullsburg, is one of the largest shippers in the district, as it produces from 250 to 300 tons per week.

Canada

BRITISH COLUMBIA

Consolidated Mining & Smelting Co. of Canada, Ltd.—This company is preparing to make concentration tests with siliceous ores from the Le Roi mine, at Rossland. The equipment of the old Le Roi experimental mills is being added to. One unit of the Elmore vacuum process plant has been obtained from the Britannia Mining & Smelting Co.; Callow screens and a Wetherill separator have been removed from the Consolidated company's ore-testing plant at the St. Eugene mine, East Kootenay. There is in the Le Roi mine much low-grade siliceous ore, and it is with the object of reducing the siliceous contents to a percentage suitable for blast-furnace work that these tests are to be made.

Granby Consolidated—The following is a summary of the results of July operations: At the mine, 106,927 tons of ore was shipped in 28 working days, a daily average of 3960 tons; development work consisted of 539 ft. raising, 508 ft. drifting, 10 ft. sinking, and 1263 ft. diamond drilling. At the smeltery 1429 tons of ores other than from Granby mines were received; 107,427 tons of Granby and 1122 tons of foreign ores were smelted.

ONTARIO

Gosselin—The Hudson Bay Mining Co., of Cobalt, has secured an option on this mine, at West Shining Tree, at $250,000.

St. Anthony—This gold mine in western Ontario, is under option to the Canadian Mining & Exploration Co. It is extensively developed. Equipment to handle a tailings pile of about 15,000 tons will be installed soon.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Aug. 9, and for the year to date, are:

Beaver		219.75
Buffalo	31.50	798.44
Casey Cobalt		212.15
City of Cobalt		812.51
Cobalt Lake	32.85	466.21
Cobalt Townsite	30.50	954.81
Chamb.-Ferland		257.05
Coniagas	207.83	1,351.46
Crown Reserve		302.08
Drummond		330.30
Hudson Bay		440.06
Kerr Lake		444.14
La Rose	84.77	2,186.36
Lost and Found		15.00
McKinley-Darragh	68.51	1,701.99
Nipissing	113.82	1,141.38
O'Brien		345.62
Provincial		22.22
Right of Way		180.01
Timiskaming	31.85	713.08
Trethewey	29.35	312.89
Wettlaufer		229.04
Totals	631.11	13,699.68

Beaver—A stringer of high-grade ore has been found in developing No. 3 vein, at the 300-ft. level

Penn-Canadian—This mine, formerly the Cobalt Central, has shipped 32 tons of ore. The old mill, with a capacity of 100 tons per day, is being refitted for the treatment of a large tonnage of low-grade ore now on the dump. The 305-ft. level is being developed for the working of a large block of milling ore.

ONTARIO—PORCUPINE

Crown Chartered—This property is being inspected by a Rochester engineer representing the New York State stockholders to determine their action as regards the payment of $35,000, which falls due this month. It is understood that a proposal for the sale of a controlling interest to Rochester men is under consideration.

Lucky Cross—Further good discoveries on this property in the Swastika district, are reported. Underground development has resulted in picking up veins traced on the surface and milling ore is being taken out. The plans for a 40-ton mill are completed and construction will be started soon.

QUEBEC

Buckingham—On account of the slackness of the market for graphite these mines have been closed down, throwing nearly 200 men out of work.

Mexico

CHIHUAHUA

Cia. Minera La Republica—For the quarter ending June 30, 1912, operations at La Republica mines were as follows: Tons of ore crushed, 2107; production, 158,366 pesos; operating cost, 125,343 pesos; construction cost, 11,277 pesos. Labor conditions continue unfavorable, the revolution having drained this district of workers so that the mills cannot be kept supplied with ore.

EL ORO

El Oro Mining & Ry. Co.—During July the mill was in operation 30 days, crushing 20,190 tons of ore and treating 14,840 tons of old tailings, the recovery as bullion being worth $169,420. The working expense was $99,100; the expenditure on development, $16,820, the mine profit, $53,500; the railway profit, $9170; the total profit, $62,670. The sum of $1770 was spent upon permanent mine improvement.

South America

CHILE

Braden Copper Co.—Cable advices indicate that a high extraction is being obtained with the new Minerals Separation plant.

PERU

Aporoma Goldfields, Ltd.—The installation of monitors is nearly completed, the plant is in partial operation and is producing. Mr. Crane, the managing director, is about to leave for England

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Aug. 14—Demand for coal is on the increase in all parts of the country. There is a pronounced shortage of anthracite and operating companies are predicting an acute situation this winter.

The Western market has been rather slower than others in responding to the improved condition, but it has picked up considerably during the week. Prices are being more firmly held while buyers are now endeavoring to cover their requirement before a higher level is reached.

The Lake shipments have been fairly heavy but were curtailed to a certain extent by the congestion at head of the Lakes and the car shortage in the Eastern markets. Shipments to the Northwest have not been as large as was hoped for and it seems probable there will be a shortage there this winter.

Exports

Total exports of anthracite for June of the current year were 301,969 tons as compared with 340,664 tons for the same month last year; for the 12 months ended June 30 of the current year exports of anthracite amounted to 2,979,102 tons, as compared with 3,146,388 tons for the same period last year.

Bituminous exports for June of the current year, exclusive of bunker coal, amounted to 1,360,489 tons, as compared with 1,311,097 tons for the same month last year; for the 12 months ended June 30, bituminous exports were 14,709,847 tons, as compared with 11,839,099 tons for the same period last year. Bunker or fuel coal laden on vessels in the foreign trade during June of the current year totaled 567,162 tons, as compared with 586,183 for the same month last year.

Iron Trade Review

New York, Aug. 14—The United States Steel Corporation issued its eagerly awaited statement for July on Aug. 10. This shows unfilled tonnage as of July 31 as 5,957,079, as against 5,807,346 on June 30, and 5,733,983 on May 30. On July 31, 1911, the figure was 3,584,085, and has not been closely approached since Dec. 31, 1909, nor equalled since Sept. 30, 1907. A further advance in price on all grades is now being discussed.

The gain in unfilled tonnage of the United States Steel Corporation in July, 149,733 tons, reflects largely the reduced shipments in that month, shipments being probably 100,000 or 150,000 tons less than in June, which month showed a gain of 56,363 tons in unfilled tonnage, so that July bookings were probably slightly less than those of June. They were, however, almost up to capacity, and if, as is expected, they are larger this month than last, a further gain in unfilled tonnage will be shown, even though August shipments are as large as those of July.

The whole tone of the iron and steel market is one of increasing optimism, similar to that which obtained three years ago, during the memorable boom of 1909, when prices advanced after a great break. It is asserted by steel manufacturers that the present improvement is much more striking, in the confidence shown by buyers, and it is claimed also that the buying is for actual consumption, and not in large part for speculative purposes. This same statement, however, was made three years ago.

Pig Iron Production—The reports of the blast furnaces, as collected and published by the *Iron Age*, show that on Aug. 1 there were 247 coke and anthracite stacks in blast, having a total daily production of 78,650 tons; a decrease of 2750 tons from July 1. The production in July was light, owing to weather and other causes. Making allowance for the charcoal furnaces, the total production of pig iron for the month of July was 2,437,625 long tons. Adding this to the official report for the first half of the year gives a total of 16,509,900 tons for the seven months ended July 31. Of this total approximately 12,242,400 tons, or 74.2% were made by steel-works furnaces.

Birmingham

August 12—Pig-iron prices in the Southern territory have advanced 50c. per ton and $12 per ton for No. 2 foundry, is the general quotation heard, delivery during the balance of the year. Already the suggestion has been made that $12.50 per ton will be reached before the end of the year and furnace companies here are not making a price for iron for the first half of the coming year. A report printed in the north is to the effect that Southern iron was being quoted at $13 per ton for No. 2 foundry, for delivery during the first half of the coming year. Prominent iron men here say that with iron approaching $12.50 per ton before the end of this year that $13 might be a quotation for the first quarter of 1913.

The sales of pig iron in this section are greater than the make right along, while there is a little better production in this section. Consequently there is continued reduction of the accumulated stocks of iron in the South, and barren yards can be looked for by the end of the year. The output in July showed an increase of about six thousand tons over the production the previous month and the same increase is looked for during the month of August. There has been some delay in the work on furnace repairing and furnaces which were already to have been in blast will hardly be ready for the torch for several days yet.

Basic iron commands a good price and there is demand for all this product being manufactured. The steel situation is strong. There is need for a steady operation of the steel-rail mills, the rolling mills handling steel and the steel wire plants. Good prices obtain for steel products and the indications point to the necessity of steady operation through the balance of the year. Though official verification is lacking, it is generally understood that the American Steel & Wire Co. will be ready to operate its new plant at Ensley, Ala., by the first of the coming year. Labor troubles at foundries and machine shops are still on; the places of strikers are being filled.

While the Baltimore Trust Co. was given the right to sell the collateral in its possession to secure the $330,000 in notes of the Alabama Consolidated company, it has not done so, and is understood to be holding off to see what the receivers and protective committees will do toward putting the organization on a sound basis.

Baltimore

Aug. 12—Exports for the week included 3,282,100 lb. steel rails and 89,250 lb. bolts and spikes to St. Johns, N. F.; 41,562,140 lb. steel billets and 286,540 lb. bars to Liverpool; 6,461,500 lb. steel rails and 547,040 lb. tie and angle plates to Tampico; 76,032 lb. of wire to Havana; and 73,601 lb. of pipe to Hamburg. Imports for the week included 50 tons of ferromanganese from Rotterdam; 6800 tons of manganese ore from Batoum; 18,500 tons of iron ore from Cuba; and 30 tons of spiegel and 2155 tons of ferromanganese from Middlesboro.

Chicago

Aug. 12—The market for pig iron has been quiet in the last week; that for finished products has continued active. Sales of pig iron have occasionally run over the 1000-ton mark, but in general the melters are buying small lots to cover their requirements for the last half, quotations on 1913 business being stiffly maintained by the furnace agents at something more than for last-half business. The sales that are being made are at $15.50, furnace—about $15.90, delivered—for No. 2 Northern foundry iron and $11.75@12, Birmingham—$16.10@16.35, Chicago—for No. 2 Southern. Most sales of Southern are made at the $12 figure, which has been standard for the last two or three weeks.

Furnace agents profess no uneasiness about the lack of activity; the furnaces, they say, are well sold up for the rest of the year and many melters have been buying so closely that there is a good deal of iron yet to be sold for last-quarter delivery. Inquiries on 1913 tonnage are numerous and occasionally indicate anxiety on the part of those in need of it. The strong outlook for business in all finished lines and for general business, in 1913, seems to justify optimism on the part of the furnace agents, despite the fact that some iron is being sold at a slight reduction from the $12, Birmingham, standard.

There is little business being done by local mills in products to be delivered this year, for the reason that they are under contract for practically all their 1912 output. Some first-quarter business is being done and the pressure for more increases with the the prospect of great crops and general prosperity. Railroad needs especially are heavy and no lessening of the heavy demand for all finished products appears in sight.

Philadelphia

Aug. 14—The chief difference between business conditions in pig iron now and a week ago is the evidence of anxiety among buyers as to prices. Within a few days the tone of the market has improved. Basic pig is urgently wanted, and large orders are hanging fire. Foundry iron has hardened over last week; No. 2, best makes, $16.25, with sales at $16. Gray pig ranges from $15.25@15.75. Southern forge is offered at $14.

Steel Billets—Requirements are increasing or at least are becoming more urgent. Several companies are again in the market, though two weeks ago they felt safe. The upward tendency in billets has aroused them to activity and a good business is in sight, especially in forging.

Bar Iron—Bars are strong and in jobbing lots an advance over last week is noted. A further advance is within reach on quick deliveries which are now more frequently asked for. Common iron is in urgent demand and car builders are covering their necessities promptly.

Sheets—All advices this week show a further accumulation of business at mills, particularly from the heavier consumers. In small lots, prices are a shade higher.

Pipes and Tubes—Merchant-pipe orders appear to be subsiding, only a scattering business has been done for a week. Tubes are strong and the recent advance has served to stimulate business.

Plates—Mills are much oversold. Recently presented requirements have not been adequately taken care of. Marine plate and tank have been unusually active and mills are considering some big orders for winter and early spring delivery. All large plate-using concerns have more or less business they would like to place and they are willing to contract at the present top-notch prices.

Structural Material—There is a steady influx of moderate-sized orders for building purposes and small bridge work.

Steel Rails—There is a steady run of orders, and mills are taken care of up to the end of the year with inquiries pending for large quantities. A large business has been done on export account.

Pittsburgh

Aug. 13—Crude steel has grown scarcer, and the Carnegie Steel Co. has again been a buyer in the open market, taking 1000 tons from a Philadelphia district producer, for shipment to the Pencoyd plant, with an option on 4000 tons more. The Carnegie Steel Co. is short of openhearth steel and may buy a considerable tonnage to apply on its contract to supply the bridge subsidiary of the Steel Corporation. Prices on both billets and sheet bars are quotably higher in this market.

Specifications for finished steel continue to be good and there is no evidence that buyers are accumulating any material for speculative purposes. There is inquiry for next year's delivery, particularly in rails and sheets, and 180,000 tons of rails are reported to have been sold already to Western roads for 1913 delivery.

Pig Iron—Foundry iron is quotable 50c. higher, there having been a number of relatively small purchases at $14, Valley furnaces, and extended inquiry in the past few days has failed to develop any lower quotation. Bessemer and basic are not easy to quote, as furnaces have been advancing prices, without sales at the higher ranges. It is quite certain, however, that there is no more basic to be had at $13.50, furnace, unless some new seller should appear in the field, and the market seems fairly quotable at not under $13.75, with most sellers asking $14 or $14.25. The supply of bessemer at $14.50 seems to be fairly well cleaned up. Two or three steel works were sounding the market on bessemer, but it is stated they have not bought because they insisted on shading $14.50. The Andrews & Hitchcock Iron Co. blew in its second furnace on Aug. 1, and the Kittanning Iron & Steel Co. blew in its Rebecca furnace about Aug. 10. Alice furnace, of the Valley Mold & Foundry Co., will likely blow in within a few weeks, also Mattie furnace at Girard and Josephine No. 2 at Josephine, Penn., the last named being a new furnace built by Corrigan, McKinney & Co., and not operated thus far. We quote: Bessemer, $14.50@14.75; basic, $13.75@14; No. 2 foundry, $14; malleable, $13.50@13.75; gray forge, $13.25@13.50.

Ferromanganese—The market has continued strong, with contract metal held at $51, Baltimore, freight to Pittsburgh being $1.95, and prompt material at about the same figure.

Steel—As noted, the Carnegie Steel Co. is a buyer of openhearth-steel billets to apply on its contract to supply the Pencoyd works of the American Bridge Co. In the local market the lowest price quoted on its inquiry was $23, maker's mill, but by buying in the East more than half the freight to Pencoyd was saved. The mills generally are out of the market as sellers, but odd lots can be picked up usually from brokers or from small mills, at material advances over prices quoted a week or two ago. We quote: Bessemer billets, $22.50; bessemer sheet bars, $23; openhearth billets, $23; openhearth sheet bars, $23.75@24, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are $25@26.

Sheets—Inquiry has begun to develop for the first quarter of next year, but the mills refuse to make commitments so far ahead, not knowing what their steel is going to cost even for the fourth quarter. Specifications have been accumulating with the mills for a long while, and this accumulation has probably been a little more rapid in the past few weeks on account of production being reduced 10 to 15% by weather conditions and the necessity for making repairs. At present about 85% of the sheet mills are active, and the proportion will likely run above above 90% within a fortnight. Prices have continued to stiffen, and the minimum of the market is now up to the prices announced by the leading interest several weeks ago. The Western market, long subject to particularly strenuous cutting, is now firm. Mills are certain that full production can be maintained through the year, which means that this year's tonnage output will surpass all records by a large margin. The market stands at 2.05c. for black sheets, 28-gage; 3.15c. for galvanized, 28-gage; 1.45@1.50c. for blue annealed, 10-gage; 2.20@2.25c. for painted corrugated, 28-

gage, and 3.10@3.20c. for galvanized corrugated, 28-gage.

Connellsville Coke—The Producers' Coke Co., in whose hands several of the operators placed their business after the recent split, reports making four or five contracts for furnace coke for the balance of the year, including one of 6000 tons a month, another of 5000 tons, and two or three smaller lots, in all aggregating 20,000 tons or more per month. This coke is understood to have all been sold at $2.25. Other sellers have disposed of 15,000 to 25,000 tons of prompt coke and coke for delivery the balance of this month, none at less than $2.25, and some at $2.30. Selling is now in full swing after the late unpleasantness between buyers and sellers, and higher prices are predicted as the coke becomes better sold up.

St. Louis

Aug. 12—Business among the founders has been good and while most of them were pretty well protected on their pig-iron supply they are now nearly all in the market augmenting their supply to some extent. Most of the current business is for small lots, though some fair-sized contracts for delivery further in the future have been closed. Prices for immediate delivery are around $11.50, Birmingham, or $15.25, St. Louis. For the fourth quarter $12, Birmingham, or $15.75, St. Louis, is being asked. Northern iron is quoted at $15.50@15.75.

Coke is in good demand, low sulphur foundry bringing from $5.30 to $5.50, St. Louis.

METAL MARKETS

New York, Aug. 14—The metal markets have been irregular during the last week. Copper has wabbled and recovered on small business, big business being absent. Spelter has turned weaker. Transactions in lead have been active at the lower level of price previously established. Tin has been stronger but not much business has been done in it.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January....	110	111	July.	112	114
February ..	115	109	August	117	..
March......	112	111	September.	111	.
April	114	115	October	112	....
May	118	118	November .	111	...
June........	115	117	December..	110	.....

Year 1909, 115; 1910, 115; 1911, 112.

Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. India was the chief buyer.

Iridium—The price for pure metal remains at $63.50 per oz., New York.

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
June 1912..	$ 7,149,035	$ 5,611,057	Exp. $1,537,978
" 1911..	3,074,755	4,767,714	Imp. 1,692,959
Year 1912..	33,374,836	25,264,342	Exp. 8,110,494
" 1911..	13,251,562	33,773,026	Imp. 20,521,464
Silver			
June 1912..	5,045,944	4,879,485	Exp. 166,459
" 1911..	5,777,703	3,506,446	Exp. 2,271,257
Year 1912..	33,668,972	25,264,249	Exp. 8,404,723
" 1911..	34,443,203	21,960,601	Exp. 12,482,602

Exports from the port of New York, week ended Aug. 10: Gold, $25,000; silver, $1,345,371, chiefly to London. Imports: Gold, $664,128; silver, $181,607; from Mexico, Central and South America, and Japan.

Platinum—The market remains rather quiet, as consumers hope for materially lower prices, but there is no change. Dealers still ask $45.50 per oz. for refined platinum, and $48 per oz. for hard metal.

Our Russian correspondent writes, under date of Aug. 1, that the market is again characterized by the absence of demand. There appears to be a considerable stock of platinum at the local speculators, and the *staratelli*, the sole uncontrolled supply of platinum, are still offering metal. From the mines it is reported that the production this year is no greater than last. Officially the prices remain unchanged; i.e., St. Petersburg, $36.75 per oz.; Ekaterinburg, $36.85 per oz., for crude metal, 83% platinum.

SILVER AND STERLING EXCHANGE

Aug	8	9	10	12	13	14
New York....	61	61	61¼	61⅛	61½	61¾
London .	28$\frac{1}{16}$	28$\frac{1}{16}$	28$\frac{3}{16}$	28⅛	28$\frac{5}{16}$	28$\frac{7}{16}$
Sterling Ex..	4.8725	4.8735	4.8735	4.8720	4.8710	4.8710

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—Silver has had a sharp advance this week, closing steady at 28$\frac{7}{16}$ pence in London.

The Indian Bazaars have been buyers and it is rumored that the Indian Mint is also in the market, which has also resulted in speculative buying.

Exports of silver from London to the East, Jan. 1 to Aug. 1, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£4,971,800	£4,240,200	D. £731,600
China ...	890,400	933,500	I. 43,100
Total ...	£5,862,200	£5,173,700	D. £688,500

Imports of silver into Great Britain six months ended June 30 were £7,307,906, of which £5,900,135 came from the United States. Exports were £6,849,350; net imports, £458,556, which compares with net exports of £971,882 last year.

Imports of silver into France five months ended May 31 were 112,259,000 fr.; exports, 97,356,000 fr.; excess of imports, 14,903,000 fr., or 10,159,000 fr. less than last year.

Copper, Tin, Lead and Zinc

Copper—The market has continued very dull. Europe, feeding on its own stocks, does not buy anything to speak of; and American manufacturers do not buy anything more than they have to, which at present is very little. The diminution in the exports in August indicates that previous contracts to Europe are rapidly being filled and renewed buying ought to develop from there before long, but whether that will take the form of drafts upon home stocks or purchases from producers here is the question that many persons would like to forecast correctly.

NEW YORK

Aug.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
8	17½ @17¾	17.40 @17.50	45⅛	4.50	4.35 @4.37½	6.85 @6.95	6.70 @6.80
9	17½ @17¾	17.30 @17.50	45¼	4.50	4.35 @4.37½	6.85 @6.95	6.70 @6.80
10	17½ @17¾	17.30 @17.50	45½	4.50	4.35 @4.37½	6.85 @6.95	6.70 @6.80
12	17½ @17¾	17.45 @17.50	45¼	4.50	4.35 @4.37½	6.85 @6.95	6.70 @6.80
13	17½ @17¾	17.45 @17.50	45¾	4.50	4.35 @4.37½	6.85 @6.95	6.70 @6.80
14	17½ @17¾	17.45 @17.50	46	4.50	4.35 @4.37½	6.85 @6.95	6.70 @6.80

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Aug.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
8	78$\frac{1}{16}$	78$\frac{1}{16}$	83¼	[illegible]	202½	19[illegible]	26¼
9	77¾	77¾	82½	206	203	19[illegible]	26¼
10							
12	78½	78½	83	207	204¾	19$\frac{7}{16}$	26¼
13	78⅝	78⅝	83½	207	205	19⅞	26¼
14	79⅛	79	83¾	208	205¾	19⅜	26½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, ± £1 = ± 21¾c.

Four of the agencies here stand pat for their price asked—17¾c., delivered, usual terms. The others are willing to sell at 17⅝c. Some sales to Connecticut on that basis were made during the latter part of our week, but other offers at the same price failed to draw business. Rumors of sales at 17¾c., usual terms, have been industriously circulated, but such as have been made at that price have manifestly been either for non-competitive deliveries or under special conditions otherwise, inasmuch as copper has all along been liberally offered in the open market at 17⅝c.

Following the publication of the statistics on Aug. 8, the market became rather soft under lower offerings by speculative houses, the statistics being taken rather unfavorably, and some sales at surprising concessions have been talked about, but the publication of Mr. Ryan's optimistic views on Aug. 12, was reassuring and the market rallied.

The business in Lake copper during the last week was insignificant and quotations are but nominal.

At the close we quote Lake copper at 17½@17¾c., and electrolytic in cakes, wirebars and ingots at 17.45@17.50c. Casting copper is quoted nominally at 17¼@17⅜c. as an average for the week.

The Producers' Association figures for July made an unfavorable impression abroad and there was considerable bear selling, in consequence of which the London Standard market, which, on Aug. 8, was £78 1/16 for spot and £78 3/16 for three months, declined on Aug. 9 to £77¼—for spot and three months. However, on Monday, Aug. 12, some good buying made itself felt, and the market advanced to £78½—for both spot and three months positions. On Aug. 13 it advanced further to £78⅝, closed on Aug. 14 strong at £79⅛ for spot and £79 for three months.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 4182 long tons. Our special correspondent gives the exports from Baltimore at 1727 long tons for the week.

Brass Prices—The American Brass Co. announces the following brass prices, dating from Aug. 1: Sheets, high brass, 18¼c. net per lb.; low brass, 20⅛c. Wire, high brass, 18c.; low brass, 20⅛c. Rods, high brass, 18c.; low brass, 20⅞c. Brass tubing, brazed, 22⅞c.; open-seam, 21¾c. Angles and channels, 22⅛c. Scrap allowances, 12¾c. net per lb. for high brass and 14⅛c. for low brass.

Tin—There has not been much business doing in this country, but the cables report large transactions in the East Indies, in consequence of which the London market has been strong and steadily advancing. In harmony therewith the American price has also advanced and at the close early delivery is quoted at 46 cents.

Tin imports from Aug. 1 to 12, inclusive, amount to 1953 tons.

Tin exports from the Straits in July were 4580 long tons, a decrease of 80 tons from July of last year.

Visible stocks of tin on Aug. 1 were: United States, excluding Pacific ports, 4412; London, 6799; Holland, 2743; total, 13,346 long tons, an increase of 426 tons over the July 1 statement.

Spelter—The market is weaker, inquiry having been light and all orders that presented themselves having been eagerly competed for. At the close, St. Louis is quoted at 6.70@6.80c., according to the time of delivery.

The foreign market is slightly higher, good ordinaries being quoted £26½, and specials 5s. higher.

Base price of zinc sheets is $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Lead—At the lower level of prices a good demand has developed and some substantial transactions have been made at 4.50c., New York, and about 4.35c., St. Louis.

The European market is practically bare of supplies. Spot metal is scarce, and there does not appear to be any relief in sight for some months to come. The market closes strong, with Spanish lead quoted at £19⅜ and English 2s. 6d. higher. Cables report that it looks as though the foreign market would advance still further.

Other Metals

Aluminum—There has been little demand during the last week. Dealers are asking 24¼@24½c. per lb. for No. 1 ingots, New York.

Antimony—Some large sales have been made recently and prices are good. Cookson's is held at 8.50@8.60c. per lb., Hallett's and U. S. at 7.90@8c., and Hungarian, Chinese and other outside brands at 7.70@7.80c. per lb. All prices are ex-dock, New York.

Nickel—Slot, blocks, plaquettes, according to quality, 40 to 45c. per lb. Electrolytic nickel, 3c. per lb. extra.

Quicksilver—Business is fair and prices here are unchanged. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London price is unchanged at £8 5s. per flask, with the same price named from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 10—In spite of the est-back in spelter the base price paid for top grades of zinc ore was maintained at $59 to $60, due to the general shortage of ore supply. The base price paid for 80% lead ore was $58 per ton.

SHIPMENTS, WEEK ENDED AUG. 10

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	635,840	......	......
Benton	567,740	86,800	760,300
Platteville	538,700	......	188,500
Hazel Green	520,000	......	......
Shullsburg	380,000	......	......
Galena	271,500	275,700	......
Highland	239,000	147,100	......
Cuba City	145,060	64,230	124,020
Harker	64,620	......	......
Linden	61,880	......	......
Total	3,424,340	573,830	1,072,820
Year to date	125,202,320	5,755,120	20,251,190

Joplin, Mo., Aug. 10—The high price of zinc sulphide ore is $62, the base ranging from $53 to $59 per ton of 60% zinc. Zinc silicate sold on a base of $30 to $33 per ton of 40% zinc. The average price, all grades of zinc, is $55.42 per ton. The high offering for lead is $58, a base price of $56 to $57 per ton of 80% lead. The

SHIPMENTS, WEEK ENDED AUG. 10

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,968,060	...	1,609,000	$162,548
Joplin	2,541,520	...	247,910	81,190
Galena	913,690	...	45,060	27,850
Miami	758,680	...	77,230	23,140
Alba-Neck	602,900	...	40,290	18,912
Duenweg	621,330	...	27,540	17,787
Oronogo	482,070	...	202,290	17,447
Granby	59,770	537,600	33,280	11,170
Cave Springs	370,000	......	......	10,730
Carl Junction	336,670	...	11,520	10,445
Spurgeon	53,700	275,890	41,760	7,350
Jackson	192,840	......	......	6,690
Springfield	110,000	......	......	3,400
Aurora		180,000	......	2,700
Lawton	65,000	......	......	1,885
Carthage	67,100	......	......	1,811
Quapaw	65,000	...	.....	1,690
Wentworth	64,210	...	......	1,669
Sarcoxie	63,650	...	......	1,664
Totals	11,336,190	993,490	2,337,680	$410,078
32 weeks	327,680,420	20,059,500	56,481,020	$10,363,210

Blende val., the week, $325,596; 32 weeks, $8,493,811
Calamine, the week, 16,155; 32 weeks, 301,887
Lead value, the week, 68,327; 32 weeks, 1,567,512

MONTHLY AVERAGE PRICES

Month	Zinc Ore Base Price 1911	Zinc Ore Base Price 1912	Zinc Ore All Ores 1911	Zinc Ore All Ores 1912	Lead Ore All Ores 1911	Lead Ore All Ores 1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50		41.28	.	60.74	..
September	42.63	..	41.29	..	59.[illegible]	...
October	42.38	...	40.89	......	54.72	...
November	45.40		43.27	.	57.19	..
December	44.13	..	40.76	....	62.03	.
Year	$41.45	....	$39.90	....	$56.76	...

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold

average price, all grades of lead, is $58.44 per ton.

Both zinc and lead offerings were $2 per ton less than last week, with zinc $3 to $4 per ton weaker at the week-end. Until within the past fortnight little ore in the bins at the week-end was unsold, but the small stock on hand tonight is held for a stronger offering.

Chemicals

New York, Aug 14—The general market is quiet, with only a midsummer business forward.

Arsenic—The market has been affected again by Mexican disturbances, and is now at 5c. per lb. for spot goods. Neither Canadian nor American producers seem willing to enter the market, and importation from England is still going on. Futures are at 4@4¼c. per pound.

Copper Sulphate—The market is dull at 5.50 for large lots to 5.75c. for small.

Nitrate of Soda—Prices have been marked up on spot goods, and now stand at 2.50c. in all positions. The market is dull, but firm.

Imports and Exports—Imports and exports of chemicals and raw material in the United States, six months ended June 30:

	Imports	Exports	Excess
Copper sulph. lb.	....	10,225,875	E. 10,225,875
Copper sul., '11	....	8,936,676	E. 8,936,676
Bleach, lb.......	34,960,712	400	I. 34,960,712
Bleach, 1911....	45,083,158	17,368	I. 45,065,790
Potash salts, lb..	318,749,519	1,698,559	I. 317,050,960
Potash salts,'11	365,666,526	2,138,268	I. 363,528,258
Soda salts, lb....	5,995,878	249,415	I. 5,746,463
Soda salts, 1911	16,065,417	287,535	I. 15,777,882
Acetate lime, lb.	....	36,384,105	E. 36,384,105
Acetate, 1911...	....	40,454,433	E. 40,454,433
Nit. of soda, tons	255,447	5,118	I. 250,329
Nitrate, 1911...	319,575	3,435	I. 316,140
Phosphates, tons	....	583,921	E. 583,921
Phosphates, '11	....	519,407	E. 519,407
Sulphur, tons....	12,049	21,498	E. 9,449
Sulphur, 1911..	10,902	4,838	I. 6,064
Pyrites, tons.....	472,973	....	E. 472,973
Pyrites, 1911...	485,620	....	E. 485,620
Magnesite, lb...	100,002,925	917,532	I. 99,085,393
Magnesite, 1911	131,944,309	1,371,105	I. 130,573,204
Sul. ammonia, lb.	51,611,003	134,715	I. 51,476,288
Sul. am'nia, '11	92,753,624	....	I. 92,753,624
Arsenic, lb.......	2,181,961	850	I. 2,181,111
Arsenic, 1911...	2,480,074	3,000	I. 2,477,074

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total quantity of sulphur imported this year was 201,238 tons.

Petroleum

The monthly report of the *Oil City* ***Derrick*** shows new oil wells completed in July as follows: New York, Pennsylvania and West Virginia, 500; Lima-Indiana, 58; Kentucky, 8; Illinois, 14; Kansas-Oklahoma, 153; Texas-Louisiana, 100. In all the divisions there were 1439 wells completed, being 75 less than in June. New production amounted to 54,997 barrels, a decrease of 3987 barrels from the June report. Dry holes numbered 240, and gas wells were 107. The productive oil wells were 1092, as against 1148 in June, and 981 in May. At the close of July there were 514 rigs and 1474 wells drilling, a total of 1988, increase of 86. The increase comes from all divisions except the Lima fields.

MINING STOCKS

New York, Aug. 14—On Aug. 8 there was a slight reaction on the Exchange, followed by some recovery on small dealing. The Curb was dull, dealings in mining stocks being small and uninteresting.

Aug. 9 was generally devoted to marking time, while waiting for the government's crop report, although some specialties made new high records.

Aug. 10 the Exchange opened strong and active, and after some realizing sales by professionals, who were unwilling to hold commitments open over Sunday, closed the same way with prospects of a continuance of the upward movement on Monday. On the Curb, the market was also active, Standard Oil being the feature.

On Aug. 12, the prices continued good, reflecting the favorable report of the Steel Corporation. The Standard Oil group was again the feature of the Curb, Atlantic Refining Co. advancing 50 points, Galena Signal Oil, 30 points and Standard of Kansas, 80 points.

Aug. 13 was without special feature on the Exchange, for trading was evenly distributed, and fractional changes were the rule. On the Curb, 34,400 mining shares were sold, of which West End Extension furnished 10,500, and El Paso 4200.

Boston, Aug. 13—A trifle more public interest is noted in the metal-share market, yet there is plenty of room for improvement in this direction. Any aggressive buying would give copper shares a sharp advance, but there is an entire lack of leadership, which coupled with the fact that mid-summer usually finds dullness, gives the market a colorless appearance except in the case of some specialties.

Both Mayflower and Old Colony have resumed marked activity during the past two days. The $1.62½ rise in Mayflower shares on Monday and the $2.62½ advance today to $15.25 came from information that the No. 20 drill is in rich copper and makes the best showing yet. This is between the depths of 982 and 1029 ft. Old Colony rose $1.25 yesterday and $1.62½ today, touching $11.12½. Today's advance was accompanied by reports that the No. 16 hole had encountered the Mayflower lode.

Some inspiration is being derived from these advances, for the same specialties gave the copper-share market the required fillip for a fair-sized boom back in April. Shannon Copper directors have declared the expected 50c. dividend, but this had been discounted. The last payment was made in 1907. The company reports an excess of assets of $567,836

COPPER SMELTERS REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	May	June	July
Alaska shipments.	1,720,391	4,134,569	....
Anaconda	25,800,000	... .	....
Arizona, Ltd.......	3,500,000	3,300,000	3,200,000
Copper Queen......	7,024,087	7,622,730	7,708,147
Calumet & Ariz....	4,424,000	4,100,000	4,718,000
Chino...............	1,277,850	1,474,979	2,945,009
Detroit.............	2,092,178	1,959,634	2,194,090
East Butte..........	1,415,000	....	....
Mammoth..........	1,760,000	. ....	. ....
Mason Valley......	1,520,000	1,500,000	1,500,000
Nevada Con........	6,063,462	5,913,832	....
Ohio................	685,000	...	....
Old Dominion......	2,180,000	2,130,000	....
Ray	2,924,913	3,004,195	2,985,965
Shannon	1,464,000	1,270,000	1,446,000
South Utah.........	236,884	....	....
United Verde*.....	2,500,000	....	... .
Utah Copper Co....	9,564,919	8,772,742	..... .:.
Lake Superior*....	21,250,000	15,600,000	19,500,000
Non-rep. mines*...	8,400,000	8,300,000	8,970,000
Total production.	105,830,984	... .	....
Imports, bars, etc..	25,836,519	24,262,292	....
Total blister.....	131,697,503	....	....
Imp. in ore & matte	6,410,226	8,404,936	.. ...
Total American..	138,107,729	....	.
Miami†	2,676,702	2,683,310	3,027,710
Brit. Col. Cos.:			
British Col. Copper	875,000	996,000	1,026,000
Granby	1,914,460	1,888,400	....
Mexican Cos.:			
Boleo†	2,260,160	1,851 920	2,386,480
Cananea	4,600,000	4,310,000	4,000,000
Moctezuma	2,892,521	3,176,819	3,094,016
Other Foreign:			
Cape Cop., S. Africa	754,880	....	..
Kyshtim, Russia...	... .. .	....	....
Spassky, Russia...	694,400	757,120	.
Famatina, Argen..	....	....	.
Tilt Cove, Newf'd..	123,087	....	.. .
Exports from:			
Chile	3,696,000	9,856,000	....
Australia	7,840,000	8,176,000	....
Arrivals in Europe‡	9,976,860	12,667,200	....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VII, 1911.......	112,167,934	56,982,582	74,880,658
VIII...........	125,493,667	59,965,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII.............	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,313,901	80,167,904
II..............	116,035,809	56,228,368	63,148,096
III.............	120,691,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI..............	[illegible]	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331

VISIBLE STOCKS

	United States	Europe	Total
VIII, 1911......	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912 ...	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,388
IV .. .	62,367,557	136,819,200	199,186,757
V..............	65,066,029	134,176,000	199,242,689
VI ..	49,615,643	117,801,600	167,417,243
VII............	[illegible]	108,186,000	152,521,047
VIII. ...	50,280,421	113,299,200	163,579,621

over liabilities as of Aug. 13. St. Mary's Mineral Land has also shown some animation, advancing $1 to $56.

Trading has been quiet on the Curb and price changes moderate. Butte Central has been a trifle more active of late, advancing 75c. to $7.75.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0.10
Belmont, Ida	July 22	Aug. 22	0.002
Black Pine M. & M., Utah	Aug 29	Sept. 19	0.00¼
Confidence, Nev	July 15	Aug. 9	0.20½
Con. Imperial, Nev	July 28	Aug. 21	0.01
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Conqueror, Ida	July 20	Aug. 10	0.001¼
Dalmatia, Ida	Aug. 24	Sept. 21	0.002
Dennemora, Ida	July 20	Aug. 20	0.002
Eagle Mt., Ida	July 31	Aug. 22	0.00½
Gould & Curry, Nev	July 19	Aug. 12	0.05
Horseshoe Ida	Aug. 8	Aug. 30	0.002
Hypotheek, Ida	July 19	Aug. 14	0.005
Laclede, Ida	Aug. 1	Aug. 24	0.003
Lone Star, Nev	July 20	....	0.02
Manhattan Red Top, Nev.	July 12	....	0.01½
Mineral Farm, Ida	July 15	Aug. 15	0.002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
National Copper, Ida	July 15	Aug. 15	0.01
New Reliance, S. Dak.	......	......	0.01
Oreano, Ida	July 18	Aug. 19	0.001
Sandstorm-Kendall, Nev	July 8	......	0.01
Seven Troughs Mon'h, Utah	Aug. 10	Aug. 30	0.00¼
Silver Mt., Ida	July 15	Aug. 15	0.002
Springfield, Ida	July 30	Aug. 31	0.002
Tonopah North Star, Nev.	July 15	......	0.02
Twin Star, Ida	Aug. 31	Sept. 28	0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	.	24.428	24.082	.
September	53.295	52.440	.	24.567	24.209	.
October	55.490	53.340	..	25.596	24.594	..
November	55.635	55.719		25.680	25.649	..
December	54.428	54.905	..	25.160	25.349	.
Year	53.486	53.304	.	24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405		12.634	.....	56.266	.
September	12.201		12.508	.....	55.253	....
October	12.189		12.370	.....	55.170	...
November	12.616	.	12.769		57.253	....
December	13.552		13.768	.....	62.068	.
Year	12.376		12.634		55.973	....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	.
March	40.157	42.577	September	39.755	.
April	42.185	43.923	October	41.185	...
May	43.115	46.053	November	43.125	.
June	44.606	45.815	December	44.655	.
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	......	4.406	......	14.260	.....
September	4.485	.....	4.356	......	14.744	.. .
October	4.265	.....	4.139	......	15.332	. .
November	4.298	......	4.181	... ..	15.821	..
December	4.450	......	4.332	.....	15.648	. ...
Year	4.420	......	4.286	......	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	.....	5.803	.. ..	26.801	. ...
September	5.869	...	5.719	..	27.750	....
October	6.102	.....	5.951	......	27.256	. .
November	6.380	......	6.223	.....	26.795	. .
December	6.301	......	6.151	......	26.849	. . .
Year	5.758	.....	5.608	......	25.281	. ...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	..	14.00	.....	14.47	......
September	15.90	.	13.57	.... .	14.40	......
October	15.43	......	13.44	......	14.34	......
November	14.92	......	13.30	......	14.25	......
December	15.15	.. ..	13.10	. ....	13.90	......
Year	$15.72	......	$13.94	....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Aug. 13

Name of Comp.	Bid.
Acacia	.05½
Cripple Cr'k Con.	01
C. K. & N.	17½
Doctor Jack Pot	07
Elkton Con	71
El Paso	1.18⅞
Findlay	06½
Gold Dollar	18¼
Gold Sovereign	‡ 03
Isabella	.16½
Jack Pot	05
Jennie Sample	.05½
Lexington	008
Moon Anchor	008
Old Gold	04½
Mary McKinney	71
Pharmacist	01⅜
Portland	94
Vindicator	.89
Work	01½

SALT LAKE Aug. 13

Name of Comp.	Bid.
Beck Tunnel	08½
Black Jack	13¼
Cedar Talisman	01¾
Colorado Mining	.21
Columbus Con	‡ 35
Crown Point	02¼
Daly-Judge	5.80
Grand Central	.30
Iron Blossom	1.25
Little Bell	‡ 35
Lower Mammoth	04
Mason Valley	12.00
May Day	16
Nevada Hills	‡1.90
New York	‡ 01½
Prince Con	1.52½
Silver King Coal'n	2.80
Sioux Con	04½
Uncle Sam	16
Yankee	10

TORONTO Aug. 13

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.25	Hollinger	12.25
Hudson Bay	‡69.00	Imperial	02
Temiskaming	37	Pearl Lake	17
Wettlaufer-Lor.	44	Porcu. Gold	27
Apex	02	Porcu. Tisdale	01
Central	‡5.56	Preston E. D.	02
Crown Chartered	08	Rea	25
Doble	30	Standard	‡ 00⅜
Dome Exten	.14	Swastika	09
Foley O'Brien	.18	West Dome	.05

SAN FRANCISCO Aug. 13

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.06	Belmont	9.50
Belcher	37	Jim Butler	65
Best & Belcher	09	MacNamara	.25
Caledonia	1.30	Midway	.58
Challenge Con	14	Mont.-Tonopah	2.10
Chollar	12	North Star	.17
Confidence	.70	West End Con	1.72½
Con. Virginia	.56	Atlanta	.28
Crown Point	.40	Booth	.07
Gould & Curry	‡ 05	C.O.D. Con	.11
Hale & Norcross	13	Comb. Frac	.16
Mexican	2.72½	Jumbo Extension	.41
Occidental	50	Pitts.-Silver Peak	‡ 98
Ophir	1.02½	Silver Pick	.11
Overman	.63	St. Ives	‡ 30
Potosi	.03	Tramp Con	‡ 02
Savage	10	Argonaut	‡2.00
Sierra Nevada	.19	Bunker Hill	‡4.50
Union Con.	.62	Cent. Eureka	‡ 40
Yellow Jacket	53	So. Eureka	‡2.90

N. Y. EXCH. Aug. 13

Name of Comp.	Clg.
Amalgamated	85¼
Am. Agri. Chem.	60¾
Am.Sm.&Ref.,com	86⅛
Am.Sm. & Ref., pf.	108
Am.Sm. Sec., pf. B	87
Anaconda	43⅜
Batopilas Min.	‡1⅝
BethlehemSteelpf	71⅝
Chino	34½
Comstock Tunnel	‡ 10½
Federal M. & S., pf.	43⅛
Goldfield Con.	3¼
GreatNor.,ore.,ctf.	44½
Guggen. Exp.	‡56¼
Homestake	96
Inspiration Con.	19
Miami Copper	29¾
Nat'nalLead,com.	‡59
National Lead, pf.	209½
Nev. Consol.	21⅞
Pittsburg Coal, pf.	99
Ray Con.	21
Republic I&S,com.	28
Republic I & S, pf.	89½
SlossSheffi'd,com.	57⅞
Sloss Sheffield, pf.	102
Tennessee Copper	42⅝
Utah Copper	63
U. S. Steel, com	73
U. S. Steel, pf.	112⅞
Va. Car. Chem.	48½

N. Y. CURB Aug. 13

Name of Comp.	Clg.
Barnes King	‡ 40
Beaver Con	.45
Braden Copper	6¾
B. C. Copper	5
Buffalo Mines	1.50
Caledonia	40
Con. Ariz. Sm.	⅝
Davis-Daly	2 3/16
Diam'field-Daisy	9
Ely Con	22
Florence	94
Giroux	5⅛
Gold Hill Con.	⅜
Greene Cananea	10⅛
Greenwater	.05
Internat. S. & R.	‡124
Kerr Lake	2⅞
Keystone	2⅜
La Rose	3¼
McKinley-Dar-Sa.	1 13/16
Min. Co. of A. new	2¼
Motherlode Gold	1
Nev. Utah M. & S.	‡ 02
Nipissing Mines	7¾
Ohio Copper	⅞
Pacific Sm. & M.	7/32
South Live Oak	2
South Utah M. & S.	⅝
Standard Oil (Old)	1055
Stand'd Oil of N.J.	415
Stand'd Oil Subs.	640
Stewart	1 9/16
Tonopah	6 1/16
Tonopah Ex	2 23/32
Tri-Bullion	[illegible]
Tularosa	[illegible]
Union Mines	[illegible]
United Cop., pfd.	10
Yukon Gold	3⅛

LONDON Aug 14

Name of Com	Clg.
Camp Bird	£1 8s 3d
Dolores	1 10 0
El Oro	0 14 6
Esperanza	1 8 9
Mexico Mines	7 2 6
Oroville	0 5 3
Stratton's Ind.	0 3 1½
Tomboy	1 5 6

BOSTON EXCH. Aug. 13

Name of Comp.	Clg.
Adventure	8½
Ahmeek	350
Algomah	6⅝
Allouez	46
Am. Zinc	30⅞
Ariz. Com., ctfs.	5½
Bonanza	‡ 40
Boston & Corbin	7¼
Butte & Balak	3⅜
Calumet & Ariz	77
Calumet & Hecla	535
Centennial	23
Con. Mercur	‡ 03
Copper Range	59
Daly West	5¼
East Butte	14
Franklin	11½
Granby	54⅝
Hancock	29½
Hedley Gold	‡17
Helvetia	1¼
Indiana	19⅜
Island Cr'k, com.	‡56
Island Cr'k, pfd.	‡91
Isle Royale	35¾
Keweenaw	‡1½
Lake	36½
La Salle	6⅛
Mass	14⅞
Michigan	2½
Mohawk	69¼
New Arcadian	4½
New Idria Quick.	‡6⅞
North Butte	30¾
North Lake	‡6
Ojibway	4
Old Dominion	58¼
Osceola	117
Quincy	93½
Shannon	17½
Shattuck-Ariz.	‡20
Superior	46¾
Superior & Bost.	1 9/16
Tamarack	44
Trinity	6¼
Tuolumne	3
U. S. Smelting	46
U. S. Smelt'g, pf.	50
Utah Apex	‡1⅛
Utah Con	11
Victoria	2 13/16
Winona	6
Wolverine	109
Wyandot	2½

BOSTON CURB Aug. 13

Name of Comp.	Last
Bingham Mines	3½
Boston Ely	1 1/16
Boswyocolo	.04½
Butte Central	7¾
Cactus	12
Calaveras	2⅜
Chief Cons	1 7/16
Corbin	.97
Cortez	1 1/16
Crown Reserve	3⅜
First Nat. Cop.	2
Majestic	46
Mazatan	‡½
Moneta Porc.	‡ 05
Nevada-Douglas	3⅜
New Baltic	3⅜
Oneco	1⅞
Raven Copper	.31
Rhode Island Coal	20
San Antonio	‡3
S. W. Miami	5
South Lake	9½
Trethewey	.40
United Verde Ext.	.40
Vulture	‡5

†Last quotation.

The Engineering and Mining Journal

Vol. 94. AUGUST 24, 1912 No. 8

Issued Weekly by the
Hill Publishing Company
John A Hill, Pres. Rob't McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg , Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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An Alaska Gold Mine

The pending flotation of a big Alaska gold mine by a mining group that has previously been identified chiefly with copper is peculiarly of interest, inasmuch as it promises to afford a kind of speculation with which the American public has heretofore been unfamiliar. Gold mines they have had in any number, and among them some big gold mines, but in general the mines have either been relatively small, like those of Cripple Creek and California, or of ephemeral character, like Goldfield, or closely held, like the Homestake and those of the Treadwell group. Certainly there has not been any promotion of a vast tonnage of ore, promising a duration of 20 years or more, at an annual milling of 2,000,000 tons, under auspices that augur, and probably will effect, a wide public subscription and an active market on the stock exchanges.

We refer of course to the Alaska Gold Mines Co., which is to acquire the majority of the stock of the Alaska Gastineau Mining Co., which owns the Perseverance mine on Treadwell Island, Alaska. Messrs. Jackling and Holden affirm that in this orebody there are 50,000,000 tons of ore sufficiently indicated, which will yield $1.50 per ton. It is planned to mine and mill 2,000,000 tons per annum, from which a profit of $1,500,000 is expected. The sum of $4,500,000 is to be put up for mine and mill development. They believe the mine to be a legitimate purchase at $15,000,000 and a bargain at $12,000,000, "provided that, in both cases, a development * * * fund of $4,500,000 is made available." The last is a somewhat cryptic statement. Anyway, the public is to get the whole thing on the basis of $7,500,000, which will provide the $4,500,000 working capital and leave enough to acquire, it is hoped, the outstanding stock and bonds of the Gastineau company.

The announcement of this company inspires the thoughts that the expenditure of this large amount of money will be a boon to the manufacturers of machinery, that the investors in the shares will be free from the thrills and chills of the copper market, and that it will be a matter of four years before they will have any good idea as to how they are going to come out, which is ample time for the cherishing of hopes without any upset in the meanwhile. Seriously, the promoters are experienced and highly successful men, and it is to be assumed that they have examined carefully into this enterprise, but we wish that they had confided more of the engineering details, because their estimate of 75c. for mining and milling is rather exciting, being much lower than in the neighboring mines.

Intermittent or Continuous Agitation

For many years the accepted method of agitating slime with cyanide solutions was by the intermittent or so-called "charge" system, which means that at intervals of time, varying according to the character of the ore under treatment, the process of agitation was stopped, the solids allowed to settle and the supernatant solution decanted. Metallurgists were inclined to the belief that this procedure was wasteful of time and labor and also required a larger installation than would be needed if the agitation process could be carried through without these periods of inaction. The prospective advantages of such continuous agitation led to study and experiment upon the subject with the result that feasible systems were devised. These systems have been in use for periods of time which have been sufficiently long to allow an estimation of their practical value, but notwithstanding their acknowledged advantages, there are competent operators who believe that the old intermittent process gives them better results.

In this case it is not a question of reluctance to accept advanced methods, but a genuine difference of opinion. Everyone is willing to admit that continuous agitation reduces the extent of installation required, simplifies the manipulation of a plant, entails the employment of less labor and is neater generally than the intermittent method. But, it is also claimed, there is danger that certain quantities of material may get through the system without receiving the contact with solution necessary for the extraction of the desired quantity of contained metal; that the agitation in one solution does not give as good results as may be obtained by the use of a method in which repeated changes of solution are permitted, and also that the interiors of the tanks of a continuous series are mysteries, the operator never being sure of what is going on inside them.

All of these points are important, but the question of extraction is the most vital. It may be said with practical certainty that agitation for a given time in one solution will not produce the extraction of metals that will be secured by agitation for the same length of time with three or four changes of solution, each of which contains active cyanide.

In brief, then, the question before the metallurgist is this: Is the advantage gained by the economies of the continuous process sufficient to compensate for the loss occasioned by the lower extraction? The question is important and has not yet been answered.

Practical Accuracy

At the present advanced stage of mining and metallurgical practice, when everyone is making strenuous efforts to make use of every possible means for obtaining better or more economical results, it is remarkable that some important steps are left in an almost medieval state of imperfection. One of these important steps is assaying, which has been brought up to a state of theoretical perfection, but is often imperfect as practiced.

The average assayer is highly skilled in the operations he has under his care, but the estimation of silver and gold in mill tailings is usually carried out on such small quantities of pulp that the results obtained have little value. Many assayers make such estimations on one assay-ton of pulp and take extreme pains in carrying out each operation, but when the estimation of gold in cyanide tailings, often as low as 10 or 20c. per ton in value, is under consideration, no amount of care can secure accurate results.

The assayer, when the subject is brought to his notice, has an answer for such criticism. He simply asks what use there is in making accurate analyses, when other important operations in the mill are carried out carelessly. He mentions that the amount of ore delivered to the mill is not weighed, but estimated; that the contents of the tanks are estimated; that sampling is not accurately carried out, and that there are spills and leaks enough about the plant to make any accurate determination on his part futile.

There is plenty of truth in this statement, and it is unfortunate that those in charge of operations cannot or will not recognize it. Without actual accuracy no knowledge of what really is going on in a plant can be obtained and no comparison can be made of efficiencies in different plants. The records of operations as carried on at present are often but little more than a vehicle for self-flattery and not to be accepted as actual facts. Practical accuracy should begin at the beginning and be carried through to the logical end.

Acetylene Lamps Underground

Early troubles with the acetylene mine lamp, the result of construction not adequate to such use, prejudiced many operators against them, but the lamps of the present day with automatic water feed, improved burners and of light weight, undoubtedly offer advantages for underground use.

Miners are notoriously conservative, and usually prefer to stick to methods and apparatus that have come to them as a heritage rather than to take something new. This is a reason why acetylene lamps are not more widely used. Among the more intelligent miners, however, these lamps are becoming more popular, and superintendents and managers particularly are appreciative of their advantages.

The small, hat lamps are now so well designed and made that they can be used by any miner who will give them ordinary care, and the same is true of the larger hand lamps. There are also still larger lamps in use which, while still portable, are successfully used for lighting entire stopes, even of great size, and which reduce lighting expense to a fraction of the cost with candles or oil lamps.

The cost of acetylene lighting is less than that of candles or oil, but this is not the only advantage. There is a notable advantage in safety, there being no candle snuffs to be left burning on timbers. The acetylene lamp uses less oxygen, making underground working more hygienic, and gives off no smoke or soot, which also tends toward more comfortable and sanitary conditions underground.

However, the greatest of its advantages is the quality of the light, which is more nearly like daylight than any other artificial illumination, enabling colors to be observed truly. This is of great service in examining rocks and ores underground.

The Mining Industry

With iron, copper, spelter, lead and silver on the present level of prices the mining industry has nothing whereof to complain. In fact the production of all of those metals is large and we believe that the industry is highly prosperous.

The demand for new mines and new prospects worthy of development is greedy. The chief drawback is the shortage of the supply.

The supply of near-mines and indifferent prospects for sale at dream-prices is bountiful. Transactions in these brands are few, the market being very dull. This may be explained by the dullness in the "sucker" market, those buyers being apparently keeping a tight hold on their pocket-books.

In brief, the mining industry is in a very healthy condition.

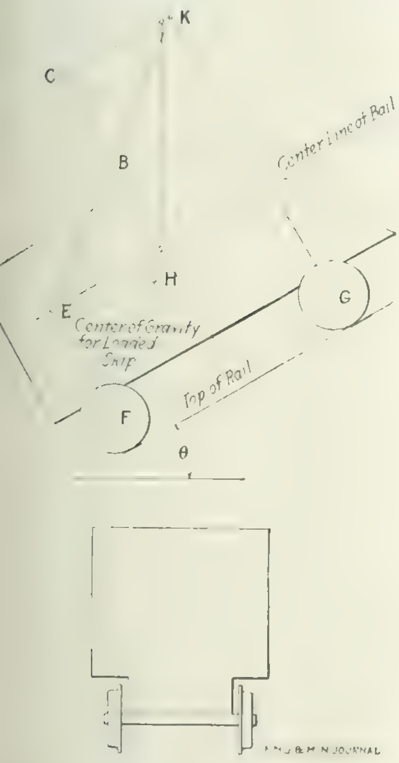
The delay in the publication of the U. S. G. S. report on Park City, Utah, which was partly due to the geologist in charge of it being switched off to statistical work, indicates an absence of intelligence in the former administration of the Survey permitting distinguished geologists thus to be detailed. Why should geologists like Lindgren and Boutwell have been put to collecting and tabulating statistics? Why should the Geological Survey concern itself with statistics anyway? The proper thing would be to transfer its division of mineral statistics to the Bureau of Mines.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Graphic Solution of Skip Loads

Referring to Mr. Rice's article and companying diagram on page 54 of the URNAL for July 13, 1912, I am inclined believe that he did not say all that he ould in explanation and that the article d diagram as published do not entirely press all that he intended they should nvey. There are many skips to which method of determining the center of avity would not apply; for example, h a skip of cross section as shown in accompanying illustration.



GRAPHIC SOLUTION OF SKIP LOADS

or this reason it is usually customary, least for large skips, to design the roughly, then analyze for wheel and loads, altering positions of wheels bail until a proper distribution of ds and pull is effected.

believe it is possible to make a ader application of his load diagram n his figure would indicate, for his of action for bail must pass through center of gravity of skip and this is quently not the case. With the diam drawn as shown in the illustration line of action of bail may be either ve or below the center of gravity, but nust be parallel to rail.

Let O be the angle of inclination with horizontal; H, center of gravity for loaded skip; AH, vertical line through center of gravity; ED, line of action for bail; D, intersection of ED and AH; AD, weight of skip and load to any convenient scale; CD, line through D normal to rail; AC, line through A parallel to ED; then; AC will equal the bail pull (to same scale as AD) and CD the total load on wheels. Locate the rear wheel and draw EF through its center and normal to rail.

Take CB equal to the load wanted on the rear wheel, draw a line through E and B until it intersects CA or CA produced at K. Draw KG, the center line of the front wheel, then BD equals the load on the front wheel. The same method may be modified to apply when the line of action of the bail is not parallel to the rail, but the diagram becomes more complicated, and has little practical value.

F. W. COLLINS

Hurley, N. M., July 23, 1912.

Efficiency Underground

"There is more money buried in the workings of poorly operated mines than the world will ever be told about," was the remark made to me a long time ago by an old miner who had spent more years underground than most of us live. The occasion of the remark is called to mind by the letter of S. H. Brockunier which appeared in the JOURNAL for Aug. 17, 1912. I recall a general manager, an exceedingly dignified individual who, on a certain morning, discharged one man and "cussed out" everyone else who happened to be handy. The whole thing happened as a result of one of the exceedingly rare excursions of the G. M. to the underground workings, where he became disgruntled over the poor appearance of one of the headings and began to find fault with the miner who was driving it. One remark led to another until the "explosion" resulted, when the miner said that the mine was a harness prospect anyway. The G. M. wanted to know the meaning of the cryptic remark and was told that the gold ran in traces. That started more fireworks and the miner lost his job. The moral of the episode is that if the manager had been in the habit of going underground he would have known how the faces looked and he would have known, too, that this particular miner was a good workman and should not have been scolded.

Most managers do not know how to handle men, and on this point Mr. Brockunier has not laid sufficient stress. It is not good management to go about and quarrel with men, and it is equally bad to make a human iceberg of oneself as some men do, walking about with no word for anyone, looking wise and transmitting orders and instructions through a series of assistants. The orders lack force when they reach the spot.

A manager may be severe if he wishes to do so, but it is a little difficult to understand why one should desire to make himself totally disagreeable. A great deal may be gained by building up a feeling of loyalty to the operating company in its employees, and this can be done by making each man feel that he is responsible for his work, that his boss knows how it ought to be done and will praise him if it is well done and chide him if it is not. But, above all, every man ought to be made to understand that when he feels it necessary to go to the "old man" with his story, he will be given an opportunity for the interview and will have his case adjusted with absolute impartiality much may be accomplished when the miner knows that "the 'old man' is on the square."

REZONGADOR.

Philadelphia, Aug. 20, 1912.

Pipe Flanges Without Gasket

In the JOURNAL of June 8, 1912, p. 1128, is described a joint made by corrugating one steam- or air-pipe flange, and clamping to the other without a gasket. It may be of interest to know that this same scheme was used as long ago as 1900 on the Missouri, Kansas & Texas R.R., at Denison, Tex., for locomotive-cylinder heads, and I am informed it is still in use.

F. E. ALLISON.

St. Louis, Mo., July 29, 1912.

A Long Raise

In the JOURNAL of July 20, 1912, two typographical errors were made in transcribing my comments on the editorial entitled "A Long Raise," published in the JOURNAL of June 22. The raise mentioned was in the Monarch mine of the Cœur d'Alene North Fork Mining & Milling Co., and the rate of advance was 150, not 190 ft. per month.

STEPHEN ROYCE.

Cambridge, Mass., July 24, 1912.

Two Decades of Mining on the Rand

By A. Cooper Key*

An analysis of Rand mining for the decade prior to, and the decade after the Boer war shows that the amount of gold distributed to shareholders is approximately the same for the two periods. Increased milling capacity has necessitated mining over a greater stoping width which, together with less thorough sorting, has resulted in lower grade of mill feed, but results to shareholders have not changed materially.

The two diagrams shown in the accompanying illustration are designed to show the principal results which have attended Rand gold-mining enterprise during two decades—before and after the war, or, more strictly, a set of ten years preceding 1900, and of 11 years from 1901 to 1911 inclusive. In the earlier period, the solid lines showing the gold recovered and the tonnage milled exhibit closer parallelism, if sticklers for mathematical exactitude will permit such an expression, than do similar lines in the later period.

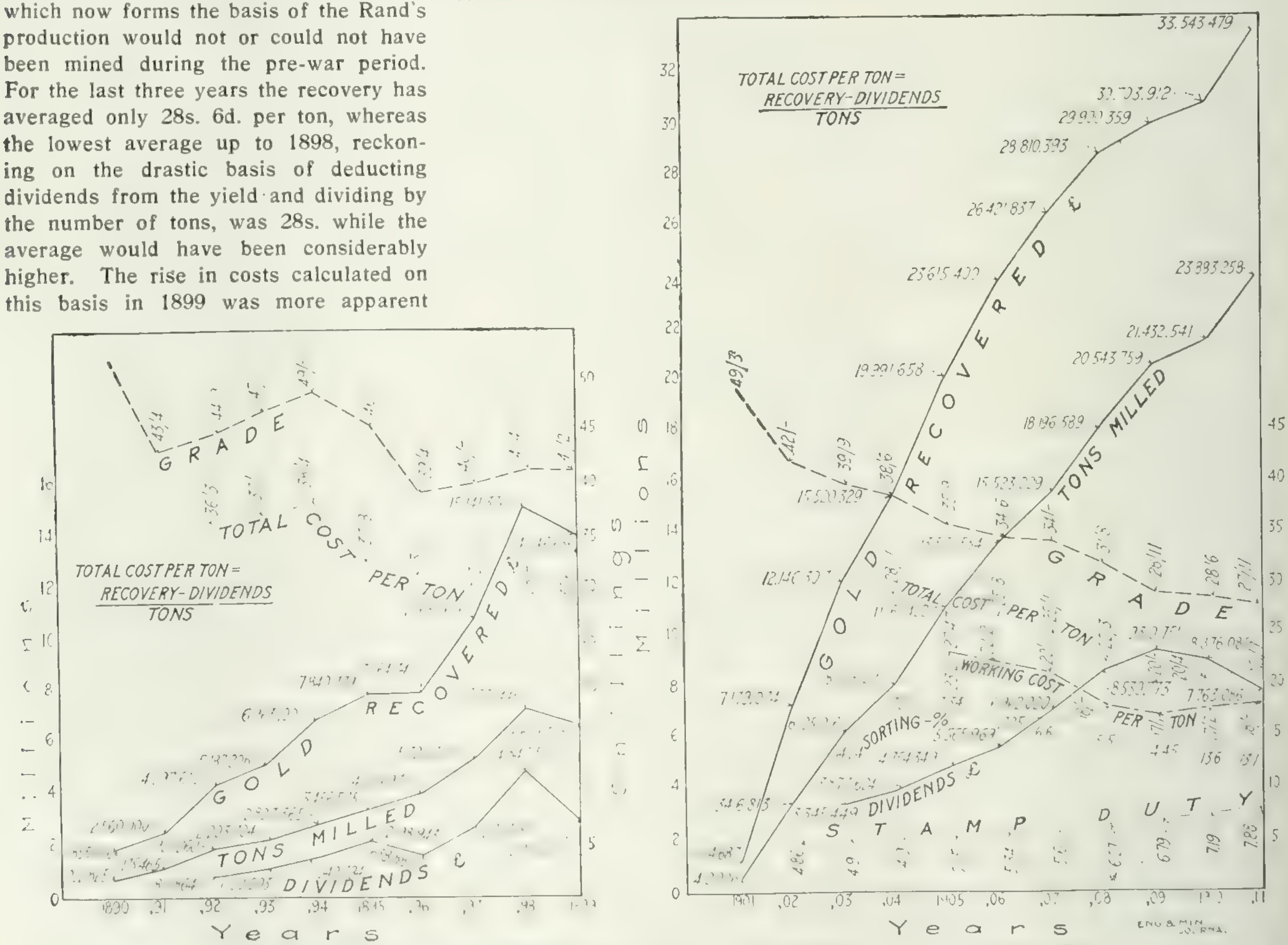
In the early years the recovery was over 50s. per ton, the companies milling being principally situated on the central and richest portion of the Rand. With the small batteries then used it was possible to select ore closely. It is a striking fact that ore which now forms the basis of the Rand's production would not or could not have been mined during the pre-war period. For the last three years the recovery has averaged only 28s. 6d. per ton, whereas the lowest average up to 1898, reckoning on the drastic basis of deducting dividends from the yield and dividing by the number of tons, was 28s. while the average would have been considerably higher. The rise in costs calculated on this basis in 1899 was more apparent than real, the companies conserving their funds to provide for a possible long period of inactivity.

Introduction of Cyanide Process

The advance in grade from the 43s. 4d. per ton of 1891 was due to the adoption of the cyanide process for the recovery of the gold from ore drawn from the pyritic zone of the mines, usually reached at depth of about 250 ft. Before the war shareholders received an average of 10s. in dividends for every ton of ore crushed, but the maximum annual crushing was at the rate of 10,000,000 tons, a quantity which the Rand mills will crush this year in the short space of two months.

Fall of Grade

In the second diagram, we see the recovery and tonnage-milled lines gradually getting farther apart when viewed over a long period, but fairly parallel when examined as to shorter durations of time. This feature being especially noticeable in the last three years. The reason for this is, of course, the regular fall in grade, or recovery per ton, from 1902 when it was 42s. to less than 29s. in 1909, since which time the figure has been steadier. In the years of limited operations up to 1904, the limitation being imposed by stringency of native labor in the main, but also by difficulty in financing some of the properties, the grade was fairly well sustained, and the divided profit in that year was at 9s. 7d. per ton or almost up to the standard o the earlier period. The difference is more than accounted for by the fact that th profit tax instituted by the governmen of the South African republic, bu allowed to remain in abeyance durin that regime was then being collected fro the companies. In the following yea however, the amount per ton received b shareholders fell sharply, averaging 8 8d. in the next triennium. In 1908 th



Charts Showing Results of Mining on the Rand before and after Boer War iinese, the first of whom had arrived in 04, had become efficient, while the eatly increased use of the tube mills, e first of which was installed at the en Deep in 1905 had greatly increased e stamp duty. These two factors, ough primarily the labor force, had the ect of raising the tonnage by 2,677,000 this year. Although the magnitude of eratious with concurrent wide stoping, ought about a reduction of 2s. 4d. per i, the working costs either taking the astic basis or the actual mine figures shown by the Chamber of Mines were duced by practically three shillings.

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*Editor, "South African Mining Review," Johannesburg, Transvaal.

SHAREHOLDERS BEST YEAR

The year 1909 was the best for Rand areholders. Dividends at high ratio of ofit were distributed among shareIders and some companies paid as nuses, profits which had been accumued years previous with a view to rticipation in amalgamation schemes, in any new business of a favorable aracter which might have offered. us it came about that while the deired working cost fell less than one illing the "drastic" method revealed a l of 2s. 3d. per ton, the lowest rate er recorded. Though in the last two ars an extra 3,350,000 tons have been ished, the expectation of a dividend stribution of £10,000,000 has not been ilized, on the contrary the yield has opped to £7,750,000; the decrease is gely explained by substantial amounts capital, expenditure having been deiyed out of revenue, owing to inability issue reserve shares at prices conlered satisfactory. In these circumınces it will be recognized that the s. 7d. per-ton figure for working costs difference is exaggerated. Between the ade rcorded and the declared working sts there is a margin of practically 10s. r ton, or the same margin as shown tween costs calculated on the drastic ethod and the grade in pre-war work-. Part of the difference is accounted by profits tax, so the showing is by means unsatisfactory. Moreover on basis of 28s. 6d. per ton, the Rand sts on a more stable foundation than lid a few years back when reliance was aced in the richer reefs yielding perps 10s. per ton more.

SUSTAINED DIVIDEND RATIO

Taking 1898 as typical of pre-war orking and the years 1909 and 1910 as oical of post-war operations, it is ticeable that there has been little varion in the percentage of gold which s reached the shareholder. In the rlier period it was 32%, while the late ars have shown 31 and 29%, respecely. But whereas South Africa rened but £10,500,000 in working exnditure in 1898 and £11,650,000 no rther back than 1904, the expenditure had by 1909 run up to £20,250,000, while last year it fell little short of £25,000,000. This has given a steadying effect to Johannesburg and the Reef. Such expenditure is generally irrespective of amounts spent on capital account which are sometimes indeed considerable.

"SORTING" AND STAMP DUTY

The subsidiary features of the chart show that by sorting the amount of waste rock inevitably mined but discarded prior to milling, has fallen regularly, due to the insistent demand of the big mills, and the straining after lower costs, for sorting of course mathematically increases the rate per ton, while the duty per stamp per 24 hr. has increased by over 50% in the last five or six years. Whereas the average duty was under eight tons in 1911, 11 companies in December crushed over 12 tons the best performances being 20.7 tons by the Roodepoort United, 16.36 by the Jupiter, and 15.17 by the Simmer Deep. This remarkable increase in crushing capacity, due to lavish use of tube mills, is the great feature of recent metallurgical advance.

Vanadium in Colorado

SPECIAL CORRESPONDENCE

There are six producers of vanadium ore in Colorado. The carnotite ore in the Paradox district, 60 miles west of Placerville, contains more vanadium than uranium, whereas the opposite is true of the carnotite ore found in Utah. The Paradox district has a wagon haul of from 50 to 75 miles, at a cost of from $25 to $35 per ton, which prohibits the shipment of much low-grade ore.

The International Vanadium Co., controlled by George D. Blackwell Sons & Co., Ltd., of Liverpool—who have taken over the management of the General Vanadium company—have been shipping steadily, when condition of wagon roads permitted. Recently, however, the operations were discontinued, owing to market conditions, which, it is said, did not leave any profit on the low-grade ores.

The Standard Chemical Co., controlled by the American Vanadium Co., and the J. M. Flannery interests, of Pittsburgh, has been developing its property, but has shipped no ore since last autumn. It is understood that the company is experimenting at its Canonburg, Penn., plant on a process for the extraction of the uranium and vanadium contents, and also to save the radium in some form.

During the last year, A. M. Wilson, of Telluride, Colo., has been shipping different grades of carnotite ore, varying from 1% to 15% U_2O_8. This ore was sold through E. P. Earle, of New York, and David Taylor, of Salt Lake City. In April of this year, Mel Turner, of Placerville, shipped a carload of carnotite running over 3% U_3O_8, and 5% B_2O_5. He is doing further prospecting.

J. M. Beslisle is hauling ore to Placerville for a first shipment, which is expected to be of fair grade in both uranium and vanadium.

The roscoelite ores containing no uranium are being mined and milled by the Primos Chemical Co., at Newmire, and at Saw Pit, where an old gold-reduction plant is being remodeled for the treatment of low-grade roscoelite ore from claims owned by the Colorado Vanadium Co.

Prospecting on the Gillies Timber Limit

SPECIAL CORRESPONDENCE

The announcement that the provincial government will throw open for staking, a considerable portion of the Gillies Timber Limit, has created much interest and recalls the early boom days of Cobalt. The section thrown open consists of about 4000 acres and embraces the area south of the lots sold several years ago and lying between the Montreal River and the lower corner of Coleman Township.

The whole of the Gillies Timber Limit was withdrawn from staking in the early days of the camp, the government deciding to go into the mining business itself. Much work was done on the Limit, but without results, and the government, exhibiting the same weaknesses as lesser individuals, held out for too much money. It is commonly stated that an offer of $10,000,000 was made and refused for the mineral rights alone.

Finally growing tired of spending money without any return the government decided to do a little wildcatting on its own account. A number of 20-acre lots were laid out and in different sales, about 100 of these were disposed of. The last sale, however, fell decidedly flat and seeing that further sales were not likely to be profitable, it was finally decided to throw the land open. With regard to the lots already sold it is sufficient to say that silver was found on only two, and on these in insufficient quantities to make paying mines.

While it is probable that all the new lots will be staked, the staking will be done more as a speculation, than with the idea of developing mining properties.

Cobalt has been coming in for much attention lately, and there has been a decided revival of interest in that district. Properties formerly abandoned are being worked again, and several leases have been made. This will probably account for a large part of the interest in the new section of the limit.

While this territory possesses certain merit on account of its close proximity to the paying mines of the district, and while too little work has been done, to justify an opinion of its ultimate value, it is a fact that all previous work done on this section has been barren of results, and the outlook for the future is not particularly encouraging.

Alaska Gold Mines Co.

A brief announcement of the program of the newly organized Alaska-Gastineau Mining Co., was made in the JOURNAL of Aug. 10. The property includes the Alaska-Perseverance, Oxford and Sheep Creek groups of mines, near Juneau, Alaska. Mention was then made of the probability of a holding company being organized, to be known as the Alaska Gold Mines Co. This company is now being organized through Hayden, Stone & Co., with authorized capital stock of $7,500,000, divided into 750,000 shares, $10 par value.

The company will secure a controlling interest in the Alaska-Gastineau Mining Co., build a mill with an initial daily capacity of 6000 tons and will finance the development of the property for extensive operations. It is estimated that $4,500,000 will be required for this purpose. The present issue of stock will be 614,700 shares and the company will hold in its treasury $1,790,000 Alaska-Gastineau bonds out of a total issue of $3,500,000 and $9,801,000 par value Alaska-Gastineau stock. There will be placed in the treasury of the Alaska-Gastineau company $1,250,000, and, in addition, in the treasury of the Alaska Cold Mines Co., the holding concern, the further sum of $3,250,000, or a total of $4,500,000 in all. The rest of the authorized capital of $750,000, amounting to 135,300 shares, will be reserved for general purposes and to acquire, if it can be arranged on reasonable terms, the outstanding $1,100,000 of bonds, and the $2,199,000 of the capital stock of the Alaska-Gastineau Mining Co. The organization of the company will be in part as follows: Charles Hayden, president; Daniel C. Jackling, vice-president, in charge of operations; Albert F. Holden, with the two officers above named and two others not yet chosen, will constitute an executive committee.

Old Freibergers in America

Notices have been sent to all the old students of the Royal School of Mines, Freiberg, Saxony, Germany, now dwelling in North and South America, whose addresses are obtainable, asking their opinion as to the advisability of forming an organization to be known as "Old Freibergers in America."

The large number of answers to these letters indicate that the idea has taken a firm root and that the organization will meet with success. It is proposed to hold the first meeting during the sessions of the Eighth International Congress of Applied Chemistry, which will be held in New York, Sept. 6-13. Old Freibergers not receiving notices should communicate with C. L. Bryden, 1015 Myrtle St., Scranton, Penn.

Lake Superior Mining Institute

SPECIAL CORRESPONDENCE

At a meeting at the Houghton Club of local members of the Lake Superior Mining Institute, plans were formulated and committees appointed to carry them into effect, looking toward the entertainment of the members attending the annual meeting scheduled for Aug. 28, 29 and 30. F. W. Denton, of the Copper Range Consolidated Co., was made chairman of the meeting and on a duly authorized motion he appointed a committee which went into immediate executive session to appoint special committees to attend to the details of the plans. After the recess, Mr. Denton, chairman of this committee, reported that committees had been selected to deal with the following matters: Entertainment, excursion, transportation, program, etc. John Knox, of the Calumet & Hecla company, is chairman of the excursion committee, other members of the same committee being Charles Lawton, of the Quincy mine, and Mr. Benedict, of the Calumet & Hecla company's mills. Thursday evening, Aug. 29, will be devoted to an entertainment excursion of some sort, and present plans call for a boat excursion by moonlight to Portage Entry, 10 miles distant, where a whitefish dinner will be served at the White City. The Calumet & Hecla band will be engaged for this occasion. The chairmen of the various committees constitute a general committee and will report on Monday evening, Aug. 12, on developments to date. Before actual business was transacted, Mr. Denton reported on the outcome of a meeting of the institute's council, held recently at Ishpeming.

At this meeting the council decided that the scope of the institute's activities could be extended advantageously to its members. As a means of accomplishing this, a number of committees were appointed to investigate and report on various technical and other subjects, including safety devices, hoisting rope, Bureau of Mines and publicity. The committee on Bureau of Mines will represent the institute officially in correspondence or other dealings with the Bureau of Mines. The committees on safety devices and hoisting will investigate conditions fully on the Michigan ranges and the institute will probably authorize the payment of any expense incurred by the committees in this work. The treasury is in good condition and annual receipts exceed expenditures by several hundred dollars. An enthusiastic meeting with a large attendance is expected at Houghton.

The following is a partial list of papers to be presented at the meeting:

Methods of Sampling at Lake Superior Iron Mines, by Benedict Crowell, Cleveland, Ohio.

System of Safety Inspection of the Cleveland-Cliffs Iron Co., by William Conibear, Ishpeming, Mich.

Raising Shaft at Rolling Mill Mine, Negaunee, Mich., by Edwin N. Cory, Negaunee, Mich.

Mine Sanitation, by E. B. Wilson, Scranton, Penn.

Raising, Sinking and Concreting, No. 3 Shaft, Negauee Mine, by S. R. Elliott, Negaunee, Mich.

The Unexplored Parts of the Copper Range of Keweenaw Point, by Alfred C. Lane, Tufts College, Mass.

Footwall Shafts in Lake Superior Copper Mines, by Dr. L. L. Hubbard, Houghton, Mich.

Some Applications of Concrete Underground, by H. T. Mercer.

Rock-House Practice of the Quincy Mining Co., by T. C. DeSoller.

Construction of Intakes at the Mills of the Champion and Trimountain Companies, by Edward Koepel, Beacon Hill, Mich.

Balancing Rock Crushers, by O. P. Hood, Pittsburgh, Penn.

In the Lake Superior Area—What Influences if Any, Did the Ancient Topography of Foot-Wall Beds Have Upon the Subsequent Deposition and Distribution of Copper in Overlying Beds, by L. L. Hubbard, Houghton, Mich.

The New Franklin Hoist, by R. H. Corbett.

Notes of Methods of Mining Iron Ore in the Lake Superior District, by F. W. Sperr, Houghton, Mich.

Failures of the Rule of Following the Hanging in the Development of Lake Superior Copper Mines, by F. W. Sperr, Houghton, Mich.

California Oil Dividends

Figures for the month of July show that the dividends paid by the various oil companies operating in California amounted to $763,629 in that month, says the Los Angeles *Tribune*:

	Per Share	Dividends.
Amalgamated	$1 00	$50,000
Caribou...	01	8,070
Claremont	01	5,000
Central.	0075	7,500
Columbia	01	9,992
Del Rey	005	3,977
Empire.	50	100,000
Fullerton..	05	30,000
Home	01	5,000
Monte Cristo	.005	12,500
Mount Diablo	01	5,000
Nevada County	06	15,000
New Penn	005	5,000
Olinda Land	0075	7,500
Paraffine	01	3,000
Peerless..	25	25,000
Record	01	5,000
Rice Ranch	015	4,500
S. F. & McKittrick	.01	5,000
Sauer Dough	0075	2,992
Section 25	50	20,000
State Con	01	5,000
Traders.	006	9,000
Union	006	184,744
Union Provident	006	91,402
United Petroleum	006	48,451
Western Union	005	5,000
W. K.	02	10,000
Total		$683,629
Mexican Pet. Ltd. pfd..	.00 2-3	80,000
Grand total		$763,629

This does not include a number of closely held stocks which make no public report.

West Shining Tree Gold District

By W. R. Hodge*

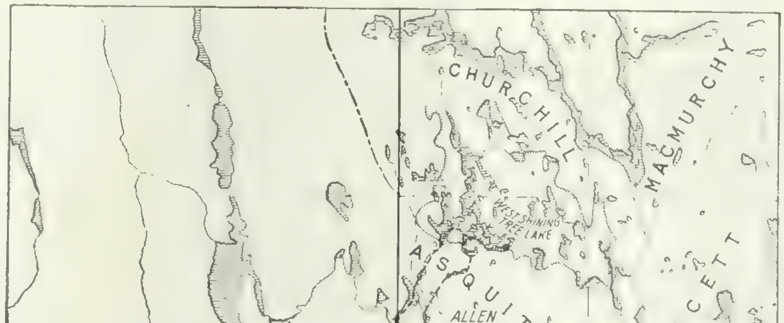
One of the newer districts in Northern Ontario near the western edge of the Timagami Forest Reserve. Reached from Ruel, on the Canadian Northern Ontario R. R., by canoe and portage. Topographically similar to other mining districts in Northern Ontario. Gold occurs in andesite. Gosselin claims the most developed in the district.

The Wasaquagima Lake gold district, or West Shining Tree, as it is more familiarly known, lies near the western edge of the Timagami Forest Reserve in Northern Ontario, and is limited by the boundaries of the townships of Asquith, Churchill, Macmurchy and Fawcett. Or rather the district is politically so limited, for, as a matter of fact, the geological conditions maintaining in these four townships are found for a good many miles to the north and west as well. To the east of the district and directly adjoining lies the silver-mining district of Gowganda, the town of Gowganda lying about 25 miles directly east of West Shining Tree Lake. The gold camp of Porcupine is 55 miles straight north and the town of Sudbury south and a little east, about 90 miles.

WAYS OF REACHING THE DISTRICT

The nearest railroad point from which the district may be reached is Ruel, the present terminus of the Canadian Northern Ontario R.R., building between Sudbury and Port Arthur. And through Ruel lies the principal trail to Shining Tree. Ruel is 72 miles from Sudbury and the night trains make the distance in about four hours of strenuous going. At present there are six night trains a week, leaving Sudbury each evening except Sunday at 7:10. On Tuesdays, Thursdays and Saturdays a mixed train leaves Sudbury for Ruel at 6:30 a.m., arriving at about 1:30 p.m. There is a stopping place at Ruel where one may obtain meals and lodging and the ordinary supplies of a prospector at a reasonable price.

From Ruel to the "head of navigation," on Opickinimika Creek, is a portage of about three miles, over a corduroy road for the most part. The winter road follows this route and goes two miles further, where it comes out on Opickinimika Lake. But in summer a 35-ft. "pointer," gasoline driven, carries passengers and freight each day between the landing on the creek and Nedon's Halfway, on Opickinimika Lake. Two dams have been built, one at the Halfway and one further down the river, to keep the water at a permanent level and enable the boats to pass the shallow rapids which occur at two or three places on the route. At Nedon's Halfway one may obtain meals and, in an emergency, lodging. From this point another boat carries the traveler as far as Allen Lake, on Opickinimika River, and from this latter point he must travel with his own outfit. It takes about seven hours to make the trip by boat from Ruel to Allen Lake. From Allen Lake to Cryderman's, at the southeastern corner of West Shining Tree Lake, is about an hour and a half by canoe. There are two short portages into the large lake. At Cryderman's one may obtain meals and lodging. There is also a store where one may purchase supplies at a moderate cost. Once at West Shining Tree Lake it is easy to reach any part of the district by canoe, the portages being good and the waterways numerous.



ROUTE TO THE WEST SHINING TREE (WASAQUAGIMA LAKE) GOLD DISTRICT

In the winter, when the traffic requires it, a stage runs between Ruel and Cryderman's. A winter road is cut at places through the timber, but for the greater distance it runs on the ice of Opickinimika Lake and River. There is also a trail between West Shining Tree and Gowganda, which is excellent in winter for traveling with a dog team, but in summer it is difficult, owing to the many portages that must be made. The Board of Trade of Sudbury is strongly advocating a railroad which shall run north to Cochrane, on the Grand Trunk, tapping the East and West Shining Tree districts and Porcupine.

LAURENTIAN AND KEEWATIN ROCKS

Topographically West Shining Tree differs little from the other mining districts of Northern Ontario. It is a country of swamps, small creeks and tortuous lakes. From the shores of the waterways and from the swamps rise gently rounded knolls and islands of rock covered with a growth of jack pine, spruce, balsam, cedar and birch and an occasional white pine or fir. The soil on the knolls is thin but the lower rock generally has an overburden of glacial drift from 2 to 20 ft. thick, which does not make for easy exploration.

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*Mining engineer, Houghton, Mich.

The predominant rocks of the district are classed by W. H. Collins, of the Department of Mines of Canada, as of the Laurentian and Keewatin periods. The Laurentian is represented by granites, gneisses and granite-porphyries in the southern portions of Asquith and Fawcett townships and at present seem to posess no economic importance. The Keewatin is present over the greater part of the four townships in the form of rhyolite, quartz porphyry, amphibolite and andesite with metamorphic variations of these rocks. The metamorphic rocks are mostly greenstone schists. The andesite is the commercially important formation, for associated with it are all the gold showings of the district. Only in a few places does the andesite occur unaltered, appearing generally as a schist.

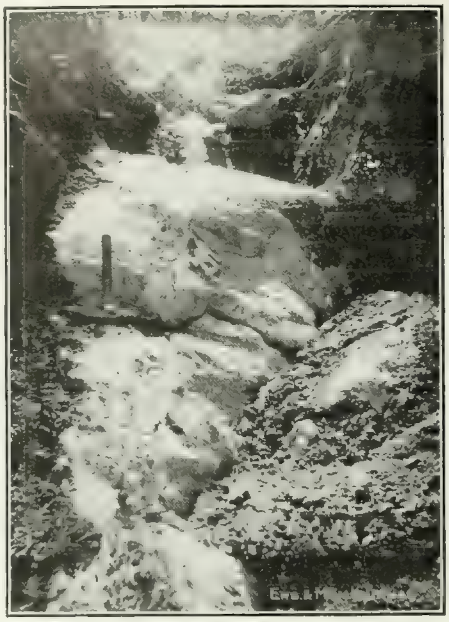
Fig. 1. Method of Sampling, Gosselin Claim

In the Shining Tree district there are two of these andesite areas, one about West Shining Tree Lake, and the other, seemingly smaller, to the east and north in the township of Macmurchy. There is little difference between these two areas except, perhaps, that the small veins seem to predominate in the smaller area, which is known locally as Wasapika. In both areas the quartz is plainly a derivative of the schists with which it occurs and into which it grades in many places.

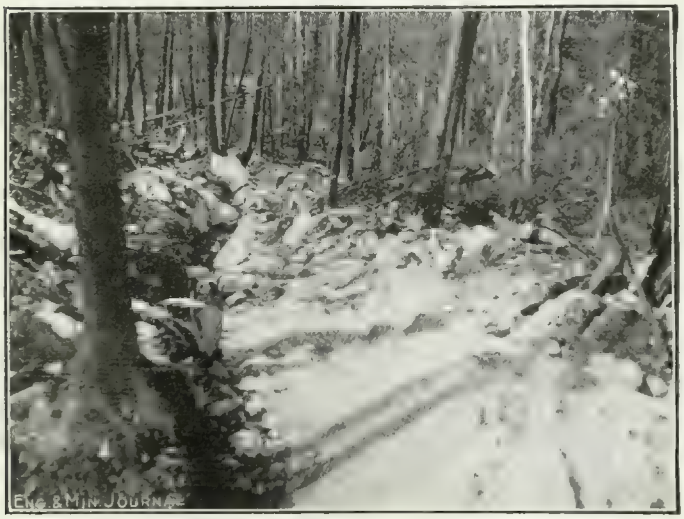

Fig. 2. Large Quartz "Dome" on Gosselin Claim

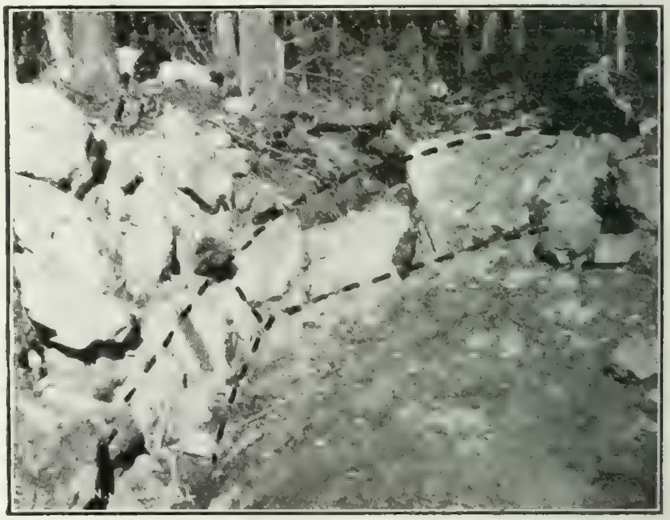
Fig. 3. Bent Vein on Gosselin Claim

Two Types of Quartz Bodies

There are two types of quartz bodies in the district, large irregular masses with indefinite and poorly defined walls and small veins of proportionally greater length, but which resemble the larger bodies insomuch as they have splintery walls with stringers of quartz running off and disappearing into the wall material.

Of the large masses there appear to be two varieties, one of which occurs in the country as suet occurs in a pudding—with hazy orientation. An example of this class is shown in Fig. 2. This is the "dome" on the Gosselin claims. It is white quartz, roughly oval in shape and about 150 ft. long by 65 ft. wide at its broadest point. In places the quartz is heavily impregnated with pyrite and chalcopyrite. However, such mineralization in the large masses seems to have little or no effect on the gold content. What gold occurs in these larger masses is most erratically and unevenly distributed, and in no place has it been found in sufficient quantities to warrant the beginning of mining operations. On the Gosselin claims the richest assays were obtained on the margin of the quartz.

In the smaller veins are found the richer deposits of gold and the metal seems to be concentrated in the narrowest point of the vein. On the Caswell claims, in the Wasapika area, is such a small vein of white quartz. The wall rock on each side is a greenstone schist carrying considerable pyrite. About 12 ft. from one wall occurs an outcrop of unaltered andesite. One slab broken from this vein was about 12 in. long, 4 in. wide and ½ in. thick and contained gold in such form and quantity that it was necessary to bend the slab after it had been cracked to separate the various pieces. This chute or pocket was sharply limited and at no other point in the vein, which extended some 300 ft., was there found even a trace of gold.

Some of the veins in the district have a tendency to lie down on the surface. One vein of this peculiar type is shown in Fig. 3. Upon first examination this vein, which is on the Gosselin property, seemed to be about 20 ft. wide with a strike which could be definitely determined along the straight edge of the northern side of the vein. Upon breaking into the surface of the quartz it developed that the quartz was but 2 ft. wide and had "flowed" over the foot wall at surface. The quartz in the "overflow" portion of the vein was decidedly brecciated.

The District Little Explored

Little exploration has been done in the district below the surface. On the Gosselin claims a shaft was sunk for 50 ft. on a contact vein between the rhyolite and sericite schist. At the bottom of this shaft neither the quartz of the vein, the walls nor the gold content of the vein was changed. On the Bennet claims, in Wasapika, a pit of 18 ft. shows identically the same conditions at the top and bottom. This is to be expected, for the country has been heavily glaciated and the rock much below the zone of weathering removed, so there is now exposed at surface what one may expect to find for considerable depth. And with this fact in mind, the explorers have worked only where there were excellent showings of gold on surface. The gold of the district is of a light yellow color and the ore contains about three parts of silver to each four parts of gold.

Future of the District

It is improbable that Shining Tree will be of commercial importance in the immediate future. The gold, while it is present on many claims in the district, is not concentrated in quantities which would pay for working. The rich pockets are few and small, and so far the prospecting of the district has been slow and inadequate. There is a tendency on the part of the prospectors to require abnormally large "first payments" on options for small showings. Most of the claims have received little attention beyond a desultory trench here and there. The only serious attempt at thorough exploration was made by Victor Rakowsky, of Duluth, on the Gosselin claims. The heavy timber of the country prevents easy prospecting and requires considerable work with the axe before the pick and shovel can be used. Could the prospectors be persuaded to go below the surface on a small scale, the district might afford a good berth for a small ore-buying company.

California Oil in June

The June production of petroleum in California fields amounted to 6,895,865 bbl., a daily average of 226,529. This is an increase over May of 13,837 bbl. in total production, and an increase in daily average of 4528 bbl. The field consumption for June was 431,965, making a daily gross production of 7,327,830. The pipe-line shipments for June were 6,272,375 bbl., the total shipments being 6,420,405 bbl. The daily shipments for May were 6,425,681 bbl. The daily average shipments increased in June, owing to the fact that June had 30 days, against 31 in May.

PRODUCTION BY FIELDS

District	Bbl
Fresno County	
Coalinga	1,577,774
Kern County	
Midway	1,989,072
Kern River	929,863
McKittrick	504,974
Sunset-Maricopa	405,023
Lost Hills	107,556
Total Kern County	3,936,488
Santa Barbara County	
Santa Marie, Lompoc, Cat Canon	431,442
Summerland	4,350
Total Santa Barbara County	435,792
Southern Fields and Counties	
Fullerton-Puente	468,668
Salt Lake- Sherman	244,834
Coyotes-La Habra	79,013
Ventura	55,976
Whittier	55,294
Los Angeles	31,842
Newhall	10,184
Total Southern Counties	945,811

The total stock on hand at the end of June was 44,919,262 bbl., an increase over May of 628,839 bbl. There were increases of production in all Kern County fields except Maricopa. The record of field development in June shows 59 new rigs, 67 completed wells, 5626 active producing wells, 819 idle producing wells, 408 active drilling wells, 352 idle drilling wells, and 5 wells abandoned. Total stocks at the end of June were 44,919,262 bbl., of which 27,871,746 bbl. were in the Kern River field.

Southern Piedmont Iron Operations

By R. J. Holden[*]

The Oriskany Ore & Iron Corporation is constructing a modern coke blast furnace at Reusens, near Lynchburg, Va., chiefly to smelt local brown iron ore. The management of this company has had long experience in mining and smelting brown iron ore in large operations in western Virginia and the prospect for the success of the Reusens operation seems good.

The foundations for the furnace and stoves are complete and other work is in progress. The furnace will be 10x16 x80 ft. There will be four Hartman stoves 18x70 ft., a steel cast house 60x 150 ft. and two Southwark vertical blowing engines. The operators claim they will have a capacity of 150 to 200 tons of pig iron per day.

The company has acquired the Barr iron-ore properties in Pittsylvania County, Va. While these properties have been operated principally for magnetite, the chief resource is limonite of which the company claims to have 2,000,000 tons in sight. This brown ore is to constitute the main ore supply for the furnace and is to be supplemented by blue billy. The chief occurrence of brown ore on this property is described in "Mineral Resources of Virginia" as follows: "Massive outcrops of limonite occur along the crest and slopes of a ridge for half a mile. Where mined the ore is massive or as closely spaced stringers in clay. The composition of the ore as furnished by the operator is as follows: Fe, 47%; Sio$_2$, 12.25; P, 0.85; Mn, 2.70 per cent.

The erection of this furnace is a matter of significant interest. It will be the only blast furnace in the South, east of the Blue Ridge. Formerly the Piedmont of Virginia, North and South Carolina was dotted with more than 25 charcoal blast furnaces. In South Carolina the iron-mining industry has long been extinct. In North Carolina, except for the operation of the Cranberry magnetite in the extreme western part of the state, iron mining has ceased. In the Virginia Piedmont there has been a small spasmodic production by independent producers for sale to furnaces for many years. In the immediate vicinity of Lynchburg a quarter of a century ago two small coke furnaces died apparently from ore starvation. In the face of this here there is building a furnace larger than any which has ever stood in the southern Atlantic Piedmont with an ore supply apparently adequate for 20 years.

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[*] Professor of geology, Virginia Polytechnic Institute, Blacksburg, Va.

Chino Copper Co.

The report of the Chino Copper Co. for the second quarter of 1912 shows production as follows: April, 1,367,851 lb.; May, 1,358,868 lb.; June, 1,562,925 lb., a total of 4,289,644 lb., as against 3,271,980 lb. for the first quarter. The ore treated in the two quarters was 167,025 tons and 160,400 tons, respectively, and the grade in the second quarter was 2.04% copper. The production of concentrates was 9035 tons, carrying 23.74% of copper, and the average recovery 62.96%, or 23.74 lb. of copper per ton of ore.

In the last report attention was called to the occurrence of oxidized minerals in the ore treated, and the consequent low recovery. In June a better class of ore was reached in the steam-shovel pit, and the recovery reached over 71%. Costs were 8.02c. per lb., not allowing for miscellaneous income, but allowing for a stripping fund of 30c. per ton of ore mined, which amounts to 1.3c. per lb. of copper.

Net income from milling was $365,533 and miscellaneous profits were $24,603. Two sections of the Hurley plant were kept in continuous operation. The third was ready, but during April and part of May the water supply was insufficient, and clayey ores gave trouble in the crushing department. In June labor disturbances at the mine resulted in an ore shortage.

The fourth section should be commissioned on Aug. 15, and the fifth completed in late September. It is hoped to mill 5000 tons per day in October and after. Stripping in the second quarter was 504,000 cu.yd., a decrease of 115,000 cu.yd. from the first quarter, due to the disturbances at the mine already referred to. No drilling was done except to test areas on which it was purposed to dump waste.

Patent Office Investigation

Washington Correspondence

An investigation into the conditions prevailing in the Patent Office will shortly be undertaken under the direction and control of the President, by the terms of provisions made by Congress for that purpose. The idea is to examine carefully into the needs of the organization, in order to see whether it is true that new buildings and equipment are needed, and whether better pay for the staff would help to reduce the lengthy delays which hamper taking out patents. The investigation will be intended also to ascertain whether it is possible to improve the general type of organization in the office and to eliminate some of the red tape of which complaint is now frequently made. There has been great and continuous complaint on this subject, and even some of those who have heretofore opposed the idea of reforming the Patent Office are now inclined to favor the plan on the ground that it is needed in order to check the dissatisfaction with patent conditions to some extent. The inquiry will not attempt to recommend general patent legislation designed to rectify the abuses of the present patent law, but will leave that to be dealt with by committees of Congress which will continue the agitation on that subject next winter along lines identical with those followed during the last year.

California Water Power Conference

San Francisco Correspondence

Preparations are being made for a water-power conference, to be held either at Washington or San Francisco, between the Secretary of the Interior and other government officials and the California Conservation Commission, for the purpose of laying the basis of a Federal water-power law that may harmonize with the spirit of the law proposed to be enacted by the State of California. This state probably contains the greatest amount of undeveloped water power of any of the states, and the interest taken in the conservation of stream and other surface waters for power purposes in California has resulted in the establishment of a State Water Commission operating in conjunction with the California Conservation Commission and supported by the state under legal appropriation.

It is recognized not only in California, but in other states, that the present Federal laws, as well as the state laws, are inadequate to meet the actual requirements resulting from the increased demand for power. Under the present laws and rulings of the departments of government that have to do with the permission to generate power from the waters of California, the applicant for hydro-electric power must submit to the independent and separate rulings of the General Land Office, the Forest Service, the Reclamation Service and the Geological Survey before the approval of the Secretary of the Interior may be secured; and the State Conservation Commission also must pass upon the application. A Federal law with which a new state law may be made to conform will enable the applicant for hydro-electric power to secure the right to such use of streams and other surface waters without long and tedious waiting and the expenditure of unnecessary money for fees.

The tentative list of subjects to be discussed at the conference includes the ultimate use, waste and non-use, misuse, extortion, monopoly, renewals, transfers, rentals, storage, transmission, prices, services, administration, and other relevant matters. Under present conditions, it is almost impossible to attract capital to invest in power sites in California controlled by the Federal government, because there is no guarantee of permanency in the permit issued by the government, and many of the better sites for hydro-electric power in the state are so controlled.

The U. S. Geological Survey, in coöperation with the California State Conservation and Water Commissions, established 75 new gaging stations last year in California. The work done by the Survey in preparing reports on the surface waters in California is under coöperative agreement with the state. The first issue of the "Gazetteer of Surface Waters in California" is "Part 1, Sacramento River Basin." This is Water Supply Paper 295; Nos. 296 and 297 are in course of preparation. They will include San Joaquin River Basin and the Great Basin and Pacific Coast Basin. Three other parts are contemplated which will relate to stream measurements in three basins mentioned. Part 1 contains descriptions of 978 streams in Sacramento River Basin. Each stream is described as to its rising point, course of flow, and confluence. This part also contains a list of 85 gaging stations maintained in Sacramento River Basin from 1888 to July 1, 1912. There are two errors in the text that might be misleading to persons unacquainted with the territory. On p. 7 the drainage area of the middle fork of American River is stated as being 861 square miles; this should be 640 square miles. On p. 36, the north fork of Feather River is credited with possible development at low water of 300 hp.; this should be 300,000 hp. These corrections were approved by the San Francisco office.

Kyshtim Corporation, Limited

The third annual report of the Kyshtim Corporation, Limited, showed that the cost of producing copper during the first six months of 1912, was somewhat high, owing to the difficulties attendant on the breaking in of the new plant, according to the *Mining Journal,* July 27, 1912. This was especially the case with the converters, and as it was essential to insure the fulfillment of copper contracts, the old converters at Kyshtim were used for this purpose, but at a large additional expense. The converter difficulties are now overcome, and the old converting plant at Kyshtim has been closed. The iron works showed about the same profit as during the previous year. The profit on timber fell off, mainly from the fact that it was thought advisable to market a smaller output, owing to local conditions.

The gold and silver produced during the year 1911, amounted to £13 14s. per ton of electrolytic copper, from January to June of this year the precious metals are considerably higher than this figure for each ton of copper produced.

In the original estimates of the costs of production made by Knox & Allen, of New York, the cost of production was estimated at £32 per ton of electrolytic copper, and the recovery of precious metal at £12, giving a net cost of production of £20 per ton of copper. This figure compares with Gilman Brown's latest estimate, £20 6s. per ton. Although the original estimate was based on ore containing 4.1% of copper, practically the same results are now being obtained from ore containing at least 1% less of copper.

The refinery can now deal with the total output of blister copper, as will be apparent from the figures of production from January to June. There were produced during this period 3460 tons of blister copper. From this and the stocks of blister copper 3801 tons of copper were refined, and there were delivered during this period 3480 tons of refined copper.

The mines are now capable of producing well over 1000 tons of ore per day, and have for some time been producing at that rate; that rate can be increased or reduced in accordance with the smeltery requirements, within reasonable limits, without adversely affecting the mining costs, or the proper development of the mines.

Calcium Carbide Output

The accompanying table, by V. B. Lewes (*Times*, London, July 3, 1912), shows the amount of calcium carbide manufactured, used and exported from the principal countries of the world in 1911.

CALCIUM CARBIDE OUTPUT

	Made tons	Used tons	Exported tons
Sweden and Norway.	52,000	4,000	48,000
United States	50,000	37,000	13,000
France	32,000	31,500	500
Switzerland	30,000	4,000	26,000
Italy	28,000	23,000	5,000
Austria and Hungary	22,500	17,000	5,500
Canada	12,000	8,000	4,000
Spain.	18,000	16,000	2,000
Germany	7,000	36,230	..
England............	2,000	16,000	..
Other countries......	5,200	63,800	..

Car Shortage Possible

The Pennsylvania R.R. has joined with the Association of Western Railways in requesting the coöperation of the public to prevent a "car shortage equal to or worse than that of October, 1907." A circular has been issued suggesting that the public can assist by unloading and loading cars promptly; by loading to capacity, and by moving lumber, coal, cement, steel, etc., before the crop movement begins. Consumers needing large amounts of machinery might profit by noting this condition.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Mine Cages at the Desloge Consolidated

BY CLAUDE T. RICE

At the different shafts of the Desloge Consolidated Lead Co. there is an interesting variety of hoisting appliances. At the No. 6 shaft a Harbord self-dumping cage is used. This works well, its only drawback being that it requires several feet of open sump below the level of the bottom station. This, in a district where the orebodies are flat and underlain by a heavily waterladened formation, is a decided drawback. At No. 4 shaft of the same company the cars are hoisted on cages of the type shown in Figs. 1, 2 and 3. The cars are unloaded by a dumping ram, designed by Thomas Fisher, the mine captain, which pushes them to spear tipples and puts them back on the cage again after they have been dumped.

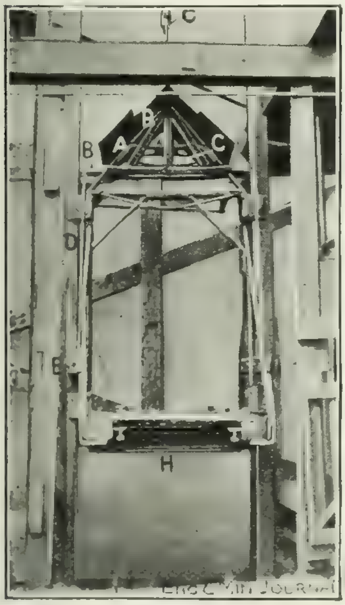


FIG. 1

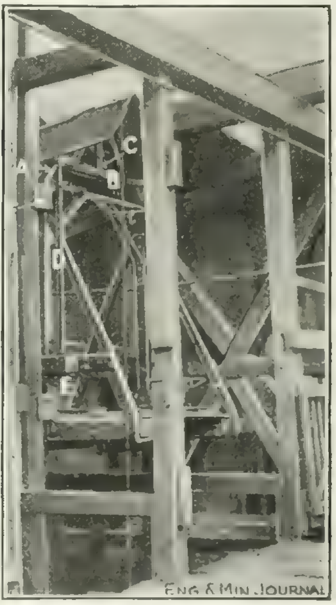


FIG. 2

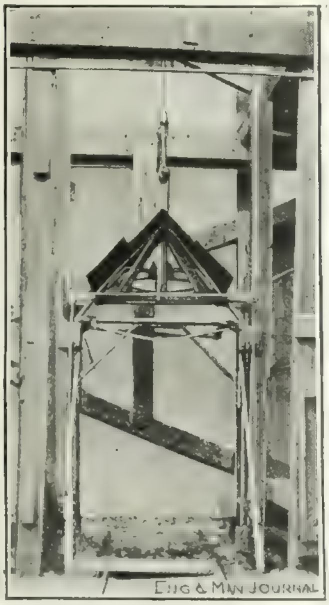


FIG. 3

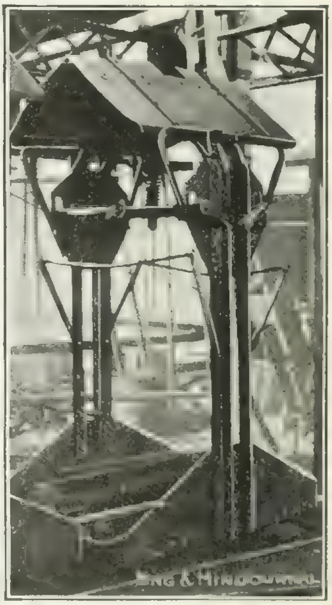


FIG. 4

This cage is of the drop-bottom type. No wrecks have resulted from cars getting off the deck in the shaft, although the drop-bottom has been in use for 13 years. In this type of drop-bottom cage, the whole center which is covered over tightly, as is the rest of the deck, with sheet iron, drops, and not merely the central track in the deck that carries the car as in some other types. As the central part clear across the cage deck drops, and the junction between the stationary outer part of the deck and the drop part is arranged so that a man cannot get his toes in between them, there is no possibility of anyone being caught by the drop-bottom.

The special features of this cage are the manner of operating the safety dogs and the use of a leaf spring for taking up the shock of lifting the cage, as well as operating the safety dogs in case the cable should break. From the accompanying illustrations, it will be seen that while the cage in its lower main part resembles the ordinary construction of cages, it is quite novel in the design of the top mechanism. In Figs. 1 and 2, *A* is the main side strap of the cage on that side. This goes up and is riveted to the main loop constituting the drawbar proper of the cage. Coming up staple-fashion on the sides of this is the auxiliary drawbar that is attached to the dog-operating frame *B*, that extends out to the rod *D*, which goes down and operates the cam dogs that are bolted to the main straps of the cage frame. In a manner clearly shown in a side view of the cage, Fig. 1, bolted to the underside of a crossbrace *C*, the crossbrace, putting off from the main frame of the cage near the top, is a leaf spring *C*, that comes down and engages with the top side of the dog frame *B*, of the cage. This is best shown in the front view of the cage. Owing to the considerable movement of the auxiliary drawbar with respect to the drawbar loop, the clevis to the pin of which the auxiliary drawbar is fastened on each side of the main drawbar loop, and which as it rises engages with the under surface of this loop, lifting the cage, has to be made long as can be seen in Fig. 3, so that the dog frame can allow the safety dogs to close home on the 6x6-in. guide before the top of the staple comes in contact with the top of the drawbar loop.

Another feature of the construction of this cage is the use of short guideshoes made of cast steel, so as to diminish the wear on the guide. In order to allow the shoes to have a little play, they are made of cast steel and fastened to the main vertical straps of the cage frame by bolts through ears projecting from the back side. In this way the shoe is fastened sleeve-like to the cage in such position that the vertical motion of the shoe is limited on the cage frame, although owing to the slight looseness of the sleeve, there is a little back and forth play allowed so that the shoe will adjust itself to the crooks in the guide.

In Fig. 4 is shown the drop-bottom cage used at No. 3 shaft. The interesting feature of this cage is a simpler modification of the Munzner type of safety mechanism than is used on the cages at the Doe Run and St. Joseph mines.

There is only one cross arm coming out to operate the dog shafts of the dog frame. This is the one in the center, the side play of which on the shafts is limited by collars such as can be seen in the accompanying illustrations. Slide plates with guide slots cut in them limit the side motion of the dog shafts, and so the shafts do not have to be bound together at their outer ends by other cross arms as in the Doe Run cages. A sleeve, inside which the coil spring operating the dog works, comes down from the top of the cage to form the stop to limit the compression of the spring and throw the weight of the cage directly upon the drawbar.

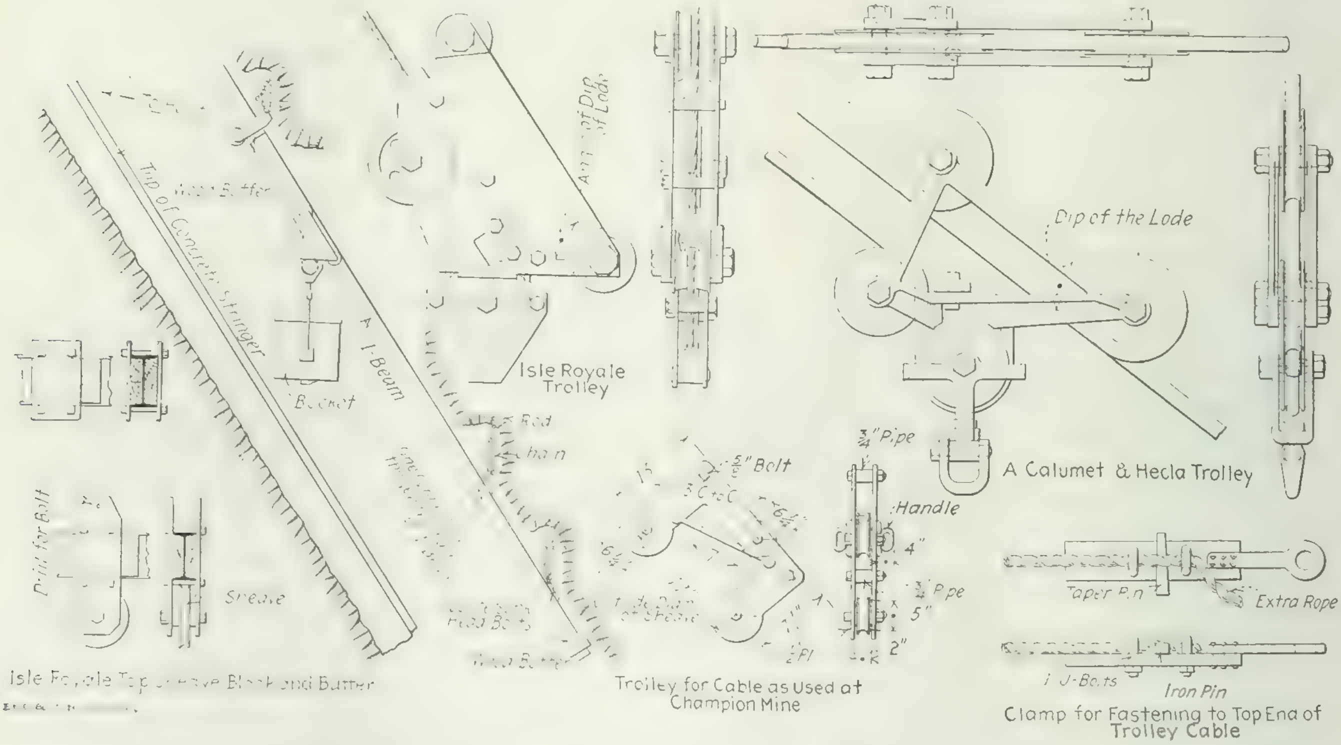
The safety dogs are 3 in. wide with a central groove that divides them into two chisel edges each 1 in. wide. With this construction of the dog frame there is somewhat less cutting up of the top of the cage than ordinarily with the Munzner arrangement, making it easier to load long rails and timbers on the cage. In addition to the simplicity gained by this construction there is also some advantage in the small amount of weight saved.

Mining from a Barge

The pillars in the Yellow Dog mine, in the Joplin district, are being worked by means of a barge, as the drifts are flooded. The barge is rowed to the pillar and a tarpaulin stretched between pillars. The rich ore is gouged out of the pillar and falls on the tarpaulin, from which it is collected. Ore enough to produce three tons of concentrates per day is being gathered in this way.

Trolleys for Sinking Incline Shafts

Buckets are used in sinking incline shafts at the Lake Superior copper mines. These are carried by a trolley that runs either on a wire rope or on an 8-in. I-beam suspended from the roof by chains, as shown in the accompanying drawing. In order to keep the I-beam from swinging upward with the pull as the bucket is being loaded, it is usual to hang the top length of the I-beam, which is curved to allow the bucket to be carried high enough so that it can be dumped into a car, from rods anchored in plugs in the roof, and to butt the upper end against a timber. Because of the fact that the I-beam does not sag as does a rope, larger buckets can be used with the I-beam equipment. This is a great advantage, while it is also possible to continue sinking as far as desired; with a rope trolley 200 ft. is as far as can be sunk at one lift.



Isle Royale Top Sheave Block and Buffer

Isle Royale Trolley

A Calumet & Hecla Trolley

Trolley for Cable as Used at Champion Mine

Clamp for Fastening to Top End of Trolley Cable

TROLLEYS USED IN SINKING INCLINED SHAFTS IN LAKE SUPERIOR COPPER COUNTRY

The I-beams are fastened together by top and bottom plates, so as not to interfere with the travel of the trolley against the webs of the beam. Beams 20 ft. long are used, but an extension piece 10 ft. long is put in until the shaft can be worked deep enough to allow the use of a regular length of track. To prevent over-running a wooden buffer is bolted to the I-beam. In order to get a binding action in the drill holes that carry the I-beams, the holes are put in at right angles to the dip of the lode. These are drilled by the machines as the shaft is being sunk. The accompanying drawing shows the details of the construction of the I-beam trolley used by the Isle Royale company. Some companies use I-beams in sinking; others use rope, and still others use both methods for carrying the bucket, as each system has its own advantages.

In shafts where a rope trolley is used, the bottom end of the rope is fastened to an eye-bolt which has been wedged into a hole about two feet deep that points back into the shaft so that the harder the pull the more the bolt is forced into the hole. At the upper end provision must be made for stretching the rope so that there will be as little sag as possible, for there can be no supporting of the trolley cable from intermediate points. In the South Hecla shaft of the Calumet & Hecla it is the custom to do the final tightening of the trolley cable by a turnbuckle having a travel of several feet. This is seated at one end against a timber running from the foot to the hanging wall, while the other is fastened by a clip to the rope. The extra trolley rope is carried in a coil out of the way. As new cable is required by the deepening of the shaft, the clip is loosened and more rope is let out. Then the clip is bolted on again and after pulling the cable as tight as possible with the hoisting engine, the turnbuckle is used to do the final stretching.

At the Mohawk mines the upper end of the trolley cable is bolted to a plate that fastens to a bolt that goes through a timber of the shaft. By tightening the nut on this bolt which is seated against a plate on the timber, the final stretching of the trolley cable is effected. The manner of fastening this clamp to the rope is shown in the drawing. There are two screw-bolts with an iron pin between them to put a kink in the cable and tighten it after the two U-bolts have been clamped upon it. Even when tightening as much as is practicable on the trolley cable, there is some sag, and even if the cable can be carried nearer the roof than the I-beam, it is necessary to use a smaller bucket with the rope than with the I-beam. At the South Hecla the sinking bucket has a capacity of 700 lb. of rock.

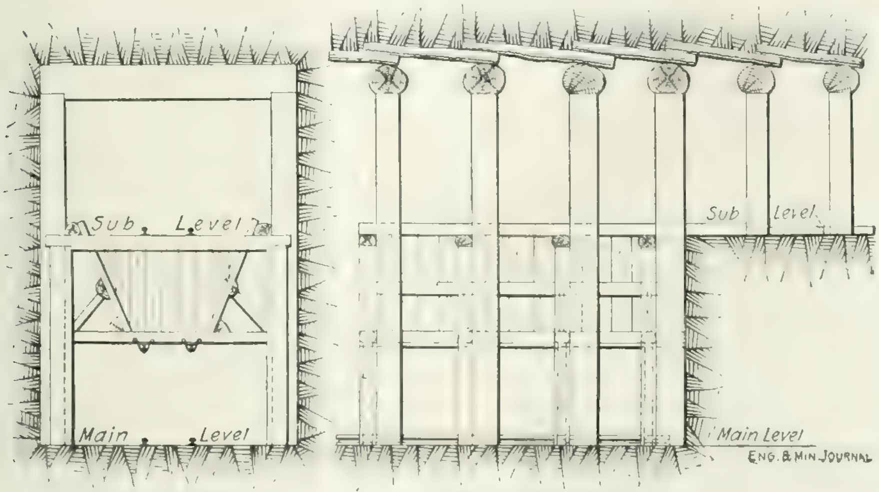
Whatever the method of carrying the trolley, the bucket is permanently attached to the hoisting cable by a fall that permits it to be lowered to the rock pile in the shaft. In the accompanying drawing is shown the rope trolley used at the Calumet & Hecla mines, where in shaft sinking the trolley is used exclusively. The air hoist that is used in sinking may be installed either in the manway compartment of the shaft or in the stations, according to the preference of the superintendent in charge of the work. But installing the hoist in the shaft does away with the necessity of placing a sheave at the top around which the hoisting cable is passed.

The advantage of using the I-beam is that the sinking can be continued to any depth desired, with the rope trolley the sag of the rope limits the depth to which the shaft can be sunk before a change in the hoist is necessary. With the rope trolley the weight of the load that can be hoisted and the weight of the bucket is also limited. On this account the I-beam trolley is, in some instances, to be preferred to the rope trolley. In other cases the rope trolley is cheaper and better. The method to be used by the operator must of course be selected to suit the needs of the particular installation in view.

Hanging Chutes

By L. D. Davenport*

When, in mining by the sublevel system, the ore has been sliced off down to the last sublevel above the main level, usually about 10 to 12 ft., it is evident that an ordinary chute will hold only about one car of ore at a time, as shown by the accompanying sketch, Fig. 1. It often happens in such cases that the miners have to wait until the trammers empty their chute before they can go on with their work.



End Elevation Side Elevation

Hanging Chutes Used in Sub-level Mining

To prevent such waits the hanging chute was devised which has been successfully used in one of the mines of this district. The sketch, Fig. 2, shows the general construction of the chute. The track from the sublevel is carried by short drift sets, which also support the sides of the chute. The bottom is made of loose boards resting on 30-lb. rails which run lengthways of the chute and carry the greater part of the weight. These rails are hung to the caps of the small sets so as just to clear the top of the tram cars on the main level.

These chutes are sometimes made 20 ft. or more in length and hold a large number of cars of ore. One tram car may be filled, or several at the same time, by loosening and removing a few of the bottom boards.

In surveying deep boreholes, check measurements should be made a few feet above and also a few feet below the position where the first measurement was made, because (*Bull.* 92, I. M. M.), there may be a local magnetic attraction at the position of the first measurement, which might be overlooked if no check readings were made and then a misleading record would be obtained.

Handling Rock in Rock Houses*

The methods of handling copper ore in preparing it for the stamp mill have undergone some notable changes in the last few years. As one place is similar to another in many respects, a description of one of the Copper Range Consolidated rock houses will be given. The ends to be obtained in a rock house are: The separation of the waste rock and copper ore, segregation of the mass copper, and the reduction of the ore to a size suitable for the mill.

At present the grizzly has been almost entirely done away with. On leaving the skip the rock drops directly into a large bin capable of holding 20 or 25 skiploads. In the front side of this bin are two sliding doors, one in front of each dump, each operated by an 8-in. air lift. These doors are 5 ft. wide and 5 ft. high, and are lined with 2-in. cast-iron plates. The front of the bins above the doors is also lined with iron to protect the wall from the impact of the rock. The bottom of the bin is about two feet below the bottom of the doors, and this space is filled with waste rock until it takes its natural slope to the door. No paving is used except near the door, where a heavy iron plate projects into the bin at an angle of 30° to help in starting the rock through the door. Outside of the bin, in front of each door, is an apron or chute about four feet long, set at 30°. The lower end of the chute rests directly on the jaw of the crusher, which is a Farrel 24x36-in. crusher, run at a speed of 155 to 185 r.p.m. These are designed for as high as 300 r.p.m. There are two of these crushers, one in front of each door. Each has a capacity of from 500 to 1000 tons daily.

Fastened by arms to a shaft on the top of the crusher is a cradle or gate which drops into the lower end of the chute. This gate is operated by a 4-in. air lift. The operation of feeding the rock to the crusher is as follows: When the bin door is raised the rock runs into the chute and is stopped at the crusher door by the cradle gate. The bin door is then shut and any "mass" or large boulders that may have come down are sorted out. Then the gate is raised and the rock feeds directly into the crusher with little or no handling.

A trolley, carrying a 10-in. air lift, runs directly over the chute in front of the crushers, and by this means the mass copper and large rocks are quickly picked up and transported to the drop hammer, to remove any surplus rock. The hammer is set at one end of the building, and is operated by a small electric hoist.

On leaving the hammer, the mass is

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*Excerpts from an article by H. T. Mercer in the Michigan College of Mines Alumnus, for July, 1912.

pushed through a door in the side of the building and dropped straight down to a platform alongside of the railroad track. This platform is built of log cribbing filled with waste rock, the top being at the same elevation above the track as an ordinary flat car.

Hinged on the side of the rock house above the platform, in such a position that it swings out over the car, is a simple jib crane, built of an 8-in. I-beam, 10 ft. long. On this beam runs a trolley to which a chainblock can be attached. By this means the mass copper is easily loaded on the car. The larger masses are picked up by a chain, and an iron pan swinging on chains is used for the smaller pieces.

No sorting of poor rock is done in the rock house. All waste hoisted is dumped into a separate bin by means of a lower hinged dump. From this bin it is loaded into a car, trammed out on a trestle and dumped through a raise into the old stopes.

At several of the shafts, where the poor-rock trestle is of sufficient height, bins have been built near the end of the trestle about six feet back from the hole, or raise. Over these bins just under the car tracks, is a screen or grizzly about ten feet long, with bars 1½ in. apart, set at an angle of 35°. When the car is dumped, the waste rock slides over the grizzly. The larger pieces go into the raise and the fines drop through the screen into the bin, where they become available for road material and concrete. When no rock is being drawn from the bin it simply fills up to the screen, and everything goes over into the mine.

At one of the rock houses where the old screen bars are still in use and the crushers are set 12 ft. away from the screens, large feed pans or tilting pans have been installed, similar to those in use at some of the Calumet & Hecla rock houses. These pans are hinged at the crusher end, and extend from the crusher to the grizzly. At the screen end they are attached by a bail and chains to a large air lift by which they are operated. On being raised they stand at an angle of about 38° and feed the rocks to the crushers.

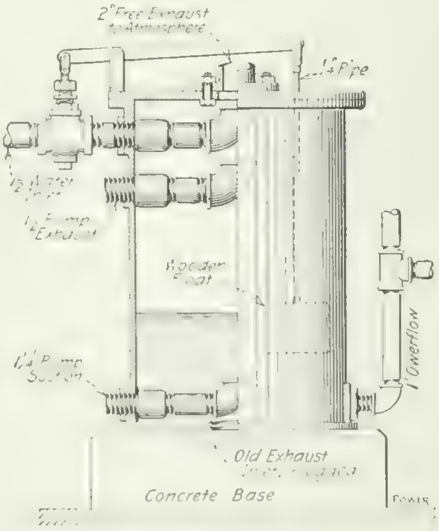
The main storage bins at the older rock houses are of the rectangular pattern, with sloping bottoms. The rock is drawn from these bins by means of apron chutes operated by long levers. Of late years, most of the rock houses built are provided with large circular bins of great capacity. The loading chutes in these circular bins are set in the bottom directly over the center of the railroad track. They are an improved pattern closed by small doors, operated by a system of levers from one central point. These new style chutes are more easily operated than the old aprons, and will probably replace the latter at the older rock houses.

The advantages gained by these changes are: (1) The large dump bin obviates the necessity of stopping the hoist in case of an ordinary delay at the crusher, such as the stopping of the crusher by a mass of copper. (2) Screen bars are eliminated and the expense of their upkeep. Under the old system, Sunday repair work was a big item. Since introducing the direct-feed scheme, Sunday work has been almost entirely done away with. The sliding doors and chutes last from 2½ to 3 years or longer, as do also the cradle gates at the crusher.

Perhaps the largest saving is in labor. Formerly a rock house crew consisted of six to eight men; at present two men will handle easily all that is hoisted. Handling of mass copper and large boulders has been made comparatively easy by means of air lifts, trolleys, cranes, and whereas in olden times a rock-house job was about the hardest job around the mines, it is now one of the easiest. Finally, to sum up the advantages in terms of actual saving in cost, suffice it to say that since installing the present system, the rock-house expense has been practically cut in half.

Home-made Feed Water Heater

The accompanying illustration shows a homemade feed-water heater which was made from material gathered from the junk pile, states W. H. Bennett, in *Power*.



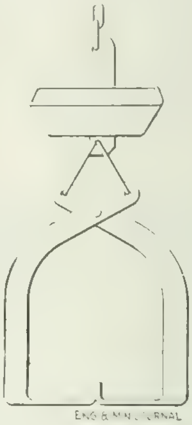
HOME-MADE FEED-WATER HEATER

Having on hand the old shell of a closed heater, I decided to use it in making the open heater shown. The illustration shows the material used and the arrangement of the various parts.

A 4½ and 2¾ by 4-in. duplex feed pump and a 6 and 4 by 6-in. service pump exhaust into the heater and raise the feed-water temperature to nearly 212° F. The surface water from the condenser enters the heater at about 100°. Approximately 2000 lb. of water per hour is heated. An oil trap is not needed with the heater.

Sanitary Clothes Hook for Change House

In some of the most modern designs for mine change houses, a large central room is provided for drying clothes, in which the wet clothes of the miner are hung from a hook attached to a line that passes over a pulley in the ceiling. The hook with the clothes is raised to the ceiling, where the hot air of the room dries the garments by morning. An improved hook for this purpose is described in the *Transactions* of the North of England Institute of Mining and Mechanical Engineers, by H. F. Bowman and W. B. Wilson. The hanger is called the stirrup suspender, on account of its shape.



CLOTHES HOOK AND SOAP DISH FOR CHANGE HOUSE

This hanger consists essentially of two pieces of iron, each resembling half of an ordinary saddle stirrup. The upper ends cross and are riveted together, so that the two pieces turn about this rivet in the manner of ice tongs. The lower end comes horizontally across to the center as the tread of a saddle stirrup, but the ends at the middle are turned upward an inch or more and the inside faces, which come together when the suspender is closed are corrugated. At the extreme upper ends of the two pieces of iron that constitute the tongs, holes are provided through each of which an iron link is passed. These two links in turn are passed through a hole in the end of a small strip of metal. Attached to this metal is a small soap dish, and at the upper end is a second hole and link, by which the hoisting rope is attached.

In use, the suspender is lowered; the two sides grasped and pulled apart; the miners' clothes are slipped between the upturned inner edges, then by pressing the two parts together and hoisting the rope the clothes are securely gripped and held in position near the ceiling. The soap dish is provided in order that each miner may have a bar of soap to himself.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Painting Cyanide Tanks

Where wooden tanks are used in cyanide works it was formerly the custom to paint them both inside and out. For inside painting the well known P & B paint was used almost exclusively, although in the Mexican plants a native asphaltic tar known as *chapopote* was used with good results.

Due, however, to the fact that it was found quite impossible to prevent the cyanide solution from reaching the wood, the practice of inside painting was discontinued and it is now exceptional to find a wooden cyanide tank painted on the inside. In practice the tanks thus untreated are tighter than those which have been painted. In painted tanks, the solution was found to get through to the wood in some spots and not in others, resulting in unequal expansion of the wood and the opening of interstices.

The outside of wooden tanks are almost always painted. If this is not done the alternate wetting and drying causes rotting which sets in at the outside and works in. The final result is a rotten stave or bottom plank through which the solution seeps and which cannot be remedied except by inserting a new piece of wood. There is no particular kind of paint required for the outside of the tanks, the only requisite being a paint of good body which will protect the wood. The solutions do not come in contact with this paint to any extent and therefore cannot be harmed. Iron tanks are usually painted on the outside as a preventive of rust, but are rarely painted on the inside. Graphitic or asphalting paints are good protectors against rust and are often used, although lead paints may be sometimes preferred.

Harz Jig Improvements

The details of construction of the Harz jigs which are installed in the Overstrom section of the mill of the St. Louis Smelting & Refining Co. are shown in the accompanying illustration. The ore of the southeastern Missouri lead district is treated in this section. In this ore the lead occurs as galena in a gangue of dolomite.

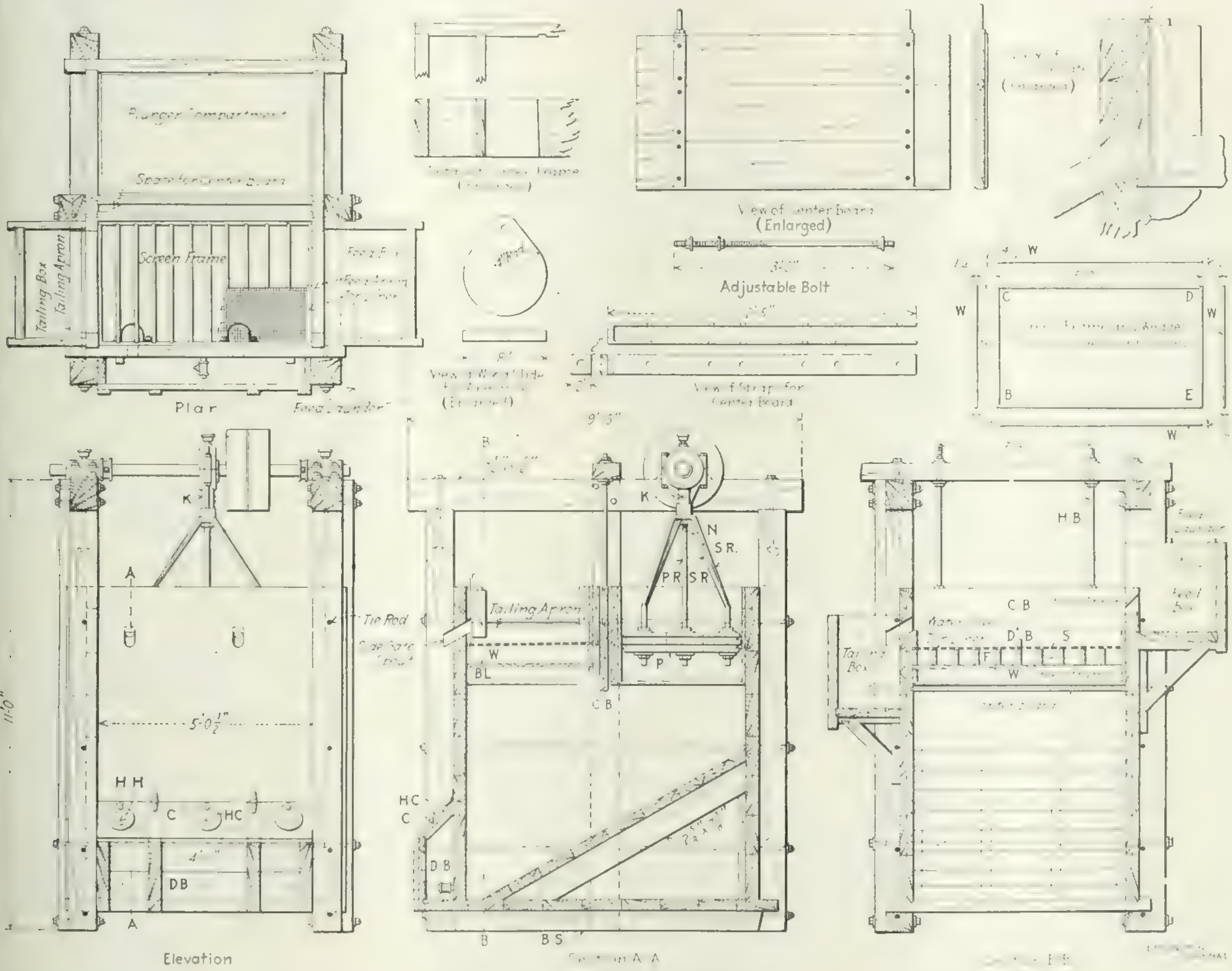


Fig. 1. Overstrom Modification of Harz Jig

There are two jigs in each section. One treats the sizes from 12 to 6 mm., the other the pulp from 6 to 3 mm. The two jigs treat about 600 tons per day. Only a gate concentrate is made, and what comes from the hutches is fine material carried over with the oversize from the trommels, together with a small quantity of fines that results from the abrasion of the bed. This hutch product is cleaned on a table. The size of the jig screens is 3x5 ft. The jigs are built with one compartment, but a division board is carried across the sieve to divide the jigs in two parts as far as the bottom bed is concerned, and a similar partition is put into the hutch. In this way a richer and a poorer product can be drawn from the gates, even if it is but a one-compartment jig.

The screen is supported by and nailed to the usual frame with cross slats, so as to prevent boiling of the bed. Owing to the width and length of the jig compartment, the sieve is given a slope of a ¼ in. in 36 in. toward the draw-off side while the feed end of the screen is 1¼ in. lower than the tail end. This is done by wedges placed under the screen frame and on top of the ledge or bottom-lining plank on which the screen frame rests.

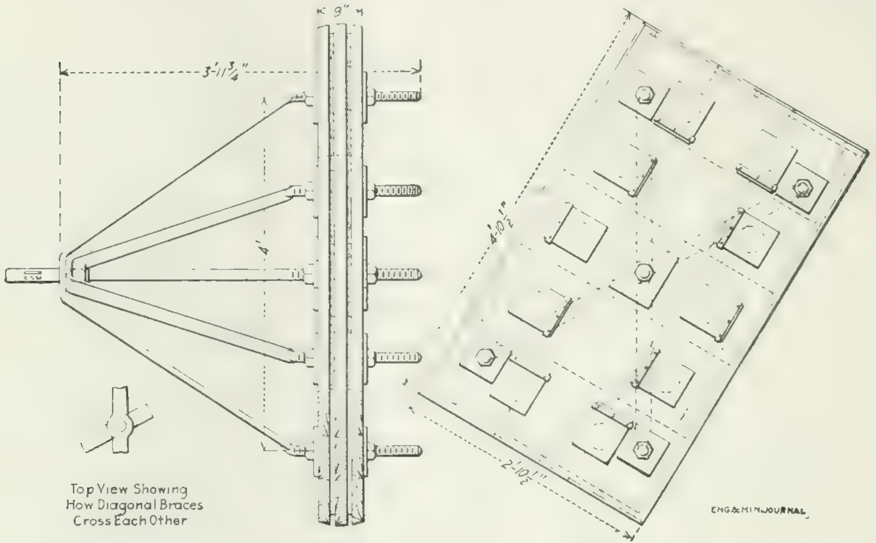


Fig. 2. Details of Jig Plunger

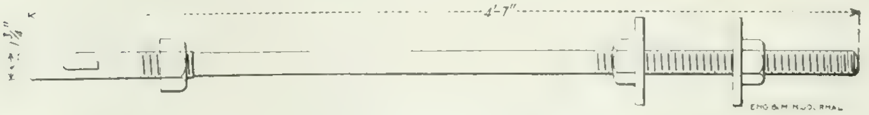


Fig. 3. Jig Plunger Rod

The plunger is secured to the eccentric by a plunger rod having four strap-iron braces extending down to steady the plunger so that there will be no tendency for the large plunger, which is an inch larger than the jig screen, to rock on the plunger rod. The plunger rod is attached to the eccentric by a key on top and a brass nut underneath. In order to take off the plunger when making repairs, the nut is loosened and then the key is driven out. This is a somewhat more convenient way of attaching the plunger to the eccentric yoke than by using two nuts and a jamb nut. Moreover when the plunger is once set, it can be taken out and put back in the same position without binding in the corners as is apt to be the case when the plunger is secured by the old nut system. In the Overstrom method, owing to the driving-in type of the key no jamb nut or lock nut has to be used. The eccentric is of the slip type, but has the advantage that the heads of the set bolts face the driving shaft and so cannot catch on the clothes of the attendant.

The most interesting feature of the jig, besides this improved safety eccentric, is the movable center board in the partition between the jig and the plunger compartment. This center board is swung from two hanger bolts that pass through the top strap of the center braces of the jig frame. It is held securely in the place where it is set, as a nut is used below as well as above the carrier beam. Owing to the use of the center board, the permanent partition between the plunger and the jig compartments is carried down only to the bottom of the bottom liner of the jig compartment, and all additional depth of partition is obtained by dropping the center board. By dropping the center board the depth of this dividing partition, upon which depends the evenness of the currents throughout the jig bed, is regulated so that the best results can be obtained and maintained. This is a far better manner of building the center partition than is the use of a permanent partition, which, in case a mistake is made in the original design, has to be chipped out if it extends too low and must be added to if too short, the plunger having been first taken out.

It will be observed that the binding timbers of the jig are so framed that the bottom sill does not extend out beyond the foot of the uprights, and so there is no danger of the attendants tripping. The body of the jig is made up of 4-in. planks laid on their sides. The joints are made water-tight by white lead and splines. The hutch draw-offs discharge into a box on the side of the jig. In order to prevent shavings and trash from getting into these boxes they are fitted with hinged covers in which are handholes. These handholes are 5 in. in diameter so that they are plenty large enough to allow the attendant to put his hand down and see how the hutches are discharging. The handholes are covered by slides. This cover slopes at an angle of about 45°. A walkway is carried along the sides of the jigs about 6½ ft. above the floor on which the jigs stand.

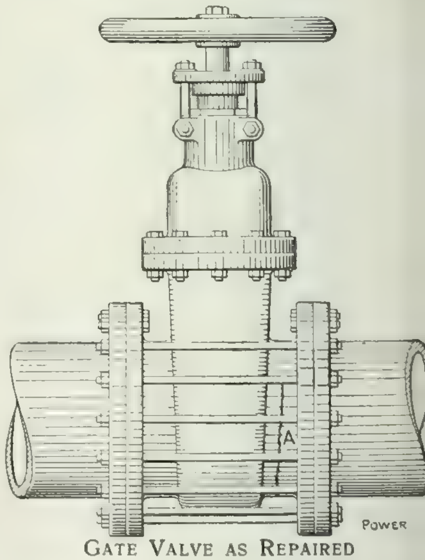
The jig is tied together by 1-in. rods with the exception of the two that run through the jig under the boards of the middle partition. The position of these tie-rods is shown by the black circles in the drawing.

The plunger is built with six flap valves operating on holes in the bottom 3½ in. in diameter, so that there will be practically no suction in the jigging, for owing to the fact that the concentrates are to come practically all from the screen and little hutch work is to be done, pulsion movement of the bed only is desired. In case suction is also wanted the intensity can be controlled by the number of these valves left working.

A Gate Valve Repair

A large gate valve in the suction pipe of a 3,000,000-1 gal. pumping engine cracked, as shown by the line *A* in the accompanying illustration.

Removing such a valve, states *Powe* was not only a laborious job, but an ex-pensive one as well. There were sixteen ¾-inch bolts holding the flanges of the valve and pipe together. Seven of these bolts were removed and through bolt substituted, passing through both flange of the valve and the two pipe flanges, a indicated. When the bolt nuts were tightened the metal on both sides of the crack was drawn together and the leak gave no further trouble.



Gate Valve as Repaired

This fracture was caused by shutting down the pump too quickly which created an excessive pressure in the suction pipe

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Ore Reserve Grades and Recoveries

One of the important aspects of mining, which is seldom referred to, is the relation of recovery to the assay of the ore in reserve, says the *South African Min. Journ.*, June 15, 1912. It has been demonstrated on the Rand ever since its inception that in practice, although the mill plates and extractor boxes may recover from 80 to 90%,or sometimes even 95% of the gold determined by assay in screen samples, as modern plants are now doing, the relation actual recovery bears to the content of the blocks in the mine is generally much below the above mentioned figures. Errors in sampling account for most of the difference. Each mine has to be considered as a case peculiar to itself in this regard, but a recovery of not over 85% is the general practice.

Separation of Titanium and Iron

The following method is given for the separation of titanium and iron by W. M. Thornton, Jr. (*Am. Journ. Sci.*, August, 1912). To the solution containing iron and titanium add tartaric acid in quantity three times the aggregate weight of oxides to be held in solution by it. Hydrogen sulphide is then passed until the iron is reduced to the ferrous condition. Ammonia is then added to slight alkalinity, and hydrogen sulphide again passed until the iron is completely precipitated, and the solution slightly alkaline to litmus. Filter and wash with dilute colorless ammonium sulphide. The titanium is in the filtrate.

Add 12 to 15 c.c. of concentrated sulphuric acid, evaporate to small bulk, and transfer to a 200 c.c. deep platinum dish, and evaporate until the tartaric acid has charred and frothed as much as the capacity of the dish will allow. Cool somewhat, and add 5 c.c. of fuming nitric acid. After the violent reaction has subsided, heat until the organic matter disappears, and the sulphuric acid begins to fume.

Pour the resulting liquid into about 100 c.c. of cold water, and add ammonia until almost neutral. This can be told by the formation of a turbidity which disappears only slowly upon vigorous stirring. Add about 1 c.c. of a strong solution of ammonium bisulphate, to hold up any traces of iron, then 5 c.c. of glacial acetic acid and 15 grams of ammonium acetate, and bring the volume up to about 350 c.c. Bring the solution rapidly to boiling, and maintain ebullition for about two minutes. The titanium comes down as a flocculent precipitate. Wash with water containing a little acetic acid first, then with water, ignite in contact with the paper, then with a Meker burner for 20 min., and weigh.

Alundum Filters Not of Constant Weight

Alundum crucibles, etc., have been recommended lately. According to E. B. Forbes (*Journ. Ind. and Eng. Chem.*, July, 1912), alundum is not constant in weight through treatment by water and fire, and hence is unsuitable for gooches and similar uses. He states that there is a hydration of some constituent of the crucible, the hydrate being stable at 160° C., but broken up considerably below 1000° C. There also seems to be a continued increase in weight on repeated heating, due to some still unexplained cause.

Russian Platinum Placers

Discussing Russian platinum placers, E. de Hautpick says (*Min. Journ.*, July 17, 1912) that the most recent geological investigations have confirmed the fact that the rich platinum placers are connected with olivine rocks, the outcrops of which conform—for example, in the Urals—to the known narrow zone where the deep-seated rock was exposed. Where this zone touches northward among the developed dunites, platinum is to be seen. Further to the south of the Goroblagodat region, the zone of deep-seated rock stops and the rich platinum placers also disappear. In places, outcrops of olivine rock are seen here and at the same time one finds platinum as an associate of gold. Generally in the southern Urals platinum is seen with other metals of the platinum group.

The placers in the Urals are becoming exhausted and it is necessary to exploit the poorer placers or platinum lying lower in the stratum. The high prices of platinum in recent years, in connection with the question of a state platinum monopoly, has stimulated the exploitation of all the existing sources of this metal —rich, poor, deep-lying, etc. At the same time it has been shown that neither in the Goroblagodat nor in the Nizhni-Tagil platinum region is it possible to expect a discovery of rich new placers, because all ground has already been used during 80 years of exploitation. This hope can be entertained only in the north of the Urals—for example, on the River Ioutyn, where outcrops of olivine rocks are shown—which are both unprospected and poorly investigated.

Accidents from Poisonous Gases

That no man should be allowed to enter a tower, dust chamber, or furnace through which poisonous gases have been circulating, without being attached to a rope held by a man outside is emphasized by the *Chemical Trade Journal*. A double fatal accident has just been recorded at Darlaston where a man entering a blast furnace was overcome, and also a fellow workman who went in to rescue him.

Artificial Nitrates in Germany

The Norwegian and Swedish artificial nitrates are beginning to appear in the German markets, says the *Oil, Paint and Drug Reporter*, June 24, 1912, although at present the prices are 1.9 to 2.2c. per kg. higher than the Chilean products. It is expected, however, that prices will soon be equalized. In 1911, German imports from Norway were 493.3 metric tons of sodium nitrate, 473.4 of ammonium nitrate, and 14,494 tons of calcium nitrate, and from Sweden, 139.2 tons of ammonium nitrate, and 1033.6 tons of calcium nitrate. There were 730,939 tons of Chilean nitrate received.

New nitrogen-fixation works are being built in Sweden, Norway, Upper Bavaria, the Tyrol, Switzerland, and the valley of the Rhine.

Borax Ore Treatment

The treatment of the colemanite ore, mined in the Lila C. mine, Inyo County, Calif., is thus described by the U. S. Geological Survey. "The best ore in the larger pieces is sorted by hand and goes to the bins for shipment in bulk; the larger part of the ore, consisting of mixed and finer material, is put through the mill at the mine before shipment. The treatment in the mill consists of crushing and passing through rolls so that the ore is reduced to 1 in. or finer. This is then passed through oil-fired rotary roasters. The flame does not come in direct contact with the ore, the roaster being fitted with an inner chamber which carries the ore. The colemanite decrepitates, falling to a fine white flour. The temperature at the hottest point is estimated as about 1200° F. The shaly particles and some portions of the ore do not break down and are separated from the powder by screening. The finer powder is sacked for shipment, the rest going to the dump as waste. The total output is shipped direct to the refineries of the Pacific Coast Borax Co., at Bayonne, N. J., where it is manufactured into borax and boric acid."

Flotation Processes

In the course of an interesting article in *Die Metallurgie,* Max Moldenhauer states that in the comparatively short space of 12 years about 500 patents for flotation processes, or apparatus in connection with them, have been applied for (*Min. Journ.,* June 29, 1912). All of them, without exception, are based upon the difference in the relations between ores and gangues to the surface tension of water. From the theoretical point of view, the only distinction between the various processes consists in the means adopted to raise the ore particles to the surface, but in the practical working of the various apparatus and plants there are some substantial differences.

About Weighing Scales

Although every engineer has to do with weighing scales in some form, it is surprising how few engineers are well informed on the essential points of such apparatus, says Dr. F. Reichmann, superintendent of weights and measures for the State of New York. In a paper before the Engineers' Society of Pennsylvania, he illustrated this point by citing (*Eng. News,* July 25, 1912), the case of an industrial concern which had a 2-ton scale for weighing ordinary iron castings and wished to use it for more accurate work in weighing copper. The scale was graduated to 5 lb. and sensitive to 5 lb. For the copper a scale reading to ¼ lb. was required. The engineer of the firm thought it was sufficient to order a new beam graduated to ¼ lb., and it took considerable demonstration to convince him that the whole scale would have to be replaced, and all the new parts made in accordance with the required sensitiveness and accuracy.

Where an engineer has to prepare specifications or is called upon to install a scale, the following pointers should be borne in mind:

(1) The specification should state the capacity of the scale.

(2) It should state the minimum graduation on the beam or the minimum reading if it is a dial scale.

(3) It should definitely state the sensitiveness at full load.

(4) It should specify that all pivots should bear their entire length.

(5) It should specifiy that there should be no deflection in the levers at full length.

(6) It should specify a stable foundation.

Mining at Laurium, Greece

The French Mining Co., of Laurium, with a capital of 14,500,000 fr., now employs about 3300 laborers, and the Greek Mining Co. about 700, whereas in former years there were over 10,000 men employed by both companies, from which it will be seen that Laurium is, and has been for some years, steadily decaying (*Min. Journ.,* July 27, 1912). Of course, the possibility remains of a new vein or veins being discovered, when the district may revert to its former prosperity for some time. The town is gradually being depopulated, and house property has sunk in value more than 50 per cent.

Lead and Tin in the Iron Blast Furnace

A case is recorded by W. Heike (Metallurgie, p. 313, 1912), in which tin scrap was mixed with the charge in a blast furnace smelting an iron ore carrying small quantities of galena. On closing down the furnace, a block of material was found carrying Pb, 88%; Sn, 3%; S, 8%. This consisted of two portions, a metal carrying 99% Pb and 1% Sn, and a matte, carrying 95.11% of lead sulphide, and 4.89% of tin sulphide. Of the tin added, about 7% was found in the lead, the remainder had been removed with the iron.

Nitrate of Soda Production

The statistics of sodium-nitrate production and consumption have just been issued for the six months ended June 30, 1912 (*Chem. Trade Journ.,* July 27, 1912), and are shown in comparison with the first six months of 1911, in an accompanying table.

CHILEAN NITRATE STATISTICS

	1912 Tons	1911 Tons
Production to June 30	1,219,980	1,231,285
Shipments		
To United States	235,304	254,849
To Europe	739,917	688,643
To all others	41,575	39,570
	1,016,796	982,882
Deliveries		
United States	275,425	330,000
Europe and Egypt	1,437,940	1,295,120
All others	41,575	39,570
	1,754,940	1,664,690
European Supply		
Afloat and in ports, June 30	321,111	342,630
Stocks in Chile, June 30	638,000	665,000

Commenting on these figures, our contemporary remarks that nitrate production has never been more of a mystery than at the present time, when it seems to be in universe ratio to the number of *oficinas* at work. Several old ones resumed operations on low-grade *caliche* and old dumps, following the advance in prices, while five new *oficinas* with a rated capacity of 225,000 tons per annum have lately commenced work, yet the six months' production fell off 11,305 tons, as compared with 1911. The general conclusion reached is that in view of the increasing output of ammonium sulphate, and of atmospheric-nitrogen products; the new *oficinas* in operation and under construction; and the sale of large Government areas at auction in October, 1912, that the present quotations on futures are without reasonable basis.

Petroleum Springs in Zante

The pitch springs in Zante, says *Daily Consular Trade Reports,* Aug. 5, 1912, are slow-flowing petroleum springs, the oil coming up in drops which break and spread on the surface of the water. Drilling was first attempted on this Ionian island by an American company in 1867, but no oil was struck. Since then four other companies have likewise unsuccessfully attempted to drill.

Recently a local company has tried again, found small quantities of oil at a depth of 200 or 300 ft., and installed heavy-duty drilling apparatus.

The promoters give the strata of the region drilled as follows: Up to 25½ ft., vegetable mold; up to 100 ft., clay with a thin stratum of sulphur; up to 230 ft., limestone; up to 310 ft.; a hard stone called locally "peritoilthos." This last stratum has never been pierced, and its thickness is therefore not known. The present promoters claim that the oil deposit lies beneath this bed of stone somewhere, and that the springs represent fissures in the bed through which the underlying oil oozes slowly. They are not agreed as to whether the oil will be found in a single reservoir or in several, the inclination being toward the latter idea, the argument in favor of this view being that the acute seismic disturbances of this region point to broken and upheaved lower strata in the geologic formations.

Treatment of Barytes Bearing Zinc Ores

According to a recent patent of J. O. Johnson, of Buffalo (No. 1,029,932), barytes may be removed from zinc ores by heating in the presence of a carbonaceous reducing agent, and leaching the residue with water. Barium carbonate may be removed from the leached residue with dilute hydrochloric acid.

The Magpie Dredge, Montana

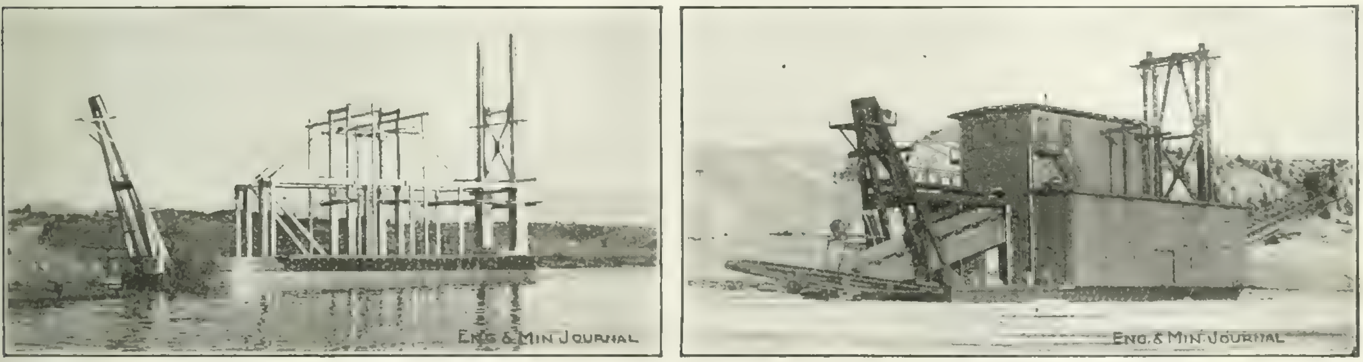
By Lewis H. Eddy

This 5-cu.ft. dredge, operating at Magpie Gulch, Mont., is of a modified California type, the design of hull and superstructure being a departure from the usual form of framing and trussing.

The Magpie dredge No. 1, built by the Union Iron Works and installed about one year ago at Magpie Gulch, Montana, is a modification of the California type that has a special interest, owing to the departure in design of hull and superstructure from the usual form of framing and trussing. It is equipped with continuous buckets of 5-cu.ft. capacity, revolving screen, longitudinal system of gold-saving tables, and rubber-belt tailings conveyor mounted on a steel truss; it has both spud and headline anchorage and is electrically driven.

SIMILAR TO LA GRANGE DREDGE

The Magpie dredge was designed by George L. Holmes of San Francisco. The general design follows the lines of the La Grange, Calif., dredge which also was designed by Mr. Holmes shortly after the San Francisco fire of 1908, and was the first to be built with this design of superstructure and trussing. The La Grange is equipped with 7½ cu.ft. buckets and flat shaking screens; otherwise the two dredges are practically alike.



MAGPIE DREDGE, MONTANA, SHOWING TRUSSING SYSTEM AND COMPLETED DREDGE

The hull of the Magpie dredge is 102 ft. long, 36 ft. wide on the water line, and 9 ft. deep in the center with the deck cambered 6 in. to facilitate drainage. The deck is overhung on each side of the hull from the stern forward to the front line of the deck house, the overhanging portion being 2½ ft. wide on each side and supported on sponsons or brackets bolted to the hull-frame stanchions. The hull, together with the superstructure and housing, contains approximately 250,000 b.ft. of select Oregon fir lumber, all of which was surfaced on four sides at the mill. It was built on the bank and launched endwise into a small lake.

The main-deck plan is shown in the accompanying engraving. On the main deck are the winches, pumps, gold-saving tables, etc.; on the mezzanine or half deck over the tables, which extends forward to the front line of the main gantry perpendiculars, ore situated the mooring-winch motor, main-drive motor and stacker winch. From this deck the revolving screen and main water valves are accessible, the main-drive room from which access is had to all parts of the main-drive gear, upper tumbler, resistance girds, operating-lever connections, etc., and which is provided with a traveling crane on overhead girts which extend from side to side of the housing and permit the heavy parts of the main drive to be removed and repaired with a minimum of lost time. On the upper deck is the pilot house or winch room from which all of the machinery is controlled.

BOW GANTRY HAS NARROW TOP AND WIDE BASE

The bow gantry is of a type first used in California on the dredge known as California No. 3, at Oroville and later on La Grange No. 1 with some modifications. Both of these dredges however were equipped with buckets of 7½-cu.ft. capacity. This type of gantry is built with a narrow top and a wide base, the top being just wide enough to permit the upper ladder-hoist sheaves being built in between the main perpendicular. The shaft on which they turn is supported in cast bearings securely riveted to structural-steel plates forming the gantry cap on the front side; cast-steel lugs for attaching the back guys are similarly fastened to plates forming the back side of the cap, the whole being bolted through with heavy bolts. This type of bow gantry is claimed to have greater strength and rigidity with less weight and material than any other form yet devised for wood construction.

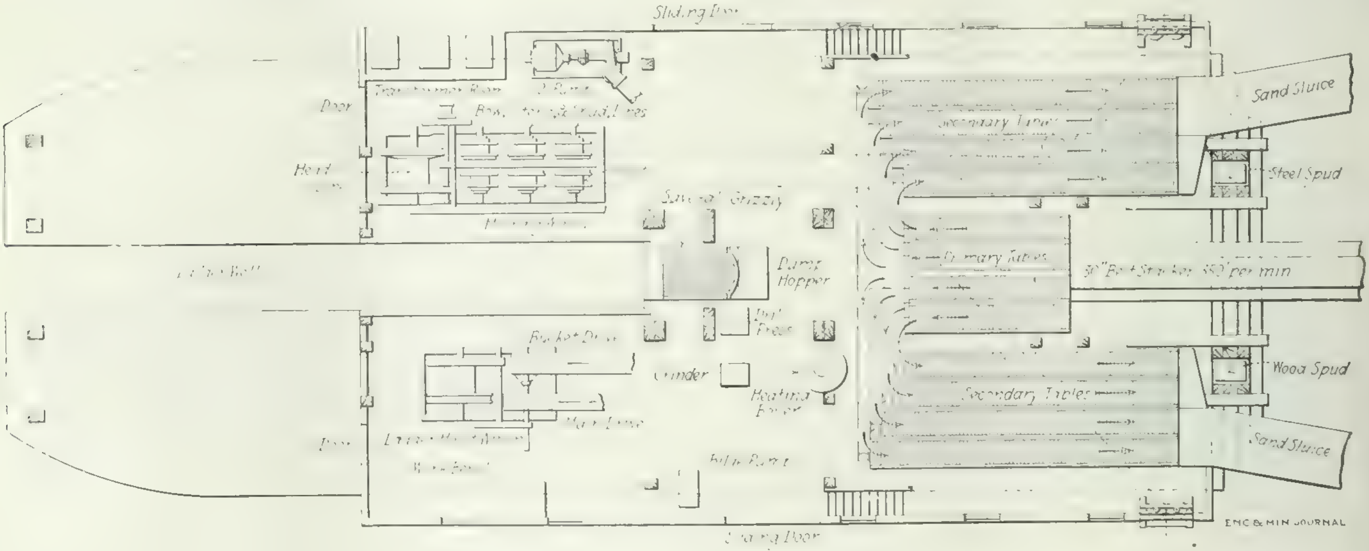
The center or main gantry is of a 4-post type, the main perpendiculars being extended aloft to a height sufficient to support the traveling crane girts and form compression members for the main trussing system. The stern gantry is of a type first designed for the La Grange dredge and is built entirely outside of the hull and bolted securely to the stern. The perpendiculars are provided with heavy chocks resting on the top stern frame and the spud guides are formed between the main perpendiculars.

From the bow gantry a pair of heavy stringers extends aft to a point just past the rear perpendiculars of the center gantry to which they are bolted on the inside while a second pair of stringers extends aft from the front end of the deck house on the outside of the main-gantry perpendiculars to the inside of the spud guides. At the intersection of these stringers with the main-gantry perpendiculars they are reinforced on top with heavy bridge-trees for supporting the upper tumbler shaft and main drive gearing. In this case the main bridge trees are wood-filled, double-web, plate girders 15 in. wide by 2 ft. 6 in. deep which together with the stringers give a depth of 44 in. of solid timber immediately under the main bearings.

A third set of upper stringers extends from the outside of the spud guides to the forward end of the deck house, and support the main roof of the deck house, the pilot house, etc., as well as to assist the other stringers in distributing the strains of the gantries and spud guides throughout the entire length of the hull. The inner stringers serve also as the upper member of the main trussing system and a secondary truss extending aloft from the stringers to the top of the main gantry further serves to distribute the strains and stiffen the entire structure.

The pilot house is situated above the bucket chain and forward of the main gantry and dump hopper, extending far enough from side to side to permit the winchman a view of either winch through apertures in the floor. Windows in either side give the operator a commanding view of the whole field of operation and a series of windows in the rear permit the operator to see his guide and stacker as well as the driving gear, dump hopper, etc. The advantages of so placing the operator that he may see all of the most important parts of the machinery he is operating without leaving the winch room will be apparent to all who are familiar with this class of work.

A mezzanine deck is built in, extending from the stern to the forward perpendiculars of the main gantry, access to this deck being had by a staircase on each side. The mooring-winch motor is placed on the forward end of this deck on the starboard side and the main digging motor on the port side, opposite. The screen-drive motor, stacker-hoist winch, auto-starters for the screen and stacker drive and main water valves are also placed on this deck leaving only the pump motors on the main deck. This arrangement gives long centers for the main driving belts and keeps the motors from possible dampness from spray or from being wet while washing down decks. It also gives additional working space and bench room for small repair work, stiffens the entire structure and permits easy access to the working parts. The whole dredge was built with the idea of making impossible any distortion of the hull and consequent throwing of machinery out of alignment from the severe racking and twisting strains due to excavating in hard ground.



Main-deck Plan, Magpie Dredge, Montana

Buckets Have Cast-Steel Hoods

The excavating machinery consists of a chain of 5-cu.ft., continuous buckets weighing approximately 1200 lb. each, consisting of cast carbon-steel backs and hoods with manganese-steel lips and bushings. The cast-steel hoods were introduced by Mr. Holmes into the Oroville field in 1902 and occasioned quite a little humorous comment. They have since demonstrated their superiority over hoods made from steel plate and have been adopted by most all of the leading companies. These buckets are mounted on a deep, double-web, plate-girder ladder frame. The structural steel portion of this ladder frame alone weighs about 42,000 pounds.

The dump hopper is of structural steel and extends from the deck to a height sufficient to prevent spill of the buckets over the top. It is provided with a rock-retaining bottom so that the dump of gravel falls on stone and obviates the necessity of renewing steel wearing plates or bars; the lower portion is provided with a bar screen or grizzly and has save-all sluices built in.

The revolving screen is 5 ft. in diameter and 32 ft. long built with a permanent frame to which the screening surface is bolted in panels of such a size that they can be readily renewed when worn out without disturbing the rest of the screen. These panels are ½ in. thick and are perforated with ⅜-in. tapered holes. Liners of ½-in. plate are provided for all parts subject to the action of gravel, except of course the screen panels themselves.

The stacker is a standard form of 30-in. belt conveyor, mounted on a steel truss which overhangs the stern of the dredge. It is provided with a canvas roof and side coverings so that it can be heated by steam during the winter months. The troughing idlers are the Holmes form of four-roll idlers so arranged that each pulley is subject to individual lubrication and any pair of idlers can be removed or their angle adjusted without disturbing the rest. The conveyor is 100 ft. between centers and is driven from the outboard end. The belt travels at 350 ft. per minute and a separate winch is provided for changing the inclination of the stacker to suit the requirements.

Holmes Tables Used

The gold-saving equipment consists of a standard set of Holmes patent longitudinal tables, built of steel and arranged as follows:

Under the screen, sloping aft on a grade of 1¾ in. per ft., is a sheet-steel collecting sluice which catches all the fine material and water passing through the screen and starts it toward the primary concentrating sluices at a high velocity, the object being to keep fines and water well mixed and to keep all of the gold which has a tendency to float, as near the surface as may be. At the lower end of this collecting sluice the pulp strikes a casting which reverses its direction and starts it down the primary concentrating sluice and at the same time throws the surface or float material in violent contact with the mercury in the upper riffles of the primary, thus saving the finest gold at once and leaving the coarser product to deposit lower down in the sluices. Experiments have shown that in at least one instance 94% of the total cleanup was recovered in the first 4 ft. of the primary and that of the gold so recovered 26.8% would pass a 150-mesh screen. The primary in the Magpie No. 1 is 10 ft. wide by 14 ft. long, giving an area of 140 square feet.

The lower end of the primary is subdivided into eight channels, each channel leading its portion of the pulp through a steel launder into a secondary sluice 30 in. wide and approximately 24 ft. long inclined aft on a grade of 1⅜ in. per ft. The second concentration therefore takes place over tables of twice the width of the primary, over which the pulp is spread out to twice its former width and half its former depth, the area for secondary concentration being approximately 500 sq. ft. and when the upper portions of the sand sluices are riffled this area is increased approximately 100 sq.ft. although this is seldom necessary.

Pulp Distribution Important

It is the designer's opinion that the area of gold-saving surface is not as important as good distribution of pulp over such surface as is provided and proper dilution combined with proper grade and velocity of flow. Next to classification, distribution is undoubtedly the most important factor in close, commercial, saving of the gold; that area is worse than useless unless each portion of it gets its proper proportion of the pulp for concentration. In the older types of dredge where area was seemingly the only thing to be desired, seldom over 25% of the area was effective owing to the fact that the bulk of the pulp was delivered to one or two small side tables while the balance had practically nothing but muddy water passing over them.

In one instance, Mr. Holmes remodeled one of these old dredges thereby cutting down the area of gold-saving tables over one-half, reducing the crew one man per shift, (this man being necessary to watch and attend to the burlap mats) and increasing the cleanup greatly each month; the time for a cleanup was reduced from six hours to 1½ hr. This was done simply by making a proper distribution of the pulp over the requisite area and cutting off the rest. In another instance he remodeled an unsuccessful dredge and not only increased the capacity of its gold-saving tables by making a proper distribution of the pulp but proved, by turning it back into its own tailings, that it could re-dredge the ground it had already worked, at a profit. The cleanup for the first 30 days in the old tailings being about 600 oz., or slightly over 12c. per yard, where it had originally only recovered between five and six cents from the virgin ground.

Grade is another important factor and in the system on this dredge the primary and secondary tables slope in opposite directions and the flow of pulp is fore and aft of the dredge, that is to say, in the direction of the principal change of level of the hull. It will be seen therefore that if the grade of the primary is increased, that of the secondary is decreased and vice versa and a comparatively uniform flow is attained.

For the average dredging ground the simplest form of 1-in. angle-iron riffle has been found to be the most lasting and effective and it has displaced many other forms of riffles, burlap mats with expanded metal, etc., on practically all of the California dredges.

All of the water for washing and sluicing the gravel is projected upon the material in the screen in such a manner as to thoroughly wash it and carry the fines down into the gathering sluice. Many of the modern dredges are provided with two pumps, one for the jets in the screen and the other for sluicing purposes. Mr. Holmes contends that more water is usually necessary for washing the gravel thoroughly than is required for sluicing and that all wash water should pass over the gold-saving devices if close concentration is to be effected. The water supply in the case under consideration is furnished by a 10-in. Byron Jackson centrifugal pump direct connected to a 75-hp. motor. This is capable of furnishing 2800 gal. per minute under 65-ft. head. A bilge pump driven by a 7½-hp. motor is also provided and piped for bilge drainage, fire protection, deck washing and cleanup purposes as well as for priming the main pump. A drill press and an emery grinder, driven by an independent electric motor complete the mechanical equipment.

All Machinery Motor Driven

The motors on the Magpie dredge were built to specification by the Fairbanks-Morse Co. They are provided with solid, phosphor-bronze bearings in place of the usual babbitted cast-iron sleeves and are fully guaranteed as to speed variation, overload capacity, temperature rise, etc.

Thus far they have proven satisfactory and have been subjected to some severe tests in raising spuds which were frozen into the guides and handling the bucket ladder when there were 24 in. of ice in the pond. The digging motor has an efficient control. It will start on the first notch of the controller and the heavy bucket chain can, if desired, be moved an inch at a time up the digging ladder. The buckets can be run continuously at low speed or increased gradually to the maximum without overheating the grid resistance.

In the pilot house a neat bank of operating levers for controlling the various clutches and brake bands for the mooring winch is arranged at the winchman's right hand with the controller for the winch motor at the inner end in easy reach of the operator; on the left-hand side is the controller for the digging motor stands and next to it is a bank of levers controlling the ladder-hoist clutch and brake, the digging clutch and an emergency brake.

The levers controlling the spuds are in a separate bank placed near the center of the pilot-house floor and when the winchman is handling them he can plainly see his spuds and the end of the stacker. A three-panel switchboard in the pilot house provides means for controlling the electric circuits to the various motors and transformers. The current is brought on board at 2200 volts through a 3-strand, conductor cable.

Three terminal panels are provided for attaching the service cable. They are situated, one on the front end of the pilot house for use when working on a head line and one on either side of the stern for use when working on spuds. They are wired direct to a 2200-volt receiving panel with oil switch and circuit breaker; thence leads are taken to a 2200-volt distributing panel which serves the 75-hp. digging motor, 75-hp. main pump motor and the transformers. The lead to the transformers is divided, one portion going to a 10-k.w., transformer which furnished a 110-volt current for the lights and others passing to a set of three 30-k.w., transformers which furnish 440-volt current for the screen motor, stacker motor, mooring-winch motor and bilge-pump motor. All of the latter being less than 50-hp. in size are carried on a 440-volt circuit distributed from the third panel of the switchboard. This system has been used in many cases and is said to have met all requirements.

The construction of this dredge required the hauling by team of all lumber and machinery over a crooked and somewhat soft mountain road. The building site was about 16 miles from the railroad and as the dredge completed has a displacement of about 1,500,000 lb. the hauling was no small task. As many as 28 horses were used on a single load although the heaviest piece, a steel spud 24 in.x35 in.x60 ft. weighed but 15 tons.

U. S. Salt Production

The total domestic salt production in 1911 amounted to 31,183,968 bbl.; there were imports of 1,014,926 bbl., and exports of 349,092 bbl., says the U. S. Geological Survey. New York, according to the same authority, stood first among the producing states, but its figures are lumped with those of Louisiana, and reported as 11,234,928 bbl. Michigan stands second with 10,320,074 bbl.; Ohio was third, 4,302,507 bbl.; Kansas fourth, 2,159,859 bbl., and California sixth, 1,086,163 bbl.; Louisiana was fifth, according to the Survey's statement, but this would place its production at over 1,086,000 bbls., which would reduce New York's figure below that of Michigan. [The New York State Geologist gives the New York production at 10,082,656 bbl., which seems to bear out this view. —Editor.] In all, 15 states, and Hawaii and Porto Rico, produced salt.

Manganese Production in 1911

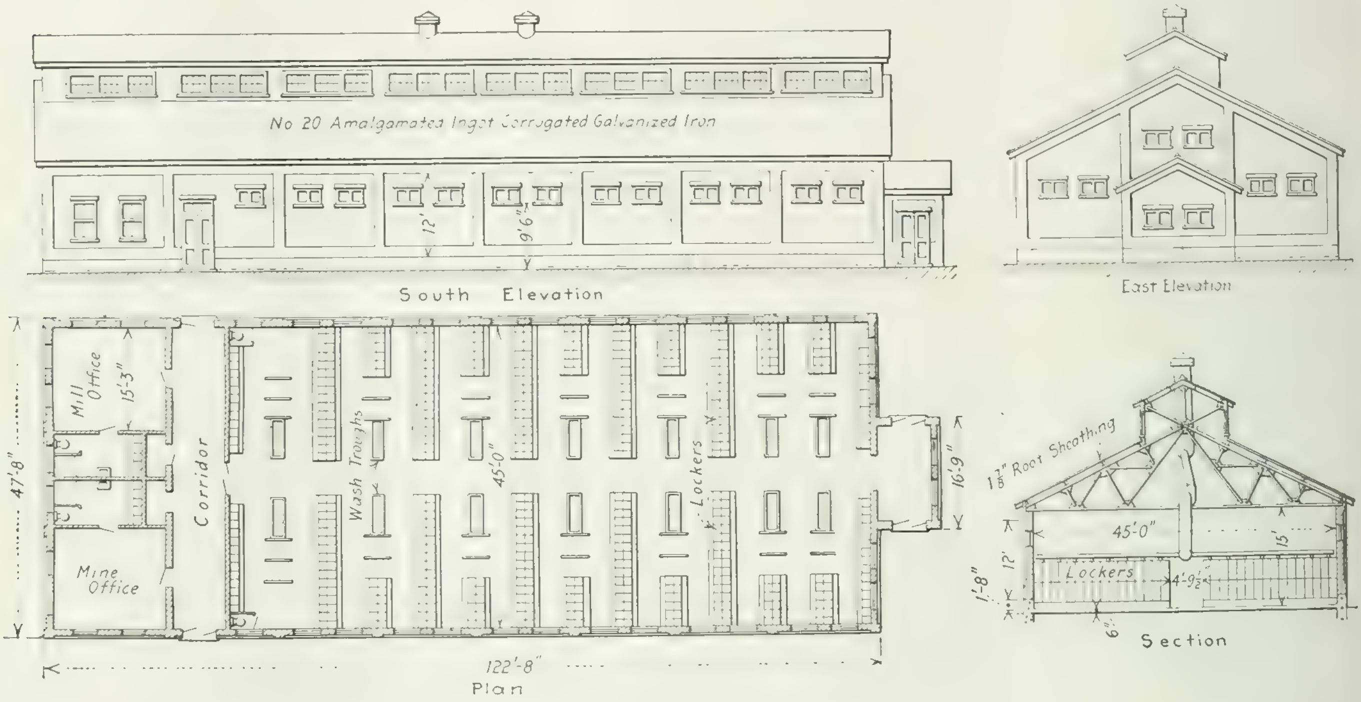
The production of manganese ore in the United States in 1911 amounted to 2457 long tons mined in California and Virginia, according to the U. S. Geological Survey. This was a slight increase over 1910. but the imports are still 176,852 long tons.

Change House at Franklin Furnace, N.J.

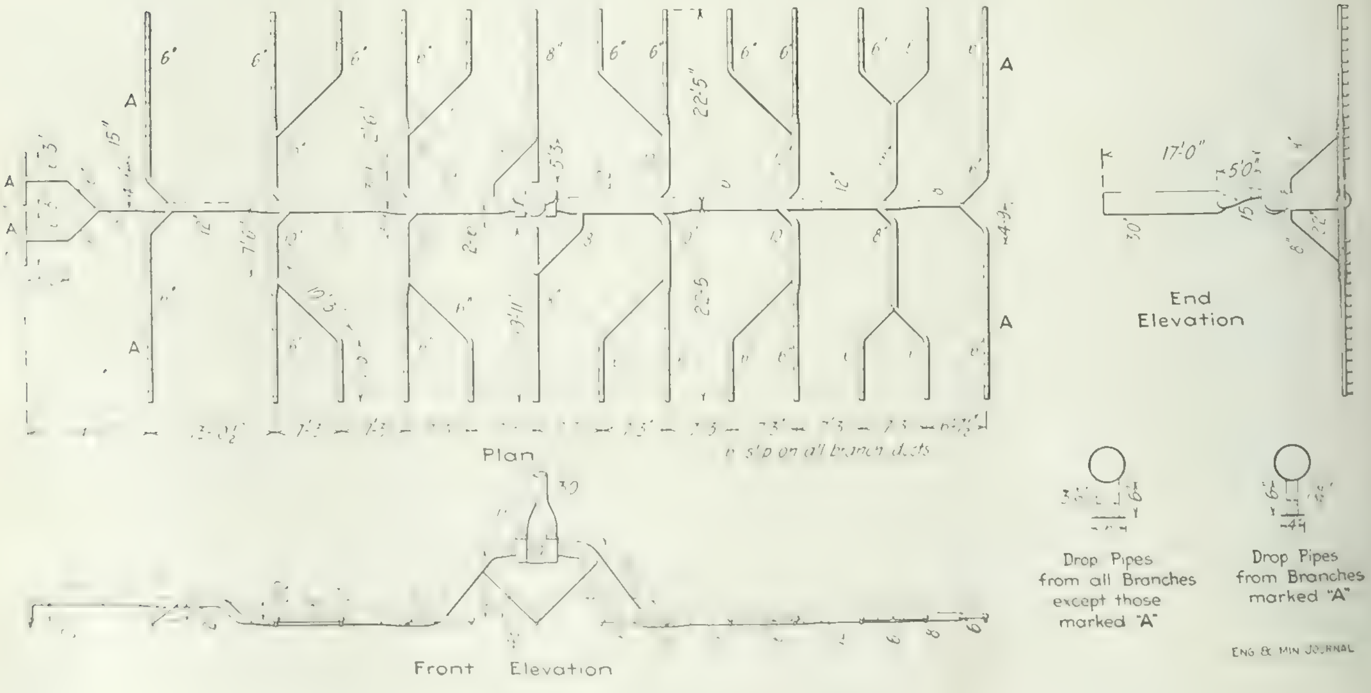
One of the best managed mines of the United States is the Franklin mine of the New Jersey Zinc Co., as directed by R. M. Catlin. Its conditions are peculiar and the methods of mining have had, of course, to be adapted to them, but equally, of course, many of the features of working are common to the working of mines everywhere. In almost all of these the Franklin mine exemplifies the best mining practice of the day, important improvements having been introduced during Mr. Catlin's régime. The net result of these is exhibited in a marvellous reduction in the number of men required to make a given tonnage of ore.

The Franklin mine is one of the first class as mines go, its output being regularly in excess of 1000 tons per day. The ore is hoisted in skips through the Palmer shaft, which is a thoroughly equipped, modern incline.

Besides the careful attention to the economics of mining, the comfort and welfare of the men are kept prominently in mind. Among the conveniences for them is a commodious and excellently designed change house, which is shown in the accompanying drawings so clearly that no further description is necessary.



General Plan and Elevation of New Jersey Zinc Co.'s Change House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6'
15"
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Plan
17'0"
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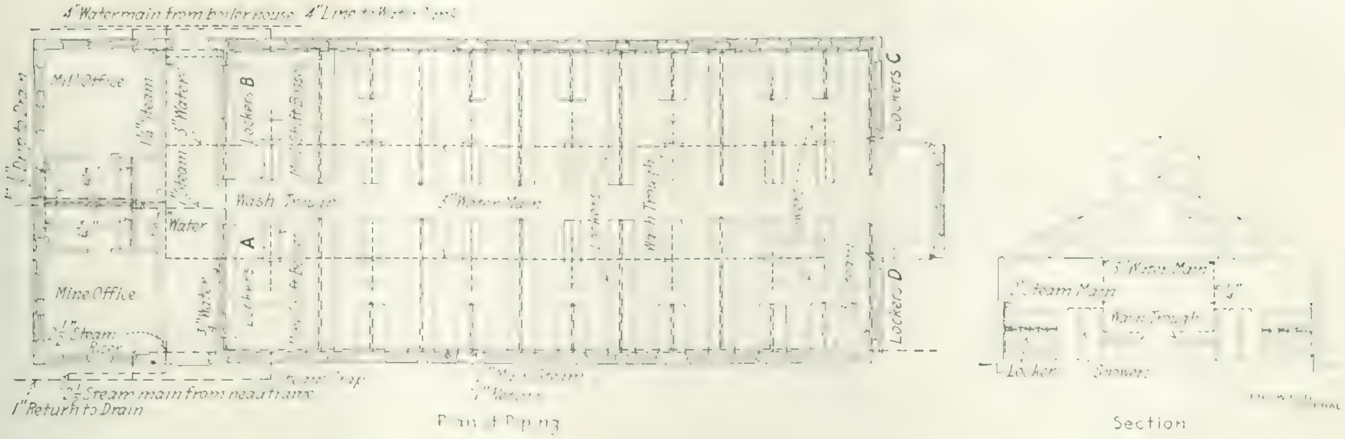
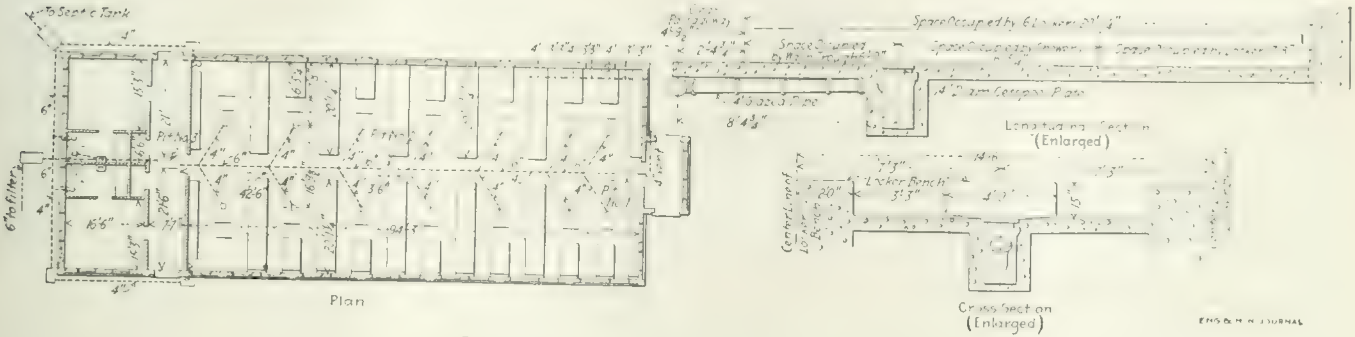
End Elevation
Drop Pipes from all Branches except those marked "A"
Drop Pipes from Branches marked "A"
Front Elevation
Eng & Min Journal

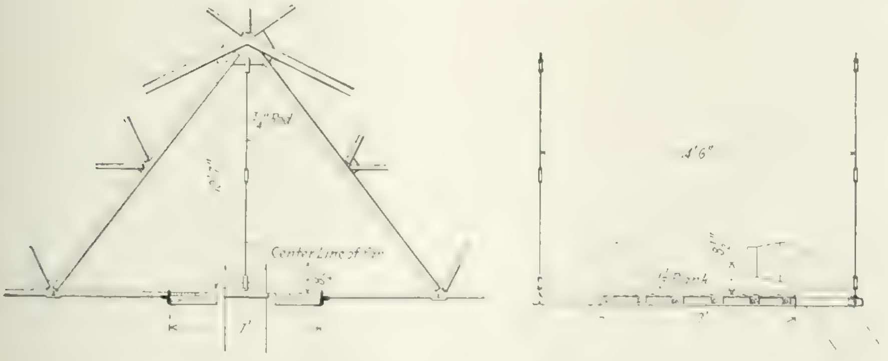
Details of Ventilating System



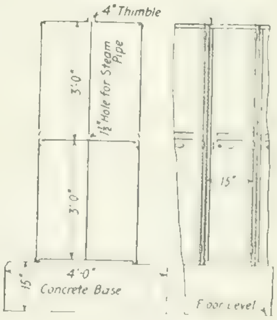
WATER PIPING AND LOCKER PLAN



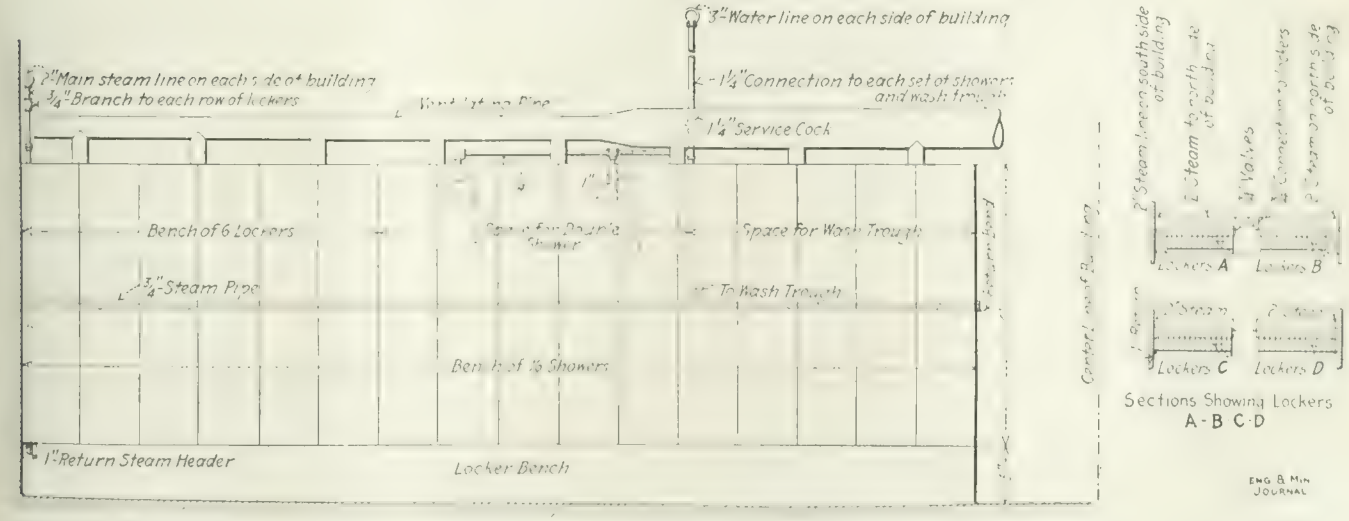
SEWER CONNECTIONS FOR CHANGE HOUSE



SETTING FOR VENTILATING FAN



LOCKER


3"Water line on each side of building
2"Main steam line on each side of building
¾"Branch to each row of lockers
1¼"Connection to each set of showers and wash trough
1¼"Service Cock
Bench of 6 Lockers
Space for Double Shower
Space for Wash Trough
¾"Steam Pipe
To Wash Trough
Bench of 16 Showers
1"Return Steam Header
Locker Bench
Center Line of Building
2"Steam line on south side of building
2"Steam to north side of building
¾"Valves
¾"Connection to lockers
2"Steam on north side of building
Lockers A
Lockers B
Lockers C
Lockers D
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Sections Showing Lockers A-B-C-D

AIR AND STEAM PIPING FOR CHANGE HOUSE, AT FRANKLIN FURNACE, N. J.

Cyaniding Troubles and Remedies—II

By Herbert A. Megraw

Agitators are not completely successful. The chief trouble in leaching is the lack of oxygen. Unsatisfactory extraction may be due to poor cyanide, impure lime or premature precipitation. The formation of white precipitate avoided by regulating alkalinity of solutions. Sampling methods inadequate.

Agitation is applied to slime and exceedingly fine sand for the purpose of insuring a thorough mixture of the solids in the solution. It is desired that every particle of solid should circulate through and come into contact with a sufficient quantity of solution so that the metal content of the solid particle will be dissolved in the solution without hindrance from other particles of solid. Many methods have been devised for accomplishing the desired result but it may be said with a good deal of truth that at the present time none of these methods are entirely satisfactory. Simple agitation with compressed air applied through hose and pipe, manually moved, and simple agitation with centrifugal pumps have been tried, but leave so much to be desired that they need not be mentioned now. The methods in use at the present time are the different kinds of mechanical stirrers, alone or in combination with compressed air and centrifugal pumps, compressed air agitation, and hydraulic agitation.

Mechanical Stirrers Largely Used

In the class of mechanical stirrers the most common device is the straight-sided, flat bottomed tank having a central vertical shaft which carries arms or paddles. Motion applied to the central shaft by means of gears causes the paddles to circulate in the tank and by this motion keeps in a state of suspension the solids in the pulp.

One objection that has been made against the mechanical stirrers is that while the solids are kept in suspension and action of the solution is freely permitted, at the same time a change of solution for each particle is not obtained. The idea is that the solution and the solid particles move in harmony so that at the end of the treatment, the solution in contact with any particular particle of solid, is about the same which began in contact with it and has followed through the treatment in contact with it.

This condition is really the existing one, to a certain extent, but the objection is mainly academic, at least for charge treatment, because the solution in one tank is not so different in different places that it would do any particular good to change it around. In addition, if it is desired to remedy this difficulty it would be simple to arrange the speed of the arms to such an extent that the greater part of the solids would not remain entirely suspended, but would sink at a calculated rate, thus passing through all the solution in the tank. Also the introduction of a centrifugal pump into the tank agitation would go a long way toward making a change of solution.

The mechanical stirrers may also be arranged in continuous circuit so that in their passage from one tank to another the solids would come into contact with a constantly changing solution. However, this involves one of the greatest difficulties with the continuous process, namely that the same solution is usually used throughout the treatment, and this is not conducive to best results in extraction. Undoubtedly the charge method here presents an advantage, for by this system a charge receives a number of definite changes of solution. It is undoubtedly true that the most effective solution for treatment is one which is quite, or nearly barren and contains a proportion of new or freshly regenerated cyanide. By the charge system this solution is constantly added, whereas by the continuous system it is difficult to obtain such a result.

One disadvantage of the mechanical stirrers is that the coarser sand and slime is likely to move toward the center of the tank where the agitation is less and there pile up, or cone, on the bottom, resulting finally in such a mass as to choke up the agitators. This condition may be avoided by using a circulating pump in connection with the tank, and arranging the intake of the pump near the center of the tank, instead of near the periphery as is generally the custom, by this means the settling out may be avoided and an improved result obtained.

The Pachuca Agitator

The well known Pachuca, or Brown tank is one of the innovations which have come into use during the last few years. It was at first supposed that by the use of this system a large economy of power necessary for agitation would result. Careful experiment, however, has shown that it has practically no advantages in this way. At the Dos Estrellas mill at El Oro, Mexico, flat-bottomed agitation tanks are used, 36 ft. in diameter and 10 ft. deep. The agitating device is moved by the usual crown and pinion gearing and has the usual arrangement of arms. The capacity of the tanks is 70 tons dry slime and the specific gravity of the dry slime 2.5. Three of these tanks are agitated with 20 hp., and this is a consumption per ton dry slime that can not be improved upon by the use of the Pachuca tank.

The Pachuca tanks may have some advantages in ease of operation, simplicity, etc., but the actual money advantage, it seems to me, does not justify the greatly increased capital expense for installation. If the charge system is used the advantage of the Pachuca is still further reduced, as it is not well adapted for decantation. The Pachuca tank is also subject to the settling out of the coarser particles of the ore. I have seen tanks in a continuous series of Pachucas so stopped up with settled sand that there was only a narrow channel left for the moving pulp to pass through. Of course this is decidedly objectionable as far as extraction is concerned for it materially reduces the capacity of the tanks and so reduces the time of contact with the solution. In using Pachuca tanks continuously, constant care should be taken to see that the tanks are open and clear, and not clogged up with settled matter, and this is a precaution particularly important because the settling can not be seen from the top of the tank but must be felt for with a stick or a weight attached to a cord.

Air under Pressure Effective

Contrary to general opinion, the Pachuca tank offers no great advantages in extraction. The inventor of the tank, Mr. Brown, never claimed a great increase in extraction, but based his claim of superiority upon the more effectual agitation given and upon the idea of the low cost of this agitation. I have always maintained that air not under pressure had little or no chemical effect upon treatment solutions beyond the small amount of actual air which is dissolved or carried mechanically in the water. The air assists but little in furnishing oxygen for the dissolving reaction, and all the experiments that I have been able to carry out have lent strength to that view of the matter. In order that the oxygen of the air be given up to solutions it must be under pressure, a condition which does not obtain in air agitation.

Hydraulic agitation is accomplished by substituting the compressed air of the Pachuca tank by a stream of solution introduced under more or less pressure from pumps in practically the same way that the compressed air acts in the Pachuca tank. The system has some advantages in that a change of solution is facilitated. It may be arranged so that a continuous decantation is made from the top of the tank and a fresh solution introduced for the agitation. The disadvantage of the system is that the power for agitating in a tall tank is increased and also the maintenance cost, due to the use of pumps which need continual attention and repair.

Parral Agitator Efficient

For an all round simple and efficient system of agitation, Mr. MacDonald's Parral tank idea seems to be a highly satisfactory one. The ordinary flat-bottomed tank may be used and the air pressure necessary to secure satisfactory agitation is much less than that required in the Pachuca tank and may even in some cases be secured from positive blowers in place of compressors. Mr. MacDonald claims that the settling or coning of the material does not occur, due to the rotary motion given to the pulp, but while this is true to a certain extent it is a little difficult to understand just why all settling should be avoided. However, even if the cone does form, it is more than likely to remain constant and if this is allowed for in the original design of the tank there should be no trouble. It seems that the system has great advantages for economy of installation and operation.

The different modes of agitation are so many that it seems as if most of them must have been devised with the idea of trying to get the effect of some already worked out system without paying for the use of the patent. It is so easy to modify any system in some way that will not seriously hurt it, and then get a patent on the modification. Apparently the time is not far away when all the possible combinations and permutations will have become used up and all covered by patents, and then the man who wants to agitate anything will have to pay for the right to do so. As an ameliorating fact, there will be so many competing processes that none of them will be able to make much of a charge for the use of its patents.

The general difficulty with agitation processes at the present time is that they do not effectively prevent the settling out of the solids, that they do not offer enough opportunity for change of solution, that they consume more power than is generally supposed and that they do not offer sufficient opportunity for the use of air under pressure. The remedies for most of these difficulties are simple, the main trouble being that they are not generally recognized as difficulties, and the remedies are not sought. The remedy for any difficulty, especially a mechanical one, is not difficult, but of course varies in each plant. After recognizing a particular mode of doing things as the wrong way, an ordinary use of natural ingenuity will be sufficient to put the operator on the right road. It can not be too strongly urged upon all operators that the search for troubles is important and, as one operator says: "The trouble is always in the last place you look for it, so look there first." The desired result in any agitation process is a continuous suspension of the particles in solution, a method of introducing fresh solution into circulation and the removal of used or exhausted solution for precipitation and regeneration.

Leaching is still used in a great many of the older and smaller plants and even some of the newer plants are returning to a system of partial leaching, believing that in some cases the additional extraction from fine grinding and agitation does not give any more profit than plain leaching, due to the cost of the grinding and agitation of the ground material. In many cases this conclusion is logical and has been arrived at after careful study. Leaching is a simple, inexpensive method of treatment, and by careful manipulation may be made to give splendid results. The first care in leaching should be that the material has been ground to the proper fineness to give maximum results and the material always maintained at the same grade. Deviation from this rule will give erratic results.

Lack of Oxygen Chief Leaching Trouble

It is generally found that the top layer of material in a leaching tank will give the best result, while the material lower down in the tank will give less and less extraction, the lower layer, in the bottom of the tank, giving the poorest result. This is undoubtedly due to lack of aeration in the lower part of the tank. The solution which is applied at the surface of the tank gives up its dissolved oxygen rather quickly and most of it is used by the first layers of sand with which the solution comes in contact. The amount of oxygen carried in solution is not great and its effect is confined to the first material which the solution meets.

There are two standard remedies for this difficulty in leaching. The first, one that has been used for years and is efficient, is the transferring of the sand charge from one tank to another, or the turning over of the charge in the same tank. Whether this operation be performed in one tank or whether the charge is transferred to another tank, the object is the same and is to invert the charge so that the former bottom layer will be the top of the transferred charge. This exposes new portions to atmospheric influence and results in an additional extraction of the precious metals which were locked up in portions of the charge removed from atmospheric influence. The only objection to this method of procedure is its cost, but the objection is serious, because the cost of such an operation is high. The second method of overcoming the effect of lack of oxidation is by introducing the baths of solution alternately on the top of the charge and at the bottom. By the latter method the fresh solution with its portion of dissolved oxygen is carried directly to that part of the charge most needing it, and the result is always good. The method is simple and easy to apply and is productive of good results.

In leaching processes poor extraction is often due to an unsatisfactory method of tank filling, whereby some parts of the charge are more porous than others. This causes the treatment solution to pass along lines of least resistance leaving parts of the charge partly or wholly untreated. Technically this condition is called "channeling" and is responsible for a great deal of the poor extraction in leaching operations. The plain remedy is in careful filling of the tanks, to avoid the existence of lumps of slime or lumps of sand covered with slime, which work to exclude solution from working upon the included portions. All lumps should be avoided as far as possible, and the slime, if there is an appreciable portion mixed with the product to be leached, should be so thoroughly mixed in with the sand that it will not collect in noticeable lumps.

Often an increased extraction in leaching may be obtained by using a vacuum pump between baths to draw air through the charge. By this means air is delivered to all parts of the charge and has an opportunity to act upon the portions which require oxygen for the completion of the dissolving reactions.

Premature Precipitation Avoided

In carrying out leaching operations, care should be taken that the solution coming from a tank should not be permitted to enter any other tank under treatment before going to the precipitation department. In the small plant, where economy is sought, leaching is often attempted from a number of tanks all connected to one large main pipe line which delivers to the precipitation department. Sometimes this is feasible, but to be so, the main pipe line must have a heavy grade and the precipitation department must be much below the tank level. Otherwise the solutions from a tank under treatment are likely to enter another tank under treatment, and in such cases precipitation is almost a certainty and trouble ensues. It is much better to have a separate line for each tank, directly to the precipitation boxes, and this recourse is strongly recommended as the entrance of pregnant solution into a charge partly treated will almost always result in precipitation of dissolved metals which are then doubly difficult to recover and makes an extra consumption of cyanide necessary.

While leaching is a simple and efficient process, it requires the exercise of vigilance to avoid unnecessary losses. Care and the exercise of good sense is as necessary in this department as in any other, but given this care, the leaching method of treatment offers a simple, cheap and effective method for the recovery of the precious metals.

EXTRACTION DIFFICULTIES ARE MANY

Difficulties with extraction result from many causes and these are so varied that it would be almost hopeless to attempt to catalogue even a majority of them. Experience has shown that the most general cause of faulty extraction is carelessness in operation. In speaking of faulty extraction, reference is made only to those ores which have been proved susceptible to cyanidation and which have already yielded good extraction, but which for some local or temporary reason are not giving the usual results. In such cases the first thing to do is to revise the treatment from one end to the other and see that conditions are what they should be. It often happens that through some oversight an important detail is beng omitted, with results which are disastrous to treatment.

A careful examination of the water used and the resulting solutions should be carried out as mentioned heretofore, so that if any disturbing element is being introduced through this medium, steps can be taken to exclude it. The chemicals used should be submitted to a thorough examination, for these may be faulty and may be the means by which disturbing factors enter. Even the cyanide may be wrong, particularly if it is not new and of standard make. I had the experience of faulty cyanide at one time in a mill far removed from commercial centers. The supply had run short and in order to keep the mill in operation, a supply was purchased from a local dealer. The material was old and not of a standard make, but showed about 90% of available KCN under the usual test. Its use was accompanied by curious actions all through the plant. The extraction fell off remarkably, in fact, went to pieces. A thorough analysis of the material showed that almost all the contained cyanide was in the form of NaCN, and contained a large percentage of impurities. A large factor was the NaOH content, which was large enough to make the solution a solvent for many elements which tended toward consumption of cyanide and seemed to oppose extraction of the silver and gold content. The material also contained a small percentage of carbon, which, no doubt, induced a precipitation of some of the metal which had already been dissolved. It is a good plan to always examine a sample of every shipment of cyanide, for it is possible that there might be something wrong with it and it always pays to be on the safe side.

The lime used should also be subjected to examination, for it may contain undesirable elements. In Mexico many cases of lime contaminated with charcoal, the result of burning with wood, have been known and should be guarded against. The charcoal causes a precipitation of dissolved metals and also causes a loss of cyanide. Methods of analyzing the lime have already been given and every shipment should be thoroughly tested to make sure that the material is right.

Premature precipitation is, in general, a prolific source of trouble but, unless one is on the lookout for it, it is not usually recognized except by the man who may have had the experience before. It may be stated with certainty that having had the experience once, the operator will not forget about it, and will be more than likely to look for that trouble at the first hint of discordant results. A careful, systematic assaying of the pulp in its course through the mill is more likely than any other way to bring this matter to light, and often where it is least suspected. Assaying the charge in the tanks at frequent intervals will keep track of how the work is going on and will be likely to show if precipitation is taking place.

LEAD ACETATE FOR SOLUBLE SULPHIDES

Lead acetate is usually used in silver treatment plants for the purpose of precipitating soluble sulphides. These soluble sulphides interfere with treatment as silver will not remain in solution in their presence, but precipitates as sulphide and is lost in the tailing. Some authorities have maintained that the use of the lead salt is superfluous, believing that the zinc taken in solution in the precipitation department should be sufficient to precipitate any sulphides formed. This idea may be true in some cases, but in others it is not true.

I remember one case in which I tried to dispense with the use of lead acetate. After cutting out its use for some time, I found that my solutions were becoming turbid, there being a fine, whitish substance suspended all through the solutions. This matter would not settle and would largely go through any filter cloth. This turbidity was accompanied by poor extraction. Analysis showed that the suspended matter was nearly pure sulphur, and by following up the course of treatment, I could find a point where precipitation was taking place. Also an inordinate amount of cyanide was being consumed. Addition of the lead acetate corrected the trouble at once, and its use had to be continued in order to assure the proper extraction. This operation was on a silver ore, of course. An excess of lead acetate is about as bad as not enough, as it uses up an appreciable amount of cyanide without any corresponding gain in extraction.

Some years ago I conceived the idea that an addition of oxygen to pulp during treatment would improve extraction by giving the oxygen necessary for the completion of the reactions in the dissolution of metals in cyanide solutions[5]. I thought that by electrolyzing water I might obtain oxygen in available form for use in the treatment solutions, and simply allow the hydrogen formed at the same time to go to waste. I tried a large number of experiments utilizing free oxygen and found that almost invariably I obtained an increased extraction, and that the improvement was most noticeable on solutions that had been in use for a long time. The apparatus necessary for the generation of oxygen in the above mentioned way were not available at that time, and have never been since, I might add, but I made my oxygen chemically and used it on treatment solutions.

ELECTROLYTIC OXYGEN BENEFICIAL

I have always had the idea that the system on a practical scale would be most beneficial, but have never had the opportunity to demonstrate it. Recently, however, T. H. Aldrich, Jr., published an article, already referred to, on the use of electrolytic oxygen in solution, and has shown that beneficial results have been obtained on a practical scale. Mr. Aldrich obtained his oxygen by electrolysis, as I suggested, but by a different arrangement, although the effect is about the same. He forms his oxygen directly in the treatment solutions by electrolyzing them, the available oxygen being used in the reactions and the hydrogen allowed to bubble away. I consider the method of such importance and Mr. Aldrich's work as so thorough and illuminating that I propose to quote from the paper at length.

> It occurred to me that since water is composed of hydrogen and oxygen, if it be decomposed by the electric current, the hydrogen would bubble away and the oxygen would be carried by solution.
>
> This was tried in December, 1908, upon an ore carrying amorphous iron sulphides from which the gold could not be dissolved by cyanide with simple air agitation, no matter what the cyanide strength nor how great the time, although the gold, as revealed by the microscope, was all metallic. The process was first tried in an inverted bottle with the bottom cut out, the air being forced in through a glass tube in the cork to agitate the pulp. Two lead plates were inserted in the agitated pulp at the top. These plates were about 4 in. long and 0.5 in. wide and ⅛ in. thick. Through them was passed the current of an incandescent lamp, which being in series and burning dimly, gave about 0.25 ampere at the beginning. The value of the ore was $4 per ton. It was ground in the mill so that 60% passed through a 200-mesh screen. The value of the tailing after 48 hr. agitation with air alone was $1.25, but after agitation for 2.5 hr. with air and the electrodes inserted in the pulp as above described, the value was reduced to

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[5] Eng. and Min. Journ., Oct. 2, 1909.

> $0.40. This typical result was verified perhaps a thousand times, with uniformly good results. . . .
>
> There seems to be a regeneration of cyanide, and the process is certainly cheaper than any added oxidizer or even air agitation of the solution.
>
> We found by numerous experiments that the alternating current was as good as the direct current and had the additional advantage of giving no deposit on the electrodes at lower current density, and with lead there was no consumption of the electrodes even where the ore pulp flowed over them. . . .
>
> As finally used in practice in January, 1909, a battery, supplied with alternating current was placed in the barren sump. This battery consisted of 18 plates in series, each plate 6x6 in., with 110 volts between the two. The plates consumed 15 amperes, and produced sufficient oxidizing effect, or whatever other effect it may be, to keep the solution in condition to treat daily 40 tons of this ore. These plates, made of ⅛-in. sheet lead, were built to form a hollow rectangle in section, the rectangle being 6 in. high, 6 in. long and 1.25 in. wide inside. The two ends were lapped at the top and holes punched. The plate was bolted to a paraffined plank 1x6 in. on the top side; 18 of these plates were connected in series. The distance between any two plates was ⅛ in., and, of course, the current would travel principally across the ¼-in. gap instead of around the 1¾-in. gap from plate to plate. Lead wires were used from the surface of the solution down to the plates. We ground the ore in the tube mill so that 60% would pass a 200-mesh screen. Previous to using the batteries in the sump, the extraction in the tube mill was 20% during grinding; after the batteries were used, the extraction in the tube mill was 75%. The effect of the batteries seemed to build up in the solution gradually and to lose from the solution gradually when the operation of the batteries was discontinued.
>
> During two months in the fall of 1910 the mill was working coarse ground, partly oxidized ore carrying considerable sulphides. The water at the hydro-electric plant was low, and the use of the batteries was discontinued because the mill was driven with steam and no arrangement had been made to supply alternating current from any but the hydro-electric plant. During this time the tailings on $4 ore went up to $1.25 per ton, and immediately after the rains gave sufficient water to drive the hydro-electric plant, the values in the tailings diminished until $0.20 per ton was reached on identically the same head values.

The work carried out by Mr. Aldrich was systematic and thorough, and the results, as noted, were quite sufficient to attract serious consideration. However, the most significant paragraph, in my opinion, is the following:

> Since the installation of this process it has treated successfully at this plant 25,000 tons of ore of all sorts, oxidized, partly oxidized and sulphides. Previous to the use of the batteries, in treating sulphide ores the average cyanide consumption was 1 lb. per ton, in some months runing as high as 1.1 lb. After the use of the batteries the average was 0.45 lb., runing for some months as low as 0.23 lb. per ton of ore treated.

It seems to me that Mr. Aldrich's experiments go a long way toward proving that the supplying of oxygen to solutions aids materially in extraction, and the method described has the additional advantage of regenerating an appreciable amount of cyanide and thus reducing current consumption. The experimental application of this idea as described, or in some modified form, might be of assistance in some plants and a trial of it cannot be too strongly recommended.

CERTAIN ORES HIGHLY REFRACTORY

In many cases there will be encountered a form of ore which will give a high tailing no matter what the form of treatment used. One of the most skilled of our cyanide operators once informed me that he had encountered an ore near Indé in the state of Durango, Mexico, in which the gold content of the tailing could not be reduced below one gram by any possible means of treatment. The matter arrested his attention and he went thoroughly into experiments on the ore, even trying to dissolve the residual gold with aqua regia. Even this failed to dissolve it, and the only means by which it could be recovered was by the fire assay. The ore was too low grade to smelt, and consequently a tailing of this value had to be countenanced. His opinion was that the gold was in some combination, possibly some silicate which had not previously been encountered. In this case the rebellious gold was found in the lower levels of a mine, the upper levels of which yielded an easily treatable ore. Circumstances of this sort may be encountered occasionally, and of course there is no remedy but for the operator to do the best he can.

In Mexico, and possibly elsewhere, there exist a number of deposits of manganese-silver ores which have generally proved difficult to treat by cyanidation. In some cases the difficulty may be overcome by careful and systematic experiment, but in others there seems to be no general way to make such ores profitable, particularly if they are not of high grade. To those troubled with this class of material I should recommend the exhaustive study made by Will H. Coghill[6]. It is possible that the Clancy process, or some modification of it, might prove available on ores of this class, and it would certainly be the part of wisdom to make the experiment. Mr. Clancy's process has proved of real value on the low-grade telluride ores of Colorado and experiments on a small scale have shown that it assists on certain Mexican ores. It is quite possible that further experiment with it in different districts will show that it is of assistance in general.

The difficulties in precipitation are not so numerous nor serious as they may be in other parts of the plant, but they are troublesome, and if one is aware of the proper way to avoid or remedy such difficulties, a good deal of worry may be spared the operator.

EASY TO ELIMINATE "WHITE PRECIPITATE"

One of the principal troubles in zinc-box precipitation is the formation of the famous and widely heralded "white precipitate." This often forms in small amounts, one might say always, but rarely causes any serious trouble. It may, if not given attention, occur in large enough amount to stop precipitation by covering up the zinc, but by giving the matter a little attention this can be easily avoided. The white precipitate is of varying formation, and always results from one of two causes, that is, too much, or too little lime in solution.

Where there is too much lime, the remedy of course is to reduce the amount in use, and this, as I have stated before, is likely to improve treatment in other parts of the plant as well. Where there is too little lime, the natural remedy would be to increase the amount in use, but here some attention must be given to the treatment, and the amount of lime used must not be sufficient to interfere with the extraction process. In case a higher alkalinity is needed and there is already all the lime in solution that the treatment will bear, the remedy would be to try some other alkali. In silver treatment plants where lead acetate is used, there is rarely any difficulty from white precipitate, as the lead in solution keeps the zinc active and avoids its formation. Therein lies a hint, namely, that treatment of the zinc with lead salts may in many cases eliminate trouble of the kind.

Copper in solution causes trouble by plating on the zinc, and the remedy for this is to treat the zinc heavily with lead and to change the zinc frequently. Copper often precipitates in the last part of the zinc box, and when this happens, if the zinc is taken up as soon as the plating appears, and transferred to the head compartments where it can be acted upon by fresh, strong solutions, the trouble will be largely avoided.

Mercury is often encountered in old tailings, and causes trouble by making the zinc brittle and breaking it up into fine pieces. This fine zinc is stilll efficient for precipitation if care is taken to avoid breaking it too much and packing it closely in the compartments, so that the passage of the solution is hindered. A good method to handle this product is to place it in shallow trays made of screen wire, using a shallow layer of the fine zinc, and placing a number of trays of this kind, one above the other in the head compartments of the zinc box. Mercury is naturally a cause for high zinc consumption, but where the mercury-bearing material has to be treated, as in the case of old amalgamation tailings; there is no way of avoiding this expense without incurring a greater one.

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[6] Min. and Sci. Press, June 1, 1912.

Strengthen Solution before Precipitation

Extremely weak solutions are difficult to precipitate, and where they are in use it is often necessary to raise the cyanide content of the solution as it enters the precipitation boxes in order to get good precipitation. No attention need be given to this point where silver ores are being treated, as the solutions used in treating silver are of ample strength for satisfactory precipitation.

Chemically pure zinc is never a good precipitant. It is better to use commercial zinc which contains a small percentage of lead, which latter acts to produce a galvanic couple with the zinc, thereby assisting in precipitation.

By cleaning up zinc boxes at regular intervals, depending upon the amount of precipitate formed, making the cleaning thorough and by livening up the zinc by passing over it a strong cyanide solution, little trouble will be experienced with precipitation.

In the use of zinc dust, which is a method that is becoming more and more popular as its advantages become known, one avoids many of the difficulties inherent in the zinc box. The method is cleaner and easier and results in the total recovery of all precipitated metal at each cleanup. On extremely low-grade solutions zinc dust makes the poorest showing, because it requires an excess of zinc to produce anything like a barren solution. On solutions, however, which contain a fair amount of metal, zinc-dust precipitation will recover the highest possible percentage of the metal and will use equal weights of zinc and metal precipitated, and in especially favorable circumstances the consumption of zinc will be even less. The troubles accompanying the use of zinc dust are few and not serious, although if a method of rapid estimation of the metal content of solution were devised, it would assist materially in the saving of zinc dust, and thereby give added impetus to the method.

There are other methods of precipitation, such as charcoal, electrolytic, etc., but these methods are not in general use and a detailed description would be out of place here. I refer to an article on this subject in which I gave a brief description[7] of some of these methods.

Pressure Important in Filtration

Filtration has come to be one of the most important operations in cyanidation, and the number of filters presented on the market at the present time would give the idea that they are a necessary part of every plant. This is true in its application to the large plants, but there are many small ones operating quite successfully without a filter. The most satisfactory filters, for the plant large enough to afford them, are the standard leaf filters and the modified filter press. To my mind, the movable unit type of leaf vacuum filter is the most satisfactory in the majority of cases, although there are, of course, local conditions which might make some other type equally adaptable.

Filter troubles are usually those attendant on manipulation of the cake and are mainly mechanical. The formation of cake in any filter is an operation that should be most carefully watched, as upon the successful formation of a whole, homogeneous cake depends the success of the later wash which should recover all dissolved precious metals. In the vacuum filter, which employs a leaf, the formation of the cake should be begun with a low vacuum, much lower than that at which the cake is finished. By this means the first layers of slime which adhere to the leaf are porous, lightly laid and even, much unlike the condition induced by starting with a high vacuum, in which case the initial layers of slime form a close, tightly adhering cake adjacent to the filter cloth, and the cake becomes more and more loose as it builds up inducing a condition quite opposed to homogenity. A cake of this sort is more than likely to crack, and portions of it will drop off, especially from the lower part of the leaf, thus leaving bare spots through which the wash solution can pass, in a short circuit, leaving portions of the cake unwashed.

The same facts are true, to a certain extent, with the modified filter press, which acts like other pressure filters. In these machines extremely high pressures can be obtained, higher than those operated on the vacuum system, and in that lies their greatest danger. High pressures tend to make the cake more solid and impermeable, and the operator is likely to use his pressure carelessly because it attains speed for him and gives greater capacity.

By using a fresh or regenerated cyanide solution for the solution wash of the filter cake, an additional extraction can be gained. It is always well to make the most of opportunities of this sort, for they are exponents of the kind of thing that makes the difference between profit and loss.

In all filtration the desiratum is the formation of a cake that is even, porous and homogenous, so that the washing may be attended to easily and reach highest efficiency. If the operator will keep in mind the condition of his cake, even a poor filter can be made to do good work. The condition of the cake means a good or bad wash, according as the cake is well made or poorly built up. Form a good cake to start off with, and the rest of the operation will give no trouble.

Inadequate Sampling Methods

It is undoubtedly true that most plants operating the cyanide process at the present time are not properly equipped to accurately determine just what results are being obtained in the work on the plant. There are some items that require to be determined with the greatest accuracy before any real calculations as to results can be reasonably attempted. For instance, the weight of the ore which is delivered to the mill. There are remarkably few mills equipped to get an accurate statement of this item, and without it, all calculations are approximations and have no real weight. Most plants endeavor by methods of measuring and estimation to arrive at the weight of the ore taken into the mill, but such calculations can not be exact, and they are often intentionally erroneous, the estimations being kept low so that a high extraction results.

And it is seldom that there is a genuine attempt at a proper sampling of the ore delivered to the mill. This generally ranks with the weighing schemes and is usually a good or bad guess at it. Hand samples taken from the battery feeders, samples taken from the lip of a mortar, samples taken from the delivery of a rock crusher, heap samples, all of these figure more or less in the methods of arriving at the value of the mill feed, but they are all farcial and mean little. The continuous automatic machine sampler is the only thing that really will take a representative sample at a cost in keeping with modern milling, but the installation is so costly that such installations are confined to the large modern plants and the small mills have to get along the best they can with the available material. The end of it all is that comparative results of extractions in different mills mean little indeed, unless such reports of results are accompanied by full descriptions of the methods of sampling.

The method of calculation has a good deal to do with it also, and it is a good plan to work out these schemes thoroughly so that after all the trouble is taken to make up a report, it will really mean something to the experienced man who may read it.

Troubles in the cyanide department are a good deal like the troubles experienced in any other line of endeavor, that is to say that the more careful and skillful the operator, the less trouble he will be likely to have, although everyone is sure to meet the extraordinary from time to time. Care and experimental study, however, will show a road toward the overcoming of any difficulty.

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[7] Min. and Eng. World, Oct. 7, 1911.

Mining Copper at Lake Superior—VI

By Claude T. Rice

In the conglomerate mines, drift-stoping is impracticable; square-set timbering abandoned for stulls placed in batteries. Timbermen are paid well for recovering stulls in old stopes. Hemlock or hardwood timbers are used, and stulls cost from $2 to $8 each. Rope haulage is used advantageously in Red Jacket workings. Shafts are sprinkled and masonry walls built on levels for fire protection.

The mining of the conglomerate ore in the Lake Superior copper country is an entirely different problem from that of the amygdaloid, because of the weakness of the hanging wall and the great pressure that is upon all rock at the depth at which most of the mining on the Calumet & Hecla conglomerate is now going on.

No Drift-Stoping in Conglomerate

No drift-stoping can be done in the conglomerate mines as the Tamarack and Tamarack companies learned. Further, the mining must be done retreating from the boundaries, or stopes will be lost, and this rule must be obeyed no matter how much the mills need ore. This is so, not only because of the weight of the ground, but also because at these depths, where the rock temperatures approach 90° F., ventilation becomes of the greatest importance in order to maintain the efficiency of the men. If the block of ground is broken up between the shafts and the stopes, there is liability that the ventilating currents will short-circuit, and even if they do not, the air will circulate through hotter portions of the mine before reaching miners; the crushing and grinding of the hanging wall in the caving stopes, and the oxidation of the timbers, which decay so rapidly that a stull loses its strength in about a year, necessarily greatly increase the temperature.

Delays Fatal at Tamarack

It is due to just such causes that the Tamarack workings are so hot and poorly ventilated, and it is due to this, to a considerable extent, that the labor in those workings is so much less efficient than it is in the Red Jacket mine. No skip pockets can be used at the shafts, no dumping of ore from level to level, no delays in stoping can take place, or endless trouble begins. A level pillar was formerly left from 10 to 15 ft. thick at the top of the stopes, but the ore is now skinned out from level to level as mining progresses. Some of the old level pillars are being mined, now that the hanging wall has come in tight both above and below them.

In the amygdaloid lodes the length of the stope is fixed arbitrarily and the level interval can be made whatever is thought best, as determined purely by economic consideration; but the level interval in the conglomerate workings cannot possibly be made greater than 100 ft. nor can the length of the stope be greater than that which will allow the ore at the top of the stope to be all mined out before the hanging wall in the lower portion begins to get too heavy for the timbers. One might think that as the speed of stoping depends on the area, the level interval might be made greater and the stopes narrower, but this is not the case as it is better to mine with the slicing running parallel to the level than to enlarge the stope by cuts taken up and down the side of the stope. A cleat, as it might be called, develops in the ore, due to the pressure on it, and parallel to the long face of the stope. Should the face of the stope, therefore, run up and down the dip, loose slabs would be hanging along the face of ore above by the time that the machine reached the bottom of the stope and the work would become extremely dangerous. This would also necessitate carrying the machines up and down the stope.

Timbering the Conglomerate Stopes

The original method of timbering the stopes in the upper part of the conglomerate mines, where the width of the ore was not over 12 to 14 ft., was with stulls, and single stulls are still used in the narrower workings of the South Hecla mine, where the width of the ore is not more than 12 feet. But in time, square sets were resorted to. These permitted the use of smaller individual timbers, which was a distinct advantage because it was found that when the lode began to increase in width, the stulls, in order to hold anything, had to have a diameter of 30 in. or more. This rapidly increased the cost of timbering and timber was already rising in price because of exhaustion of the larger sizes of standing timber. These square sets differed from those used in the West, being of a more complicated framing and being put in with the post perpendicular to and the cap parallel with the walls of the lode, instead of with the post plumb as in Western practice. The cost of standing the square sets, the amount of timber required per ton of ore mined and the slowing up of the mining that resulted from their use, caused their abandonment and the Calumet & Hecla company again returned to stull timbering, for it was only in the mines of that company that square sets were used.

Unique Form of Stull Timbering

A unique form of stull timbering was resorted to. This consists of arranging the stulls in batteries of three. Two larger stulls stand side by side with common head-blocking, while in front of these a smaller post or stull is placed, carrying the cap or wall plate upon which rest the poles carrying the cross-lacing of slabs, broken timber and planks with which the dribblings from the roof are supported. This wall plate was formerly square timber, but is now a round log about 10 in. in diameter, flattened at the end so that it can be blocked down from the top on the front leg of the battery. It is generally put in when the battery is stood. If the back promises to stand well during the life of the stope, a block is inserted between the front leg and the top blocking of the battery, to be knocked out later, if it becomes necessary to put in wall plates and lagging. In this way a sort of stull set is developed which permits lacing the back and utilizing unframed and unbraced timbers in stopes that have great weight on them, even when the post used must be generally 20 ft., and in places, over 30 ft. long. The arrangement of the stulls in batteries has also permitted the use of smaller and therefore cheaper timber. After the ore has been mined, it is possible, also, to recover a certain percentage of this timber. Another advantage is that the arrangement of the stulls in batteries divides the work so that the top post takes much of the top weight from the others, while the two bottom timbers resist most of the bending stresses. This permits the use of a spliced stull, for the front leg in ground that is not especially heavy, by putting together two short stulls recovered from old stopes.

Breaking Ground in the Stopes

To commence the mining on a level, a small 7x7-ft. raise is put up for ventilation at the boundary or in the far stope of the level. This is the only raise necessary for there is always enough open space between the caved roof of the last stope and the solid ground of the next, to produce good ventilation. The last row of batteries is roughly lagged to keep the ore in the new stope from mixing with trap rock from the caving roof. The cutting-out stoping begins by taking off the slices across the length of the stope parallel to the level. These slices are about 6 ft. deep in the Red Jacket workings. But in the narrower parts of the conglomerate, in the South Hecla workings, where the width at No. 9 shaft is only 10 or 11 ft. and at the other Hecla shafts 14 ft. for the top and 16 ft. for the bottom levels, a slice 7 to 8 ft. thick is carried across the stope. This slice, of course, is too great for one row of holes unless the ground is much broken up by shear planes near the face, but two rows will take such thicknesses, as in the Hecla part of the lode a burden of from 3½ to 4 ft. on the toe of a hole is quite common and in the Red Jacket workings the holes will bring 3 ft. of burden.

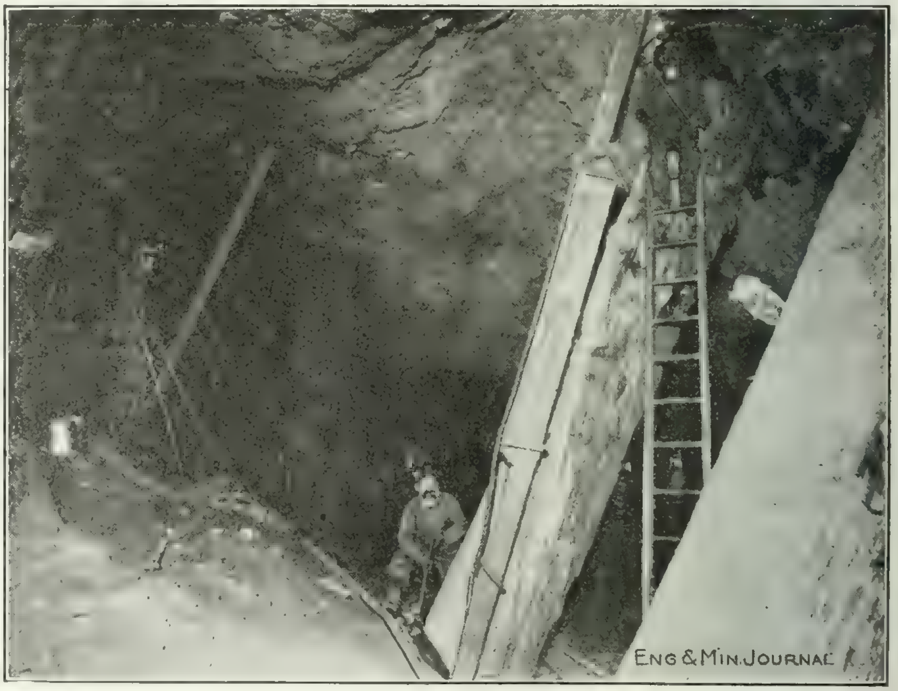
Three holes will almost invariably carry the lode from foot to hanging, although in some of the narrower stopes of the South Hecla workings, four are necessary. Often in the South Hecla, two holes are drilled in the first row and three in the next, and the front holes are blasted without tearing down the post. In both mines the holes are drilled 8 ft. deep in the stope and from six to eight sticks of 45% dynamite per hole are used. The men generally drill about 24 ft. per shift, or three holes. The two lower holes are water holes, while the ore next the hanging wall is brought down by an upper, for the conglomerate does not give as much trouble with dry holes as the amygdaloid ore does. After stoping is well under way, the men rig up on a stage carried by the timbers.

These timbers are put in as soon as stoping has gone up about 20 ft. from the foot-wall rail of the track and they are then carried quite close to the face to keep the "keb" of scaly trap, that forms the immediate hanging in some of the stopes, from mixing with the ore. The batteries are placed about 6 ft. apart on the strike and from 6 to 9 ft. apart on the dip, according to the condition of the hanging. These timbers are placed at right angles to the walls and are braced from one another both at the top and bottom, until sufficient weight has come on them so that the blast will not knock them out. In some of the wider stopes braces are placed between the batteries at their middle, to take care of bending strains, and occasionally the batteries are bound with wire rope at that point.

Putting in Battery Timbers

The timbers used in the batteries at the bottom of the stopes have a diameter of from 24 to 30 in. in the widest parts of the lode, but after the stope is halfway up, the timbers of decreasing size are put in until the top ones are only 16 in. through. These timbers are green and are quite heavy to handle. For this reason a small air hoist is installed at the shaft to unload them from the timber car and to lift them on the timber trucks that take them to the stope. Another air hoist is used to pull the stulls up in the stope and with a heaving pole, to the top of which is fastened a pulley, the timber is swung in place in the stope without any great exertion. The heaving pole is only a light cedar or spruce telephone pole that is put in from foot to hanging above the timbers. A hemp rope, of course, is used in handling the timbers.

There are five timbermen and a boss in a timber gang, one being a boy who runs the hoist. Such a crew in the narrow stopes of the South Hecla will trim down the hanging wall, stand two batteries and lace up the hanging in a shift, while in the Red Jacket workings, where the stopes vary in width from 16 to 25 ft. and average about 20 ft., a crew is able to put in on an average only one battery per day. In these batteries strong head blockings, covering a considerable area of wall rock, are used. But the posts, unless they are found to be too short, are stood directly on the foot wall. The timbermen in all the mines work day shifts.



Stull Timbering, Tamarack Mine

In the South Hecla stopes a covering of logs is carried on the second row of batteries, 4 ft. up from the ground, to keep slabs that occasionally drop out of the back, from bouncing down and hitting the men. If the back is especially bad, the covering is placed on the first row of batteries. In the Red Jacket workings, coverings are rarely used, except where the back is especially bad, as after the breast of ore has been worked up into the stope some distance, the covering does not give the men much protection for the boulders are apt to pass under the covering.

Slide Chutes in Stopes

Slide chutes are generally placed between the batteries. In the South Hecla workings the chutes are put in with a steel plate, 4 ft. wide and 8 ft. long, forming the center part, with hard-wood planks on each side to fill the space between the center plate and the batteries. A plank placed on edge is nailed to the batteries and the planks, to contract the width of the chute mouth. In the Red Jacket workings the iron plate is commonly omitted and the whole bottom of the chute is made of hard-wood planks. The weight of the overhang of the chute is carried by a cross-piece. Formerly this was fastened in place by iron hangers driven into the posts of the batteries, but now the cross-piece rests on short legs placed under each end, and is fastened to the battery posts with long spikes. This is cheaper and permits the cross-pieces to be removed more easily.

The length of the stope depends upon the width of the lode in that part of the mine and the condition of the hanging. In the Red Jacket workings the stopes are carried from 80 to 110 ft. long; in the South Hecla workings the length varies, according to the width of the lode, from 100 to 150 ft., with an average of about 135 ft., while in the Calumet workings, where there is the heaviest hanging in the district, the stope cannot be carried more than 80 ft. long. Two machines are used in these conglomerate stopes, but if the hanging is especially heavy, three are used so as to hurry the mining, as the weight on the stope is dependent, to a large extent, on the length of time that the ground has been opened. In the Red Jacket workings it takes about five months to drive one of these stopes from level to level, while in the South Hecla workings it takes about seven months to drive through a stope 100 to 125 ft. long, and eight months for one 135 to 150 ft. In the Calumet workings a stope must be carried through from level to level in three months.

RECOVERING TIMBERS IN STOPES

The stope length is planned so that the roof in the bottom part will still be good enough at the end of stoping to enable timbermen to go in and rob the stope of timbers. At the Red Jacket workings this robbing is done on overtime, after the shift in the stopes is finished. But in the South Hecla workings the timbermen are allowed, whenever they are caught up with the timbering in their stopes, to recover timber during their shifts. At times as much as 20% of the timber used in a stope is recovered, but this work has been going on so short a time that it is hard to give any general statement as to recovery. The work permits the men to make a good bonus, and it pays the company well as the value of the timber underground is far greater than its first cost, owing to the expense and time of getting it underground.

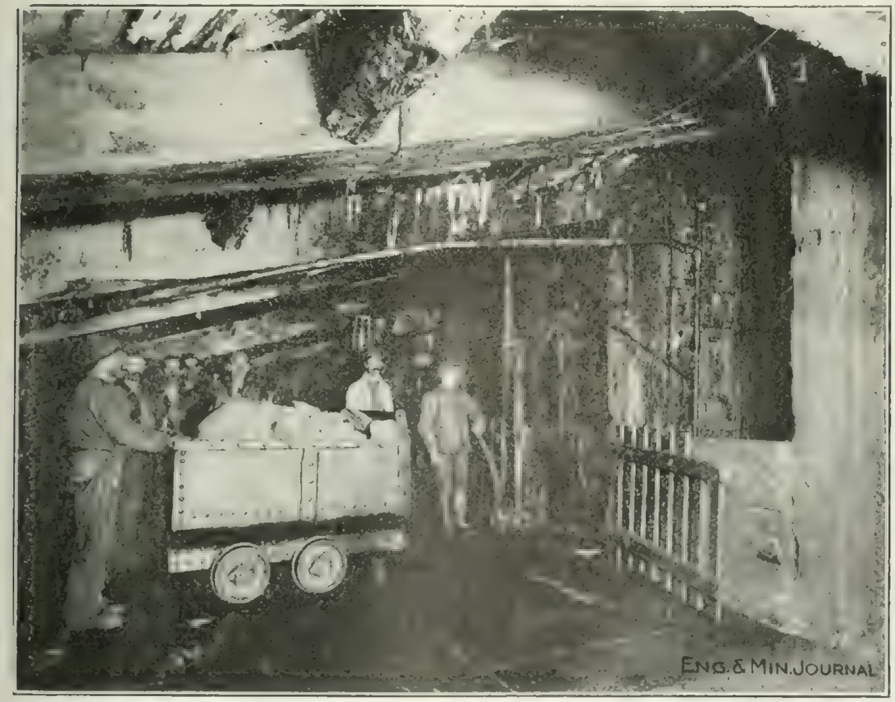
The timbers are recovered by blasting the ground from under them with a pop-hole in the foot wall. It was formerly the practice to shoot the batteries out by placing dynamite in a hitch cut in the timbers at the bottom. But this is no longer permitted as it started a fire in the Tamarack mine and many timbers were split by the dynamite. Before blasting the holes, a rope from the timber hoist is fastened to the battery and the air is turned on so that the timbers can be jerked out as soon as freed by the blast. This saves them from being buried under the loose rock resting on the top lagging and allows the men to work in less danger. As much of the lacing is recovered as possible, although a portion of it lies under the pile of rock that has come from the hanging.

KIND AND COST OF TIMBER

These battery timbers are either hemlock or hardwood. The hardwood is mainly birch and maple with some ash and elm. The hemlock is short-grained and brittle and lasts better if put in green. In the stopes the hemlock fails through decay in about a year, although in the better air of the shaft it lasts more than twice as long. The hardwood is also put in green. Little, if any of the timber used in the stope is barked before being sent into the mine. The wedges used are sent down strapped into bundles.

The hemlock battery posts cost from $2 to $8 apiece, while the lacing and sprag timbers cost from 4c. to 9c. per running ft., according to size, the company taking all logs scaling over 8 in. In this way the logger is aided in disposing of all his trees and so is able to make a cheaper price than if the company took only the larger sizes. Much of the smaller timber is hewed flat in the woods owing to its being too small to send to a saw. This is sawed up into head-blocking and used for lacing, where one flat side is desired. Many of the smaller logs are ripped in two by a portable saw at the mine and these are also cut up into blocking and used as lacing; but most of the lacing in the stope is old stuff recovered from other stopes and broken sollar and chute planks.

The hardwood costs the same as the hemlock, but it decays rapidly; in fact, in shafts it falls to pieces in a year. Hard-wood planks, such as are used for sollars and chutes, cost only $14 to $15 per thousand, as mill rejects, discards containing knots, and heart pieces are taken. For the recovered timber, the men are paid $1.50 to $1.75 apiece for stulls in good condition that are about 14 ft. long, while for the longer pieces in the Red Jacket workings, they are paid $2.75 or more, depending upon the conditions and the value of timber delivered to a stope in that part of the mine.



SHAFT STATION IN TAMARACK MINE

ROPE HAULAGE AND SHOVELING

In the Red Jacket workings the drifts are now driven so as to carry two tracks. in driving the drifts the trammers load cars on both tracks. When stoping begins the trammers use the foot-wall track, and the timbermen the other for running in their timbers, without interfering in the least with the loading of the cars. Most of the ore in the stopes is loaded in the cars by scraping it off the chutes at the bottom of the stopes, although in a few stopes of the Red Jacket workings where the foot wall happens to be high, the slides are not used, but instead a sollar is put in that stands about 2½ ft. above the track. The cars are hauled to the shaft by a crude rope-haulage and no hand-tramming is done. The air hoist at the shaft station has two drums that can be thrown in or out by a friction clutch. One drum carries the hemp rope used in unloading timbers, while on the other is wound the wire rope used to haul the cars out from the stopes. In the Red Jacket workings strands of old hoisting cable are used for this haulage, as they can be cheaply unstranded and are sufficiently good to serve on the haulages used at these mines.

This haulage aids the men and they are able to do a little more work than in the amygdaloid mines; in the Red Jacket workings a man will load 15 tons from a low sollar, 17½ tons off a high sollar and 20 tons off a chute in a 9-hr. shift. Two men work on a car and the car holds 2.3 tons, while the skips hoist three cars of rock per trip. At the Red Jacket mine the men are paid for all cars loaded over the stint, a bonus of 40c. per car from low sollars, 35c. for high-sollar cars, and 30c. for chute cars, and some of the men load considerably more than the tonnages given, which are about the average for the mine. In the South Hecla workings the men load 14 to 16 tons of ore from a low sollar in a shift, and 21 tons from a chute, the work being done on contract. In order to even up the work the trammers are changed about in a mine so that each man has to take the bad and the good places in turn. The foot wall in the conglomerate workings is fairly smooth so that most of the ore that accumulates on it is easily taken out by the scraper. But when there is not much bellying of the foot, most of the ore slides down of its own accord and there is little to be scraped out. In such cases this can be shoveled and scraped out by a gang of men about as cheaply as to rig up for the scraper.

One of the remarkable things in a conglomerate stope is the schistosity or cleat that is developed in the ore. Often there are fully 18 in. of ore in the breast that have been shattered by this cleat. The men bar as much of it down as possible and if much loose remains, they sprag it up from the batteries. In the Red Jacket workings there is often a slab of trap along the hanging that is low grade and about 2 ft. thick. By keeping the timbering near the breast this trap can be held up and kept from mixing with the ore to be picked out later in the rock house. In the South Hecla this layer of trap is not so common.

FIRE PROTECTION

Owing to the great amount of timber in these mines, there is considerable danger from fire. On that account the timbering in the shaft is sprinkled frequently. This also lengthens the life of the timber. On the different levels fire doors are put in. Some of the fire walls are made of brick, others of masonry and still others of wooden blocks set in mortar. A dam is put in so that the space under the door can be sealed by water in case of fire. In the past there have been some disastrous fires in the conglomerate workings. At one time it was thought that these were incendiary in origin, but probably all of them started in other ways; some from candles and others from friction at the rollers, for at one tome the oiling of the rollers was left to boys and they neglected badly the rollers in parts of the shaft through which the bosses did not pass often. Now that lamps and Sunshine are used, instead of candles, and men attend to these rollers, fires have been less frequent.

Two men go through the shaft from top to bottom each shift, oiling and replacing the rollers and keeping a close eye on the condition of the skip tracks. This is necessary because the swelling of the foot gives trouble with the skip track and the rollers wear out rapidly, sometimes once a shift, due to the changes in the angle of the shaft caused by the varying dip of the lode. The ground in these conglomerate shafts is so heavy that a crew of 146 men are constantly at work keeping the shafts of the Calumet & Hecla company in condition, easing the back in one place and replacing timbers in another, there being seven men on a shift in the more important shafts. This is in spite of the fact that in the upper workings shaft pillars 85 ft. wide were left on each side of the shaft and below a depth of 5000 ft., on the lode, the pillars have been increased to 100 ft. on each side of the shaft.

CAUSE OF BAD CONDITIONS AT TAMARACK

The work in the Tamarack mine was carried on less systematically and with more regard for immediate conditions than for future economy of operations. Stoping was begun before the boundaries of the deposit were reached. Large drifts 20x20 ft. were driven, to get tonnage for dividends, 200-ft. level intervals were tried, but with disastrous results, in the hope of getting the mine opened up faster and in order to put it more rapidly in a position to meet mill requirements.

Stopes caved before the top part could be mined; inside stopes came in before stopes beyond could even be started; and the cost of maintaining the 20x20-ft. drifts consumed small fortunes. The expense of operating through each of the long crosscuts, owing to the fact that there is no subshaft used to concentrate the tonnage from several levels on one, for haulage to the main shaft; the mining of the ore with 200-ft. level intervals and the consequent necessity of using intermediate levels to get the ore in the upper half of the block, together with the large amount of blockholing that is required to make the ore small enough to draw readily out of the chutes that are used to take it to the level below; the poor ventilation due to the cutting up of the levels with stopes started near the crosscuts from the vertical shaft, and the extending of the stopes from the inside to the boundary of the property instead of the ore being taken retreating as it should be to get low cost and good ventilation; indeed the whole lack of system that necessitates the driving of laterals to get at blocks of ground that are locked in by caved workings; all these things remain saddled on the mine to militate for some time against efficient work and low costs. Many think that the limits of payable ore are being approached in the deeper mines on the conglomerate and that the high costs at the Tamarack are traceable to the difficulties that have attended mining at great depth. The truth is, that taking the practice throughout, from hoisting in cars instead of ships to the mining away from the shaft instead of retreating to it, the only thing that mining at the Tamarack has shown is how not to mine at great depth. The property that does supply information in regard to the possibilities of mining at great depth is the Red Jacket and there 15- or 16-lb. rock can be made to pay while Tamarack until recently could not make ends meet with 20-lb. ore.

METHODS BEING CHANGED

Radical changes are rapidly being made in an endeavor to make the ore pay in the future by other mining methods, and as much as possible the practice is being changed to conform with that of the conglomerate mines at the Calumet & Hecla company which now controls the Tamarack. Owing to the long trams on the bottom levels of the Red Jacket and Tamarack mines, that are necessitated by the vertical shafts, endless-rope haulage is used to take the ore from the blind inclined shafts, from which stoping is done, through crosscuts to the vertical shafts where it is hoisted to surface. At the Red Jacket shaft it is the practice to connect the incline and the vertical shafts only on every third level, thus concentrating the ore haulage on the endless-rope systems, as much as possible, as well as reducing the number of levels at which stations and ore pockets must be maintained in the vertical shaft. The ore is hauled from the stopes to the subshaft by rope haulage on each level and then at the subshaft the ore is lowered in cars to some one of the lower haulage levels, to be taken to the vertical shaft, while supplies for the stopes are hauled in and handled from the top levels connected with the incline. It pays to concentrate the tramming. Long crosscuts have forced it in the Red Jacket workings and in time mining on the amygdaloid lodes will follow suit in order to do away with hand tramming.

(To be concluded)

Eastern States Gold Production in 1911

The Eastern States produced 7710 oz. of gold in 1911, divided as follows: North Carolina, 3400 oz.; Georgia, 1697; South Caroline, 987; Alabama, 915; Tennessee, 562; Virginia, 148; all others, 0.43 oz., says the U. S. Geological Survey. Of the total output placer mining yielded 1447 oz., siliceous ores, 5700 oz., and copper ores, 563 oz.

Over one-third of the entire gold output of the Eastern States comes from Montgomery County, North Carolina, where the Iola mine near Candor is the largest producer. This has a 45-ton all-slime stamp mill and cyanide plant. The Uwarra (old Montgomery mine) is being reopened in this same district, and a 50-ton fine grinding cyanide plant is being figured on.

New Publications

THE MOUNT BALFOUR MINING FIELD. By L. Keith Ward. Pp. 165, illus. Bull. 10, Tasmania Dept. of Mines, Launceston.

LES NOMOGRAMMES DE L'INGENIEUR. By Ricardo Seco de la Garza. 6½x 8½, pp. 220, illus.; 12 francs. Gauthier-Villars, Paris, France.

ELECTRICAL INJURIES. Their Causation, Prevention and Treatment. By Charles A. Lauffer. 4x6½, pp. 77; 50c. John Wiley & Sons, New York.

THE TRANSMISSION OF HEAT INTO STEAM BOILERS. By Henry Kreisinger and Walter T. Ray. Pp. 180, illus. Bull. 18, U. S. Bureau of Mines, Washington, D. C.

UTILIZATION OF ATMOSPHERIC NITROGEN. By Thomas H. Norton. Pp. 178, illus. Department of Commerce and Labor, Bureau of Manufactures, Washington, D. C.

KURZE ANALYSEN-VORSCHRIFTEN. Zum Gebrauch in Metallhütten Laboratorien. By Ernst Pancke. 6¾x 9¾, pp. 42, paper; 2.40 marks. Wilhelm Knapp, Halle a. S., Germany.

THE MINING LAWS OF THE REPUBLIC OF COLOMBIA. Translated with an Introduction and Notes by Phanor J. Eder. 6x9, pp. 150, paper. Pan American Union, Washington, D. C.

GAZETTEER OF SURFACE WATERS OF CALIFORNIA. Part I, Sacramento River Basin. By B. D. Wood. Pp. 99. Water-Supply Paper 295, U. S. Geological Survey, Washington, D. C.

DAS RETTUNGSWESEN IM BERGBAU. Seine Technik und gesetzliche Regelung im In- und Auslande. By O. Pütz. 6¼x9, pp. 174, illus., paper; 4 marks. Craz & Gerlach, Freiberg in Sachsen, Germany.

THE TUNGSTEN-MINING INDUSTRY IN NEW SOUTH WALES. By J. E. Carne. Pp. 100, illus.; 2s. 6d. Mineral Resources No. 15. New South Wales Department of Mines, Geological Survey, Sydney.

REPORT ON THE MINING OPERATIONS IN THE PROVINCE OF QUEBEC DURING THE YEAR 1911. Pp 210, illus. Department of Colonization, Mines and Fisheries, Mines Branch, Quebec, Canada.

HEADWATER REGIONS OF GULKANA AND SUSITNA RIVERS, ALASKA, with Accounts of the Valdez Creek and Chistochina Placer Districts. By Fred H. Moffit. Bull. 498, U. S. Geological Survey, Washington, D. C.

STATISTICS OF THE AMERICAN AND FOREIGN IRON TRADES, 1911. Part I. Prepared under direction of James M Swank. 6x9 in., pp. 104 Philadelphia: The American Iron & Steel Association. $5, including Part II.

ANNUAL REPORT OF THE UNITED STATES MINT, FISCAL YEAR ENDED JUNE 30, 1911. ALSO REPORT ON THE PRODUCTION OF THE PRECIOUS METALS IN 1910 George E. Roberts, Director of the Mint. 6x9 in., pp. 404. Washington: Government Printing Office.

ANALYSIS OF METALLURGICAL AND ENGINEERING MATERIALS. A Systematic Arrangement of Laboratory Methods. By Henry Wysor. 8¼x10½; pp. 82; illus. Chemical Publishing Co., Easton, Penn.

This is an elementary manual of quantitative analysis, but above the average. An elementary manual cannot contain the methods needed by a finished chemist, and this one does not, but an elementary manual could be made to contain the points needed to make a finished manipulator. In this the book under discussion does far better than most, if not all, of those we have seen. Theory is largely eliminated, which is also proper, as the classroom is the place to acquire theory. The book is printed half blank, for notes. There seems to be little in it for the expert, but a great deal for the beginner.

MICA: ITS OCCURRENCE, EXPLOITATION AND USES. Second Edition, Revised. By Hugh S. de Schmid; pp. 411, illus. Canada Department of Mines, Mines Branch, Ottawa, Canada.

This volume gives a comprehensive account of the present condition of the mica industry in Canada, and a description of the existing mines and prospects of value, together with full information as to the geological features of the mica areas and the mode of occurrence of the commercially valuable deposits. It also contains full details of the methods of mining and of the preparation of mica and strongly criticizes some of the uneconomical systems adopted, which have been largely responsible for the unprofitable results of many mining enterprises. A valuable feature of the book is a chapter on the world's supply and production of mica, with tables showing the output and distribution of the mica-producing countries. The report is profusely illustrated with photographs and drawings, showing sections of various mica deposits.

STEEL SHEET PILING TABLES AND DATA ON THE PROPERTIES AND USES OF SECTIONS. 5x7¾, pp. 87, illus., paper. Carnegie Steel Co., Pittsburgh, Penn.

The first edition of the steel-sheet-piling pamphlet was issued on July 22, 1907, when the use of steel-sheet piling was in its infancy and few data were obtainable as to proper methods of driving, pulling, etc. Since that time the industry has grown, so that a number of companies are engaged in its manufacture, and its uses have been extended to a great variety of constructions.

The Carnegie Steel Co. has remained in touch with all the developments made in the art, and believing that there was no adequate treatise covering the various operations of driving, pulling, etc., nor any convenient set of tables to facilitate the work of pile-driving contractors and engineers, has reissued its pamphlet, which has been out of stock for some time, so as to fill that want, and to create a booklet which will contain the ordinary data required by those engaged in foundation work generally.

THE MINING DISTRICTS OF THE WESTERN UNITED STATES. By James M. Hill; pp. 309, illus. Bull. 507, U. S. Geological Survey, Washington, D. C.

This bulletin takes up the general distribution of the mining districts of the West, the line being drawn to include the western part of Texas, New Mexico, Colorado, Wyoming and Montana. The general principles, so far as there can be generalization on such a subject, which correlate ore distribution and the country's geology, are enunciated, and a classification of the ore deposits given. A short chapter is then given on the principal ore deposits of each state.

Following this is a catalog giving each known Western mining district, its situation, railroad connection, type of deposit, and bibliography. Maps of the states, or sections of the state are given, showing the various districts with appropriate signs to show the chief metals. The scheme of the book is ambitious, but very well carried out, and it will make a valuable reference work for the consulting engineer.

THE EXAMINATION OF PROSPECTS. A MINING GEOLOGY. By C. Godfrey Gunther. 5x7½, pp. 222, illus., leather; $2. McGraw-Hill Book Co., New York.

The examination of prospects is one of the most unsatisfactory tasks of the mining engineer, because after all he is gifted with but little more clairvoyance than the ordinary mortal and every time he expresses an opinion he takes great chances. On the other hand it is one of the most alluring of functions in as much as the developer of a hidden orebody may win the greatest rewards that the profession has to offer.

Many attempts to formulate guides and rules for prospecting have been made, but with no great success. Mr. Gunther's book is distinctly better than most but it falls short of what we should like to have. Possibly it is the case that nobody now knows enough to write what we should like to have.

Any hand-book of prospecting is necessarily a compendium of mining geology to a large extent. That, indeed, is the subtitle of Mr. Gunther's book and as a concise and well-presented summary of that subject we consider it to be excellent.

DIFFERENTIAL AND INTEGRAL CALCULUS. By Lorrain S. Hulburt. 6x9 pp. 481 + xviii; illus. Longmans, Green & Co New York

Except an engineer use his calculus constantly, the major portion of it is soon forgotten. When needed, it is, of course, most convenient to refer to the book he used in college. If, however, the book he formerly used is lost, and a new one is to be bought, we recommend this volume for consideration.

To the engineer, it is of chief interest to know that apart from following the ordinary lines of an elementary textbook, there is also a short chapter on differential equations and also something on hyperbolic functions. There are many problems on kinematics, although none on dynamics, as that is more particularly the field of a textbook on mechanics. Of course, the geometric subjects of convexity, concavity, flexes, maxima, and minima, are all treated fully. What is also an advantage to the engineer is the omission of many long rigorous proofs; results are there, which are the things needed, why these results should be so under every possible and impossible condition of $f(x, y)$ can be omitted.

While we have written the above from an engineer's standpoint, we believe the book can be still more highly recommended from the teacher's, especially in engineering schools.

PERSONAL

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

L. Vogelstein has returned from Europe.

George E. Farish, late manager of the Dobie mine, Porcupine, now closed down, has gone to New York.

T. Walter Beam, of Denver, Colo., recently made another trip to West Kootenay district, British Columbia.

Dwight E. Woodbridge, Duluth, Minn., has returned from Cuba, where he has been inspecting iron ore deposits.

J. Cleveland Haas, of Spokane, Wash., was lately in California, examining mining property.

Arthur H. Carpenter, of Denver, has accepted a position on the chemical staff of the American Vanadium Co., Pittsburgh.

Thomas Flynn has been placed in charge of operations at the Foster mine, Cobalt, recently leased by his brother, C. B. Flynn.

Ernest Waterman, manager of the Princeton Coal & Land Co., operating a colliery at Princeton, Similkameen, B. C., was in Spokane, Wash., late in July.

John B. E. Bell has severed his connection with the Fort Bidwell Consolidated Mines, of Fort Bidwell, Calif., and has gone back to field work.

Quincy A. Shaw, president of the Calumet & Hecla, has been a visitor at the various properties in which he is interested for the last few days.

George MacNaughton, formerly manager of the Trethewey mine, Cobalt, has accepted the position of manager of the St. Anthony gold mine, Sturgeon Lake, Ont.

Clyde B. White, formerly in charge of one of the mines of the Arizona Copper Co., is now engaged in mining-engineering work in Slocan district, British Columbia.

Samuel Hale, vice-president and general manager of the Wisconsin Steel Co., has been appointed general manager of the Algoma Steel Corporation, Sault Ste. Marie, Ont.

David Little, formerly superintendent of the Second Relief gold mine and stamp mill, at Erie, Nelson mining division, B. C., was in Republic camp, Wash., at the end of last month.

W. Weston, with John E. Mayers as assistant, is examining mining properties in the Mogallon mountains, N. M., for Hon. J. C. Helm, of Denver, counsel for the D. H. Moffat estate.

J. Parke Channing will sail for Europe on Aug. 24, to be gone about six weeks.

B. B. Thayer, who has been spending the summer in Montana, will return to New York early in September.

S. M. Scott, Jr., has resigned his position as chief chemist of the Garfield Smelting Co., to accept the assistant superintendency of the Shannon Copper Co.'s smeltery, near Clifton, Ariz.

William H. Larkin, Jr., who has been chief engineer of the Herrick Engine Co., West New Brighton, N. Y., has accepted the position of mechanical engineer with the Revere Rubber Co., Chelsea, Mass.

D. B. Forestal, vice-president of the Iron Mountain Mining Co., Duluth, Minn., is in charge of sinking the shaft on the company's property on the Cuyuna range. He has been supervising the drilling and development work.

Capt. John Trebilcock, who has been in charge of the underground work at the Hard Ore properties of the Oliver Iron Mining Co. for some time, has been placed in charge of the underground work at the company's Hematite mine.

Theodore Breidenbach, at one time manager of the Mikado gold mine, but for several years past manager of a mining property in Mexico, is at Kenora, Ont., having left Mexico on account of the disturbed condition of the country.

George F. Comstock has resigned as metallographist with the Park works of the Crucible Steel Co. of America, Pittsburgh, to accept a position with the Titanium Alloys Manufacturing Co., Niagara Falls, N. Y., in charge of its physical testing laboratory.

John W. Gocher, formerly chief engineer of the Cambria Steel Co., Johnstown, Penn., has been transferred to the executive department to make exhaustive studies of works, extensions, improvements and efficiency of plant operation. Stewart M. Marshall succeeds Mr. Gocher as chief engineer.

P. G. Beckett, formerly assistant superintendent of the Copper Queen mine at Bisbee, has been appointed general manager of the Old Dominion mine at Globe and took charge on Aug. 16. He succeeds G. H. Dowell, who has been promoted to the position of assistant general manager for the Copper Queen company, with his office at Douglas.

Leslie Hill, for about 16 years in charge of mining properties in the Boundary and Kootenay districts of British Columbia and others in southwest Alberta, is giving up his mining-engineering connection and is removing from Nelson, B. C., to Vernon, in the same province, where he has a valuable fruit and agricultural property, to which he will in future give his attention.

C. Hanckel, formerly with the Zinc Corporation, Ltd., at Broken Hill, New South Wales, Australia, is now engaged at Silverton, B. C., in preparing plans for a concentrating mill for the Silverton Mines, Ltd.; operating a silver-lead-zinc mine in Slocan district, British Columbia, where it is intended to use a flotation process for the recovery of a silver-zinc product after the extraction of silver and lead by water concentration.

OBITUARY

Hugh Clements, a pioneer coal miner of Knightsville, Ind., died suddenly on Aug. 17, 1912.

John W. Smith, president of the Windfall Mining Co., of Eureka County, Nev., died in Chicago on July 28.

Frank W. Stollenwercke, principal stockholder in the Mineral Hill Consolidated Mines Co., Eureka County, Nev., died suddenly on July 30, while on a visit of inspection to the new mill.

Adonijah Bickford died at Oakland, Calif., July 12, of heart trouble. He was 80 years old, and was born in Charleston, Me., which place he left in 1851 and went by way of Panama to California. He was extensively engaged in mining in the early days, but later turned his attention to agriculture.

Rowan Ayres, an American mining engineer, is reported to have been killed by Mexican rebels, near Morelos, Michoacan, on Aug. 15. He was the son of Dr. Stephen C. Ayres, of Cincinnati, and graduated from Yale in 1898, after which he immediately engaged in mining and railway engineering work in Mexico.

William Reader, formerly well known in the Pennsylvania oil fields, where he was a contractor, and later in the business of a producer, died on Aug. 8, at his home at Marietta, Ohio, after a long illness. He was 73 years of age. He located in that field about 18 years ago, when the oil excitment was at its height, and in recent years was also interested in the developments in West Virginia.

Societies and Technical Schools

Canadian Mining Institute—A semi-annual meeting of this Institute is to be held in Victoria, B. C., on Sept. 18 and 19. Papers are to be contributed by Dr. A. E. Barlow, president; H. Mortimer-Lamb, secretary (both of Montreal, Quebec); James Buchanan, of Trail, B. C., metallurgist for the Consolidated Mining and Smelting Co. of Canada, Ltd.; and others. This opportunity to ascertain the views of Western members relative to proposed changes in the by-laws is to be taken advantage of. The holding of a semi-annual meeting of the institute in the West is an experiment, introduced with the object of bringing Eastern and Western members into closer touch.

Mining Institute of Scotland—A general meeting was held in Glasgow on Aug. 10, 1912. Papers on the "Inglis Engine Controller," and "Capping of Winding Ropes" were discussed, and papers read on "Facts and Theories Relating to Fans," and "An Automatic Stop Grip for Pit Cages," the last being illustrated with a model.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Aug. 15—The launching of Natoma No. 8 dredge, Aug. 13, was an event in the history of dredging in the American River division of the California dredging fields. Launching is not common practice in dredge building. The usual method is to build the dredge in a shallow pit and then flood the pit when the hull is completed. In the construction of No. 8 it was necessary to build the hull on the shore at the side of the flotation pond from which the machinery was recovered from the fire which destroyed the original No. 8 in October, 1911. The launching was successful. The boat went into the water sideways evenly. The new No. 10 dredge in the same field at Natoma is nearing completion, and will be ready for commission early in September. This boat is of the same design and size as No. 8, equipped with 15-cu.ft. buckets and built entirely of steel and iron with the exception of the decking plank, roofs and doors. Dredge No. 6, of 9-cu.ft. bucket capacity, in the same field has been undergoing repairs, being fitted with new ladder castings and given a general overhauling of the screens, pumps and winches. The boat resumed digging on Aug. 14. Dredge No. 7, another 9-cu.ft. dredge in the Natoma field, will be reconstructed with steel hull and all steel parts. This boat will be of the same design as No. 8 and No. 10. Dredge No. 1, which is in the south section of the Natoma field, the oldest one of the Natomas Consolidated boats, of 14-cu.ft. bucket capacity, has kept up its record work in the first half of 1911. This boat has dug over an area 700 ft. wide and about 1½ miles long since the beginning of this year. The dredging men of California and other countries will watch the operation of these dredges as they will demonstrate the practical value of steel hulls. The operation of No. 10 dredge will prove or disprove some theories of construction and operation that will be of great value to gold dredge operators. Cache Rock dredge operating in middle fork of American River, recently placed under new management, has been remodeled in construction and arrangement of the gold-saving tables, the Holmes system being installed. The dredge is now making a better record than under the former management. Union No. 1 dredge, placed in commission in the American River district at Folsom by the Union Dredging Co., of Philadelphia, in March, 1911, has been digging steadily in the last two or three months, handling about 150,000 cu.yd. of gravel per calendar month. B. C. Warnick, general manager of this company, has recently taken over by lease about 2000 acres of placer land in Merced County on the Merced River. The ground is being prospected with Keystone drills and shaft sinking. More than 50 drill holes have been driven to an average depth of 26 ft., and eight prospect shafts have been sunk to a depth of 18 ft. This land is in what is known as the southern district of California dredging fields. A dredge is operating at La Grange and one at Snelling. In Calaveras County two dredges are working at Jenny Lind, and at Camanche another dredge was built this year.

Butte

Aug 14—The Anaconda Copper Mining Co. has virtually completed arrangements for the purchase of the Oro Fino mine in the Georgetown district, as an addition to the Southern Cross mine adjoining the Oro Fino on the west, which was purchased by the Anaconda company some time ago. The Anaconda engineers have been making a thorough examination of the property, and unless some totally unforseen difficulty arises in the near future, the property will be transferred at a figure said to be in the neighborhood of $250,000. Although the deal has not been finally settled, the transfer papers have been made out and it seems assured that it will go through. The Oro Fino, a gold property, is owned by Charles Bostrom, of Anaconda, Whiting & Alexander, and John R. Bordeaux, of Butte. For several years it has been producing profitably.

Efforts have been made for some time to enlist the aid of the government in determining whether the barren flat directly south of Butte city, is underlaid with water. Congressman Pray, of Montana, has been agitating the matter at Washington, and according to a telegram just received from him by the secretary of the Butte Chamber of Commerce, it seems assured that an appropriation will be secured with the passing of the Sundry Civil bill in the near future. In this event Mr. Mizner, the government director of investigations of underground water supply, who is now in California, will bring an outfit to the city and begin boring for artesian water. The flat is ideally located for an artesian flow, as it is a natural depression, surrounded by high ranges of the Rocky Mountains. The soil which was derived from erosion of the surrounding hills, has great depth, but due to the lack of water it is practically a desert. It would, however, be transformed were a large supply of water available, as the soil has proved its worth in the few places where irrigation has been employed.

Salt Lake City

Aug. 15—The Tintic mine operators' association, through its representatives, John Dern and H. F. Joseph, has obtained a better rate on Tintic zinc ores to the Kansas zinc smelteries. The rate secured is $7.30 on $30 ore, as compared to $9.50 per ton heretofore. The new rate is 50c. greater than from Park City to these smelteries, the Park City rate being $6.80 per ton. From Butte, the rate is $7, and from Keeler, Calif., it is $8.25 per ton. Word had been received that the 30 days' notification usually required before shipments can be started under a new schedule has been waived by the Interstate Commerce Commission, so that shipments of zinc ores from Tintic mines may be started immediately after the filing of the new rate. There are a number of Tintic properties, which have zinc deposits developed or partially developed, including the May Day, Yankee, Uncle Sam, etc. Zinc ore has been found in the Bullion Beck and Lower Mammoth. The rise in the price of zinc has stimulated the search for this metal in Tintic.

The effort being made by Utah mine owners and operators to secure remedial legislation from the Department of the Interior on the granting of mineral-land patents, the creation by the government of a mining commission to recommend needed legislation, and the naming of Salt Lake City as the center from which inspection of mineral claims in Utah and Nevada shall be made, has resolved itself into the question as to whether these matters can best be served through the American Mining Congress, or through a new and locally organized body. To discuss this matter a special committee, consisting of Duncan MacVichie, F. B. Cook, R. C. Gemmell. Imer Pett and G. H. Dern has been appointed. At a meeting of this committee, Aug. 12, it was determined to secure a general expression of opinion from Utah mining men on this subject, and a communication has been sent to mine owners and operators, asking their opinion in regard to the formation of an independent organization as a separate body or the supporting of the local chapter of the American Mining Congress. The sentiment so far appears to be in favor of a state organization, which would be independent in every way, to attend to matters within the state of Utah. This could coöperate with the American Mining Congress, if deemed desirable, on matters of general interest to the metal-mining industry, but would be organized especially to attend to matters within and concerning the state directly.

Kingman, Ariz.

Aug. 14—Two measures affecting mining, upon which the referendum will probably be invoked, are the bill providing for semi-monthly paydays and the Kenney bill, which prohibits the employment of non-English-speaking people in hazardous occupations. The miner's lien law has previously been mentioned in this connection. The general sentiment seems to be in favor of the semi-monthly payday, hence it will probably be approved. It is doubtful if it will affect the steadier class of miners, except that it may give them earlier warning of the financial instability of a company about to become insolvent. The comment heard upon the Kenney bill among the miners is also generally favorable. The purpose of the proposed bill seems to be altruistic, in its intent to reduce the liabilities of accidents due to misunderstood directions or warnings, although the knowledge of who are its sponsors might alter one's estimate as to the true purpose of the bill. It will probably handicap some of the larger companies who are employers of Mexican and other foreign labor.

Deadwood, S. D.

Aug. 16—By purchasing the Hidden Fortune property from trustee Kirk G. Phillips, the Homestake Gold Mining Co. comes into possession of a property that was well, if not conscientiously advertised a few years ago. As the basis of a promotion in which stock was sold in all parts of the country, it was energetically exploited, probably to a greater extent in the press and prospectuses than underground. At any rate, its pyrotechnic career was suddenly halted about six years ago and the property placed in the custody of a receiver. After numerous delays authorized by the court to allow the stock and bondholders an opportunity to redeem the property, the sale was finally held, and for the sum of $51,000 the Homestake becomes the absolute owner of all the real and personal property of the Hidden Fortune Gold Mining Co. The property adjoins the Homestake on the west and north. It has produced some rich ore and will no doubt be a valuable acquisition of the Homestake's territory. The purchase price covered taxes amounting to $34,000; receiver's fees, pay for watchmen, legal fees, supply liens, etc., made up the remainder.

Construction work has been started by the Homestake company on a club building for employees. This will be a two-story and basement building, on Main St., Lead, and will be known as "Recreation Hall." It will contain reading rooms, lounging rooms, baths, a ball room, and in fact all of the usual departments of a good club house. It will be maintained by the company for the benefit and use of its employees, with the administration of its affairs managed by a board of directors elected from among the employees.

Negaunee, Mich.

Aug. 16—Interest is being manifested in the new liability and compensation act, which goes into effect Sept. 1. The Cleveland-Cliffs Iron Co. and the Calumet & Hecla Mining Co. have already announced that they will accept the provisions of the new law, which are optional to employers and employees.

In Iron County, Paul Schook, of Crystal Falls, is suing Col. Eugene Zimmerman, of Ohio, for an interest in the Zimmerman mine at Iron River. He claims a verbal agreement, made several years ago, when Zimmeran and Clutts came into the iron region looking for a mine, during which Zimmerman promised to "whack up" with Schook if the latter would get him a mine. Schook states that he secured the lease of the present Zimmerman mine, for the Spring Valley Iron Co., of which Colonel Zimmerman is a stockholder, from Kinney, the fee holder. Colonel Zimmerman claims that no agreement was made about "whacking up." The case has been postponed until December. A large orebody has been proved.

Houghton, Mich.

Aug. 15—Notwithstanding the higher prices of copper, the Michigan copper country is not experiencing the general boom that was freely predicted and that might well be expected. Conditions are healthy, however, and a general improvement is expected to be manifested before long in all branches of business. It is an interesting fact that during the last three or four years, in which copper commanded a low price, exploratory operations continued undiminished in many parts of the district. This was especially true of the properties in the vicinity of the Lake mine on the South Range. Now that fundamental conditions are apparently more favorable for the conduct of such work, there seems to be no more, and possibly less of it underway or projected. Few new operations are being planned for the immediate future. The reasons for this may not be apparent to the casual observer, and when explained may seem to be inadequate. Operators familiar with the district, some of whom do not hold the same view themselves, say that those men in the East, who are frequently sought to finance new undertakings here, are credulous as to the permanence of the present level of copper prices, that they are withholding support for new operations until they are convinced that the present price of copper is fully warranted, and that copper has not been boosted into its present position by sheer manipulation. There are large tracts of land in the district, that through developments in nearby mines or drilling operations, have been shown to offer attractive possibilities. In some cases, such tracts are owned by large mining or holding companies. Land of this character is scattered promiscuously the full length of the range. Further, it is freely admitted that drilling is warranted, and, for various reasons, should be done. It is also stated with equal emphasis that it is purely a case of being shown that the present price for copper is permanent, or reasonably so at least.

The recent 10% increase in wages, granted voluntarily by several of the larger companies, some weeks ago, has been followed quite generally by the smaller mines, and is looked upon by tradesmen as a hopeful sign of better business. At the same time it must be confessed that the looked-for increase in volume of trade so far has failed to materialize. It is quite possible that the workmen also are wondering if the increase is going to continue for any length of time.

Toronto

Aug. 16—The announcement of the opening of the Gillies Limit in the Cobalt area, on Aug. 20, has induced a great rush of prospectors from the mining districts of northern Ontario. According to the latest reports there are already between 300 and 400 men camped on the limit and the number will largely increase during the next few days. As the area is only about 4000 acres in extent the greater proportion of the prospectors will be disappointed, and much confusion is likely to result. Hon. W. H. Hearst, provincial minister of mines, has issued a statement to the effect that locations can be staked on the same terms as on other lands open for prospecting, and that no royalties will be exacted or other special conditions imposed.

A Finlander, named Johann Salas, alias John Perga, was arrested at Niagara Falls, with 40 lb. of pure silver in his possession, which he brought from Cobalt. He was stopping at a hotel, and, having evaded the payment of his bill, the landlord opened a suit case in his room, which he found filled with bar silver. He was tried before the local magistrate, and on conviction was sentenced to six months' imprisonment.

The Mining News

The Current History of Mining

Arizona

GILA COUNTY

Inspiration Consolidated—C. C. Tinker, representing McArthur brothers, who have the contract for building a spur from the Arizona Eastern R.R. to the mill site and main shafts, is in Globe starting the work. A camp is being established, machinery, horses and supplies are being unloaded at Miami, and work will be started in a few days. McArthur brothers also have the contract with the railroad company for the construction of the extension of its line from the town of Miami to the Inspiration tunnel and the Live Oak mine, and this work will be carried on at the same time. The main west working shaft is now 300 ft. deep and the main east shaft, about 100 ft. deep. Sinking is progressing at the rate of over 6 ft. per day.

MOHAVE COUNTY

Arizona-Southwestern Copper Co.—The mill building at Copperville has been completed and the machinery is being installed. The plant was designed by G. A. Overstrom. Part of the machinery was purchased from the Frisco Mines & Power Co. It will probably be 90 days before the mill is ready for operation.

Grand Gulch Copper Co.—The mines of this company are about 40 miles north of the Colorado River. It is reported that the company is shipping copper ore to the Salt Lake smelters, the sorted ore being rich in copper and containing some gold and silver. The main shaft has been sunk to a depth of 500 ft. The ore-bearing veins, to the depth exploited, are in sandstone, the gangue being principally calcite and quartz.

McCracken—Arrangements have been completed for the sale of this old property and some adjacent claims, to J. H. Hoffman, of Pueblo, Colo., and C. L. Davidson and Throck Davidson, of Wichita, Kan. This property has produced ore, but has been idle for several years. The chief metallic constituents of the ore are silver and lead. The deepest shaft is 400 ft. in depth. It is understood that work will be commenced soon.

Nevada-Arizona Gold Mines Co.—This company is developing the Lucknow, Florence, Mohawk and other claims in the Music mountains east of Kingman. The work is in charge of Supt. J. T. Wallace, who has opened several orebodies. The shaft on the Lucknow, which is equipped with a 25-hp. Western hoist, is to be sunk to a depth of at least 500 ft. A mill is to be erected, for which three carloads of machinery have already been received at Antares station, about six miles northwest of Hackberry. A chilean mill is to be installed and for the present amalgamation alone will be tried. Later, when mining at depth, a concentrating plant will probably be necessary.

California

PLUMAS COUNTY

Gruss—The 10-stamp mill recently installed is crushing ore. The mine is operated through a single-compartment shaft sunk by former operators. A drift that is being driven along the vein for ventilation carries a small shoot of pay ore. The mill is electrically driven and the mine will be electrically equipped throughout. Johnson-Locke Mercantile Co., of San Francisco, lessees; Mr. Kinze is superintendent.

RIVERSIDE COUNTY

Gray—This mine in Palos Verdes district has recently been sold to Eastern men who contemplate the installation of a 40-stamp mill.

Stanchfield Gold Mining & Milling Co.—The company has recently acquired a group of claims in Palos Verdes district embracing 120 acres, and has begun active development; four shafts are being sunk. The deepest is 135 ft. The veins carry pay ore of high grade. A stamp and cyanide mill are contemplated. J. A. Stanchfield, president and manager.

SIERRA COUNTY

Telegraph—The survey for a new power plant has been completed, and the company is also about to run a tunnel nearly one mile in length, from powerhouse site to a point under the present workings to cut the rich veins that have been cut in the upper works. This tunnel will also be used for taking out pay gravel already developed. When extended the tunel will give over 2000 ft. of backs. The mine is owned by a Chicago corporation and managed by J. W. Finney, of Downieville.

SISKIYOU COUNTY

Portuguese—This property on the Klamath River near Seiad, has been purchased by San Francisco men who will begin operations immediately. The mine was formerly a producer by the hydraulic system, but contains cemented gravel which will be handled by mill crushing.

TRINITY COUNTY

Horseshoe Mining Co.—This company has taken a lease on the Trinity River Mining Co.'s placer 5 miles north of Lewiston on the Trinity River. The property had been formerly worked by a project that included the diverting of the river through the tunnel at Horseshoe Bend, but this did not prove commercially successful. The present company is building a dam to divert the river through the same tunnel. W. E. Proctor, of San Francisco, president.

Craig Mining Co.—This company has the Globe, Chloride-Bailey, and the Mason-Thayer near Dedrick, on which extensive development work is being undertaken in addition to the mining of pay ore. A 40-stamp mill will be built. The construction of the mill will be in charge of Prof. H. N. Herrick, formerly in the department of mining at the University of California.

TUOLUMNE COUNTY

Climax—This property, one mile south of Jumper, has recently been under option to N. E. Nelson and others of Los Angeles. A small propect mill will be built and the mine thoroughly prospected

Dutch—Ore is being milled in the 40-stamp mill from the 400-, 600- and 800-ft. levels; 60 men are employed.

Gold Ship—J. De Martini has resigned as superintendent, and will be succeeded by Frederick Meyer.

Dreisan—This mine at Arrastreville is reported to have been taken over by the Tonopah-Belmont company. A contract has been let to sink the two-compartment 9x5-ft. shaft 150 ft. deeper, which will make a total of 550 ft. It is expected to drift from this point in belief that the vein will be tapped at a distance of 150 ft. from the shaft.

O. K.—A mill run of 50 tons of ore is being sacked for shipment to the Wickham mill.

YUBA COUNTY

Campbell—Preparations are being made to reopen this mine at Brown's Valley, which, after being closed about a year ago, filled with water. New pumps and a new hoist have been installed. The installation of a new rotary mill is also contemplated.

Colorado

BOULDER COUNTY

White Raven—Ralph Davis, lessee on this mine at Ward, has shipped three cars of silver-lead ore. This is one of the old-time producers which made the Ward camp famous.

Lucky Two—At this mine, near Boulder Falls, a tunnel is being driven on a vein of tungsten ore. William Crossley, manager.

Boulder Tungsten Co.—At the annual meeting of the company, the following officers were reëlected: J. G. Clark, president and general manager; M. M. Rinn, vice-president; J. N. Williams, secretary-treasurer. The stockholders authorized the construction of a 50-ton concentrating plant.

CLEAR CREEK COUNTY

McClellan—This property on Leavenworth mountain is being operated under lease. The new adit has been driven 80 ft., the last 60 ft. of which is in a shoot of rich silver ore. The drift is 65 ft. below the surface where the shoot was intersected.

Merrimac—This property, in West Argentine, on Kelso mountain, is being developed by a crosscut tunnel. A shaft has been sunk 60 ft. on the Merrimac vein, but the crosscut will permit the property to be opened more economically at greater depth. John T. Johnson, of Denver, owner.

Stanley—During July the fifth level west heading was advanced 105 ft. Crosscut 502 north was abandoned six feet.

Gladstone—This property, in Clear Creek gulch, has been developed during the last year by the Superior Leasing Co. A shaft has been sunk on the vein and drifts have been driven. Small shipments are now being made. Milling ore is being shipped to the local concentrating mills. F. W. Davis, superintendent.

Metropolitan—This company's crosscut tunnel is now a little more than 3800 ft. long, and is to be advanced 600 ft. farther. The object of the tunnel is to drain and operate the lower workings. The recent increase in the flow of water in the tunnel indicates that the drainage of this property and neighboring territory has commenced. Thomas Coppard, superintendent.

Bessie M.—Development of this mine, on the south slope of Seaton mountain, will be resumed. The shaft, which is 215 ft. deep, will be unwatered and the level will be advanced to the west. Pumping and hoisting equipment will be installed.

Law—It is reported that this property has been leased for a period of five years to E. J. Butts, who has commenced a new adit at a point where the vein assays well in silver and lead.

Gambetta—Shipments of lead-zinc ore are being made from this property by lessees. The ore is given a preliminary treatment in one of the local mills. The lead is disposed of in Denver and the zinc is shipped to Kansas.

King & Queen—This property on Kelso mountain, in the West Argentine district, is being developed by the owners, Maxwell & Davis.

Big Indian—The crosscut has intersected the vein at a distance of 400 ft. from the portal. The south drift on the vein has cut a 6-in. streak of ore assaying high in gold and silver. It is proposed to drift to a point directly under the shaft and then raise to connect with the next level above for the double purpose of development and ventilation.

Bellevue-Hudson — Development has been in progress for several months and the property is now producing lead-zinc-silver ore. Compressed air for drilling is supplied by a Union Pump Co., belt-driven compressor having a capacity of 260 cu.ft. of free air per min. A. T. Holman, manager.

SAN JUAN DISTRICT

The shipment of concentrates from Telluride was 40% greater during July than for the same month last year. Both the Smuggler and Tomboy companies have increased their milling capacity.

Tomboy—Preliminary surveys and specifications have been completed for the new tramway from the Ophir tunnel to the Pandora loading station, a distance of about one mile through Marshall Creek gulch. The construction of the tramway will begin as soon as satisfactory contracts can be closed with the manufacturers and builders of this equipment. This tramway will transport concentrates from the mills to the railroad and carry supplies to the mines and mills. It is estimated that a saving will be made over present methods of transportation. David A. Herron, manager.

Junta—A meeting will be held, Aug. 20, 1912, to arrange the consolidation of the Junta Mining & Milling Co. and the Jim Crow Mining Co. into the Junta Consolidated Mining & Milling Co. These neighboring mines will then be operated under one organization. The millsite in Bear Creek Gulch, formerly occupied by the old 120-stamp mill of the San Miguel Consolidated Gold Mining Co., has been secured under lease. Surveys have been made for the new mill and plans are being prepared by the contractor, W. H. Doyle. The new plant will contain 50 stamps, and concentrating and cyaniding equipment. The ore will be stamped in cyanide solution. The new tramway will be built to deliver the ore from the mines to the mill. This enterprise will require new mining, milling and tramway equipment. T. E. Thomas, manager.

Telluride Iron Works—This plant is being improved by the addition of new buildings and equipment. The foundry and machine shop have for many years served the mines, mills and tramways of the Telluride district with machine repair parts and other equipment. E. H. Sackett, manager.

Camp Bird—During the five months, began Feb. 1, 1912, and ended June 30, 1912, the mill crushed **13,426** tons of ore from which bullion worth $230,601 and concentrates sold for $114,718 were recovered; a total recovery of $345,319. The working expense was $151,095. The profit was therefore $194,224, or £39,800. The estimated profit from Santa Gertrudis (Mexico) holdings was £126,762, so that £166,562 total profit was made.

Primos Chemical Co.—Bad roads have made transportation, by auto truck, difficult, and the company has recently been compelled to resort to wagon haulage. The plant at Newmire has been unable to work at full capacity on account of the delay in hauling ore from the mines.

Idaho

BONNER COUNTY

A report from Sand Point states that a rich strike has been made in a placer at Moyie Springs, which has long been known, Chinamen having worked the bars of the river in the early days. Arrangements are now being made to purchase hydraulic-mining equipment in Spokane.

Michigan

COPPER

Kaukana—Negotiations are under way for optioning this property, supposedly to the Lewisohn interests, who are said also to be acquiring about 1000 acres additional, in that vicinity. The tract adjoins the Elm River mine on the north and west.

Osceola Consolidated—Additional machines have been placed in No. 6 shaft of the old mine and the tonnage is being gradually increased. It is planned to resume operations at No. 5 shaft by September 1, provided the necessary men can be secured.

Indiana—This company's shaft is bottomed in felsite at a depth of 1000 ft. Sinking is going on satisfactorily, the objective point being about 1350 ft., at which level it is hoped that the rich felsite that was revealed by the drill core from No. 9 hole will be developed. Conditions of the formation passed through by the shaft have tallied closely with that of the drill core at corresponding depths.

Naumkeag—Drilling with two diamond drills is in progress and two holes are being drilled, one at the north and the other at the south end of the company's property. This has been underway for some time, but results are withheld.

Franklin—The Western Federation of Miners is reported to have been intimately connected with the recent labor troubles at this mine. Work has been resumed and conditions are now satisfactory.

Victoria—The company is erecting houses for trammers of whom there is a great scarcity in this district. Mineral product for July was 170,384 lb. The only reason for the falling off in production during the last three months is the shortage of miners and trammers. This has also made it necessary to discontinue drifting temporarily.

Houghton—The winze being sunk from the drift on the 625-ft. level is down 90 ft. with only a fair showing of copper. The drift on the same level is now in about 400 ft. with copper showing in patches. Development work has not yet been started on the new west lode, and it is probable that the shaft will be sunk another lift before this lode is open. The winze will be sunk until the lode has been thoroughly explored, when shaft sinking will be started. The shaft is 630 ft. deep.

Wyandot—The No. 22 drill hole has been discontinued at 1700 ft. depth. A lode was cut at a depth of 304 ft. Almost simultaneous with the cutting of this lode, surface trenching was started, and the outcrop uncovered. The lode lies about 1700 ft. west of the Winona lode. The crosscut on the 1700 level of No. 2 shaft, designed to open up the lode previously cut in diamond drilling, is now in 2528 feet.

Old Colony—No. 16 drill hole on the Mayflower lode ran into copper in amygdaloid at a depth of 1131 ft. This hole was expected to cut the lode at a depth of 1080 ft., but a roll in the lode probably accounts for the drill making no important discovery until reaching the 1131-ft level. This coincides exactly with hole No. 14 disclosures which were made a few weeks ago, except for the roll in the lode; No. 14 went down vertically and cut the lode at 1538 ft. or about 1900 ft. below the outcrop; No. 16 was located in the same place, but was inclined and presumably cut the lode at 880 ft. below the outcrop. No. 20 drill hole has uncovered 10 ft. more of what the superintendent characterizes as "good-looking material." No. 19 drill hole is down about 2000 ft. with no important results. The drill has passed below the mineralized horizon.

Baltic—During the first six months of 1912, 333.863 tons of ore was shipped and treated which yielded 20.72 lb. refined copper per ton; for the first five months, the cost of production was 8½c. per lb. at the mine, or 9.3c. per lb. total expense. In June the yield was somewhat higher than that for the five preceding months, being 21.07 lb. per ton. July's output should about equal that of June, both as to tonnage and grade.

Iron

Forbes—Slightly more than a year ago the Jones & Laughlin Co. took over the Forbes tract of 40 acres, one mile north of Iron River. Diamond drilling was continued during the late summer and autumn, and shaft sinking was started early in December. When the shaft was down 200 ft., a drift was started 175 ft. from surface and is now in 225 ft. A station is now being cut in which a pump will be installed. The temporary wooden headframe is still in use, pending the arrival of a 76-ft. steel shaft house from the Minneapolis Steel & Machinery Co.

Cortland—Work has been begun on the spur of the Chicago & Northwestern Ry. to this mine of the Wickwire Mining Co. Day and night forces will be employed and it is hoped the line will be completed in time to ship ore from the stockpile this autumn. A new electric compressor and hoist have been installed.

Johnson—The fourth drill hole on this property, near Beechwood, in the Iron River district has struck ore, but results so far are unfavorable. This is in an unexplored part of the district, and developments will be watched with interest.

Davidson—At this New York State Steel Co. mine the new brick engine house is completed and adjoining it a brick building has been erected in which are installed the electric transformers for reducing the current furnished by the Peninsula Power Co. A new frame change house is being erected just east of the over-crowded old change house.

Wickwire Mining Co.—The Wickwire mine is using electricity for the Peninsula Power Co. A new warehouse and an office has been constructed. About 150 tons of ore is being hoisted daily, and shipments are now being made from the stockpile.

Minnesota

Mesabi Range

Butler Brothers are expected to begin work on the two contracts recently received from the Arthur Mining Co. One adjoins the Whiteside, at Buhl, and the Great Northern is already laying track to it. The other is near the North Uno in the Hibbing district. There is less than 400,000 cu.yd. of overburden to be stripped.

Buffalo—Shipping from this mine has just been started. The overburden exceeds 100 ft. average depth.

La Rue—Several miners are at work in this pit near Nashwauk. M. A. Hanna & Co., owner.

Winston-Dear—Two more steam shovels will be started in a short time by this company at the stripping contract on the new Adams' mine of the Great Northern ore properties in the Chisholm district.

Winnifred—This mine is loading ore from the stockpile and is shipping to the Head of the Lakes. There are about 100,000 tons to be moved before the shipping season is over. The ore movement over both the Great Northern and Missabe is heavier now than at any time since the opening of the shipping season.

Missouri

Joplin District

New leases are being taken out and drilling operations planned for the district in the vicinity of the Dutchman's Dream, the Betsey Jane and the Oakhill mines; 331 acres have been leased lately southeast of Joplin. Seven drill rigs will be required for prospecting.

Miami—Pumps to handle 3000 gal. of water per min. have been installed. They are expected to lower the water to the 300-ft. level.

Connor—A 250-ton mill is being put in operation on this land west of Joplin.

Allegheny Mining Co.—This company has taken a lease on the Jackpot land and intends to reopen the old works.

Nine O'clock—A lease has been taken on this property by J. R. Nowlin and associates. It is said that there is a wide face of ore in the mine. Development work will begun at once.

Engineer's Drill Co.—The third hole being drilled for this company, and which is being sunk on the W. E. Johnson land at Four Corners, went into ore at a depth of 42 ft. and continued in the deposit to a depth of 55 ft. Both lead and zinc ore were found.

Interstate Trust Co.—At the mine of this company, at Carl Junction, prospecting is being done by drilling. While the mine is now in the producing class, the workings are not yet extensive enough to keep a mill supplied with ore.

Bumble Bee—This old mine has been leased, and recently was the site of a rich strike of ore. An order has been placed for a four-stage, electrically driven centrifugal pump with a capacity of 2000 gal. per minute.

Dutchman's Dream—At this mine, at Thoms Station, a rich strike of ore was made recently, yet, according to the drilling records, but only one-third of the face has been opened.

Chat River Drainage & Leasing Co.—This company has recently been organized for draining the Aurora camp, by which means a large part of the old camp will be put in condition for immediate resumption of mining. The present plans are to install a large centrifugal pump in the deepest shaft on the United Zinc tract which will drain a large area of ground to a deep level.

Montana

BUTTE DISTRICT

Butte & Superior—A special meeting of stockholders will be held Sept. 24, to take action on a proposed increase of the capital stock from 250,000 to 350,000 shares; 30,000 shares of new stock to be issued at $37.50 per share. Stockholders of record Sept. 26, may subscribe for one new share for every eight shares held. The funds so obtained will be used for exploration work and possibly for the acquisition of new properties, now under option, and which adjoin the property of the company.

Butte Main Range Mining Co.—Articles of incorporation of this company have just been filed in Butte. The company was incorporated for $1,500,000, in shares of $1 each. The following directors were elected: Edward Hickey, Patrick Sheehan, P. J. Brophy, M. S. Largey, J. J. Harrington, Charles R. Leonard, F. X. Girard, R. J. McDonald and Edward Hickey, Jr. The company has acquired several patented claims near the Pittsmont property in the eastern portion of the Butte district. On one of these claims, the Sinbad, a shaft was sunk to a depth of about 700 ft. several years ago and a crosscut driven north to the vein, which was drifted on for a short distance both to the east and to the west, with fairly good results. A crosscut was also driven south into the Spread Delight claim adjoining, cutting a vein carrying copper, gold and silver. On the Lilly claim a shaft was sunk and some ore mined and shipped. The company is planning to build a new surface plant, and to sink preparatory to systematic development. The company is under the management of the same men that are directing the affairs of the Tuolumne, and Pilot-Butte companies.

LEWIS & CLARK COUNTY

Bald Butte—A new vein was recently cut in a crosscut driven from the 600-ft. level of the shaft, and, although only low-grade ore was found at the intersection, a raise was started which at a height of 50 ft. ran into a good shoot of ore. This is now being mined and milled and is keeping the mill running at nearly full capacity.

Copper-Silver Montana Mining Co.—This company is operating a property in the Scratch Gravel hills, six miles north of Helena. A shaft has been sunk to a depth of 300 ft. and a tunnel is being driven to tap the vein at this depth, as well as to drain the property and to afford the miners now at work there, another exit from the workings. The ore contains copper and silver, and small amounts of gold. E. R. Purnell, of Helena, who is managing the property, expects to sink the shaft an additional 200 ft. shortly, and crosscut to the veins.

Oriole—Malden Bros., of Helena, are operating this property adjoining the Lexington mine on the west. The ore contains native silver, the same as the Lexington, which in the early days shipped its ore by ox-train to Utah, from where it was carried by rail and steamship to Swansea, Wales, at a good profit.

Martha W—Ore is being mined above the 200-ft. level of this mine in the Winston district, and plans are being made to sink the shaft to greater depth. James S. Smith, manager and principal owner.

Iron Age—This mine in the Winston district is producing steadily under the management of Charles S. Muffly. The ore being mined comes from the Lilly vein, which was traced into the Iron Age from an adjoining claim.

POWELL COUNTY

Big Dick—Frank Cooney and T. J. Bennetts, of Elliston, have secured a lease and bond on this mine, the property of the Butte & Elliston Mining Co., six miles from Elliston. On Aug. 1 operations were begun. The mine was operated from 1901 to 1908, producing about $100,000 in gold, silver and lead. Work was carried on by a shaft 300 ft. deep, but in 1908 operations were suspended, due to a large flow of water. The lessees, to overcome this difficulty, have started a tunnel near the base of the hill upon which the mine is located, and expect to drive a distance of 1100 ft. to a depth of 450 ft. below the collar of the shaft, and then to raise, allowing the water to drain from the tunnel, after which operations in the old working will be resumed. After the completion of the tunnel, a cyanide plant will be erected to treat the low-grade ore, of which much was blocked out during previous operations.

Nevada

COMSTOCK LODE

Union Consolidated—A raise has just been started on the 2500-ft. level in the ore cut in the east crosscut from north drift from the south boundary line.

Ophir—An east drift has been started on the 2200 level, in the northeast drift 107 ft. from the bottom of the 2000 winze. This drift will enter territory east of the Hardy vein stopes, never before explored. The run of 1500 tons of ore at the Kinkead mill has been completed, and a cleanup is being made. The tube mill for the new cyanide plant is being put on its foundations.

Mexican—The ore mined last week exceeded 600 tons, of a gross assay value of $22,000. High-grade ore was stoped from the 2500-ft. level. Nine bars of bullion were shipped to the Selby smeltery.

C. & C. Shaft—Preparations are now about completed for lowering the vertical, centrifugal pump to the sump, where it will temporarily displace one of the hydraulic elevators. This pump will be used until the station on the 2500 is enlarged and equipped for the new permanent hydraulic plant. The new temporary plant, including the 2310 station pumps, were expected to be in operation by Aug. 20, 1912.

EUREKA COUNTY

Buckhorn—Construction of the new mill has been started, and it is hoped that it may be completed within a year. A large tonnage of ore of fair milling grade is developed. The mill site is about 20 miles west of Blackburn station on the Eureka-Nevada Ry.

LANDER COUNTY

Quartz Mining & Reduction Co.—This company is planning a mill at Mill Cañon to treat the large tonnage of ore already blocked out; the mill will be of sufficient capacity to handle custom ores.

LYON COUNTY

Two stamp mills, the McTigue and Hamilton & Pollard, together with three cyanide plants, known as the Woodbury, Phillips and Donovan, at Silver City, were busy throughout the month of July, the former crushing over 1000 tons of ore. The Overland mill of 10 stamps, has begun operations this month on company account, a considerable tonnage having accumulated on the dump supplying the mill. The camp is now being operated almost entirely by lessees, a dozen different claims being worked successfully in this manner. Plans are said to be underway for resumption of work in the Hayward mine, owned by the Nevada Mining, Reduction & Power Co., which also has a 40-stamp mill at Dayton, connected by aërial tramway with the mine.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Aug. 8, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,000	106,869
Tonopah Belmont	3,710	68,941
Montana-Tonopah	1,297	32,863
Tonopah Extension	1,050	31,453
West End	820	22,989
Midway	40	380
MacNamara	.....	10,935
North Star	.	130
Mizpah Extension	40	40
Totals	9,957	274,600
Estimated value	$248,925	......

Tonopah Mining Co.—The report for the month of June states that 13,832 tons of ore was crushed of the average assay of $17.51 per ton producing 234,580 oz. of bullion worth $186,850, and 65 tons of concentrates worth $30,100; the net profit for the month being $119,205. In consequence of the recent developments in both the Tonopah-Extension and Merger mines, the company will now develop its Sand Grass claim, which is between these properties.

Tonopah-Belmont—The main vein has been cut on the 1166 level west of the

Tesoro fault. It is 8 ft. wide, and of good grade ore. The mine is now yielding 130,000 gal. of water daily, which is being used in the mill.

Tonopah-Extension—This company has again opened its new contact vein on the 500-ft. level, 300 ft. west of the place where first encountered.

MacNamara—The mill resumed operations, Aug. 10, and is now treating 65 tons of ore daily of the average grade of $17 a ton. A new orebody has been opened on the 375-ft. level.

WHITE PINE COUNTY

Nevada Consolidated—Production at the Veteran mine has been reduced to between 700 and 800 tons per day. Work during the last few months has included a large amount of development, during which a large tonnage of low-grade ore has been taken out and shipped. The Veteran orebodies are now in good shape, and the tonnage, although smaller, is of considerably higher average grade than formerly.

Copper Mines Co.—This company is putting in ore bins to which ore from the Minnesota claim will be sent over an incline tramway operated by a gasoline engine. A car of ore is being sent to McGill every other day, but the production will be considerably increased as soon as the ore bins are completed and the tramway finished.

New Jersey

Raritan Copper Works—It is reported that this company is making a Cottrell electrostatic fume-condensation installation in which fume from the silver refinery will be treated.

New Mexico

SOCORRO COUNTY

Deadwood—An uptodate, automatic sampler has recently been ordere to facilitate the handling of custom ores, of which an increasing tonnage has been delivered during the last eight months. The new 50-hp. auxiliary gasoline engine for the mill is now in commission. The last cleanup for July produced 7050 oz. bullion.

Oaks—Ore from the Johnson mine will henceforth be delivered to Socorro mines for treatment, effecting an appreciable saving in transportation cost compared with delivery to the Deadwood. At the Pacific mine, the output has been increased sufficiently to keep 30 burros packing to the mill. The week's production from the Pacific and Johnson was 115 tons of a high-grade mill ore.

Deep Down—On Aug. 2, the lessees began packing their ore to Socorro mines custom bins, as the distance is less than to the Deadwood. The tonnage and grade of ore is excellent.

South Dakota

LAWRENCE COUNTY

Victoria Gold Mining & Milling Co.—A new set of coarse rolls is being installed, which, it is hoped, will increase the capacity of the mill which will be in operation by Sept. 1. As at present arranged the ore trammed from the mine is dumped into a bin from which it is drawn to a No. 5K Gates crusher, thence taken by belt conveyor to an ore bin at the upper terminal of a Trenton aërial tram. This tram, 1700 ft. long, delivers the ore to a bin at the mill above a No. 3K crusher. From the bin beneath this crusher the ore will go to the new Davis Iron Works, 16x36-in. rolls, weighing 27,000 lb., and thence to two sets of 14x24-in. rolls, where the finished product will be made. As all crushing will be done dry, there will be no separation of the crushed product, but it will go direct to the leaching tanks, for treatment by cyanide. The strong solution will have a strength of 3½ lb. per ton. O. N. Brown, of Deadwood, is manager.

New Reliance—After a short suspension, during which time an assessment was levied to furnish money for liquidating some floating indebtedness, the company has resumed operations at the plant on Annie Creek, in the Bald Mountain country. The mill contains 30 stamps, sand-leaching tanks, and is equipped to handle slime by agitation and decantation. F. C. Bowman, of Trojan, manager.

Utah

BEAVER COUNTY

Majestic—During July, 26 lots of ore were shipped to the Salt Lake Vallev smelteries, and more ore could have been shipped had the company been able to secure railroad cars.

Horn Silver—During June and July between 250 and 300 tons of zinc ore was shipped to Bartlesville, Okla., smelters. There is still much zinc ore on the dumps. The June output was 20 cars, and in July 19 cars were shipped. The shipments for the present months are being made at the rate of about 25 cars. Both lead-silver and zinc ores are being mined. The ores occur in a series of pockets usually connected by stringers, but are sufficiently continuous to make steady shipments possible. Lessees are working in various parts of the property, and are employing a total of 90 men. There are about 70 men at work on company account. Shipments are soon to be started from the old slag dump at the north end of Frisco.

Hub—Ore has been cut recently on the lowest level. This is a continuation of the shoot developed in the upper workings.

Moscow—This company, in the Star district, is employing 40 men, and shipments are being maintained, and development work carried on.

Red Warrior—Ore is being mined from the 500 level, where lead carbonates have been opened. Development is being done on the 600-ft. level in search of the same orebody. Up to the present, all the ore has been oxidized, and sulphides are not expected until at least the 1000-ft. level has been reached. Shipments are being made at the rate of one car per week.

Indian Queen—A lease for a year on the southern part of the property has been given to H. W. Nichols and Henry Turner. The lease will not interfere with operations on company account. Other applications for leases have been made.

SUMMIT COUNTY

Barry-Coxe—Returns amounting to $1134 have been received on the first car of ore.

John the Revelator—A vein of ore in the face of the tunnel is reported by lessees.

Silver King Coalition—New ore discoveries are reported in the old Creole workings on Treasure Hill. This is in ground recently purchased, when the Uintah Treasure Hill Co. was taken over.

TOOELE COUNTY

Bullion Coalition Mines—During July 750 tons of lead-silver ore was shipped. Lessees shipped eight cars or 400 tons, making a total production of 1150 tons for the month. The lessees are above the 600-ft. level for the greater part. Some of the ore is rich, and the grade is maintained by sorting.

Cliff—This company at Ophir is in a position to increase shipments now that the railroad has been completed.

Ophir Hill—Work is being pushed on the mill, the capacity of which will be increased from 150 to 300 tons per day. These changes and improvements have been in progress for several months, and should be completed at an early date.

Canada

BRITISH COLUMBIA

Hewitt—The mill at this mine, near Silverton, which was recently destroyed by fire, will be rebuilt.

Rambler-Cariboo—It is reported that a vein of high-grade galena has been cut on the 1400-ft. level of this property. It is thought that this is a new vein.

British Columbia Copper Co.—An agreement with the Western Federation of Miners has been made whereby the company will pay the present scale of wages when the price of copper is below 16c. per pound. When the price rises above 16c., but is below 18c., a raise in pay of 25% above the schedule now in effect will be made; while a further increase of 25c. per day will be made when the price of copper exceeds 18c. per pound.

British Columbia—Atlin District

The gold output reported from Atlin last year was valued at $198,493. The output this year will probably show a slight increase.

Placer Gold Mines, Ltd.—Operations on this mine, on Ruby Creek, have been steady since the commencement of the season and good progress has been made, although the water supply has been short. About 20 men are employed. T. M. Daulton, manager.

Pittsburgh-British Gold Co.—Operations were commenced later than usual at this mine on McKee Creek, as the water supply has been limited; notwithstanding this, good progress has been made and a satisfactory clean-up has been shipped. About 20 men are employed. G. Adams, manager.

Pine Creek Flume Co., Ltd.—This company on Pine Creek conducted some prospecting operations last season with a scraper outfit, and this season has installed a hydraulic plant. Piping has been in progress for several weeks. No returns have been reported as yet. C. L. Queen, manager.

Otter Creek Development Co.—This company is operating on the upper part of Otter Creek with satisfactory progress. J. E. Moran is manager.

Newfoundland

Tilt Cove—The mines of the Cape Copper Co., produced during July, 730 tons of 3.25% copper ore from the East Mine; 680 tons of 3.75% copper ore from the South Lode; 122 tons of 7.28% copper ore from the West Bluff.

Ontario

While drilling for gas near St. Thomas, first-class oil was recently struck, states a recent consular report. This is about 25 miles east of the oil field of Petrolea and Oil City.

Ontario—Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Aug. 17, and for the month of July are:

Beaver	.....	38.76
Buffalo	.....	114.53
Casey Cobalt	.....	102.40
City of Cobalt	42.75	....
Cobalt Lake	31.55	91.69
Cobalt Townsite	52.50	144.30
Chamb.-Ferland	.....	31.70
Coniagas	.....	137.33
Crown Reserve	22.48	24.19
Drummond	.....	.
Hudson Bay	.....	96.86
Kerr Lake	30.49	60.55
La Rose	42.90	152.63
Lost and Found	.....	..
McKinley-Darragh	38.10	348.78
Nipissing	.....	170.76
O'Brien	.....	69.39
Provincial	.....	26.55
Right of Way	.....	61.83
Timiskaming	31.85	..
Trethewey	41.00	. .
Wettlaufer	....	...
Millerett		20.00
Totals	333.62	1,689.55

McKinley-Darragh—A new record for the value of a single shipment of ore has been made by this company, which has sent out a carload valued at $142,231, containing 231,270 oz. of silver. The average silver content of the ore was 6000 oz. per ton, some running as high as 13,000 oz. The ore came from the 150-ft. level.

Foster—This mine has been leased to C. B. Flynn, of New York, and preparations to resume work are being made.

Hawthorne—The silver properties of the Hawthorne Silver & Iron Mines Co. at Elk Lake and Gowganda are to be worked, operations having been begun. There are a number of locations with veins showing on the surface, which have never been sufficiently developed to indicate their value.

Ontario—Porcupine

Standard—The assets of this company now in liquidation, consisting of two claims, west of the Preston-East Dome, will be sold by auction.

Hollinger—The stamps have been falling regularly for six weeks and the refinery has produced bars of a total weight of 380 lb., approximating a value of $105,000, which are now ready for shipment.

Foley-O'Brian—Negotiations for the sale of a large interest in this property are pending. Should the sale be effected, work will be at once resumed. If not, operations will be started by the present owners some time in the autumn, the company having $130,000 in the treasury.

Mexico

Chihuahua

Dolores Mines Co.—It is reported that Mexican rebels recently raided this mine and destroyed much property. The mine has been forced to cease operation.

Sonora

Mexico Grande Mining Co.—This is the name of a mining company recently organized in Cananea to develop the property of Peter Lepash, northwest of Cananea. A small shaft has been sunk on the vein. The company is capitalized at 10,000 pesos. W. A. Johnson, president.

Greene-Cananea—It is reported that this company is now employing more men than before the shutdown. Work is being done to increase the ore reserves, to find new orebodies, to connect properties and to reopen old workings. Preparations are being made to sink a new four-compartment shaft on the Capote property. A large orebody has already been developed extending from the 300 to the 800-ft. level. The second new converter of the Great Falls type has arrived and will be installed at once. The first converter has already been installed and will soon be in operation.

La Cruz-Elisa—At this mine in the Sahuaripa district some high-grade copper ore has been discovered. The property is 40 miles from the railroad, La Dura being the nearest shipping point.

La Republica—At this mine in the Sahuaripa district, there is a shortage of labor.

Transvaal—In this mine near Cumpas 75 men are at work. Diamond drilling has been temporarily abandoned, after 15,000 ft. of work had been done on the Verde ground.

Minneapolis Copper Co.—Work has been done on this company's Archipelago property. Ore has been mined some of which has been shipped, but not much compared to the quantity mined. The property is not well situated in regard to transportation. At present it is necessary to pack all the ore to the nearest shipping point, Nacozari.

Abundancia—This property, five miles west of Cananea, has decreased its shipments to the Copper Queen smeltery at Douglas, Ariz., on account of recent heavy rain. At present about 15 tons of ore per day is packed to Cananea. O. L. Neer, manager.

San Ignacio—This mine near Moctezuma, is shipping at the rate of 20 carloads per year. Nicolas Gartolius, owner.

Mina Mexico—This mine, east of Tonichi in the Sahuaripa district, has received a new motor truck which will be used for the transportation of supplies and ore on the wagon road recently completed.

Africa

Transvaal

Modderfontein Deep Levels, Ltd.—A cablegram states that the Main Reef series was struck in No. 1 shaft on Aug. 2, at a depth of 2990 ft. The reef series consists of the hanging-wall leader, assaying 24.88 dwt. per ton over 27.0 in. including partings, followed by 31 in. of waste; the middle reef assaying 23.78 dwt. per ton over 6 in., which is separated by 22.6 in. of waste from the footwall leader, assaying 7.26 dwt. per ton over 39 in. including partings. The average for the whole body including waste is 126.5 in. assaying 8.8 dwt. per ton. The deepening of the shaft and the cutting of the station are in progress and will take about two months to complete.

Asia

Chosen

Oriental Consolidated—During June 240 stamps were in operation 28.8 days crushing 28,483 tons of ore. The gross receipts for the month were $134,930; operating costs were $70,918; operating profit for the month was $63,952. The net profit was $57,412 after putting $6540 back into improvements and development work.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Aug. 21—It is estimated that there is a shortage of between seven and eight million tons in the anthracite requirements, due to the two months' suspension in the early part of the year. Operating companies are working up to full capacity, but it is doubtful if they will be able to meet the demand this fall and the situation is generally regarded as serious.

The bituminous market experienced another advance during the week and is now apparently on a firm basis for the balance of the season. The demand is well up to the production and prices are firm or improving. A car shortage is being felt in some districts, particularly on the Pennsylvania in the East and the Illinois Central in the West. The Lake movement is fairly heavy, but still curtailed by the railroad congestion.

HAMPTON TONNAGE

The following is a statement of the tonnages handled at the Chesapeake & Ohio and the Virginian Ry. piers at Hampton Roads during July:

	Sewells Point	C. & O. Piers
Berwind-White Coal Co.	....	84,839
White Oak Coal Co		50,424
Chesapeake & Ohio Coal Agency Co		44,162
Smokeless Fuel Co.	7,595	34,070
New River Consolidated Coal Co.	....	32,588
Chesapeake & Ohio Coal & Coke Co.	65,124	30,085
G. E. Warren Coal Co.	....	15,485
Maryland Coal & Coke Co.	....	6,441
Atlantic States Coal & Coke Co.		2,297
New River Coal Co	36,288	12,390
Miscellaneous		9,091
Castner, Curran & Bullitt.	63,821	....
Northern Coal Co.	21,601	....
C. H. Sprague & Son.	20,141	.....—
Total.	214,570	311,751

Total shipments of coal over the Virginian Railway for June of the current year were 256,070 net tons, as compared with 311,247 for the month previous.

IRON TRADE REVIEW

New York, Aug. 20—The feature of the steel market continues to be the well sold up condition of the mills and the demand for early-delivery material, which, according to all reports, is bringing premiums, and, in some cases, large premiums. While among buyers there is a settled feeling that sellers of steel are exaggerating the strength of the situation, sellers point to the actual facts in the market that buyers are insistent for early deliveries and are evidently not stocking material.

By the curious method by which steel prices are now advanced, in open market, plates and shapes have moved upward $1 per ton, making the price 1.40c. All the independent producers seem to have made the advance within the last few days, and while the steel corporation subsidiaries have not formally marked up their prices, it is practically certain that they would not sell at less than 1.40c., so that an advance in plates and shapes has been effected as quietly as that of Aug. 1. There is no proof that these price advances are not entirely the result of voluntary independent action by the various sellers, and if so, a strong foundation for the market is indicated, since it is unusual for prices to advance with such rapidity in an open market. There have now been three $1 advances in plates and shapes, June 26, Aug. 1 and Aug. 20, or $3 per ton in less than 60 days, and this in what is usually the dullest season of the year.

There is an increase in the number of those who doubt that the present active demand will extend into next year. It is pointed out that demand for steel has increased much more than has the general business activity of the country, which does not point to permanence, and it is also suggested that so many relatively low-priced contracts extend through this year that buyers will face a large and sudden advance in prices when they come to renew contracts for next year, which is liable to make them pause and cause a distinct lull.

Baltimore

Aug. 20—Exports for the week included 205,535 lb. of steel plates and 134,900 lb. of iron pipe to Rotterdam. Imports included: Terne and tin plate, 429 boxes and 70 cases from Liverpool; ferromanganese, 1099 tons from Liverpool and 70 tons from Rotterdam; silicospeigel, 80 casks from Liverpool; tin, 653 slabs from Liverpool; charcoal iron, 1356 blooms from Hamburg; iron ore, 23,650 tons from Cuba; manganese ore, 7200 tons from Poti; and 239 tons of steel billets and 7 cases of steel wire from Bremen.

Birmingham

Aug. 19—Southern pig is still strong at $12 per ton, No. 2 foundry, with the sales exceeding the make. There were a few sales made during the past week for export iron to Genoa, Italy, a small order at prices equal to the domestic quotations, although manufacturers of iron here are not seeking the foreign business with present favorable domestic conditions. Some inquiry has been received in this section as to 1913 iron, but as far as can be learned, no sales have been attempted. Some of the more prominent iron men of the Birmingham district say that all indications point to a most active market during the last quarter of this year and that the conditions will continue into next year. The certain quotations for last quarter of 1912 have not yet been fully announced. With present prices firm at $12 per ton, No. 2 foundry, it would be a little foolish to begin this early to fix 1913 prices. Thirteen dollars is considered a certainty, if not a better price for the first quarter in 1913.

It will be the middle of September before the pig-iron make in the Southern territory is increased as much as has been desired for several weeks. Two more furnaces are being gotten in readiness to blow in shortly. An increase in the output in August is looked for.

The Sloss-Sheffield Steel & Iron Co., the second largest iron-producing company in the South, has reduced its accumulated stocks of iron from 110,000 at the first of the year at about 40,000.

The steel market in the Southern territory is also steady with prospects of a continuation of these conditions through the balance of the year and longer. All shapes of steel are in demand and good prices obtain. The steel plants at Ensley (Tennessee company), and Gadsden (Southern Iron & Steel Co.), are doing well and stoppages have been made so far this summer only for repairs. Rail, fabricated steel and steel-wire goods are moving out in all directions.

Cast-iron pipe movements are active, the production steadily improving and the sales satisfactory. The new foundry of the Central Foundry Co., at Holt, Ala., is doing nicely on the start. The pipe prices are firm.

James Bowron, president and receiver of the Southern Iron & Steel Co., has announced that the company has paid up its entire wage debt and that its numerous employees are satisfied. The steps looking to the refinancing of the company and a reorganization are still on, with all prospects of a speedy completion.

With a furnace at Florence recently repaired and about to be blown in, the Sloss-Sheffield Steel & Iron Co. will most likely consider further development of its brown-ore fields, near Russellville, not very far removed from its furnace plant. The mines at Sloss (hard ore), located a short distance below Birmingham, continue to produce a large quantity of ore. Water troubles have been obviated at this place.

Harry W. Coffin, who was elected trustee for the Alabama Consolidated Coal & Iron Co. at a meeting of the creditors of the concern, announces the appointment of W. E. Leake as assistant trustee. Messrs. Coffin and Leake were named by the Federal court as receivers for the company and they have been operating the company, running one furnace, together with coal mines and coke ovens to furnish a sufficient amount of fuel and coke. Mr. Leake is a practical coal operator as well as experienced in other lines of industrial operation. The statement is made that steps are being taken looking to a reorganization of the company.

Chicago

Aug. 20—General Western conditions in the iron market remain unchanged, except that there seems a slight improvement in pig iron from the seller's point of view. Prices on pig hold firmly to $12, Birmingham, or $16.35, Chicago, for No. 2 foundry, and $15.50 for Northern of the same grade, at the furnace, which means about $16, delivered in Chicago. Sales are running light—up to 1000 tons in general—with much demand for last-quarter requirements and a few sales running into 1913 deliveries at slightly advanced prices over last quarter. The $11.75, Birmingham, price for No. 2 Southern seems to have disappeared; $12 is being quoted everywhere on ordinary requirements. Melters are buying now largely for the increased requirements of the last quarter and it is probable that more of them will contract, at the prices asked by furnace agents, for 1913 delivery, as general business increases with the general prosperity following large crops.

In the market for iron and steel products there is a continuation of the large buying that has been going on for several weeks, notwithstanding increases in prices. Structural material is in heavy demand, in the aggregate, though individual orders are light, the tonnage being widely distributed. Railroad supplies are in increasing demand, as the roads find good prospects ahead of them, and though next year's business is not being sought it comes in unceasingly. Standard rails and track fastenings alike are in demand. Bars are in good demand at 1.40c. for iron and 1.48c. for soft-steel bars. Plates and sheets have an active business and minor lines are flourishing. There is no falling off anywhere, in iron and steel lines, and conditions are promising for increased business.

Philadelphia

Pig Iron—Prices for all grades of iron have again been marked up, but less business has been done than advancing prices would indicate. Office talk is optimistic and another advance is confidently predicted within a week or two. Most interest is felt in basic, which is sold up far ahead, and makers feel like doing no more business until they can see where prices are likely to land. Within a few days two furnaces will be added to those in blast. Most of the last weeks' business has been done with small consumers. There are indefinite inquiries from large Eastern and New Jersey users. Southern makers have been quietly taking business from this territory at high figures and another advance of 50c. is on its way. No. 2 X foundry is quoted $16 to $16.25 with best Southern quoted 50c. higher. Good gray forge is being picked up where possible at $15.50, basic $16.25.

Steel Billets—Several buyers are in the market and there is no present probability that all can be accommodated because of the unwillingness of manufacturers to book future deliveries at present prices with crude material creeping up every week. Several small early delivery lots were taken at premium rates.

Bars—Steel bars advanced since last week in small lots. Refined iron has also moved up and the mills are unable to quote definite prices on all inquiries. On common iron there is urgent inquiry for large lots and negotiations will be closed soon on the best terms to be had.

Sheets—An advance in black and galvanized sheets has been practically made and a rush of orders from small buyers have been taken. Blue annealed sheets have also been advanced.

Pipes and Tubes—Cast-pipe quotations have been marked up in sympathy with raw material. Tubes are strong and latest inquiries presented indicate the probability of large contracts at the outside prices in a few days.

Plates—The mills have little spare capacity to accommodate urgent buyers, who are increasing in number every week. The volume of unplaced business is larger than for years. Requirements are springing up from unexpected sources and premiums are the order of the day.

Structural Material—Within a few days contracts for exceptionally large quantities have been placed at prices which are withheld. Within a week or two some large orders will be closed, much of the material being deliverable in 1913. Much construction work, involving about 1000 tons, is ready for submission and most of this will be taken at premium rates.

Steel Rails—The pressure for early winter delivery is strong. Several systems have recently decided on side-tracking and short extensions. Export business continues to be a feature.

Scrap—Yards are about empty except in the lower grades, and those stocks are going down.

Pittsburgh

Aug. 20—In sympathy with the fresh advance in shapes, some of the mills have also advanced bars $1 per ton, but this is not general, and the bar market can be quoted at 1.30c. to 1.35c.

Specifications continue good all along the line, and many of the mills are shipping material at substantially the heaviest rate of the year. The National Tube Co. is doing so, having a large output and also drawing from stocks, so that it is already stated its August shipments will be the heaviest of the year.

Pig Iron—A fair tonnage of bessemer is reported as sold at $14.75, Valley, an advance of 25c., also a fairly large tonnage of basic at $14, Valley, an advance of 25c. over last week's quotation, and an advance of 50c. in the fortnight. Stocks have practically disappeared, under quiet buying in the past few months, and production has not materially increased, so that suddenly the market has turned entirely in sellers' favor and since the matter of coke prices is now fairly well settled by heavy sales at $2.25, the furnaces are freer to mark up their prices. Foundry iron is strong at the recent advance to $14, Valley, and important consumers who recently bought at $13.50 have found it impossible to increase their orders at under $14. We quote: Bessemer, $14.75; No. 2 foundry and basic, $14; malleable, $13.75; forge, $13.25@13.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—There is a moderate amount of contracting at the recently established price of $51, but most of the buying was done before the advance, at $48.50. It is represented that prompt material is scarce and that it is sometimes difficult to secure prompt shipment at the regular figure. We quote prompt and forward at $51, Baltimore, freight to Pittsburgh being $1.95.

Steel—Unfinished steel continues scarce and prices are difficult to quote as offerings are so light. Since consumers have contracts at so much lower than present open market quotations they would not be large buyers at the current market, although they are all taking deliveries on contract well, and in some cases are asking for larger tonnages. We quote: Bessemer billets, $22.50; bessemer sheet bars, $23; openhearth billets, $23; openhearth sheet bars, $23.75@24, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are quiet at $25@26, Pittsburgh.

Sheets—Effective Aug. 15 the American Sheet & Tin Plate Co. advanced its price on blue annealed sheets $1 per ton, from 1.45c. to 1.50c., for 10-gage. Some of the independent mills, being able to make fairly early deliveries, had already been quoting 1.50c., and the advanced price immediately became the market. Specifications are fully equal to current output in all classes of sheets and the market is strong, with the prospect of an early advance in black and galvanized. Between 85 and 90% of the sheet mills are now in operation, making a better showing than in July, when some of the mills, averaging from 10 to 20%, were down for repairs. We quote: Blue annealed, 10-gage, 1.50c.; black sheets, 28-gage, 2.05c.; galvanized, 28-gage, 3.15c.; painted corrugated, 2.20@2.25c.; galvanized corrugated, 3.10@3.20c., both for 28-gage.

Connellsville Coke—Two or three more contracts, aggregating about 15,000 tons per month, have been closed for the balance of the year at $2.25, and in the past week there have been sales of 8000 to 10,000 tons of prompt and near-by coke at $2.25 and $2.30, the bulk of the tonnage being at the lower price. All furnaces seem now to be fairly well covered for this month, but a number are uncovered for September and later and further activity is to be expected by Sept. 1.

St. Louis

Aug. 19—The market has been dull during the last week, probably caused largely by the intensely hot weather. There has not been much inquiry though a few small contracts have been closed. The price on No. 2 Southern iron remains unchanged at from $11.50@12, Birmingham, or $15.25@15.75, St. Louis. The lower price prevails for immediate shipment and the higher for four-quarter delivery. There has been practically no Northern iron inquiry.

Coke remains firm at around $5.35, St. Louis, for 72-hr. low-sulphur foundry.

Iron Ore Trade

The Eastern markets are firmer and some sellers of iron ore are asking advances of 20 or 25c. per ton. Foreign ores are higher on account of higher ocean freights.

July shipments of iron ore from the Lake Superior region are reported by the Cleveland *Iron Trade Review* at 7,600,283 tons. For the season to Aug. 1 the total shipments were:

Port	1911	1912	Changes	
Escanaba	1,711,806	2,478,294	I.	766,488
Marquette	843,177	1,430,814	I.	587,637
Ashland	1,102,263	2,103,858	I.	1,001,595
Superior	4,698,855	6,668,655	I.	1,969,800
Duluth	3,158,450	4,385,802	I.	1,227,352
Two Harbors	2,549,740	4,223,481	I.	1,673,741
Total	14,064,291	21,290,904	I.	7,226,613

Total increase this year 51.4%. The heaviest gain was at Superior, in ore from the Hill leases.

The Ohio board of assessment, after discussion with ore receivers, has decided to tax stocks of ore on docks, the stocks to be taken on Apr. 7, and the ore to be valued at 40c. per ton.

METAL MARKETS

New York, Aug. 21—The markets have been dull all around, but a little stiffer than last week. There has been a considerable advance in spelter, while copper and lead have become distinctly firmer. Some European buying of copper at the end of the week has been encouraging.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London was 77s. 9d. for the last week.

Iridium—The price for pure metal remains at $63.50 per oz., New York.

Platinum—The market remains rather quiet, as consumers hope for materially lower prices, but there is no change. Dealers still ask $45.50 per oz. for refined platinum, and $48 per oz. for hard metal.

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess	
Gold				
July 1912	$ 7,263,624	$ 3,747,869	Exp.	$3,515,755
" 1911	2,178,088	2,594,653	Imp	416,565
Year 1912	40 660 460	29,012,211	Exp	11,648,249
" 1911	15 429,650	36,367,679	Imp	20,938,029
Silver				
July 1912	6,591,054	3,449,716	Exp.	3,141,338
1911	5,275,008	3,920,794	Exp.	1,354,214
Year 1912	40,260,276	28,713,965	Exp.	11,546,311
" 1911	39,718,211	25,881,395	Exp.	13,836,816

Exports from the port of New York, week ended Aug 17 Gold, $13,600; silver, $1,217,913, chiefly to London. Imports: Gold, $287,149; silver, $105,197, from Mexico, Peru and Japan.

Silver—The market advanced sharply until 29⅛d. was bid for silver in London, on Aug. 17. This rise was due to buying for the India mint. On the 19th, the price dropped to $28\frac{11}{16}$ on news that India mint had stopped buying for the present. The market, Aug. 21, closed steady at $28\frac{13}{16}$ on India bazaar buying.

SILVER AND STERLING EXCHANGE

Aug.	15	16	17	19	20	21
New York	62⅞	63	63¼	62¼	62⅛	62⅝
London	28⅞	29	29⅛	$28\frac{11}{16}$	28⅝	$28\frac{13}{16}$
Sterling Ex.	4.8705	4.8715	4.8715	4.8705	4.8715	4.8710

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Samuel Montagu & Co. report under date of Aug. 8, that news from India as to climatic conditions was entirely satisfactory, but that buying orders from the bazaars have been held up by the heavy speculative stocks. The center of interest, however, continues to be China, although its influence is at present negative, for neither buying nor selling has been done this last week. It is difficult to believe, however, that the Chinese negotiations for a foreign loan will not take shape before long, in which case a renewal of silver purchases for that quarter will be likely.

Shipments of silver from London to the East, Jan. 1 to Aug. 15, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes	
India	£5,038 100	£4,640,700	D.	£397,400
China	890,400	933,500	I.	43,100
Total	£5,928,500	£5,574,200	D.	£354,300

During the week ended Aug. 8, there were £750,000 in gold bars arrived in London, of which £584,000 came from South Africa. India took £126,000, the Bank received the balance.

Sales of gold bars from the New York Assay office in July amounted to $2,039,869. For the seven months ended July 31 the total sales were $15,717,430 in 1911, and $15,990,081 in 1912; increase, $272,151. These sales are to jewelers and others for use in the arts.

Copper, Tin, Lead and Zinc

Copper—In general the market continued dull. However, there was considerable scattered buying of both Lake and electrolytic copper, especially by domestic consumers who found themselves under the necessity of replenishing their stocks. Sales of prime Lake copper were made at 17.50@17.65c., while 17¾c. was paid for special brands. Sales of electrolytic are reported at 17⅝c., delivered, usual terms, and at slightly under during a part of the week. There has been a tendency on the part of some of the smaller producers to make substantial concessions on contracts running well along toward the end of the year. In the meanwhile the larger producers have continued to stand pat for their price asked of 17¾c., delivered, etc. Near the close of the week European buyers appeared in the market and took some small lots of copper for early shipment. At the close, Lake copper is quoted at 17½@17¾c., and electrolytic in cakes, ingots and wirebars at 17.45@17.50c. Casting copper is quoted nominally at 17¼@⅜ as an average for the week.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6950 long tons. Our special correspondent gives the exports from Baltimore at 747 long tons for the week.

The London market for standard copper declined on Aug. 15 to £78¼ for both spot and three months. On the 16th, it reacted to £78 11s. 3d. for spot, and £78½ for futures, and held around these figures during the 19th. On the 20th, the market closed at £78⅞ for both deliveries, and advanced further on the 21st to £79½ for spot and £79⅜ for three months. The market closes at £79¼ for spot, and £79 3s. 9d. for three months.

NEW YORK

Aug.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
15	17½ @17¾	17.45 @17.50	45.70	4.50	4.35 @4.37½	6.85 @6.95	6.70 @6.80
16	17½ @17¾	17.40 @17.50	45.75	4.50	4.35 @4.37½	6.90 @7.00	6.75 @6.85
17	17½ @17¾	17.40 @17.50	45.75	4.50	4.35 @4.37½	6.90 @7.00	6.75 @6.85
19	17½ @17¾	17.40 @17.50	45.95	4.50	4.37½ @4.42½	6.95 @7.00	6.80 @6.85
20	17½ @17¾	17.45 @17.50	46.50	4.50	4.37½ @4.42½	6.95 @7.05	6.80 @6.90
21	17½ @17¾	17.45 @17.50	46.00	4.50	4.37½ @4.42½	7.00 @7.10	6.85 @6.95

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Aug.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
15	78 1/16	78⅛	83¾	207½	205	19⅞	26½
16	78 9/16	78½	83¾	207¼	205½	19½	26½
17		....	.	..	.	...	
19	78¼	78¼	84¼	208⅝	206¼	19½	26½
20	78⅞	78⅞	83¾	211¾	209½	19½	26½
21	79¼	79 3/16	84½	209½	208	19½	26½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 ± 21¾c.

Lead—There is a good demand and the market is strong. Prices in the West have advanced, and at the close St. Louis is quoted at 4.37½@4.42½c. New York is unchanged at 4.50c.

The European market is firm, Spanish lead being quoted at £19½, and English 2s. 6d. higher.

Spelter—The volume of transactions has been small, but the desire to sell on the part of certain producers having disappeared the market advanced smartly upon the relatively small tonnage that was wanted by consumers. At the close, St. Louis is quoted at 6.85@6.95c., and New York at 7@7.10c.

The London market is unchanged, good ordinaries being quoted at £26½ and specials at £26¾.

Base price of zinc sheets is now $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Tin—The market has been strong and advancing. There has been considerable buying in the East, which has been attributed to American concerns, and there has also been a great deal of bull speculation in London. Consumption is excellent, and the position is a healthy one. The market advanced from 45¾@46½c. and closed at 46c.

The London market closed on the 15th at £207½ for spot, and £205 for three months. On the 19th, it advanced to £208⅝ and £206¼ respectively. This was ascribed to large orders by dealers from this side, and also to bull speculation in London. A further advance to £211¾ for spot and £209 for three months took place on the 20th. There was a reaction on the 21st, and the market closes at £209½ for spot, and £208 for three months.

Tin-ore arrivals at Hamburg during July, 1912, as reported by Messrs. Robertson & Bense, were: from Bolivia direct, 2194 tons; via Liverpool, 464; total, 2658 tons.

Other Metals

Aluminum—There is a decided scarcity of spot goods now. Dealers are asking 24¼@24½c. per lb. for No. 1 ingots, New York.

Late London quotations for aluminum are £72@74 per long ton—equal to 15.68@16.08c. per lb. for No. 1 ingots.

Antimony—Antimony continues firm, and there has been a marked decline in ore production in the last nine months, which should affect the price of the metal. Cookson's brings 8.60 per lb.; U. S. and Halletts, 7.95c.; Hungarian, Chinese, and other outside brands, 7.70c.; all prices ex-dock, New York.

Nickel—Shot, blocks, plaquettes, according to quality, 40 to 45c. per lb. Electrolytic nickel, 3c. per lb. extra.

Quicksilver—Business is dull, but prices here are unchanged. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London price is unchanged at £8 per flask, with the same price named from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 17—The base price paid this week for zinc was $53 to $57 per ton of 60% zinc. The base price paid for 80% lead ore was $56 per ton.

SHIPMENTS, WEEK ENDED AUG. 17

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	763,100	....	702,400
Mineral Point	746,610	......	....
Galena	661,700	72,300	....
Platteville	488,470	....	214,100
Shullsburg	430,000	.....	.....
Hazel Green	280,000	60,000	......
Harker	216,820	.....	..
Highland	194,200	....	......
Cuba City	124,940	....	203,180
Montfort	64,000	......	......
Total	3,969,840	132,300	1,119,680

Shipped during week to separating plants, 2,542,000 lb. zinc ore.

Joplin, Mo., Aug. 17—The high price of zinz-sulphide ore this week was $60, the base $52 to $57 per ton of 60% zinc. Zinc silicate sold at $30 to $33 per ton of 40% zinc. The average price of all grades of zinc was $53.90 per ton. The high

SHIPMENTS, WEEK ENDED AUG. 17

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,147,200	.....	967,090	$172,100
Joplin	2,373,370	.....	286,840	74,675
Miami	525,120	....	240,230	19,955
Galena	503,850	....	74,410	16,225
Oronogo	500,670	....	102,840	15,585
Granby	198,620	463,940	13,490	13,780
Duenweg	337,890	......	65,260	11,290
Alba-Neck	237,070	......	20,570	7,465
Spurgeon	.....	275,390	85,010	6,740
Carl Junction	215,440	......	41,760	6,460
Jackson	177,530	......	......	4,970
Carthage	128,540	....	......	3,470
Cave Springs	63,010	.....	......	1,825
Aurora	....	68,200	......	1,465
Totals	10,408,370	825,530	1,855,740	$356,065
33 weeks	338,088,790	20,884,030	58,336,760	$10,719,275

Blende val., the week, $288,378; 33 weeks, $8,782,689
Calamine, the week, 14,535; 33 weeks, 316,422
Lead value, the week, 53,152; 33 weeks, 1,620,644

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price 1911	Zinc Ore: Base Price 1912	Zinc Ore: All Ores 1911	Zinc Ore: All Ores 1912	Lead Ore: All Ores 1911	Lead Ore: All Ores 1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50		41.28	....	60.74	.....
September	42.63	....	41.29	....	59.33	......
October	42.38	..	40.89	......	54.72	.....
November	45.40	..	43.25	.....	57.19	.....
December	44.13	....	40.76	....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

price of lead was $57, with 80% grades selling at $55 to $56. The average price, all grades of lead, $57.28.

Sellers held this week's acceptance back until Friday afternoon before they would dispose of the ore, and even then a number declined to sell. Buyers were on the market with light orders and their wants were satisfied. They stood firm at the same price offerings that were made on Wednesday.

Other Ore Markets

Manganese Ore—The price for domestic ores as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent. or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess phosporus and silica. Most of the manganese ore used here is imported—from India, Brazil and Russia—and is bought abroad on the open market.

There has been recently an advance of 10% on ores in foreign prices of manganese ore. Recent quotations in Great Britain are: Indian and Brazilian ore, 50% manganese, 21@22½c. per unit; 48%, 20½@22c.; 45%, 20@21c. Russian, 50%, 17½@18c.; 48%, 17@17½c. per unit.

In discussing the current high prices of manganese ore, *Echo des Mines*, Aug. 1, 1912, states that they seem to be warranted by present conditions and should persist, lowered perhaps later a little by greater Russian shipments. The closing of the Dardenelles by the Italo-Turkish war has greatly hindered shipments from Poti, while all the great steel-making countries promise a record breaking year, with attendant great use of manganese ore.

Chemicals

New York, Aug. 14—The general market is still slow, but growing better.

Arsenic—We still quote 4@4½c. per lb. for futures, 5c. per lb. spot. Several small lots have arrived, but have been taken immediately.

Copper Sulphate—There is a small, steady demand, and the price is still 5.50 for large lots to 5.75c. for small.

Nitrate of Soda—Spot goods are 2.47½c.; September delivery, 2.50; October and November, 2.52½; December, 2.55; and January and later, 2.57½c. High ocean freights and a scarcity of labor in Chile are given as the cause of these prices.

MINING STOCKS

New York, Aug. 15—After five days of continuous advance, the markets showed a reaction on Thursday. Public buying was probably in some measure checked by the passing of the steel-tariff reduction bill by the House over the veto of the President. There were few changes in the Curb mining list; 47,000 shares were dealt in, of which 11,000 were West End Extension.

Among the miscellaneous securities sold at auction on Wednesday, in New York, were the following mining shares: 50,000 Porcupine Southern Mining Co., and 249 Development Co. of Porcupine, $7500 for the lot.

Aug. 16, the market was dull in the morning, but in the afternoon prices strengthened, closing just about at Thursday's level. On the Curb, mining share sales amounted to 44,990 shares, of which 24,470 were Tonopah shares.

Aug. 17 again showed a decline which was not overcome, with some activity developing as prices lowered. On the Curb the silver issues were neglected and copper stocks dull. Total mining share transactions were 33,850 shares.

Aug. 19 was marked by extreme dullness, with sales only about one-half what they were a year ago, and it is strikingly evident that the general public is not yet back in the market. On the Curb, quotation changes were narrow, but 55,000 shares were dealt in.

On Aug. 21 there was a decided boom in copper shares. On sales of 76,100 shares Amalgamated moved up 2¼ points, and Anaconda 1¾ points, on sales of 40,200. U. S. Steel common was their nearest competitor, 29,600 shares. A. S. & R., Chino, Guggenheim Exploration, Miami, Ray, Inspiration, and Tennessee Copper also advanced. On the Curb small gains were numerous. Mining transactions totaled 55,026 shares.

Boston, Aug. 20—While the copper-share market has been a dull and listless affair, it begins to show signs of life and activity as a result of the sharp advances in Amalgamated and Anaconda. The time is approaching when increased disbursements will be made by many of the companies. Some disappointment was felt today that the Quincy company did not increase its rate from the $1.25 paid three months ago, but this mine is known as the "old reliable" and will do its turn when the time is ripe.

Calumet & Hecla came to the fore today with its $16 advance during the week to $544, the highest of the year, and within $1 of the 1911 high. The opinion is generally expressed that the next quarterly dividend will be increased from the present $10. Butte & Superior has again attracted attention with its $4.12½ drop to $42, and recovery to $43. Announcement was made today that this company will increase its capital from 250,000 to 350,000 shares and this 100,000-share increase will be offered to stockholders of record Sept. 26 at $37.50

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	May	June	July
Alaska shipments.	1,720,391	4,134,569	2,224,441
Anaconda	25,800,000	....	....
Arizona, Ltd........	3,500,000	3,300,000	3,200,000
Copper Queen......	7,024,087	7,622,730	7,708,147
Calumet & Ariz....	4,424,000	4,160,000	4,748,000
Chino...............	1,275,850	1,474,979	2,945,000
Detroit...	2,092,478	1,959,634	2,194,090
East Butte....	1,445,000	....	....
Mammoth.	1,760,000	....	....
Mason Valley......	1,520,000	1,438,580	1,500,000
Nevada Con.......	6,063,462	5,913,832	....
Ohio...	685,000	....	....
Old Dominion.....	2,180,000	2,130,000	....
Ray................	2,924,913	3,004,195	2,985,965
Shannon.	1,464,000	1,270,000	1,446,000
South Utah...	236,884	162,335	142,555
United Verde*	2,500,000	....	....
Utah Copper Co...	9,564,919	8,772,742	10,602,000
Lake Superior*....	21,250,000	15,600,000	19,500,000
Non-rep. mines*..	8,400,000	8,300,000	8,970,000
Total production	105,830,984	....	....
Imports, bars, etc..	25,836,519	24,262,292	....
Total blister.....	131,697,503	....	....
Imp. in ore & matte	6,410,226	8,404,936	....
Total American..	138,107,729	....	....
Miami†.............	2,676,702	2,683,310	3,027,710
Brit. Col. Cos.:			
British Col. Copper	875,000	996,000	1,026,000
Granby	1,914,460	1,888,400	....
Mexican Cos.:			
Boleo†.............	2,260,160	1,851 920	2,386,480
Cananea	4,600,000	4,310,000	4,000,000
Moctezuma	2,892,521	3,176,819	3,094,016
Other Foreign:			
Cape Cop., S. Africa	754,880	....	....
Kyshtim, Russia...	....	....	....
Spassky, Russia....	694,400	757,120	....
Famatina, Argen..	....	....	....
Tilt Cove, Newf'd..	123,087	....	....
Exports from:			
Chile...............	3,696,000	9,856,000	....
Australia..........	7,840,000	8,176,000	....
Arrivals in Europe‡	9,976,860	12,667,200	....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VII, 1911.......	112,167,934	56,982,582	74,880,658
VIII.	125,493,667	59,935,364	69,855,660
IX.	115,588,950	57,311 584	50,824,011
X	118,255,442	64,068 307	60,084,349
XI. .	111,876,601	68,039,776	67,049,279
XII....	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912..........	119,337,753	62,343,901	80,167.904
II.........	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V... ...	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII.............	137,161,129	71,094,381	60,121,331

VISIBLE STOCKS

	United States	Europe	Total
VIII, 1911......	137,738,858	191,891,840	329,630,698
IX............	133,441,501	191,228,800	324,670,301
X..............	140,894,856	191,945,600	332,840,456
XI.............	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912.........	89,454,695	158,323,200	247,777,895
II....... ..	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082 380
IV	62,367,557	136,819,200	199,186,754
V..............	65,066,029	134,176,000	199 242 029
VI	49,615,643	117,801,600	107,417,232
VII..........	44,335,004	108,186,000	152,521,047
VIII.	50,280 421	113,299,200	163,579,621

in the proportion of one new for eight shares held. This new money will be used for exploratory purposes and the possible acquisition of properties now under option.

Curb trading has been of fair proportions, with slight price variations.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0.10
Belmont, Ida	July 22	Aug. 22	0.002
Black Pine M & M., Utah	Aug. 29	Sept. 19	0.00¼
Cedar Talisman, Utah	Sept. 14	Oct. 3	0.00½
Con. Imperial, Nev	July 28	Aug. 21	0.01
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Dalmatia, Ida	Aug. 24	Sept. 21	0.002
Dennemora, Ida	July 20	Aug. 20	0.002
Eagle Mt., Ida	July 31	Aug. 22	0.001
Horseshoe Ida	Aug. 8	Aug. 30	0.002
Hypotheek, Ida	July 19	Aug. 14	0.005
JohnnyGold M & M Co., Utah	Aug. 30	Sept. 20	0.00¼
Laclede, Ida	Aug. 1	Aug. 24	0.003
Lone Star, Nev	July 20		0.02
Manhattan Red Top, Nev	July 12		0.01½
Mineral Farm, Ida	July 15	Aug. 15	0.002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
National Copper, Ida	July 15	Aug. 15	0.01
New Reliance, S. Dak.			0.01
Oreano, Ida	July 18	Aug. 19	0.001
Sandstorm-Kendall, Nev	July 8		0.01
Seven Troughs Mon'h, Utah	Aug. 10	Aug. 30	0.0¼
Silver Mt., Ida	July 15	Aug. 15	0.002
Smuggler, Utah	Aug. 20	Sept. 20	0.00¼
Springfield, Ida	July 30	Aug. 31	0.002
Tonopah North Star, Nev	July 15		0.02
Twin Star, Ida	Aug. 31	Sept. 28	0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	....	24.428	24.082	.
September	53.295	52.440	..	24.567	24.209	.....
October	55.490	53.340	..	25.596	24.594	...
November	55.635	55.719		25.680	25.649	.
December	54.428	54.905	...	25.160	25.349	.
Year	53.486	53.304	.	24.670	24.592	..

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York Electrolytic 1911	New York Electrolytic 1912	New York Lake 1911	New York Lake 1912	London, Standard 1911	London, Standard 1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	....	12.634	..	56.266	.
September	12.201	....	12.508	.	55.253	....
October	12.189	....	12.370	....	55.170	.....
November	12.616		12.769	....	57.253	....
December	13.552		13.768	...	62.068	....
Year	12.376	.	12.634	....	55.973	....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.619
February	[illegible]	42.962	August	43.319	..
March	[illegible]	42.577	September	39.755	..
April	42.185	44.923	October	41.185	.
May	43.115	46.053	November	43.125	...
June	44.606	45.815	December	44.655	.
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	....	4.406	......	14.260	.
September	4.485	....	4.356	......	14.744	.....
October	4.265	.....	4.139	......	15.332	......
November	4.298	......	4.181	......	15.821	.....
December	4.450	......	4.332	......	15.648	.....
Year	4.420	......	4.286	......	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton

SPELTER

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	.	5.803	.....	26.801	....
September	5.869	......	5.719	..	27.750	....
October	6.102	......	5.951	......	27.256	...
November	6.380	......	6.223	......	26.795	......
December	6.301	......	6.151	......	26.849	......
Year	5.758	......	5.608	......	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No. 2 Foundry 1911	No. 2 Foundry 1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	..	14.00	...	14.47	....
September	15.90		13.57	.....	14.40	..
October	15.43	......	13.44	....	14.34	.
November	14.92	..	13.30	....	14.25	....
December	15.15	.	13.10	....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Aug. 20

Name of Comp.	Bid.
Acacia	.05
Cripple Cr'k Con.	.01⅞
C. K. & N	.16
Doctor Jack Pot	.06⅝
Elkton Con	.67
El Paso	1.11
Findlay	.06
Gold Dollar	.18¼
Gold Sovereign	.02
Isabella	.21
Jack Pot	.05
Jennie Sample	.06
Lexington	.008
Moon Anchor	.009
Old Gold	.04
Mary McKinney	.70
Pharmacist	.01½
Portland	.94
Vindicator	.86
Work	.01½

SALT LAKE Aug. 20

Name of Comp.	Bid.
Beck Tunnel	.10
Black Jack	.12
Cedar Talisman	.01½
Colorado Mining	.19
Columbus Con	.25
Crown Point	.02½
Daly-Judge	5.50
Grand Central	.58
Iron Blossom	1.27
Little Bell	.30
Lower Mammoth	.05
Mason Valley	13.50
May Day	.16
Nevada Hills	2.02
New York	‡.02
Prince Con	1.55
Silver King Coal'n	2.10
Sioux Con	.05¾
Uncle Sam	.15
Yankee	‡.10

TORONTO Aug. 20

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.35	Hollinger	12.00
Hudson Bay	‡69.00	Imperial	.02
Temiskaming	.37	Pearl Lake	.16
Wettlaufer-Lor.	.35	Porcu. Gold	.28
Apex	.02	Porcu. Tisdale	.01
Central	‡5.56	Preston E. D.	.02
Crown Chartered	.07	Rea	‡.25
Dobie	‡.30	Standard	‡.00¾
Dome Exten	.08	Swastika	.07¾
Foley O'Brien	.17	West Dome	.05

SAN FRANCISCO Aug. 20

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.07
Belcher	.40
Best & Belcher	.09
Caledonia	1.20
Challenge Con	.11
Chollar	.10
Confidence	.75
Con. Virginia	.53
Crown Point	.45
Gould & Curry	.04
Hale & Norcross	.12
Mexican	2.65
Occidental	.05
Ophir	.94
Overman	.60
Potosi	.05
Savage	.10
Sierra Nevada	.19
Union Con	.75
Yellow Jacket	.47

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	9.75
Jim Butler	.65
MacNamara	.24
Midway	.61
Mont.-Tonopah	2.00
North Star	.15
West End Con	1.70
Atlanta	.26
Booth	.07
C.O.D. Con	.11
Comb. Frac	.16
Jumbo Extension	.39
Pitts.-Silver Peak	.93
Silver Pick	.11
St. Ives	‡.30
Tramp Con	‡.02
Argonaut	‡2.00
Bunker Hill	‡4.50
Central Eureka	.37
So. Eureka	‡2.90

N. Y. EXCH. Aug. 20

Name of Comp.	Clg.
Amalgamated	87⅝
Am. Agri. Chem	59¾
Am.Sm.&Ref.,com	87⅞
Am. Sm. & Ref., pf.	108
Am. Sm. Sec., pf. B	87½
Anaconda	45½
Batopilas Min	‡1¾
Bethlehem Steel pf	73½
Chino	38
Comstock Tunnel	‡.10½
Federal M. & S., pf.	44
Goldfield Con	3¼
Great Nor., ore., ctf.	46¼
Guggen. Exp	59¼
Homestake	95½
Inspiration Con	19⅝
Miami Copper	29¾
Nat'nal Lead, com.	60
National Lead, pf.	110¼
Nev. Consol	22½
Pittsburg Coal, pf.	97½
Ray Con	22
Republic I&S, com.	28½
Republic I & S pf.	91⅝
Sloss Sheffi'd com.	56¼
Sloss Sheffield, pf.	100
Tennessee Copper	43¾
Utah Copper	64
U. S. Steel, com	74¼
U. S. Steel, pf.	113
Va. Car. Chem	48

BOSTON EXCH. Aug. 20

Name of Comp.	Clg.
Adventure	8⅝
Ahmeek	345
Algomah	8½
Allouez	46½
Am. Zinc	30¼
Ariz. Com., ctfs.	5¼
Bonanza	40
Boston & Corbin	7⅛
Butte & Balak	3 1/16
Calumet & Ariz	77½
Calumet & Hecla	540
Centennial	22½
Con. Mercur	‡.03
Copper Range	58¾
Daly West	5
East Butte	14
Franklin	11
Granby	56
Hancock	29
Hedley Gold	19¼
Helvetia	1
Indiana	18¼
Island Cr'k, com.	55
Island Cr'k, pfd.	‡91
Isle Royale	35¼
Keweenaw	‡1½
Lake	36⅛
La Salle	6⅜
Mass	7¼
Michigan	2½
Mohawk	60⅞
New Arcadian	‡4½
New Idria Quick.	‡6⅞
North Butte	30⅞
North Lake	‡6
Ojibway	4
Old Dominion	59½
Osceola	118
Quincy	91½
Shannon	60⅞
Shattuck-Ariz.	20
Superior	47
Superior & Bost.	2¼
Tamarack	43
Trinity	6¼
Tuolumne	3
U. S. Smelting	45¾
U. S. Smelt'g, pf.	50
Utah Apex	2⅛
Utah Con	12½
Victoria	3
Winona	5¼
Wolverine	107
Wyandot	2

N. Y. CURB Aug. 20

Name of Comp.	Clg.
Barnes King	.40
Beaver Con	.45
Braden Copper	6⅞
B. C. Copper	5
Buffalo Mines	1.45
Caledonia	.40
Con. Ariz. Sm.	⅝
Davis-Daly	2 3/16
Diam'field-Daisy	.07
Ely Con	3/16
Florence	.91
Giroux	5¼
Gold Hill Con	⅛
Greene Cananea	10
Greenwater	.06
Internat. S. & R.	‡124
Kerr Lake	2⅞
Keystone	2⅜
La Rose	3 1/16
McKinley-Dar-Sa.	1⅞
Min. Co. of A. new	3 1/16
Motherlode Gold	1
Nev. Utah M. & S.	‡.02
Nipissing Mines	7⅞
Ohio Copper	¼
Pacific Sm. & M.	7/32
South Live Oak	1¼
South Utah M. & S.	⅝
Standard Oil (Old)	1040
Stand'd Oil of N. J.	413
Stand'd Oil Subs.	525
Stewart	1 7/16
Tonopah	7
Tonopah Ex.	2 13/16
Tri-Bullion	½
Tularosa	¾
Union Mines	‡3/16
United Cop., pfd.	10
Yukon Gold	3⅝

BOSTON CURB Aug. 30

Name of Comp.	Last
Bingham Mines	3½
Boston Ely	1 1/16
Boswyocolo	.03
Butte Central	7½
Cactus	10
Calaveras	2½
Chief Cons	1 3/16
Corbin	.95
Cortez	1 1/16
Crown Reserve	3½
First Nat. Cop.	2
Majestic	.49
Mazatan	‡½
Moneta Porc	‡.05
Nevada-Douglas	3½
New Baltic	2½
Oneco	1½
Raven Copper	.32
Rhode Island Coal	.19
San Antonio	‡3
S. W. Miami	4½
South Lake	9½
Trethewey	.40
United Verde Ext.	.38
Vulture	‡5

LONDON Aug. 21

Name of Com.	Clg.
Camp Bird	£1 8s 9d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 6 10½
Mexico Mines	7 5 0
Oroville	0 5 3
Stratton's Ind.	0 3 1½
Tomboy	1 6 6

‡Last quotation.

The Engineering and Mining Journal

Vol. 94. AUGUST 31, 1912 No. 9

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres Rob't McKean, Sec'y
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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A New Departure in the Manufacture of Agricultural Phosphates

This is the era of the industrial chemist. Having given us such things as calcium carbide, which has become of great importance in illuminating and metallurgical industries, carborundum, siloxicon, and artificial graphite, which are valuable for many purposes; having developed the art of aluminothermics and others; he is now mastering the problem of extracting nitrogen from the atmosphere and is grappling with that of developing new sources of potash. Now comes an innovation that promises to be of importance in another department of agricultural chemistry, with consequential effect upon the mining and metallurgical industries.

Spencer B. Newberry, who is well known as an expert authority in matters relating to the manufacture of cement, has for some years been making experiments to ascertain what is the effect of calcination at high temperatures upon the crude phosphate rocks of commerce. It is well known that ordinary phosphate rocks as mined are unavailable as plant food, even when finely pulverized. The chief process for rendering this phosphoric acid available has been grinding the rock and treating it with sulphuric acid, which changes the insoluble "bone phosphate" into a soluble form, i. e., soluble in water, and thus easily taken up by the roots of vegetation. Depending upon the composition of the original rock, i. e. the amount of certain basic impurities present, and upon the strength of acid used, etc., some of the phosphoric acid "reverts" into a form which is not soluble in water, but this so-called reverted phosphoric acid is nevertheless available as plant food to a greater or less degree. The agricultural chemists of the world have agreed that treatment with a solution of citrate of ammonia of given strength, applied under given conditions, closely imitates the action of the roots in dissolving reverted phosphoric acid, so that this "citrate-soluble" phosphate is given a valuation by the state fertilizer control stations and is recognized as being nearly, if not quite, as valuable as the water soluble compound for agricultural purposes.

Mr. Newberry discovered that the calcination of ground phosphates alone, if carried out under suitable conditions, rendered the phosphate in most crude rock "available" or citrate soluble, and submission of samples to agricultural stations proved that chemically and agriculturally it is as available as the reverted phosphate which results from the solution in acid. Mr. Newberry and his associates furthermore discovered that the addition of many substances to the ground phosphate rendered the calcination quicker, more thorough and more regular in its product. He found that sulphuric acid, coal dust, common salt, sulphate of lime, sulphate of soda, etc., all produced these results, but that the best effect was produced when the salt of an alkali was employed, preferably that which is one of the cheapest, niter cake or salt cake, which is a byproduct in many places. An increase of the heat, after the effect desired has been produced, drives off by volatilization the alkaline salt, leaving the phosphate not only available to the citrate test, but in a concentrated form.

When the phosphate is decomposed in the old process by 50° acid, sulphate of lime is formed which dilutes the product, so that a phosphate containing, let us say 30% of total phosphoric acid, will yield a product containing only from 15 to 16% of soluble or available phosphoric acid, whereas repeated experiments obtained in many laboratories, have shown that rock running 32% total phosphoric acid yielded, by the Newberry process, a product averaging over 30% of available. There seems to be no question as to this fact, for we have seen reports from a number of State agricultural stations and from other reputable laboratories in many parts of the country confirming this statement.

Many patents have been applied for: Those covering the use of alkaline phosphates, alkaline carbonates, sulphuric acid, etc, have been granted. The one covering the use of alkaline sulphates has been allowed but not issued, and other patents are being considered at Washington. Patents have likewise been granted in Belgium, Great Britain, France, Germany and other foreign countries.

Should further field experiments on a large scale confirm the availability of this product for fertilization, it should serve as a means of making complete fertilizers containing a large percentage of available phosphate, undiluted with sulphate of lime. It would also mean a considerable diminution in the amount of the sulphuric acid employed at present for making acid phosphates, which acid is now employed to the extent of a million and more tons annually. It seems as if the Newberry product were similar to that obtained from Thomas slag, which to a certain extent is employed in this country, but more largely in Europe, as a source of phosphoric acid.

It is perhaps too early to say anything upon the subject of cost as compared with that of the acid phosphate made with acid, but the product being about twice as rich in available phosphoric acid, there will at least be a saving in transportation and other handling. Further news about this new process will naturally be awaited with interest by the miners of phosphate rock, pyrites and brimstone, and by the metallurgical industries that produce sulphuric acid as a byproduct.

The Mexican Situation

Conditions in Mexico continue to be unsatisfactory. The people of the United States generally know almost nothing of the real state of affairs, an amazing ignorance obtaining except in territory contiguous to Mexico.

President Madero's mild policy and the already proved ease and safety with which brigandism can be undertaken, are responsible for the present so called revolution, and have brought about conditions that cannot be righted in a short time. The establishment of order cannot be expected until the government becomes convinced of the futility of soft words.

So far Americans, and foreigners generally, have enjoyed a measure of safety, but now that the resources of the Mexicans are becoming exhausted, the bandits are looking with lustful eyes upon the possessions of outsiders, who would do well to bear in mind that the bandit is not a patriot, and has no conception, and consequently no fear, of international complications, and has no moral scruples.

Steel Trade Conditions

The movement in the iron and steel trades which took its first start early in the year, when the attempt to control prices was practically abandoned, has proved that it was based on something more than the demand for cheapness. Once started it was found that there was a strong demand for materials of almost all sorts, and that there was a readiness to enter into new construction on a scale which surprised many of the manufacturers themselves. At first buyers did not venture on long contracts and the demand was chiefly for early deliveries. Gradually contracts were extended, though even now they are hardly for as long periods as has been the case in some former years. The buying has been chiefly for immediate or early consumption, and there has been very little speculative purchasing.

Prices have been advanced from time to time, but the changes seem to have been the legitimate result of active demand and based upon the actual conditions of the market. At any rate they have not checked the demand, which has gone on increasing, without much regard to them. As a general rule they are still below the controlled level of a year ago. At the present time we have reports from many important mills and companies which are running to 90 and 95% of capacity. This means practically full, for no mill can keep up to its estimated capacity for any length of time, when allowance is made for casualties, weather conditions and needed repairs. And at this many find some difficulty in keeping up their deliveries of material as it is needed. The present indications are that this state of affairs will continue for some time. The critical period will come with the first of the new year, when many contracts at low prices will expire, and must be renewed at asking prices generally considerably higher. If the present rate of consumption keeps up, the renewals will be made; but some check to new sales may be expected.

The mills are now fairly up to the increases of capacity made or begun during the boom of four and five years ago. With a few exceptions no new enlargements have been made, though some have been begun. Two causes have tended to keep down production in the past two or three months. One is a shortage of labor of which some complaints have been made, though there has been a tendency to keep rather quiet for some reason. The other, which will be felt more during the coming three months, is slow transportation. The railroads are beginning to be short of cars and motive power, and this will be felt more as the necessity for moving the agricultural crops comes upon them. They have been slow in providing increased equipment, as manufacturers know; and while now they are ordering freely, cars and locomotives cannot be improvised in a day.

Taken altogether the steel trade is in a better and sounder position than even during the boom of 1907-8, notwithstanding its complaints of low prices, and there is no serious setback probable, so far as can be foreseen, for a year to come.

The International Congress of Applied Chemistry, which meets in Washington and New York early in September, will bring together a noteworthy group of chemists and chemical engineers. The papers scheduled to be read before the metallurgical section are attractive.

A new development that is likely to be of industrial importance is the competition that is being planned in the American brimstone business. Several deposits on the Gulf coast, supposed to be similar in character to that of the Union Sulphur Co., have been discovered, and at least one of these is likely to be exploited in the near future.

In its Minnesota iron mines, the Steel Corporation has followed the example lately set by the Cleveland Cliffs Iron Co., and has appointed a "mine rescue engineer." His business will be to look after safety appliances at the mines, to determine where they are needed, and to instruct miners in the use of rescue apparatus in case of accident. His chief work will be rather to prevent accidents as far as possible, than to mitigate their consequences.

By the Way

The latest application of the electric furnace in this country is being made by the Bethlehem Steel Co., which is now installing a 10-ton furnace of the Girod type in its works at South Bethlehem. The furnace is to be used in preparing and treating tool steel and other high grades of metal.

The following was found on the bulletin board where machine runners mark up their troubles, at a certain coal mine, says the Ohio Brass *Bulletin*: "No. 4 Masheen awl Shot tu hel. Chain brok. fix the dam thing. it brok twist Last nite. needs new rearstaff leaver for the resisting box. amatoor smokes like heltoo. Power bad. lots of short circles. this is the masheen with self compeller truck. Wer outa oil tu."

Development of the iron resources of Texas on a large scale is to be undertaken by a company recently organized, which has secured property on which to build a blast furnace and steel works near Houston. The raw material will be derived from the ore deposit, a part of which the Bethlehem Steel Co. is developing, and from which shipments are now being made to Pennsylvania. The drawback is the distance of the fuel supply.

An authenticated story is told of a cyanide shiftman who had the habit of overindulgence in the "flowing bowl" to such an extent that his work suffered, and he was notified that the next offence would be his last with that company. In spite of warning, the offence was soon repeated, with immediate result as per specifications. In his maudlin condition, the offender complained bitterly that all the world was against him, and proceeded to imbibe liberally of the contents of the strong solution tank, with the object of ending his troubles. His already overloaded stomach refused to accept this new insult, and sent it back, together with the rest of its contents. In telling of it afterward, the man said that the prompt sobering was the only ill effect of the dose. A like effect, however, could not be guaranteed in every case.

A discovery of gold was announced from Cape Town, a few weeks ago, and the discoverer, a Mr. Tearnan, who is said to have been a prospector in his younger days and to have worked subsequently "in the mines in the north," is reported to have declared that "it ought to set Cape Town aflame." That statement, in itself, when considered in relation to what seems to have been actually discovered, says the South African *Mining Journal*, stamps Mr. Tearnan as a person of a distinctly enthusiastic temperament. The geological details read strangely to a person accustomed to these matters, and when it is asserted that "Mr. Tearnan gages the reef at 30 ft. wide and 1000 ft. long, with a downward tendency at first, running then on the level for a considerable distance," one feels somewhat dissatisfied with the mode of description. Mr. Tearnan preferred not to give the names of the analysts who pronounced his samples to be gold-bearing quartz—which is unsatisfactory from every point of view; so also is the apparent attempt to connect the age of the formation with the value of the reef, as if it had any bearing on the point. The frankly sceptical attitude of the majority of the Cape Town public is commended.

The grubstaker is sometimes repaid, even rewarded, if we are to believe the mid-summer news. Through the heat waves at Knoxville, Tenn., under date of Aug. 22, comes the following dispatch: "Joe Harris, aged 62, who years ago was a prosperous auctioneer, but is now poor, had cause today to remember that 24 years ago on a winter morning he befriended a poor stranger, a man of 28, just from Scotland, whose sweetheart had jilted him. The local postmaster today read to Harris a letter which stated that William Robinson had died in Brisbane, leaving his fortune of $2,000,000 to Joe Harris, who had staked him on a trip to Alaska, where he had "struck it rich." Five years after Harris had staked Robinson, a letter came from Nome, inclosing $500 and stating that Robinson had made a fortune. As this more than repaid Harris for his stake, he was not surprised that he did not again hear from the young Scotchman." We hope this is true. If he went there 24 years ago the lovelorn young Scotchman was certainly in Alaska early enough to have been in "on the ground floor" for some of the good things.

With many years of usefulness still before him, says the New York *Sun*, Sir William Ramsay has resigned his chair of chemistry at the University College, London, as he himself says, "To give a young man a chance." During the quarter century that he has been affiliated with University College, Sir William has made the chemistry department famous and in that time has made a number of discoveries, any one of sufficient importance to insure his own reputation. Several of the distinguished chemist's discoveries have led to the cognizance of new laws of science and have subverted previous ideas upon the subject investigated by him. For example, his verification with Soddy of the theory of the production of helium from radium was a knockout blow to established views on the subject. Another of the scientist's great accomplishments was his discovery with Lord Rayleigh of argon, and with Travers of other gases of the same group, neon, krypton and xenon. The startling characteristic of these gases is their refusal to combine with any other substances, and their discovery filled a vacancy in the chemist's periodic table of elements. He was born in 1852, educated at Glasgow and Tübingen, and was made professor of chemistry at University College in 1887. He was knighted in 1902.

New gold districts seldom get their deserts. It is difficult to keep the "boomers" within reasonable bounds and the bombardment of the over-enthusiastic sometimes causes the pendulum to swing the other way; all reports are discounted and if a sensational mine is not opened, a good, medium- or low-grade camp may not be able to bear up under the burden of enthusiastic expectation and excessive capitalization. Naturally, a new gold district is not a modest violet, but it may be unwisely overboomed in its infancy, as has happened with the Highgrade or Hoag district in northern California. Possibly this district will be proved to have merit as a milling camp, but an extraordinary "boosting" campaign was started from Denver last spring and the district was acclaimed "A Second Cripple Creek." The flamboyant and irresponsible misrepresentation became so great that W. H. Storms, the state mineralogist of California, issued a warning to the promoters that they might be called upon to substantiate certain statements. For this he was promptly excoriated in the local press of the district, as well as assailed in open letters by certain of the leading spirits. The latter became more cautious, however, and when the snows began to disappear some real work was undertaken. The U. S. Geological Survey, with commendable promptness, had arranged to send a representative into the district to make a geologic examination, but this became the signal for another flamboyant outburst of the boomers; the Survey's name was so persistently used in this connection, says a Washington dispatch, that Director George Otis Smith found it necessary last week to issue the following statement: "Notices were being circulated to the effect that the Geological Survey had made a second Cripple Creek gold find in the Hoag mining district, Calif. A geological examination of a number of small mining camps in Nevada and California was ordered recently, but since the Survey is made to appear involved as an involuntary accessory to a newspaper boom the work of the geologist in this mining district has been indefinitely postponed. Under present conditions, for which the Survey is in no wise responsible, work in that region would probably serve only to afford an excuse for further misrepresentations." State Mineralogist Storms has just returned from a visit to Highgrade. His preliminary report indicates that with a continuation of real work a profitable district may be developed, but that in general Highgrade is not high grade, and as a gold-mining boom it nearly died a'borning.

California State Mineralogist's Visit to Highgrade

San Francisco Correspondence

W. H. Storms, state mineralogist of California, visited the new mining camp, Highgrade, in northeastern part of California during the first half of August. The result of his observations, given on his return to San Francisco, follows.

The Highgrade district is in Modoc County, situated on the California-Oregon state line, on the summit of the Warner range about eight miles by wagon-road east of New Pine Creek, a town situated in both states, and about a mile east of Goose Lake. The state line runs through one of the principal streets of New Pine Creek. The Werner range, as far as the eye can see from this point, consists of tertiary volcanic rocks, rhyolitic and andesitic flows and tuffs. The ore belt of the district is on what may be called the central portion of the range, about four miles in length, in a north-south direction, and about one-half mile wide. The district is as yet undeveloped. The work that has been done is nearly all superficial and has been done since last June, with a few exceptions. The deepest shaft is at the Alturas mine, and is 150 ft. deep. The most extensive development of the older mines is on the Fort Bidwell Consolidated toward the south end of the district. This mine has been in operation for several years, and is equipped with a 10-stamp mill. About 1¼ miles to the northward the Big Four mine, which also has been in operation for some time, is equipped with a 5-stamp mill. On the east side of the mineral belt a Lane mill has been installed for the purpose of doing custom work. It is owned by Wall & Co., but has done little milling. So far all the ore milled has been treated by amalgamation, but owing to the extremely fine gold it is probable that the cyanide process can be utilized with good results.

Ores in Zones of Brecciation

The ores of the district occur in zones of brecciation varying greatly in width and vertical extent. Some of these zones are intersected by fissures, some of which run in a direction essentially parallel to the main axis of the range, others crossing it. At the intersection of the smaller fissures some rich ore has been disclosed. Most of the ore is too low grade for shipment but it may be milled with profit in the district.

There is an abundance of splendid timber on all the mountains of the region. The water supply in the adjacent cañons is practically inexhaustible. The snowfall is heavy, and the summer season short. There are about 150 men at work in the district. The leasing system, which has been found so effective in the development of new territory in Cripple Creek and elsewhere, has been inaugurated at Highgrade. On Sunshine Hill there are at present 10 leases in active operation, most of which are in good ore.

The geology of the camp is comparitively simple; thus far the pay rock has been found altogether in the highly silicified rhyolite, or a contact of rhyolite and andesite; but nearly always in zones of brecciation. Some of the orebodies seem to be flat shoots; others undoubtedly extend to a considerable depth. Owing to the present conditions from lack of railroad transportation to the mining district, the hardness of the rock, and the present lack of financial aid, it will probably be two or three years before the camp is sufficiently developed to warrant a fair estimate of its real value. However, the present showing will afford sufficient inducement for further development, and the district will undoubtedly produce some good mines.

The town of Highgrade is situated in a little basin on the east side of Sunshine hill. It has one street running in a north and south direction, and is within a half mile of the Oregon line. The trees have been cut, and the stumps still remain. All about the town may be seen the location stakes of mining claims which stand 10 or 15 ft. above the present surface of the ground, showing that the claims were located during a time when there was heavy snow on the ground. In the street of the town there are numerous large cobbles, and boulders of rhyolite. Both sides of the street are occupied by log cabins, square-front shacks, tent houses and tents. There are no saloons in the town owing to the fact that a portion of the district is situated on a school section and license to sell liquor can not be obtained until the applicant has been a resident of the county, at the place where he proposes to sell the liquor, for at least a year. The balance of the district is on the U. S. forest reserve where liquor license can not be obtained. This places Highgrade town and district on the California side in an unique position. In the town the evenings are spent around out-door camp fires, and the men engage in singing and speech-making. The saloons at New Pine Creek are on the Oregon side of the line, also the mercantile houses. The barber shops and the mine offices are on the California side.

The California, Nevada & Oregon R.R. is establishing a new town on the road about a mile from New Pine Creek, on the California side, to be named Fairport. It is said to be the intention of the company to run steamers across Goose Lake for the purpose of shipping to the railroad the lumber from the west side of the lake. The main street of Fairport will run east and west, and extend directly into Pine Creek cañon toward the principal mineral-bearing hills, which are in plain view.

New Copper Country Map

For many years the map of the "Copper Range of Northern Michigan," originally compiled and published by R. M. Edwards, a well known mining engineer of the district, has been accepted as standard. Of late years developments have been rapid and the ownerships have been considerably changed. To meet these changes and to serve adequately those to whom it is of especial value, the map has recently been revised by B. F. Sparks and W. R. Hodge, mining engineers, of Houghton, Mich. In revising, the map has been entirely redrawn and rearranged to include all of Houghton County, all of Keweenaw County except Isle Royale, and the most important parts of Baraga and Ontonagon Counties. All wagon roads, railroads, etc., have been brought up to date and the newer properties shown with distinctive colors. Special attention has been given to the matter of ownerships by smaller, independent companies and individuals, a great number of which are shown in full. Colors have been used freely to bring into prominence the large tracts held by most of the companies. The map is mounted on heavy paper, folded and contained in a canvas-back paper cover, of a size that fits readily into the pocket. It can be obtained for $3 per copy from B. F. Sparks, Houghton, Michigan.

International Association for Testing Materials

Many technical experts, including representatives of various foreign governments, are to attend the congress of the International Association for Testing Materials the sessions of which will open in New York on September 2 and continue through Saturday, September 7. The engineers constituting this association are the men who determine the "factor of safety." At this congress will be considered the standard for a safe rail for present heavy-traffic requirements; fireproof materials and construction; the strength of concrete.

Canadian Bounty Payments

The total amount paid in bounties by the Canadian Government for the year ended Mar. 31, 1912, was only $538,529, compared with $1,591,663 for the preceding year, says the *Canadian Engineer*, Aug. 8, 1912. The bounties paid were as follows: Wire rods, $160,750; crude petroleum, $141,935; lead, $179,288; manila fiber, used in the manufacture of binder twine, $50,556. Since 1896, when the bounty system was introduced, the total payments have been a little over $21,000,000, of which $7,000,000 went for pig iron, over $4,000,000 for puddled iron bars, and $6,000,000 in steel bounties.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Mining on Forest Reserves

I am glad to see that my letter published in the JOURNAL of July 13, 1912, in reference to the practice of the Forest Service has been noticed and answered in the JOURNAL of Aug. 17 by the Forester, H. S. Graves, himself. It is plain that all of us have only the public welfare in view in these discussions.

But, let me quote from the letter, to which mine was an answer and from the official instructions of the Service, "The Use Book." Mr. Booth says "The service has no desire to antagonize the locating of valid mining claims" and "The statutes provide that mining claims may be located only upon a discovery of valable deposits." And there is the hitch. It is the interpretation of the statute which makes the difficulty. I hold that there is a wide difference between "the discovery of valuable mineral deposits" and "the discovery of deposits of valuable minerals."

The spirit of the statute plainly throws open the public lands for the latter, but the Forestry instructions adopt the meaning of the former. "The Use Book" says, p. 33: "There must be a valid discovery of mineral and a sufficient exploration of the ground to show it beyond question." And again "It must appear that the land contains enough mineral to warrant its disposal under the mining laws." And again on the same page "If the applicant has had ample time and opportunity to show by exploration and development whether valuable mineral deposits exist on the land, and has not done so, his location cannot be held to be a valid mining claim."

I take it that the service is familiar with the veins of the Cripple Creek district. There are many small crevices here, which, upon development, may turn out to be valuable veins or merely planes of cleavage. The prospector may discover one of these and drive a drift on it at a cost of $500. But the crevice shows no pay ore even after that. Nevertheless, the prospector, knowing from the float in the vicinity that valuable deposits exist somewhere, is willing to spend time and money for further exploration, but he wants a patent to secure his title. Under the Forestry instructions patent would be refused. Cripple Creek can show many such examples. Under Forestry instructions the opening of this district would have been impossible.

I know personally of a hill, which has the exact geology of the Cripple Creek district. There is valuable float on the hillside. It is timbered and lies within a forest reservation. It is my intention to prospect that hill and if I find one small vein of good pay value I shall dig further and probably find several other crevices, but which may carry no pay ore. However, I am convinced from the showing that it warrants heavy development. I want to drive a crosscut tunnel to develop all and thus do enough work for patent. I must have good title to form a company with a fair amount of capital and I cannot get this capital until I can prove title. Under the instructions of the service I might get a patent on the one claim which shows pay ore, but the others would be more valuable for timber. I would be refused patent on sufficient ground to warrant the enterprise and possibly a real, new mining district would be lost. And still I am told that the Forest Service does not interfere with legitimate prospecting. I must let this enterprise alone, since I cannot risk the time and money, unless I feel sure that I can get the title to the land, if I find what I think does exist there. This is an actual case. Would the Forester take chances in this enterprise?

MAX BOEHMER.

Denver, Colo., Aug. 20, 1912.

Graphic Solution of Skip Loads

In response to Mr. Case's inquiries, I wish to say that he is correct in assuming that the center of gravity *O*, as found by the method I gave in the JOURNAL of July 13, 1912, is the center of gravity of the plane figure *ABCD*. This, however, is so close to the center of gravity of the skip and load that for all practical purposes it may be taken as such.

In the example given, if the plates *AB*, *CD* and *AC* are made of $\frac{3}{16}$-in. steel, the theoretical center of gravity of the skip and load will lie one-fifth of an inch below *O* and one-ninth of an inch to the left. If the skip is drawn to a scale of one inch to the foot, this distance would not be noticed as the one-ninth of an inch is all that affects the final result, and would be less than $^1/_{100}$ in. when drawn to scale.

Mr. Case is in error when he assumes that the wheels would affect the center of gravity of the skip, for the skip rests on the wheels and therefore they would have no effect on the center of gravity, though they would increase the pull on the bail. In practical work, a great many things are done that are not in strict accord with theory, and if the exact center of gravity be calculated in the above problem, it would be a parallel case to reading angles in stadia work to single minutes, and then plotting them to the nearest fifteen.

E. R. RICE.

Miami, Ariz., Aug. 11, 1912.

Copper Determination With Revolving Anodes

An article entitled "Copper Determinations with Revolving Anodes," by Frank H. Probert, appears in the JOURNAL of Aug. 17. The article, which is illustrated with detailed drawings, describes an electrolytic apparatus in use at the Ray Central Copper Co.'s laboratory, without, however, giving credit to the originator of this device for electrolytic analysis with a plurality of rotating anodes. In the same issue the JOURNAL editorially calls attention to Mr. Probert's article and the device described, giving the impression that Mr. Probert is describing something new.

As Mr. Probert is evidently ignorant of the fact that the apparatus which he describes was designed more than five years ago, and that a full description, with detailed drawings and photograph was published 4½ years ago; and as the editors of the JOURNAL apparently have forgotten this fact, we wish to take this occasion to refer them and all those interested to the original articles by us in the January and February, 1908, issues of *Electrochemical and Metallurgical Industry*. A two-column abstract of the original articles appears in the ENGINEERING AND MINING JOURNAL for May 9, 1908, p. 956.

By reference to the first of our original articles, it will be seen at a glance that the electrolytic cabinet described by Mr. Probert is essentially the Fairlie electrolytic cabinet. This cabinet was originally designed in the laboratory of the Tennessee Copper Co., whence the idea was transferred to the Miami Copper Co. and to other Western copper companies, and now to the Ray Central.

There is no objection, of course, to the use of the Fairlie electrolytic cabinet by other laboratories, but it does not seem right—if the apparatus must be repeatedly described—that the designer be altogether ignored in the description, and the credit assumed by others.

We believe that Mr. Probert will be quick to recognize and to acknowledge his error in writing his article without first investigating the prior literature on the subject. Those who will take the trouble to compare Mr. Probert's drawings with our own will be interested to note that after 4½ years it has not been possible for others to improve on the original design.

Andrew M. Fairlie.
Albert J. Bone.
Copperhill, Tenn., Aug. 19, 1912.

[Mr. Probert described the installation in the laboratory of the Ray Central Copper Co. and made the most useful presentation of a valuable method that has come to our attention. It is likely that Mr. Probert was ignorant of the origin of this method. For our own part, we frankly confess that we had forgotten it, although we reported it in our own columns about four years ago. We can not find either in Mr. Probert's paper or in our editorial remarks any implication that either of us thought we were telling of something new, the idea being simply that we were telling of something excellent. Nor do we conceive any impropriety in failing always to attach the inventor's name to a description of a method that has become standard. For example, basic copper converting is frequently the subject of description and discussion without any reference to Messrs. Peirce and Smith. As for the present case, Mr. Probert is an honorable engineer and would be the last to assume any credit to which he is not entitled. In his article he did not make any such assumption. —Editor.]

Sampling of Ore

"Sampler's" observations in the Journal of Aug. 3, 1912, p. 198, call to mind an experience of mine in checking samples taken by hand. The chief metal in the ore was gold, of which samples varied from $1 to $175. The vein was sampled at intervals of 5 ft., while development work was progressing. During stoping operations on the same block of ore samples were again taken. A grab sample was taken from every car which was drawn from the various chutes, the car samples from the same chutes being combined daily and assayed. The cars were all weighed and the contents in gold computed. Samples were again taken at the feeders to the stamps. Finally, covering a period of about five months, the bullion obtained from the cyanide plant was compared with the computed recovery obtained by subtracting the gold remaining in the tailing from that in the feed to the stamps. The results from the five sets of samples when compared were found to show a range of only 10 per cent.

S. F. Shaw.
Charcas, S. L. P., Mex., Aug. 8, 1912.

Iodide Copper Assay

The articles and correspondence which have recently appeared in the Journal under the above and similar headings are of great interest and should prove of value to many who are engaged in the assay and valuation of copper-bearing material.

The question has been raised as to the best method of separation of the copper prior to the iodimetric determination proper. In the Journal of July 13, 1912, a correspondent claims much for what he pleases to call "the old reliable method of separating copper with aluminum," but I doubt if the average analyst would pin his faith and risk his reputation by the use of aluminum in the way that Mr. Hallett does. So far as I personally am concerned I have not this faith and would not dare to risk my position by the use of aluminum for I cannot with any degree of certainty completely remove copper from an assay solution by means of any metal. Naturally in judging a method of assay, everything depends on the degree of accuracy aimed at; if an error of 0.1% or 0.2% does not matter, no doubt the use of aluminum is perfectly satisfactory, but where more accurate results have to be obtained a more thorough precipitation of the copper is essential. A few years ago I went into this matter somewhat fully and while there is nothing original about the experiments, a summary of the results may be of interest.

For the complete precipitation of copper by aluminum the solution must be free from both nitric and hydrochloric acids. In this connection, it may be pointed out that too much faith should not be placed in the evaporation with sulphuric acid; it was found in these experiments that the last traces of chlorine were difficult to remove, owing to complex secondary reactions with the sulphuric acid, and that the presence of chlorine in a solution (even free from other impurities) prevented the complete precipitation of the copper by aluminum.

The observations of T. Brown, Jr., (Eng. and Min. Journ., June 8, 1905) as to the difficulty experienced in completely separating copper from materials containing arsenic, bismuth, antimony and organic matter were confirmed, and in ores, mattes, etc., containing these impurities in quantity, complete separation of the copper was only effected by the use of sulphuretted hydrogen. Even after boiling two or three hours with aluminum a considerable quantity of copper was precipitated from solution on passing in a stream of sulphuretted hydrogen. To these difficulties, add errors of manipulation, the solubility of the precipitated copper should the sulphuric acid become at all concentrated, the ease with which the precipitated copper oxidizes and passes into solution on washing and you have what Mr. Hallett terms "a reliable method."

True he covers himself to some extent when he states that the method must be correctly handled and all proper precautions taken. He recognizes the possible source of error due to the oxidation of the precipitated copper and in order to minimize it recommends washing with sulphuretted-hydrogen water. In laboratories where the precipitation with aluminum is still adhered to it is, I believe, a common practice to pass in sulphuretted-hydrogen gas after filtering off the copper in order to complete the work of precipitation and so secure the whole of the copper originally in solution. But this double precipitation is needless since the whole of the copper can be directly precipitated by the sulphuretted hydrogen in one operation. This practice is preferred by the English assayers; by its use the risk of incomplete precipitation is completely eliminated.

The precipitated copper sulphide may be ignited and roasted to oxide, or if the dangers of a muffle ignition are feared to the extent Mr. Hallett fears them, they may be avoided entirely by dissolving the precipitated sulphide in nitric acid directly off the filter paper. It may be argued with accuracy that there is a small loss in this operation, owing to the imperfect removal of the precipitate from the filter and to the retention of particles in the fused globules of sulphur, but as shown by Beringer ("Text Book of Assaying") this is trifling and need only be considered when great accuracy is required.

As for the use of sodium thiosulphate as a medium of precipitation; the separation with sulphuretted hydrogen is more rapid and more satisfactory since the conditions as to acidity, etc., need not be so strictly adhered to, and the solution is free from precipitated sulphur.

The iodimetric method of determining copper offers many advantages and is unrivaled where rapidity combined with accuracy is essential. In capable hands its accuracy rivals that of the electrolytic and even surpasses it for the assay of some copper-bearing materials, especially alloys of copper with zinc, nickel and tin.

Arthur J. G. Smout.
Birmingham, England, Aug. 14, 1912.

Acetylene Lamps

That the prejudice held by a number of engineers against the use of acetylene lamps underground, is a matter of imagination, was clearly demonstrated to me recently when a prominent member of the profession, forced by circumstances to use an acetylene lamp, became its ardent advocate.

F. M. Lothrop.
Houghton, Mich., Aug. 17, 1912.

Insurance on Mine Property

By W. H. Charlton*

A discussion of the factors which tend to raise or to lower basic insurance rates. Attention to these points when building will save money.

The insurance account of a company should receive just as close supervision as any other expense account on the books. By giving it the same attention as other accounts the opportunity for reducing the cost of insurance without reducing the amount carried will be apparent after a careful perusal of this article.

The insurance companies maintain mine schedules for the different camps or districts throughout the country. These schedules can be obtained from the insurance inspectors for the district in which the mine is situated. Below is a mine schedule covering the Lake Superior district, which is applicable to both copper and iron mines.

MINE SCHEDULE

(Lake Superior District, Revised to Jan., 1903.)

BASIS RATES

A Brick engine houses, all classes	$0.75
B Brick boiler houses (separate)	0.75
C Stamp mills (steel frame)	1.00
D Brick change or dry houses	1.25
E Shaft and (or) rock houses (steel frame)	1.25
F Brick carpenter shops	1.25
G Brick machine and (or) blacksmith shops	1.00
H Brick warehouses	0.75
I Frame boarding or sleeping houses	2.00
J Frame coal trestles, sheds and coal	1.75
K Brick office building	0.50
L Brick laboratory	0.75
M Steam shovels, ore pockets and trestles	1.25
N Steam shovels (all-iron car)	1.00
O Frame oil house	2.00
P Frame barns, stables and out buildings	1.50

DEFIENCY CHARGES (CUMULATIVE)

To be applied specifically to each building unless otherwise stated.

(1) *Building.*
- (*a*) If wood frame filled in with brick or if wood with steel frame, iron clad (not to apply to basis *C, E, I, J, M, N, O* or *P*), add $0.25
- (*b*) If iron clad on wood (not to apply as above), add 0.35
- (*c*) If ordinary frame construction (not to apply as above), add 0.50
- (*d*) If stamp mills and shaft houses are frame or iron clad, add to basis *C*, or *E*.. 0.25

(2) *Foundation*—If on wood-post foundation (to apply only to basis *I*), add 0.25

(3) *Roof*—If shingle, board or tar paper (to be applied also to frame buildings, but not to basis *C, E* or *P*), add.. 0.25

(4) *Whitewash*—If not whitewashed or painted inside (to apply only to basis *A, B, D* or *F*), add 0.10

(5) *Boiler and (or) Engine House*
- (*a*) If brick with iron-truss roof and wood roof boards, add.. 0.10
- (*b*) If brick with wood-truss roof, add 0.20
- (*c*) Metal stack through wood roof, protected by ventilating jacket, add 0.10
- (*d*) Metal stack through wood roof without ventilating jacket, at least 12 in. from wood, or breeching through side of building not properly protected by brick or concrete, add 0.25
- (*e*) If metal stack through wood roof without ventilating jacket and less than 12 in. from wood, add (instead of item fourth) not less than. 0.50
- (*f*) If boiler house is not ventilated, add 0.10
- (*g*) If boilers are not covered with brick or asbestos or boiler arch within three feet of wood; or with wood floor in front of boilers, add.... 0.25

(6) *Oily Waste*—If without metal cans for waste in machine shop or where needed, add 0.10

(7) *Change or Dry House*
- (*a*) If wood lockers used, add.. 0.25
- (*b*) If heated by stoves, add.... 0.50
- (*c*) If oiled clothing principally used and kept or dried in building, add...... 0.50 to 1.00
- (*d*) If steam pipes are not properly protected, and free from combustible material, add.. 0.25

(8) *Warehouse.*
- (*a*) For storage of lubricating oils, add 0.50
- (*b*) For wood floors under oil barrels or without drip pans, add 0.25

(9) *Forge*—If on wood base or floor, add 0.25

(10) *Office or Laboratory* For assaying in the building or for power grinding, add 0.25

(11) *Lighting or Power* If electric wiring is not in accordance with rules of "National Code," add...0.10 to 0.50

(12) *Bridge Construction* — For covered bridge connection (to apply only where connection is between frame building add 0.10

(13) *Fire Protection.*
- (*a*) If not protected within 500 ft. by pump of at least 100 gal. capacity per min., according to size of plant, add 0.15
- (*b*) If without sufficient amount of 1½- to 2½-in. hose to reach buildings of plant within 500 ft. of pump, add 0.10

Note—Items 13*a* and 13*b* not to be applied to basis *K, L, M* or *N*.
- (*c*) If without barrels and buckets of water or chemical fire extinguishers (unless item 13*b* is applied), add...... 0.10

(14) *Exposure.* Charde at discretion.

(15) Objectional Features, add... ....

(16) *DEDUCTIONS*
- (*a*) For specific form of policy, with 80% reduced rate, coinsurance or percentage value clause (in states where coinsurance is permitted), 10 per cent..
- (*b*) For watchman with approved clock 0.10
- (*c*) If shaft or rock house of copper mine has steel frame with steel girders and supports, deduct from basis *E*.. 0.25
- (*d*) For protection by fire pump of at least 500 gal. capacity per min., with mains at least 4 in. in diameter and frost-proof hydrants within 500 ft. of buildings, 5 per cent.

(17) *Addition to New Rates*—For taxation, muncipal or state —submit).

Rule—Wherever under lease or contract the owner has waived his right of recovery from a railroad company for loss or damage by fire caused by it to the property insured whether from negligence or otherwise, add to the base rates 5%.

Inspectors and stamping officers are

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*Mine accountant, 46 Hooker Ave., Detroit, Mich.

instructed to pass no daily report of policy on such risks as correct where waiver of right of recovery has been made, unless the additional percentage in rate as shown above has been paid.

Inoperation

Watchman Clause—It is warranted by the assured that at all times when the property herein described shall be idle or inoperative, a constant day and night watchman shall be kept on duty; and provided that if such property be idle or shut down for more than 30 days at any one time, notice must be given this company, and permission to remain idle for such time must be endorsed hereon, or the policy shall immediately cease and determine.

If at the expiration of 30 days the plant remains inoperative, notice of continued inoperation must be given, and permission therefor endorsed upon the policies. This permit must be based upon the warranty of the assured that during the period of inoperation a constant day and night watchman will be maintained upon the premises, or in lieu of watchman the following form of permit shall be attached:

Permission is hereby given for the premises insured or containing the property insured under this policy to remain inoperative from this date, until the.... .... day ....19.... And in consideration of this permission, it is hereby agreed that this company shall only be liable for three-fourths of any loss or damage under this policy that may happen to the property insured while the said premises remain inoperative under this permission, and in no event shall this company be liable for more than three-fourths of the sum insured under this policy, for all loss or damage occurring while said premises so remain inoperative under this permission, and this permit is given and accepted under the above conditions.

(No permission for vacancy or inoperation should be given for a longer time than three months in one period.)

Possibilities of Saving Money

A working knowledge of the insurance schedule will enable the managers when laying out a plan to design it so as to obtain the minimum insurance rate, as against the costly expense of alterations later to obtain the same results.

As an instance to illustrate this point take a brick or masonry boiler house that would take a base rate of 75c. on the above schedule. To obtain this rate it is necessary to comply with the following conditions:

The building must stand by itself on masonry foundations; the roof must be composition and iron trussed; the roof must be provided with suitable ventilators; the stack must be upon a masonry foundation outside the building and must be connected with the boilers by iron breeching or masonry smoke flue; the inside of the building must be painted or whitewashed; boilers must set on masonry foundations; the boilers must be bricked in or covered with asbestos; they must not be within three feet of any side of the building; iron floors must be provided within three feet of the front of the boilers; electric wiring in the boiler house must be according to the National Code.

Only by complying with the above conditions would the base rate be granted. For each condition not complied with, a deficiency charge is made, as shown in the schedule, and these deficiency charges are cumulative, increasing the base rate amazingly.

From the above illustration it will be seen that the conditions to be complied with in order to obtain the lowest possible rate would not add greatly to the cost of the building provided they are incorporated in the design and specifications of the building when erected.

During the development stages of a mine the type of building that is generally erected to enclose the hoist and a boiler or two with possibly a compressor, is of frame construction covered with corrugated iron, the building setting on posts, and the machinery resting on masonry foundations.

How Extras Raise Rates

Considering the insurance on this type of building, we find that to the base rate of 75c. must be added the following:

For being iron clad on a wood frame, $0.35; for not being whitewashed or painted inside, 0.10; for the building not being ventilated, 0.10; boilers not covered with asbestos or bricked in, 0.25.

With the above extras added the rate will be $1.55. In order to bring this rate down the following changes may be made. By bricking in between the framework of the building up to the eaves, the first extra will be reduced to 25c. The second extra of 10c. can be eliminated by whitewashing or painting the inside of the building. In the third case the 10c. extra can be eliminated by providing suitable ventilators on the roof. The 25c. extra in the fourth case can be eliminated by covering the boilers with asbestos or bricking them in as the case may require.

With the above changes made the rate is reduced to $1.00 and the actual amount of insurance saved depends upon the value of the plant and the amount of insurance carried upon it. The illustrations cited are for specific buildings but the approximate rate for any building under any conditions can be worked out from the schedule applicable to your district. Townsites are generally granted a straight village rate, provided the town is laid out symmetrically and the houses are not within exposure distance; of course there would be extras if the buildings do not set on masonry foundations, also if the town is not provided with the necessary fire protection. All buildings must be provided with chemical fire extinguishers or an extra charge of 10c. will be added to the rate.

A general reduction of 10c. in the premium rate is made on your insurance as a whole, if a night-watchman is maintained, the watchman to be provided with an approved watchman's clock. Another general reduction of 5% in the premium rate on your insurance as a whole is made for adequate fire protection, as explained under item 16-*d* of the schedule.

In states where coinsurance is permitted a reduction in the premium of 10% on the insurance as a whole is made if a "specific form of policy" is written, with 80% reduced rate, coinsurance or percentage-value clause inserted.

The above clause means that insurance must be carried at all times during the life of the policy, in order to obtain the reduced rate, of an amount equal to or greater than 80% of the value of the plant, buildings, etc., insured.

In the event of loss by fire and the insured value was less than 80% of the value of the buildings insured, there would be a corresponding reduction in the amount recoverable from the insurance companies.

This subject of insurance on the mine plant is one that can to advantage be given considerable attention; only two specific illustrations were made to show how this matter can be taken up in a systematic manner, any building or plant on your property may be figured out in a similar manner and the result will probably be beneficial to the mining company.

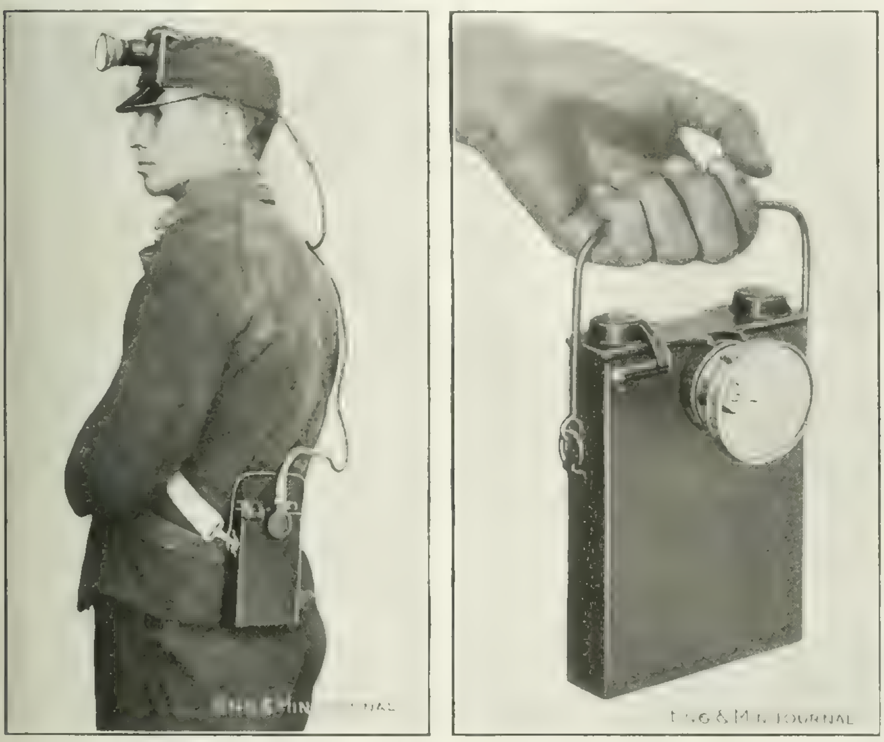
Burning Powdered Coal

In discussing the abatement of coal smoke with its attendant waste, J. M. Searle (*Proc.* Eng. Soc. West. Penn., July, 1912), took the view that this could often be advantageously done by using powdered fuel. At the American Iron & Steel Co.'s Lebanon, Penn., plant, 300 tons per day of powdered coal are burned, in puddling, billet-heating, welding and miscellaneous small furnaces, besides the boilers. This fuel was introduced in one furnace about nine years ago; now nearly all of the company's 85 furnaces use it. The ash is taken out as a slag. At first there was difficulty with the fuel, because it was not fine enough; it is necessary to powder, not to pulverize. The fuel is shot down against a hearth, in boiler practice, not up against the boiler tubes. The coal is dried just before powdering.

A New Electric Miners' Lamp*

A new electric miners' lamp of improved design has recently been developed by the General Electric Co. to meet the increasing demand for a safe and reliable lamp. The idea of a systematic investigation as to the possibilities of developing such a lamp originated with W. J. Richards, vice-president and general manager of the Philadelphia & Reading Coal & Iron Co.

The lamp is of the combination hand-lantern and headlight type, and consists of a miniature tungsten lamp unit, operated from a light storage battery. The lamp is provided with an efficient reflector, designed to illuminate a 9-ft. circle at a distance of 4 ft. from the lamp, and photometric records show about 2.5 or 3 cp. at a distance of 2 ft. The battery has a capacity of 5 ampere-hours, and is of sufficient size to operate a lamp from 12 to 14 hours.



Electric Miners' Lamp Used as a Headlight and as a Hand Lantern

When used as a headlight, the lamp, with its reflector, is fastened to the miner's cap and connected by means of a flexible cord to the battery, which is carried on a belt or from shoulder straps, as shown in the accompanying halftone. When used as a hand lantern, the lamp socket is removed from the cap receptacle and inserted into the receptacle on the side of the battery, simply taking the place of the cable attaching plug.

Some of the important points in connection with this design are substantial construction, light weight and compactness; complete inclosure of all conducting parts, use of an absorbent for the electrolyte to prevent spilling, small number of movable contacts, increased efficiency of a 4-volt lamp, efficiency of the reflector, impossibility of charging with reversed polarity, instant convertibility from hat-lamp to hand-lantern.

The battery is flat and compact in order that it may lie as close as possible to the body. It weighs approximately 3 lb. and measures 6½ by 4⅝ by 1⅛ inches. In order to prevent accidental short-circuits, causing sparks, all live parts are totally inclosed in molded compound. The battery terminals, attaching plug, hat receptacle and lamp holder are all molded from hard fireproof and acidproof compound and thus perfectly protected from corrosion due to acid spray or gases.

An absorbent is used for separating the battery plates and also fills up the extra space in the battery, except the mud space. This absorbent acts like a sponge and holds the electrolyte in the battery even though it be inverted for some time.

Where low voltages are used, the pressure drop caused by the contact resistance may be serious. The movable contacts in this lamp have, therefore, been reduced to a minimum and have been so designed that they come together with considerable pressure.

The increased efficiency and life of the apparatus is principally due to the improved tungsten lamp. A 2-volt lamp is somewhat inefficient and has a comparatively short life. This is due to the cooling effect of the large leading-in wires on the short filament. This cooling by conduction reduces the temperature of about one-third to one-half of the filament to a point where little or no light is produced. In order to produce the rated candlepower, the rest of the filament must be operating at a temperature far above a safe value, with a consequent unreliability and shortening of life. The filament of the 4-volt lamp, for which this outfit is designed, is about twice as long as a 2-volt filament, so that the percentage of length cooled by the leading-in wires in a 4-volt lamp is about one-half that in a 2-volt lamp. This allows the rest of the filament to be operated at a safe temperature.

The reflector is made of stamped steel, enameled both inside and outside, thus protecting it from corrosion. Tests have shown that white porcelain enamel forms one of the best possible reflectors, and is durable and easy to keep clean. The lamp globe is protected from injury by a glass plate fastened to the rim of the reflector by a spring. This glass further tends to prevent dust from accumulating on the inside of the reflector.

The contacts on the battery terminal and plug are made concentric, so that no matter how the plug is put in the polarity must be the same each time. A separate plug is supplied for use in charging, and can be wired permanently on the charging rack with its polarity correct. It will then be impossible to charge the battery from this plug with reversed polarity.

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*Excerpt from an article by D. B. Rushmore in Bull. A. I. M. E., July 1912.

Graphite in Korea

Extensive amorphous graphite deposits occur in nearly all parts of Korea, especially in the southern, northeastern and northern districts (*Min. Journ.*, July 27, 1912). The quality, however, is inferior, the carbon contents of the mineral averaging no more than 60%. A fairly soft and good quality with more than 80%, and fit for export, has so far been found in a few mines only. Working costs are low, so far as mining itself is concerned, but, as all the properties are situated far from shipping places and good roads are scarce, transport is difficult and expensive. The better sorts of the Korean mineral are blended in Europe and America with Ceylon graphite, and used for making crucibles, while the lower qualities are turned into paint stuffs, lubricants, blacklead, etc. The total production amounted in 1906 to 1000 tons, in 1907 to 5000 tons, in 1908, 18,000 tons, in 1909, 18,000 tons, in 1910, 12,000 tons, in 1911, 10,000 tons. For export the graphite is packed in barrels of 320 lb. each, present prices for best amorphous being £5 5s. c.i.f. London, £4 15s. c.i.f. Amsterdam, and $25 c.i.f. New York. The low level of prices is due to overproduction since 1909 and to the fact that large consignments shipped by speculators to Europe and America, having remained for years without finding buyers, had at last to be sacrificed for next to nothing.

A Romance of Industry*

The hundredth anniversary of the founding of the great firm of Friedrich Krupp has been celebrated in Germany much as if it were a branch of the government, as in a sense it is. The Kaiser himself took part in the celebration, together with the Prussian Minister of Commerce, and many decorations were distributed among the leading employees. The firm divided $3,500,000 among its army of workmen. The newspapers devoted column upon column to the history of this great enterprise, the rise of which is so bound up with that of the German Empire itself. Indeed, the century that has passed since the first Friedrich Krupp started in business marks the modern development of this greatest of the Continental nations. A hundred years ago Germany was just beginning to throw off the Napoleonic yoke; she had begun to feel the first stirrings of that national life which was to flower at Versailles in 1871, and to that flowering the Krupps of that period contributed enormously by the munitions of war which they had produced for the wars of 1866 and 1870. Germany has proportionately grown not more, if as much, than the company which is today, as for decades past, the greatest maker of war materials the world over.

The founder of the firm, the first Friedrich Krupp, began the iron and steel business with a handful of men, imitating English methods and practices. Of a family already well-to-do for that period, he would none the less have failed but for the aid and counsel of his grandmother—women have played a distinguished part in the story of this vast concern. The founder himself died in 1826, before achieving any material success. Indeed, the firm was insolvent when his widow, Therese Krupp, with her 14-year-old son Alfred, undertook to carry it on. But Therese Krupp's determination was speedily reinforced by the discovery of her son's remarkable scientific and business talents. Shouldering while still a boy the tremendous cares and responsibilities which were his sole heritage, he had by 1837 an establishment of 55 workmen, with receipts of approximately $25,000 in that year. Gradually he forced his way into the field of high-grade machinery, and in 1847, a year before he bought out the other members of his family, he sent to the military authorities a three-pounder, breech-loading cannon, which was the beginning of his connection with the military affairs of Germany.

Today every German military or naval cannon is a product of the Essen works, and the Krupp devices and system have been adopted by Austria-Hungary, Italy and Russia as the basis of their artillery. Up to 1902 alone the Krupps had sold 40,000 cannon to no less than 30 states—enough to make them great believers in the necessity of armed peace! But guns were not their only product. Steel rails and all sorts of railroad and machinery materials have been turned out in great quantities, and every invention in the steel or iron industries has been promptly adopted, and often improved upon. Nowhere else has the union of applied science and industry been more marked or more serviceable. In the perfectly equipped Krupp chemical and physical laboratories 500,000 analyses are made annually in direct connection with orders and routine business, quite aside from any experimenting. With the tremendous expansion of his work, Alfred Krupp gradually began to buy coal and iron mines, notably in the north of Spain. And as the German navy and mercantile fleet developed, the company, not content with furnishing the armor and guns, established the great German shipbuilding yards at Kiel to compete for vessels of war directly, and also bought a ship-repair works at Rotterdam. Its foundries and iron works and mines are scattered all over South Germany, all operated on a capital of $40,000,000. In 1903-04, the first year of operation as a stock company, the net profits were nearly $3,000,000, after paying taxes of $800,000 and contributing $1,300,000 to the insurance fund of the more than 71,000 employees, or to benevolent and philanthropic undertakings on behalf of the workmen.

Such was the achievement of Alfred Krupp's genius. He died in 1887, and was succeeded by his son Friedrich Alfred, to whom the present Kaiser, his intimate friend, has erected a monument. For Friedrich Alfred Krupp died in Essen in 1902 and left his vast fortune to his daughter Bertha, whose husband, von Bohlen-Halbach, is the real director of the enterprise, or rather the head of the cabinet which now guides the works. But the influence of the real owner is visible in the steady extension of the philanthropic undertakings of the firm; their men are well housed in 4342 model dwellings, and for their families there are schools and kindergartens, and institutions of every kind for the sick, the invalided, and the orphaned. Yet even in Essen strikes have been known, and the Socialist vote is tremendous, despite the Kaiser's having once solemnly proclaimed there in Essen to the workmen that to vote for a Socialist was to commit treason to the state—whereupon the Socialists promptly carried the district. Yet it is in many ways a model community, while the business itself has the same record of producing quality above quantity, of seeking always new means of using steel and iron, and of never standing still, which explains this wonderful romance of industry, favored as it has been by kings and emperors. Certainly it is no exaggeration to say that all Germany prides itself on the Krupp establishment.

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*From the Evening Post, Aug. 16, 1912

Opening of the Gillies Limit

Special Correspondence

The excitement caused by the staking of the Gillies Timber Limit has died away, and all that many of the prospectors can be said to have gained is the memory of an interesting moment. To the lawyers belong the spoils, as there is bound to be much litigation. The crowd of stakers and their assistants, who were waiting on the Limit with their lanterns till midnight of Aug. 19, were orderly, and, although many of the men carried guns, no trouble was experienced. Promptly at midnight the race to stake the claims began and it is probable that bush claims were never before staked in so short a time.

One man claimed the record for having completed the legal staking in 28 min. The claims once staked, the rush to the recorder's office began. Special trains, automobiles, bicycles, fast power-launches and horses were used, the first men reaching the office in Haileybury, shortly after 1 a.m. The crowd lined up in an orderly manner, but shortly after the recorder's office was opened at 8:30 a.m., the men began to push their way in; the line was broken and the office crowded. In several instances people were endeavoring to record the same claim. The recorder was unable to differentiate so that all these disputes will be referred to the mining commissioner. This will doubtless lead to much litigation.

There has been much speculation as to the cause of the rush, because the Limit has never produced any good mines and the outlook is not encouraging for future development. The reason, however, is not far to seek. During the present season there has been little staking going on throughout northern Ontario and the majority of the prospectors are "broke." When it was announced that part of the Limit would be opened, an opportunity for making a little money was presented. It was not difficult to find men who were willing to risk a few dollars, particularly in view of the fact that many of them were approached with the tale that the prospector could stake a lot having a good vein known only to himself. The consequence was that many of the prospectors received employment for a short time. Others staked with the idea of turning their lots over quickly to promoters or leasers.

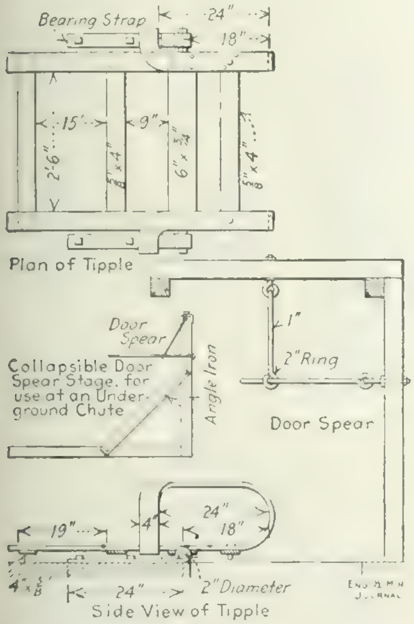
Time alone will tell the value of the Limit, but as far as can be learned, not a single lot has a discovery showing silver in commercial quantities.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Spear Type of Car Dump

In the accompanying drawings are shown the details of the construction of the spear type of car dump that is used in many coal mines, but which is not so frequently seen at metal mines. In fact the only metal mines that are using it are those of the Desloge Consolidated Lead Co. in the southeastern Missouri lead district. This type of dump has its advantage, especially when low, long cars are used. While such shapes of cars cannot be used to advantage in mines where the drifts must be heavily timbered and the tracks are crooked, still there are many metal mines in this country where such cars could be used. The advantages of using low, long cars of large capacity are not appreciated. The lower the car, the greater is the tonnage that can be loaded per man; and the larger the capacity of the car, the cheaper is the tramming cost, other things being equal.



TYPE OF CAR DUMP USED AT DESLOGE MINES

Any car that is to be dumped with a spear type of tipple must be fitted with a squirrel-cage type door, and this door must have a loop extending above it for catching on the spear, so that it will be raised in respect to the body of the car as the tipple dumps the load. This loop, owing to the side movement of the long body according to the way that the car is seized with respect to the rails, should be at least 10 in. wide, and 8 in. high.

In the spear type of tipple the car body is dropped enough by the cradle so that the bottom of the car assumes an angle greater than the angle of repose of the material. The front of the car body then strikes a cross piece or else the floor, so that it cannot dump or go down farther. In rigging up a dump at a chute where the roof is so high that the spear cannot be suspended from it, two uprights are carried up from the stringers, carrying the cradle bearings. These uprights are fastened by a single bolt in each side, so that they can turn on them as pivots. Angle braces, also fastened by single bolt at each end, come up and secure the uprights from pushing forward when the door strikes the spear. When blasting near-by, the bolts of the strap braces can be taken out and the whole frame lowered down on the ground where it will not be damaged by flying rocks from a blast. An accompanying drawing shows this arrangement.

The front support of the spear must be arranged so that it will slide back on the spear and hook it up as the car comes forward into the dump. The spear must catch into the loop on the door a little ahead of the dumping of the car, so that, if for any reason, there is a failure of the spear to catch the loop, the car will not dump with the door unlifted, possibly causing trouble through overbalancing of the car.

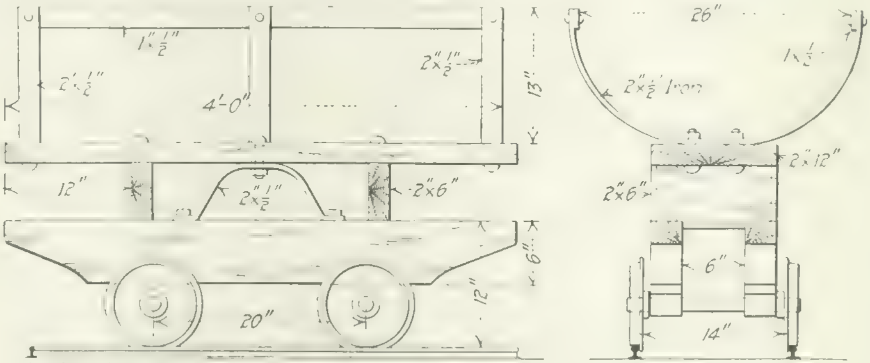
Moving a Keystone Drill in the Tropics

The work of prospecting placer ground in a tropical jungle with a Keystone drill, of the nontraction type, is about equally divided between road making and drilling. In the dry season a road 12 to 15 ft. wide is cut through the bush two or three weeks before the drill is to pass over it, the sun is thus given a chance to dry up the ground and provide a little better surface. During the wet season it is necessary to lay plank tracks ahead of the machine and at the same time have jacks and blocking at hand to pry up the wheels which frequently slip off the tracks into the mud.

Districts are frequently encountered where no draft animals capable of pulling the drill are available. In this case it is necessary to resort to man power and a plank track is always provided. A man, at each wheel, with a crowbar will usually be sufficient motive power for ordinary ground. One man steers, another blocks the wheels and two are kept busy moving the track. When the road is particularly bad, a block and tackle hitched ahead to a tree, usually solves the difficulty.

Car for Tramming Drill Steel

In the Joplin district the ore is trammed almost entirely in buckets. These buckets rest upon low, flat-topped cars that are not convenient for transporting drills, dynamite, machines and other supplies about the mine. In the accompanying drawing is shown a convenient car for such purposes.



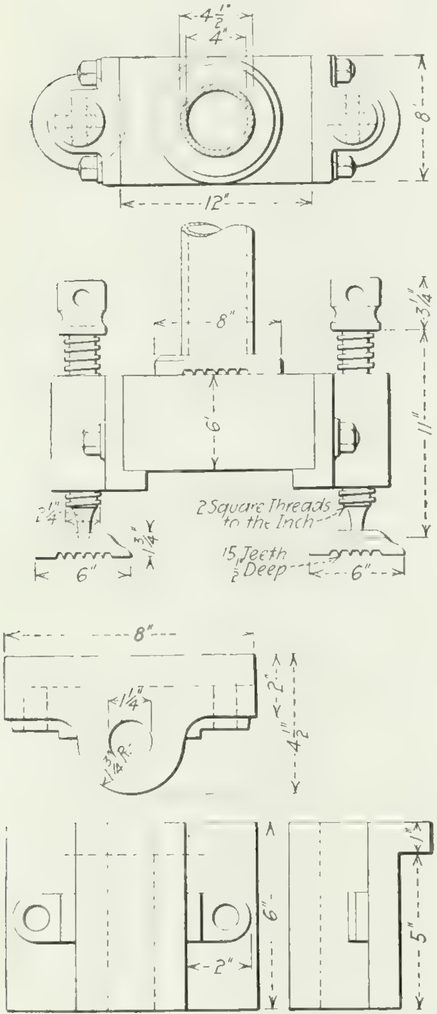
JOPLIN CAR FOR TRAMMING MINE SUPPLIES

The body of the car is raised high enough from the track to be convenient. The rack on the top is circular and made of 2x½-in. strap iron. It is strapped together longitudinally only at the top so that in tramming dynamite to the underground magazine the boxes can be piled flat on the deck of the body, which is about 12 in. wide. The other details of the car are evident from the drawing.

The miner's inch is defined by California law as equivalent to 1½ cu.ft. of water per minute through any aperture or orifice.

Copper Range Drill Jack and Post

An unusual form of drill post is used in the mines of the Copper Range company in Michigan. This post has two toothed ends. It is mounted on top of a two-screw jack which is fitted with a wooden center block into which the teeth of the bottom of the post nip when the post is set up. The post and the jack are independent and thus the weight is divided. Moreover, one jack can be made to serve several lengths of posts. This is a decided advantage whenever, as at the Copper Range mines, it is necessary to have several lengths of posts owing to the different heights of the back from the filling. The advantage of a two-screw jack is obtained without the drawback of the great increase in the weight of the posts that is so objectionable where the two-screw jack is fastened tightly to the post part.



Two-screw Drill Post Used in Copper Range Mines

The jack nuts are castings that have a projecting ledge for the wooden block to rest upon. Two bolts go through the block and hold the nut castings and jack blocks together. This jack block lasts about a year before it becomes so worn that it has to be replaced. The post, while it looks somewhat crude at first glance, will be found to have decided advantages under certain conditions, especially where posts of different lengths are necessary. The post part is simply a standard 4-in. gas pipe with toothed head pieces shrunk tightly into it at both ends. Because of the cheapness of the post, the men in the stopes are given three lengths. Consequently, they do not have to build up much blocking when making a set-up.

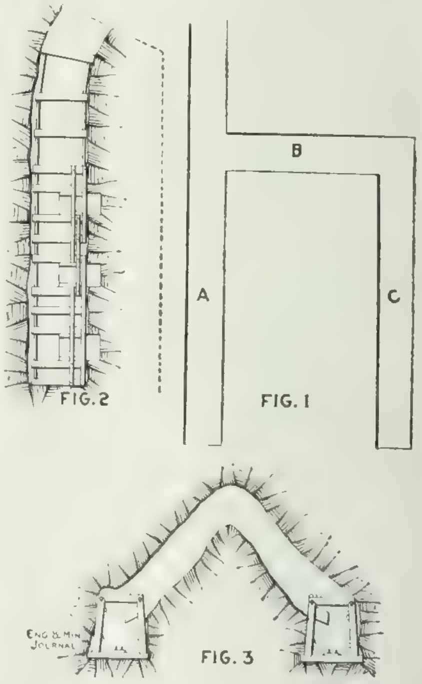
Stope Filing and Caving for Waste

Depleted stopes are filled with waste for support in several ways, and the waste is obtained from many sources, states Ernest K. Hall, in the *Mining and Engineering Review*. Occasionally in the case of small orebodies, sufficient waste is obtained from development, and from wall rock unavoidably broken in the stopes. The mine that can obtain sufficient waste for stope filling from these two sources of supply is fortunate. In many places, water-borne sand residues from mills can be used.

Opencutting for waste on the surface can often be carried on cheaply, but in older mines it sometimes happens that filling cannot be economically conveyed to them from the surface. Of course, this remark also applies to the use of dry-sand residues. In such a predicament, resort is at times made to driving or raising from the stopes for the necessary filling; but these waste drifts and raises are entirely unsatisfactory, the drift being the more objectionable on account of the extra handling from the face. The overwhelming disadvantages are: The cost of breaking waste is as excessive as that of breaking ground in development work, yet the advantages of well judged development are absent; their use induces a tendency to work these orebodies with insufficient connection for good ventilation, attended by labor inefficiency.

A means of gaining waste by caving is especially adapted to erratic ore deposits, provided the country is favorable to its adoption. When the rock weathers away quickly, and in small fragments but large quantity, it is well worth considering whether or not waste caving can be advantageously employed. If there does not already exist, remote from known or probable ore, an old unused drift or crosscut, one is driven into suitable country. As soon as a point has been reached at which caving is unlikely to cause damage to the stopes, and levels above, laying out the cave is commenced.

It may be taken as a general rule that the maximum caving effect will be obtained when the cave drifts run parallel with the strike of the lode, or with a fault system, rock bedding, or whatever may be the weakest zone. On this account should it be necessary, in seeking a suitable position, to run a crosscut at right angles to the strike to such lines of weakness, on reaching the intended cave area it will generally be advisable to turn the cave drift parallel to this direction of weakness. At the Tasmania mine, Beaconsfield, where waste caving was practiced with success, a crosscut *B*, shown in Fig. 1 of the accompanying illustration, was driven for 50 ft. from a drift *A*, and from the extremity of *B*, a drift *C*, was driven parallel to *A*, *A* and *C* being driven at the Tasmania, a distance of 50 ft.; the lengths of *A*, *B* and *C*, in the illustration are shown different from the Tasmania instance. The ground was stoped out above each drift as though the work were done on two narrow veins meeting like the slopes of a gable roof, the ground being taken out just wide enough for economical stoping, say 40 in., and the backs supported, where necessary, by stulls and head boards and lagged. Such were put in at 4-ft intervals, and a chute put in every alternate set. When all was ready a pop charge was put in each stope stull and these were fired.



Methods of Obtaining Waste for Filling

An alternate method of laying out the cave drift is to cause such a drift as *A*, in the accompanying illustration to fork into two parallel branches 20 to 50 ft. apart. Fig. 2 shows one leg of the fork; Fig. 3 is a cross section applying to both methods. Fig. 2 shows a case requiring stronger timbering, chutes are put in at six-feet intervals; 6-in. poles are spiked a *C*, across the caps from set to set on the chute side, also from leg to leg.

In all waste caving, the cutting out of the ground when started, should be pushed on with the greatest speed possible until completed, so as to obviate premature settlement and consequent excessive use of timber, for this would mean trouble before caving commenced, with consequent blocking of the chutes. In suitable ground there is seldom difficulty in drawing almost all the timber before caving sets in. The run may start from a day or two to a week or even more, after the stulls are shot out, and so long as waste is constantly drawn from the chute, it will continue to run.

There are probably many instances where an old drift on a lode or fault wall could be made to serve the purpose, by beating out a stope six or seven feet high, for any convenient distance, putting in the necessary chutes. Dead work would then be reduced to a minimum, and timber would not be required in carrying such a stope.

At the Progress mine, New Zealand, not long ago it was possible to gain a quantity of useful waste by periodically cleaning up an old prospecting drift which crosscut a system of parallel faults. Although no chutes were put in and waste had to be shoveled from the floor, that was nevertheless a welcome addition to waste gained from development work. Under the somewhat exceptional conditions favoring it, the caving method will be found a useful and cheap means of obtaining waste in large quantities.

An inclined shaft at the Salisbury mine in the Michigan iron country starts from the surface dipping in one direction but changes its dip to the opposite direction at depth, necessitating a skip with wheels on top and bottom.

Magazine for Storing and Thawing Dynamite

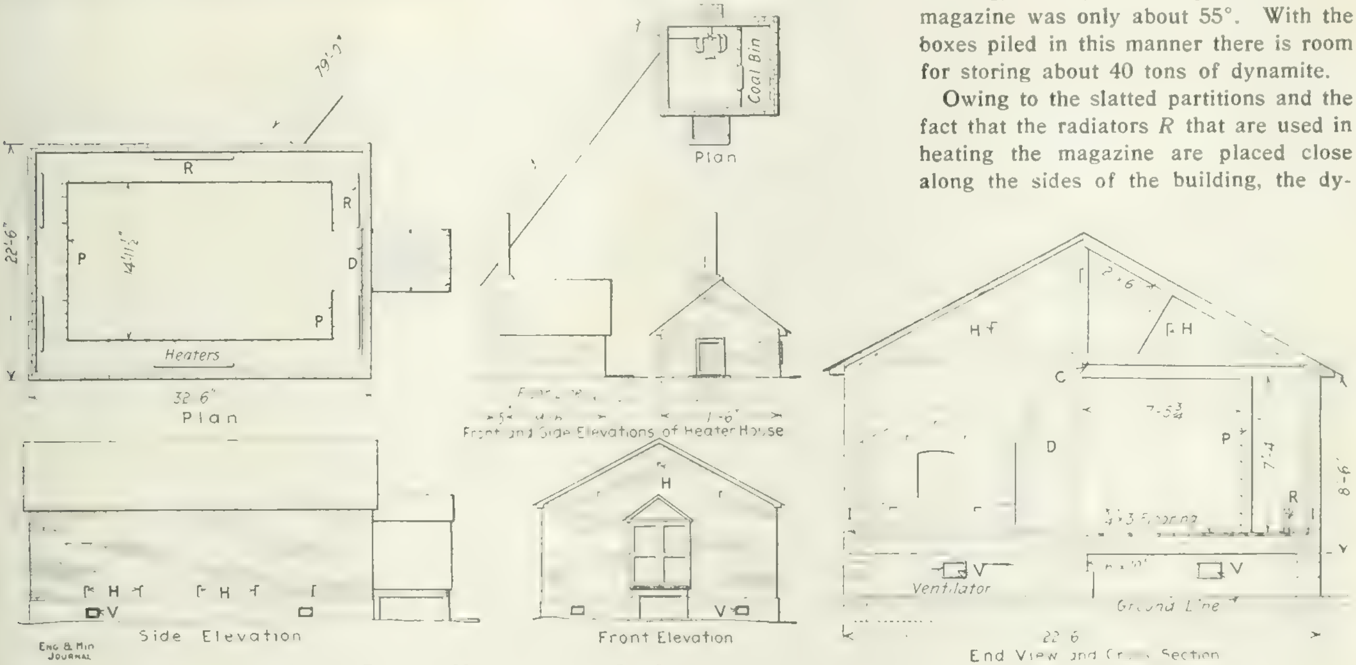
By Claude T. Rice

In the accompanying drawing are shown the details of construction of the magazine used by the St. Louis Smelting & Refining Co. But, before passing to the description of the magazine itself, it probably will be well to call attention to the fact in choosing a site for the magazine, a hollow was selected so that there is practically no possibility of any one shooting into the magazine except if done with malicious intent. The magazine is several hundred yards away from any other building.

The important feature of the magazine is that the dynamite is thawed in the boxes without any unnecessary handling. This makes the thawing cheaper and less dangerous, for at every point where the dynamite is handled there is a source of danger, while it might also be well to add that owing to the headache that results the job of unpacking and repacking dynamite is not a desirable one. It is a mistake at large mines to erect magazines for thawing dynamite in which it is necessary to take the dynamite out of the boxes; such handling of the dynamite only pays when the amount that is used each day is small. The thawing house should be large enough to hold at least a week's supply as then the thawing can be done slowly. Consequently, it is just as well to do the thawing in the magazine itself as to do it in a separate place.

The small thawing houses ordinarily shown in the catalogues issued by the dynamite companies are built so as to require unpacking the dynamite and are absurd affairs only warranted at small mines where the erection of a suitable magazine heated by steam from a separate building is not warranted.

It will be noticed from a study of the accompanying drawings that there is a partition *P* of 2-in. planks carried on studding of 2x6-in. lumber built out three feet from the walls inside which the dynamite, still in the original boxes, is piled. To enable air to circulate between them, the boxes are piled with ½x2-in. strips between them. A small space is also left between the vertical rows of the piles. As the air is free to circulate around the boxes, it only requires about three days to thaw frozen dynamite in the box when the temperature of the thawing room is kept at 70° F., while last winter in the coldest weather with the thermometer outside 15° below zero, it only took about five days to do the thawing, although the temperature of the magazine was only about 55°. With the boxes piled in this manner there is room for storing about 40 tons of dynamite.



Powder House of the St. Louis Smelting & Refining Co.

Owing to the slatted partitions and the fact that the radiators *R* that are used in heating the magazine are placed close along the sides of the building, the dynamite can be placed within three feet of the water pipe. The hot water for these radiators is generated in a Tabasco No. 21 heater which is directly connected to the water pipes without any temperature regulating mechanism being installed on the heater, for force the heater as hard as one can, it is impossible to heat the magazine above a temperature of 70° in ordinary winter weather. It might be well to add that in this connection it probably is better to install a heater of the right size than to depend upon some regulating mechanism to keep down the temperature in the magazine. In a colder climate than that of southeastern Missouri during an ordinary winter, although last year the thermometer went down to 16°, the next larger heater should be used.

The heater house is placed 79 ft. away from the magazine. The hot water used for heating the magazine shown in the drawings is carried to the magazine building in pipes incased in asbestos pipe covering. Anthracite coal is used to fire the heater.

Both the heater building and the magazine are placed on concrete foundations. The walls of both buildings are made of brick. Corrugated iron is used for the roofing laid on top of 1-in. planking. A ceiling *C* of 1x3-in. lumber is carried across the building even with the tops of the side walls so that ample air space is left above the dynamite to allow the magazine to be kept cool in summer. This air space is connected with air holes *H* but in winter these are kept closed. The floor is made of 1x3-in. planks, and there are air holes *V* connecting with the space under the floor as well as others *I*, coming in just at the level of the floor. These air spaces are arranged so that it would be difficult for a malicious person to insert a burning piece of oily waste in the magazine in case, during labor trouble or at any other time, some one should decide upon such a procedure for revenge. Owing to the ceiling, it is impossible to pile the dynamite higher than the brick walls that protect the dynamite from stray bullets.

To prevent the chilling of the magazine during the loading each morning of the dynamite supply for the different shafts as well as when frozen dynamite is being loaded into the magazine, double doors are provided. These are lined with sheet iron to prevent the entrance of bullets. The outside doors are those on the front of the covered entrance and loading platform which acts as an air-lock, as one might say, when taking dynamite into or out of the magazine. This covered entrance also serves to keep the cold winds in winter from blowing directly against the main doors, chilling the magazine more than they would otherwise.

The magazine is placed at a distance from the shafts. According to the Missouri law the dynamite supply in the mine may not be more than enough to last 24 hr. Consequently, the dynamite has to be taken from the magazine to the different shafts each day. This is done by placing the boxes of thawed dynamite in a transfer box, built with double walls, of 2-in. planks so as to provide an air space two inches wide all around the box. This box has low wheels attached to it and travels along a track of 1x6-in. iron nailed to the floor of the magazine and extending out on the covered porch or entry which is arranged so that it just comes even with the bed of an ordinary wagon such as is used in hauling the dynamite to the different shafts.

This transfer box is made so as to hold about 30 boxes of dynamite, which is ample supply for one day at these mines. It is loaded with the dynamite in the magazine, and then pushed directly to the wagon, the doors of the magazine only having to be opened long enough to push the box through. Owing to the air space in the walls the dynamite does not freeze in the box even with the thermometer down to 16° below zero in the open. At the different shafts the number of boxes of dynamite that are required are taken out of the transfer box and the cover replaced instantly. This thawed dynamite is placed directly on the cage and lowered to the underground magazines before it has a chance to freeze. The transfer box when empty is returned to the magazine and placed inside it again so that it will be warm when the dynamite is loaded into it next day. This magazine was built according to the directions of George A. Allen, of the Aetna Powder Co.

Around the magazine and at a suitable distance is a picket fence 6 ft. high. Between the fence and the magazine also outside the fence for a distance of 10 ft. is a deep layer of tailings so as to prevent any danger from brush fires reaching the magazine.

Locating Underground Pipes

In waterworks systems there are often pipes, the exact position of which is not recorded, and when repairs or new connections are to be made with such pipes, a great deal of time and money may be saved by the use of a device which will indicate their positions, says *Eng. News* for Aug. 15, 1912. Some electric devices have proved successful in this field, one of them being based on the principle of causing a slight flow of electric current in the pipe, which thus becomes a conductor. When an electric coil is brought within the field of this conductor, a current will be induced in the coil and cause a sound in a telephone receiver connected to the coil. The sound increases or decreases as the coil is carried nearer to, or farther from the underground conductor, but ceases when nearest to it; that is, directly over it. By locating a number of points directly over the pipe, its situation is accurately determined.

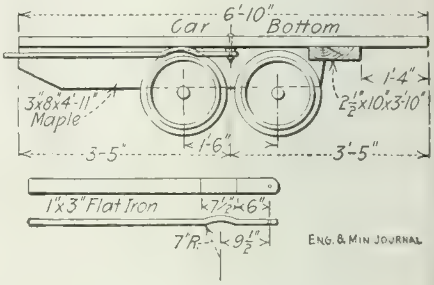
In using the instrument, wires from a portable battery, are attached to suitable connections and the operator, carrying the instrument in his hand and the receiver at his ear, walks across the supposed line of the pipe, the exact position being indicated by the absence of sound. To locate a service pipe the battery wires would be connected to the house cock and hydrant, creating a current along the service line. This device is manufactured by the Modern Iron Works, of Quincy, Ill., and is used by a number of water companies.

Brake for Sublevel Car

By L. D. Davenport[*]

The accompanying sketch shows the details of a car brake used on some of the sublevel cars in one of the mines in the Chisholm district in Minnesota.

The brake consists of a piece of 1x3-in. flat iron about 4 ft. long, curved near one end to fit the tread of a 14-in. carwheel. It is fastened to the bottom of the car with a ½x6-in. bolt, so that it has plenty of play. When not in use, the end of the brake extending beyond the car is held up by a hook, so that the curved part is clear of the wheel.



ENG. & MIN JOURNAL

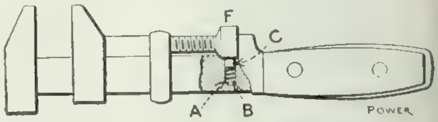
BRAKE FOR SUBLEVEL CARS

Where the grade is unusually steep, two of these brakes are used, one on each side of the car, and one of the miners stands on them and rides down to the chute.

The main advantages of this brake are that it is cheap, the cost amounting to little more than the value of the iron, practically indestructable and simple, having only three parts, the main bar, the bolt and the hook. Any blacksmith can make one and any miner can, if necessary, put it on the car.

Improved Monkey Wrench

An old monkey wrench usually works so easily that it tends to shift its adjustment. I have, states Jacob Lustenberger in *Power*, overcome this trouble by removing the handle and screw and drilling a 3/16-in. hole as shown at *A* in the illustration. Into the hole is inserted a spring *B*, the tension of which should not be too great. On the end of the spring the plug *C* is placed so that it binds against the knurled roller *F*.



POWER

IMPROVED MONKEY WRENCH

This kink works most satisfactorily when using the wrench in cramped quarters. It may be further improved by drilling a number of depressions the size of the face of the plug into the roller. The spring would then force the plug into the depressions and hold it more firmly.

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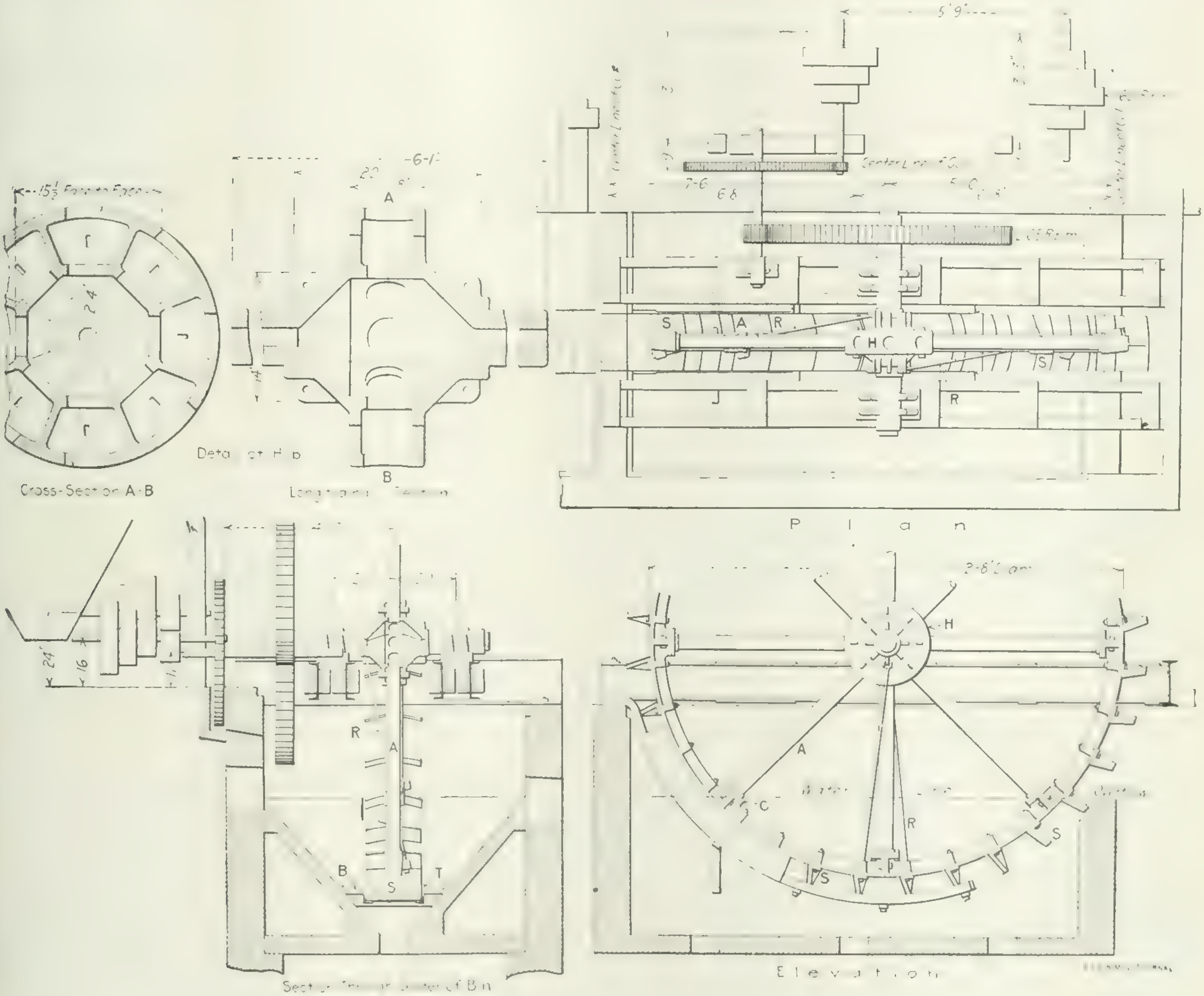
[*] Assistant chief engineer, Oliver Iron Mining Co., Chisholm Division, Chisholm, Minn.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Tailings Dewatering Wheel

In the accompanying drawings are shown the details of construction of the dewatering wheels 14 ft. in diameter that are used in the No. 3 mill of the Doe Run Lead Co. at Rivermine, Mo. for dewatering the tailings before discharging them on the belt conveyor that takes them to the tailings pile. There are two of these wheels; each handles 1500 tons of pulp in 24 hr. when run at 2 r.p.m., the most efficient speed.



Small Tailing Dewatering Wheel Used in Flat River District, Missouri

Referring to the general drawing of the shovel or dewatering wheel, it will be seen that this wheel is made of segments tied together by bolts and arms to a cast-iron hub. This hollow hub-casting extends beyond the sides of the tank that the wheel runs in and forms the axle to which the driving gear is keyed. The hub has sockets in it to receive the pieces of 4-in. pipe that are used for the spokes or arms of the wheel. There are eight of these spokes or arms, and they screw at their outer end into a cap piece that bolts to flanges on segments of the rim. There are eight of these segments in the rim, and they are bound to the hub by ⅝-in. tension rods *R* that go through lugs on the rim segments and hook into the hub. These tension rods are hooked into the hub before the rim is assembled.

As will be noticed the tension rods alternately pass through the wheel from different sides, and each rod hooks into the hub on the other side from the lug on the rim into which that rod fastens. The arms at the inner end are fastened to the hub by keys. After the wheel has been assembled and trued, zinc is poured around the pipes where they fit into the sockets of the hub. To these outer segments, sheets of ¼-in. iron 18 in. wide are fastened to form a deflector for catching the rock particles that adhere to the shovel blades.

The shovel blades or scrapers are then bolted through the rim of the heavy reinforcing segments of the wheel. These scrapers slant back slightly from the direction in which the wheel rotates, so as to make the angle of the discharge about

45°. They are cast with 5/8-in. holes so as to allow the water to drain back out of the tailings as they are scraped up the trough. This, to protect it from wear, is fitted with cast-iron wear plates. The scraper blades are 18 in. wide and are made concave so as to cause the tailings to run towards the center of the shovel, as the shovels rise out of the water narrowing the stream that is poured out into the spout that leads to the conveyor belt.

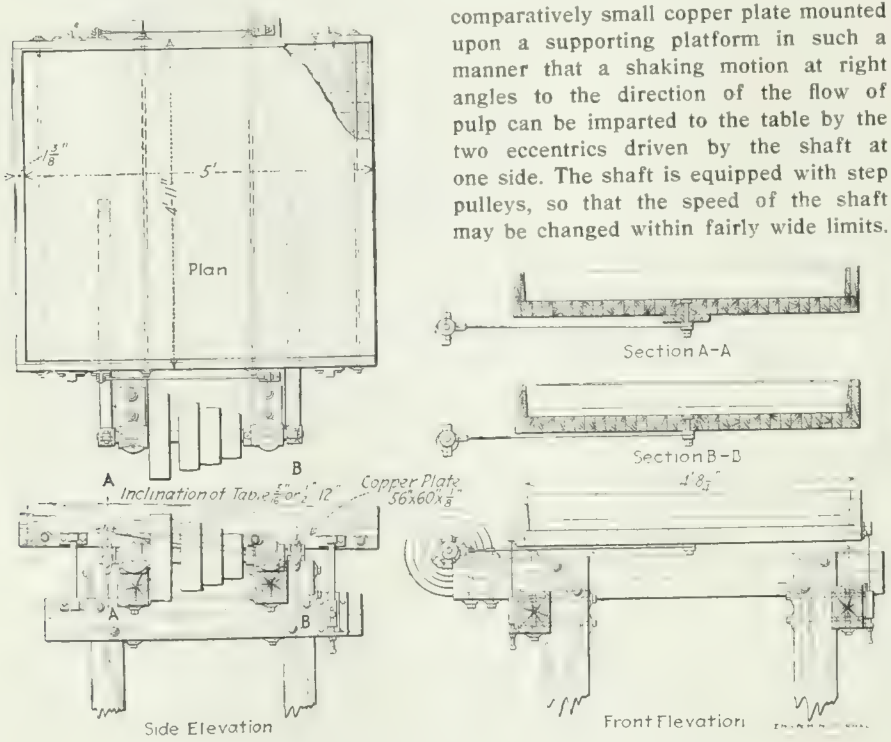
The tailing wheel rotates in a concrete tank with sloping sides so that any tailings that settle on the sides will slide down to the bottom of the tank and be scraped up to the discharge by the shovel blades. In the tank is a trough carried on iron bars that are anchored in the concrete. The purpose of the trough is to confine the coarse tailings that settle into the shovel box so that the blades can scrape them up to the discharge spout easily and without spilling. The trough does not extend much beyond the point where the tailings are poured into the settling tank by the feed launder that comes in from the side of the box. The feed launder comes in about the level of the discharge spout while the overflow lip is about 8 in. below the bottom of the discharge spout.

In the first wheel built, the false bottom or trough was carried directly under the scraper blade so that there was not much clearance left for the blades. Some of the blades became broken in one way or another and these fragments upon getting wedged between other blades and the false bottom broke more blades. Consequently in the later wheels, the trough is being placed lower so as to allow more clearance around the shovel blades. But it is probable that it would be still better to let the tailings build up their own bottom in these shovel tanks.

These tailing wheels are driven by gears, and the driving pulleys of the train are arranged so that the speed of the wheels can be varied so as to run at 4, 2 or 1 r.p.m. This was in order to determine the best speed at which to run the wheel so as to get the lowest amount of moisture in the tailings being handled.

Shaking Amalgamation Table

The amalgamation table shown in the accompanying illustration consists of a comparatively small copper plate mounted upon a supporting platform in such a manner that a shaking motion at right angles to the direction of the flow of pulp can be imparted to the table by the two eccentrics driven by the shaft at one side. The shaft is equipped with step pulleys, so that the speed of the shaft may be changed within fairly wide limits.



A STANDARD TYPE OF SHAKING AMALGAMATION TABLE

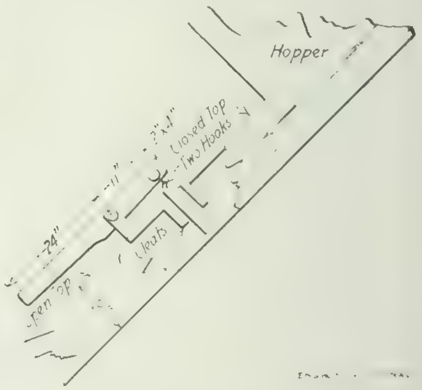
The platform upon which the copper plate is mounted is made of a number of battens, smoothly planed and held tightly together by tie-rods. The platform is carried above the base by four flexible standards. The table is shown in the illustration as manufactured by the Allis-Chalmers Co., for a mill in Ontario and for several mills in Colorado, Montana and other western mining districts.

The advantages of using shaking amalgamation tables has been questioned; one of the objections raised being that the mercury is jarred off the copper plate. That this objection is well founded seems to be indicated by the experience with such tables in a certain mill in the West. A narrow copper cleat was attached to the lower end of the main copper plate, and behind this cleat little balls of amalgam would roll up and find lodgment. The table is set at a very low grade, so low that banking of the coarser particles of pulp would occur if the table were stationary. The vibration prevents actual settling and where trouble is experienced by small particles of clay settling on stationary plates in spite of heavy inclination, and which settling causes the formation of a coating on the surface that interferes with amalgamation, the shaking table may be used sometimes to advantage.

Gate for Roll Feed Trough

A gate for controlling the feed of ore to rolls or crushers, or even elevators, is shown in the accompanying illustration. In many mills the feed to intermediate crushers or rolls comes from some screening device such as a trommel, under which there is a hopper of moderate storage capacity, and from the bottom of which a launder or trough leads down to the rolls.

It is usual to make this trough of considerable length, and in order to obviate blocking or choking as much as possible, it is advisable to make the trough as wide as convenient. In many mills the upper part of the trough is covered over, so that it becomes a box chute, but just above the rolls there should be no covering, in order that the millman may at all times be able to see whether or not the feed to the rolls is coming down properly no matter in what part of the mill he may be.



GATE FOR CONTROLLING ROLL FEED

At the bottom of the closed section of the trough a simple gate of the type shown in the accompanying drawing should be used. The handle of this gate extends down far enough so that it may be closed quickly by an attendant standing near the rolls. By this means of control the time lost in digging out the rolls may be minimized.

It is also advisable to place an electric light with a good reflector in back of it in such a position that a strong light will be thrown upon this spout which will better enable the attendant to see how the feed is coming to the rolls when he is at a considerable distance from the machine.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Round Mountain Mining Co.

The Round Mountain Mining Co., Round Mountain, Nev., according to its annual report for 1911, milled 54.915 tons of ore having a gross value of $7.09 per ton, of which 85c. was lost in tailings and $6.24 recovered in the mill. The total mining and milling cost of $4.45 is made up of stoping, $2; development, 90c.; milling, $1.16; bullion tax, transportation, marketing and insurance, 7c., and general expenses 32c. per ton. To this must be added depreciation on mine plant and equipment, 31c., and litigation over title to mining claims, 20c. per ton. A credit of 8c. for miscellaneous earnings makes the net operating expenses $4.88 and profits $1.36 per ton of ore milled, which is equivalent to 21.8% of the net yield of the ore in gold.

The development work consisted of 3273.5 ft. of drifts, 1688 ft. of crosscuts, 2450 ft. of raises and 97 ft. of winzes, a total of 7508.5 ft. In the statement of costs it is stated that this work cost $49,520, which is equal to an average cost of about $6.60 per ft. The ratio of development to production was about one foot for every 7.35 tons of ore milled. Approximately 54% of the tonnage nage mined is rejected as waste; by installing an underground crushing plant it is expected that this average will be raised to 66% of the ore mined. The principal items included in general expense were: Mine office, 6c. per ton; Goldfield office, 8.2c.; automobile, 2.9c.; liability insurance, 2.04c. and general mine expense, 10.7c. per ton.

Labor in an Arizona Crushing Plant

The Arizona Copper Co., Clifton, Ariz. in its annual report for the year ended Sept. 30, 1911, says in regard to a new crushing plant which it installed during the year: "As now arranged, the ores are delivered through the new shaft, situated 426 ft. uphill from the original concentrator building, into the coarse-ore bins of 1000 tons capacity; from these bins the ore is automatically fed on to a conveyor belt, and the coarse smelting ore is picked out by hand. This belt then delivers it on to a grizzly, with bars spaced two inches apart, the oversize dropping into a gyratory crusher, which reduces it to 2-in. size.

"The ore is next passed through revolving trommels, with manganese-steel jackets, perforated with ¾-in. round holes; the oversize is delivered to a wide, slow-traveling conveyor belt, on which a further sorting of smelting ore can be done. It then passes under powerful magnets by which any odd pieces of steel are removed, and the ore drops through heavy crushing rolls, set to crush to ½ in. The product of the rolls, together with the fines separated by the trommels, now drops on a third conveyor belt, which delivers it into the fine-ore storage bins, of 2000 tons capacity, the ore being distributed into the bins by means of an automatic traveling tripper. This dry-crushing plant has a capacity of about 1700 tons in 10 hr., and is operated by three men."

Wettlaufer-Lorrain Costs

The Wettlaufer-Lorrain Silver Mines, Ltd., South Lorrain, Ont., treated 4166 tons of ore in the mill during quarter ended June 30, 1912. Based upon the tons milled, the cost per ton, including all expenses, was $11.80, made up of $8 for expenses at the mine and mill, and $3.80 for general charges, such as freight, smelting, superintendence, etc. The expenses at the mine and mill were: Development, $1.42 per ton milled; stoping, $1.30; timbering, 28c.; tramming, 21c.; hoisting, $1; ore sorting and concentration, $1.32; mine office and general, 18c.; assaying and surveying at mine, 38c.; moving ore from dump, 20c.; boarding house expense, 40c.; plant and equipment, 88c.; and general mine expense, 43c. per ton milled. Of the tons milled, 2279 tons, or 54.7%, came from dumps, making only 1887 tons from the mine. Of the general charges, smelting was $1.45 per ton milled, or $52.40 per ton of product; freight to smelter, insurance, assaying, etc., 56c. per ton milled, or $20.18 per ton of product; superintendence and engineers' salaries, 65c. per ton milled; taxes, 60c., and New York office expenses, 54c. per ton. Based upon the tons of product shipped, the total cost was $426.52 per ton.

The total cost per ounce of silver was 24.684c., leaving a profit of 36.101c., figuring silver at 60.785c. per oz. The company expended $3481.97 on options during the quarter, which is equal to about 1.75c. per oz., not included in the cost stated. The cost at the mine was equivalent to 16.735c. per oz. of silver, smelting charges, 3.033c.; freight to smelter, insurance, etc., 1.168c.; and other expenses, 3.748c. per oz. The development work amounted to 621.5 ft., of which 385 ft. were raises and winzes, 216.5 ft. drifts and 20 ft. crosscuts. This was equivalent to one foot of development for every 3.4 tons of ore taken from the mine, the average cost was about $9.50 per foot.

Tigre Mining Co. Costs

The Tigre Mining Co., El Tigre, Sonora, Mexico, according to its annual report, produced 46,945 tons of ore during 1911; of this tonnage, 45,079 tons were milled and 1866 tons shipped. The total cost of operating was $15.51 per ton, from which a credit for sundry profits of $1.14 was deducted, making a net operating charge of $14.37 per ton. The various items included in the total cost were: Mining, $3.047 per ton; development, 94.3c.; transportation to mill, 13.9c.; milling, $4.33; general expenses, including management, etc., 88.2c.; marketing and taxes on ore and concentrates, $5.182, marketing and taxes on bullion, 30.2c., and treatment of dump tailings, including taxes and marketing charges, 68.5c. per ton of ore produced.

Of the total mining and development expense, $2.883 was for labor, 35.2c. for explosives, 14.9c. for light, 48.8c. for general supplies and 11.8c. for general power. The cyanide dump tailings treated amounted to 5922 tons and based upon the tonnage treated the cost was $4.855 for treatment and 59.8c. for marketing and taxes on bullion. It is stated that 4098 ft. of development work actually placed in sight 31,300 tons of ore, which would be equivalent to about 1 ft. of development for every 7.66 tons of ore. The total cost of development was $10.80 per foot advanced, or 23.6% of the total mining expense.

In the stamp mill it cost 97.6c. per ton, made up of 45.8c. for crushing, 6.2c. for regrinding and 45.6c. for concentrating 13,974 tons of ore, while at the old mill the cost was $2.632 per ton, of which 42.4 was for crushing, 49c. for regrinding, $1.534 for concentration and 18.4c. for construction. The cost of treatment in the cyanide plant was $4.287 per ton treated and consisted of 13.1c. for conveying and screening tailings, 93.4c. for tube milling; 24.3c. for classification, elevating and dewatering; $1.804 for cyanide treatment, 38.2c. for filtration, 18.1c. for precipitation, 25.2c. for melting and 36c. for alterations.

The average grade of ore milled during 1911 was 0.182 oz. gold, 28.56 oz.

silver, 0.091% copper and 0.388% lead per ton, while the average grade of all the ore handled was 0.2776 oz. gold, 39.61 oz. silver, 0.196% copper and 0.858% lead and the average value $27.75 per ton.

Producing Sulphuric Acid at Port Wallaroo, Australia

The following data were extracted from the 1911 annual report of the Wallaroo & Moonta Mining & Smelting Co., South Australia. The smelting works are situated at Port Wallaroo, seven and ten miles from the Wallaroo and the Moonta mines, respectively. Since the company has installed a converter plant it has been of no advantage, in blast-furnace treatment, to have the ores treated in the pyrites burners. The entire charge of operating the burners has, therefore, been charged against the production of sulphuric acid. During 1911 the plant operated 44 weeks and produced 4627 tons of acid, or an average of 105 tons per week. Extensive repairs were made which interrupted operations for nearly eight weeks, the cost of this work is included in the figures given herewith, which represent the approximate cost of producing one long ton of sulphuric acid at this plant during 1911: Wages $3.19; machinery, plant and material $1.69; fuel 33.3c. general charges 3c.; stationery, printing, etc., 0.5c., fire insurance 6.1c., water 4c., and establishment 20.1c. making a total of $5.55 per ton. The average price received from the sale of sulphuric acid, which is bought by the Wallaroo Phosphate Co., was about $7.39 per ton, indicating that the profits averaged $1.84 per ton of acid.

Iron Ore Mining in Crystal Falls District, Michigan

The Crystal Falls district is situated in Iron County, Mich., on the Chicago & Northwestern R.R. Dr. C. K. Leith says of the district: "The ores are in the upper Huronian slates, except for the Mansfield, which is in a band of slates in the Hemlock volcanics, and the Groveland, which lies at the base of the upper Huronian series in the Felch schist." The iron formation lenses are described as being about the same as in the Iron River district. The active mines show total shipments of about 14,000,000 tons of ore to date, 17 of the principal properties appraised by J. R. Finlay for the state were estimated to have 8,054,000 tons of probable ore in reserve.

The Tobin mine, operated by Corrigan, McKinney & Co., is the most important, and the Bristol, of the Bristol Mining Co., ranks second. Other mines in the district are: The Crystal Falls, Lincoln, Fairbanks, Lamont, Armenia, Great Western, Genessee, Genessee No. 2, Kimball & Dunn, all owned by Corrigan, McKinney & Co.; the McDonald, of the McDonald Mining Co.; Mansfield and Michigan, of the Oliver Iron Mining Co.; Hemlock, of the Hemlock Mining Co.; Gibson, of the Rogers Brown Ore Co.; and Channing, of the Verona Mining Co. Besides these mines there are seven or eight important explorations that have shown considerable ore by drilling. The average depth of the mines is about 1000 ft. The profits of the district for five years were shown by Mr. Finlay's report to have been $6,238,753 for 10 mines operating at a profit, while six mines lost $710,684 during the same period.

A summary of the five-year period, 1906-1910, shows that the average cost per ton of the ore produced was 80% of the total value of the ore at Cleveland. This cost was made up in the following proportion: Mining, 31% of the average value of the ore; exploration and development, 1.1%; construction, shafts, machinery, etc., 6.6%; general expenses, administration, etc., 2.6%; royalties, 7.6%; taxes, 0.5%; rail freights, 11.5%; lake freights, 16.5%; and commissions, 2.6% of the average value of the ore. According to this the profit on the ore mined in the district should be about 20% of its average value.

West Rand Consolidated

The West Rand Consolidated, Transvaal, South Africa, during 1911 mined 359,249 tons of ore from which 39,559 tons, or 11.01%, were discarded as waste by sorting. The mill treated 319,640 tons in the 302 days run, with an average of 100 stamps crushing 10.58 tons each per day. The cyanide department treated 316,124 tons, of which 186,271 tons were sand and 129,853 slime. The total working cost was $4.82 per ton milled, made up as follows: Mining, $2.50; sorting, crushing and transporting, 16c.; milling, 41c.; cyaniding, 39c.; general charges, 38c.; head office expense, 35c., and development redemption, 63c. per ton. The average value of the yield was $5.56 per ton, which leaves a profit of about 74c. per ton milled. Approximately 64% of the gold was recovered by milling and 36% by cyanidation. The theoretical extraction by cyanide was 84.83% and the actual extraction, 88.20%. An average of 2820.5 men was employed, of whom 345.5 were Europeans and 2475 natives; this would indicate that about 115 tons of sorted ore were mined and treated per year per man employed.

The annual report of the Ooregum Gold Mining Co. in India shows that the consumption of cyanide is 0.62 lb. per ton; caustic soda, 0.611 lb. and zinc, 0.094 lb. per ton. The yield in gold per ton cyanided is approximately 0.0955 ounce.

Shaft Sinking, Goldfield Merger Mines

A record of vertical-shaft sinking at the Goldfield Merger Mines Co., adjoining the Goldfield Consolidated, Goldfield, Nev., according to data furnished by L. H. Metzgar, general manager, was as follows:

After enlarging the shaft to 7x16 ft. for a depth of 470 ft. sinking was started by hand drilling and continued to a depth of about 700 ft. by this method. The rock was of medium hardness and work was carried on in three shifts of eight hours each with five men on a shift. About 60% of the drilling was done with churn drills and the rest by single-hand drillers. Approximately nine hours per day were required for drilling and blasting and the average advance was 3.81 ft. per day.

The dynamite consumption was 8 lb. per foot of shaft, or 0.0714 lb. per cu.ft. of rock broken. Timbering required about seven hours for each 5-ft. shaft set which indicates that an average of 5.33 hr. per shift was required for timbering. On this basis the time was divided as follows: 37.6% for drilling and blasting, 40.4% for mucking, etc., and 22% for timbering. With a total of 120 man-hours per day this would mean that one foot of shaft was sunk or 112 cu.ft. of rock removed for every 31.5 man-hours of which approximately 11.8 were for drilling and blasting, 12.7 for mucking, etc., and 7 for timbering.

After sinking by hand, as stated, four 2¾-in. Ingersoll-Rand C110 drills were used to sink from about 700 to 1200 ft. depth. The ground during this period was variable from soft to medium hardness. Three shifts of eight hours each, six men per shift or 144 man-hours, were worked per day. The average advance was 4.2 ft. of shaft, or 470.4 cu.ft. of material per day. The dynamite consumption was 11.68 lb. per ft., or about 0.096 lb. per cu.ft. of rock. It required about seven hours per day to set up machines, drill holes, take down machines and blast. The average advance per machine drill was 1.05 ft. of shaft or 117.6 cu.ft. of ground. According to figures given the average day's work was composed of 29.2% for drilling and blasting, 45.5% for mucking, etc., and 25.3% for timbering. A total of 144 man-hours per day would mean that 1 ft. of shaft or the removing of 112 cu.yd. of rock required 34.3 man-hours, of which about 10 were required for drilling and blasting, 15.6 for mucking, etc., and 8.7 for timbering.

While the sinking by machine drills shows an increase of 2.8 man-hours per foot over drilling by hand it must be remembered that the time of raising and lowering men and material was much greater.

A System of Mine Sampling

By E. F. Pelton*

Close mine sampling is necessary at the Detroit Copper Co. since distinct walls distinguishing ore and waste are lacking. In blocking out an orebody, channels to give a 9-lb. sample per foot are cut with moil and hammer in 5-ft. blocks, two or three samples being taken in a block. Generally the channeling is horizontal. In stope sampling a rough groove is made with a geologic pick so as to give a 3-lb. sample per foot, larger samples being taken in spotty ground. The mine sampling gives results 5 to 10% too high.

The introduction in 1908 of the caving methods of mining by the Detroit Copper Co., emphasized the need of a system of mine sampling to replace the haphazard and unrecorded grab sampling of an overworked shift boss. While the methods adopted are subject to minor change, the too frequent neglect of this important branch of mining, and a dearth of information in technical literature on the every-day sampling at mines, may warrant a somewhat detailed description.

NO DISTINCT WALLS

Sampling methods must take into account the rather divergent types of ore occurrence. Oxidized ores of copper in limestone and shale which first brought the district into prominence are still encountered, though in small amount. The common form is the replacement type of fissure vein, in which chalcocite and cupriferous pyrite are the valuable minerals occurring in rather persistent fissures and as a network of small veins in a dry kaolinized porphyry. Closely associated with this are stockworks in porphyry and in friable quartzite. Distinct walls are lacking, ore grading into waste at the boundaries of the stopes, and it is this factor which compels close sampling.

For 1911, ore of 1.75% Cu was regarded as the minimum workable grade, the average tenor for that period being 2.87% Cu. A production of 1600 tons per day is mined in one eight-hour shift; 90% of this from top slicing and sublevel caving, and 10% from block caving and square setting.

Five men, under the supervision of a chief sampler, are usually employed; three to four "stope" samplers, who make daily rounds of the stopes and development work; and one or two "channel" samplers, who systematically sample given blocks of ore. The aim of stope sampling is to draw a dividing line between ore and waste. The aim of channel sampling is to accurately determine the copper tenor of certain blocks of ground, whether portions of such blocks are rich ore, lean ore, or waste. Hence the methods of work are different.

CHANNEL METHOD IN ORE BLOCKS

In the stoping methods in vogue it is essential to know the size, shape and character of any block of ore before the details or even the method of mining can be planned. A large orebody may frequently include irregular masses of low-grade material. Is it better to mine only the higher-grade portions at an increased tonnage cost or the entire body at a lower extraction figure?

Is there ore enough to warrant an extra crosscut or where should a certain raise be placed? Data furnished by thorough sampling must be at hand to supply such information.

This sampling is done by channeling or grooving and follows closely the blocking out of an orebody. The chief sampler examines the ore, giving instructions as to the manner of taking each sample. Measurements are made from survey stations, and, as a rule, the ore is divided into 5-ft. sampling blocks.

Loose rock and small projecting pieces are first dressed off. Canvas is spread on the floor, and from the smooth face a channel with squared sides and bottom following the irregularities of the wall is cut by moil and hammer. The channels are from 4 to 5 in. wide and 1½ to 2 in. deep, representing 9 lb. per foot. Preparing the face and squaring the channel are to insure taking an equal amount from every part of the cut.

The channeling is usually done by experienced men; but when the amount of work increases, it may be necessary to employ other labor under the supervision of a sampler. In such case, greater care is taken with the preliminary smoothing of the face, and both width and depth of cut are increased to yield 15 lb. or more per foot, as an offset to the lack of experience and interest.

RICH AND LEAN ORE SEPARATELY SAMPLED

In ore showing much variation in grade, two or even three samples may be taken to represent a 5-ft. block, with the object of keeping the richer and the leaner ore separate, and calculating the block from measured sample widths. Where the rich veins are closely associated with ore of low grade, it is customary to gouge out the veins first, including the adjacent enrichment, rather than to take the second class first, which might lead to salting. In extreme cases, such rich samples may be but $\frac{1}{16}$ ft. wide. Beyond this point the accuracy of a sample is more than offset by error in measurement.

Another reason for this separate sampling of rich ore is that it tends to eliminate errors in the preparation of samples for assay; the rich samples being brass tagged and separately treated in the crushing room. On completing one side, the opposite wall is cut in the same manner as a check on the original work.

The above applies chiefly to crosscuts, though the same details are observed in the back sampling of drifts, except that the sample interval is generally increased to 10 ft. or more.

While most of the channeling is horizontal at breast height, no rule is followed other than to make the channel represent its particular block. In "bunchy" ore, such as may be found at the intersection of veins or oxidized ore in limestone, it may be necessary to cut channels both above and below the middle height of the crosscut or to incline the channeling at any angle from 0° to 90°. Interesting but fortunately uncommon cases have arisen where mineralized horizontal quartzite beds have been intersected by two vertical series of veins, each at right angles to one another—a sort of isometric mineralization. Separate sampling was done on each of these systems, the results being combined in certain proportions.

It is only ore or ground that at some future time may be regarded as ore, which warrants channel sampling. In exploratory work of a lower tenor than 1%, development sampling or more rapid cutting is sufficient. Channeling with pneumatic-riveting machines has given satisfactory results in soft ore, but in harder material pieces breaking along seams outside of the cut caused so much trouble that the experiment was abandoned.

Ore from each of the larger stopes is separately put through an automatic sampler at the mill, thus affording a check on the mine work. For a period of 12 months, in which 26,000 tons were produced, the estimated grade of ore by mine sampling for one stope was 2.20%, while automatic sampling showed a grade of 2.10%. This percentage of error is supposed to represent a constant, though it might be safer to assume that mine sampling is from 5% to 10% too high.

Of the two most important local errors entering into mine sampling, one is the occurrence of the richer ore in softer rock, there being that tendency in sampling as in other matters to follow the line of least resistance, and so cut a somewhat larger proportion of the softer, better mineralized material; and again that the chalcocite which is closely associated with the brittle pyrite is more apt to break back from the cut than is any individual piece of gangue and thus form an undue amount of mineral. Related to these, though not a sampling error, is the general impossibility of mining the ore clean, and this factor may at times become the most important.

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*Chief geologist, Detroit Copper Co., Morenci, Ariz.

Note—A paper presented at the Morenci meeting of the Phelps-Dodge Geological Conference, March, 1912.

The accompanying form of sample ticket, 3x6 in., printed on tough, rather heavy colored paper is used, the color distinguishing the special samples from the similar white form of the stope ticket. The sample ticket is protected by placing the folded ticket into the neck of the sample sack, which is then gathered into pleats and firmly tied.

Stope Sampling to Distinguish Ore from Waste

The equipment for sampling the stopes and development work is a heavy geological pick, tape, small compass, note book, etc., and small acetylene lamp worn on the hat. A convenient device to catch the sample is a flatly conical bag supported on a square wire frame, which also serves as a handle.

The sampler covers an assigned route every day, and in stopes of doubtful grade, two or even three visits may be necessary. Since the prime object of stope sampling is to distinguish ore from waste, little attention is paid to the richer ore beyond an inspection of fresh faces. Time is spent to best advantage near the edges of the stope where ore grades off into waste.

Having selected a place where the pay grade of the ore is open to doubt, the sampler picks down any loose projecting rocks along the line of the proposed sample, and then makes a rough groove perpendicular to the trend of mineralization. Where the distribution of the mineral is fairly uniform, from two to three pounds per foot is taken, but where its character is spotty, and it frequently is such in limestone and shale, the amount is increased to five or six pounds per foot. As the chutes are at squared intervals of 30 ft., the position of a sample is readily determined.

Grab samples drawn from the caves of the sublevel and block-caving stopes are the least reliable. Their weight, determined by the character of ore, is from 20 to 50 lb. As the ore from successive surges or runs from a cave often shows great variation, the best results are obtained by drawing off small amounts of ore at intervals and sampling each drawing. Sizing experiments seem to show that pieces of ore that will pass a ¾-in. ring and remain on a ⅝-in. ring represent average grade of ore, and the bulk of a grab sample is made up of such size.

In development work of importance, face samples are taken after each round, but exceedingly lean or barren ground is sampled only occasionally for future records. In ground requiring close timbering, the stope sampler is expected to take a more careful groove as a substitute for the work of the special sampler. The sampler is held responsible until his assay returns have been so recorded that they may be of immediate use to the stope and shift bosses.

In the stopes the recording is done by tacking a small, heavy paper tag, bearing the assay value, to the timber nearest the place sampled, and also by posting the value on a sample map kept in the stope. A map is made for each slice or stope floor on a scale of 20 ft. to the inch, and shows coördinate lines, chutes and boundaries of adjacent old stopes in ink. It is tacked to a light board and protected from dirt by a canvas flap. As stoping operations progress, the advance work is recorded in lead pencil, assays being posted at the same time.

SAMPLE TICKET USED AT DETROIT COPPER CO.

ORIGINAL	DUPLICATE
Mine........................	Mine..................
Working or Stope.............................	Working or Stope....................
Level or Stope Floor............................	Level or Stope Floor....................
Date................................	Date....................
Description..............................	Description..............................
....	....
....	....
Assay Value........................	Assay Value..............................
Sample No........ Sampler........	Sample No.............. Sampler..............

The same method is used in development sampling, a sheet of cross-section paper fastened to a small board, being hung at the entrance to the working, a survey nail or other permanent point serving as draft mark. Assays are shown in their relative positions in columnar form, and opposite each assay is set down the date and any remark. On completion of the stope floor or development work, the mine maps are placed on file as original records.

Chief Sampler Supervises Sampling and Recording

It is the duty of the chief sampler to see that the samples are correctly taken, that the workings are neither under sampled nor over sampled and that the mine records are promptly and properly posted. This requires him to be underground about two-thirds of the time, office duties occupying the rest. The halves of the sample tickets marked "Original" are sent by the assayer to the chief sampler and from these the office records are posted; the "Duplicate" halves go to the mine sampler.

Stope records are kept in a loose-leaf cross-section book, the records being a duplicate on a smaller scale of the maps hung up in the stopes. For development work a sheet of cross-section paper, covering a month's period, is used. Each working is represented by a vertical column with horizontal columns for dates, the assay value with distance from draft mark being set down opposite its date. The sheet is posted daily and is kept in the mine superintendent's office. From this sheet at the end of the month, permanent entries are made in loose-leaf cross-section books, which group each working by itself, and in addition to assays recorded in relative positions in vertical columns, shows draft mark or initial measuring point, a monthly date, footage, character of ground, etc. Channel samples, which may be supplemented by samples taken in the course of development work, are recorded on 30-scale tracing-cloth maps, a simple form of legend being used to distinguish a sample taken horizontally from one taken vertically or across a drift; colored ink is used where assays have been determined for silica or iron.

On a cost for labor of from $2.50 to $3.25 per day, the following summary is given: Labor, 69% of total; supervision and office, 24%; supplies, etc., 7%; development and stope samples, 29c. each; cost of channeling, 8.8c. per ft.; cost of sampling, 1.2c. per ton of ore.

U. S. Platinum Production

California and Oregon produced all the platinum mined in the United States in 1911, according to report of the U. S. Geological Survey, and this output was $8631 greater in value than the 1910 production. The California production was 337 oz. worth $8386 in 1910, and 511 oz. worth $14,873 in 1911. The Oregon output in 1910 was 53 oz. worth $1121 in 1910, and 117 oz. worth $3265 in 1911. The total production in 1911 was 628 oz., valued at $28.87 per ounce.

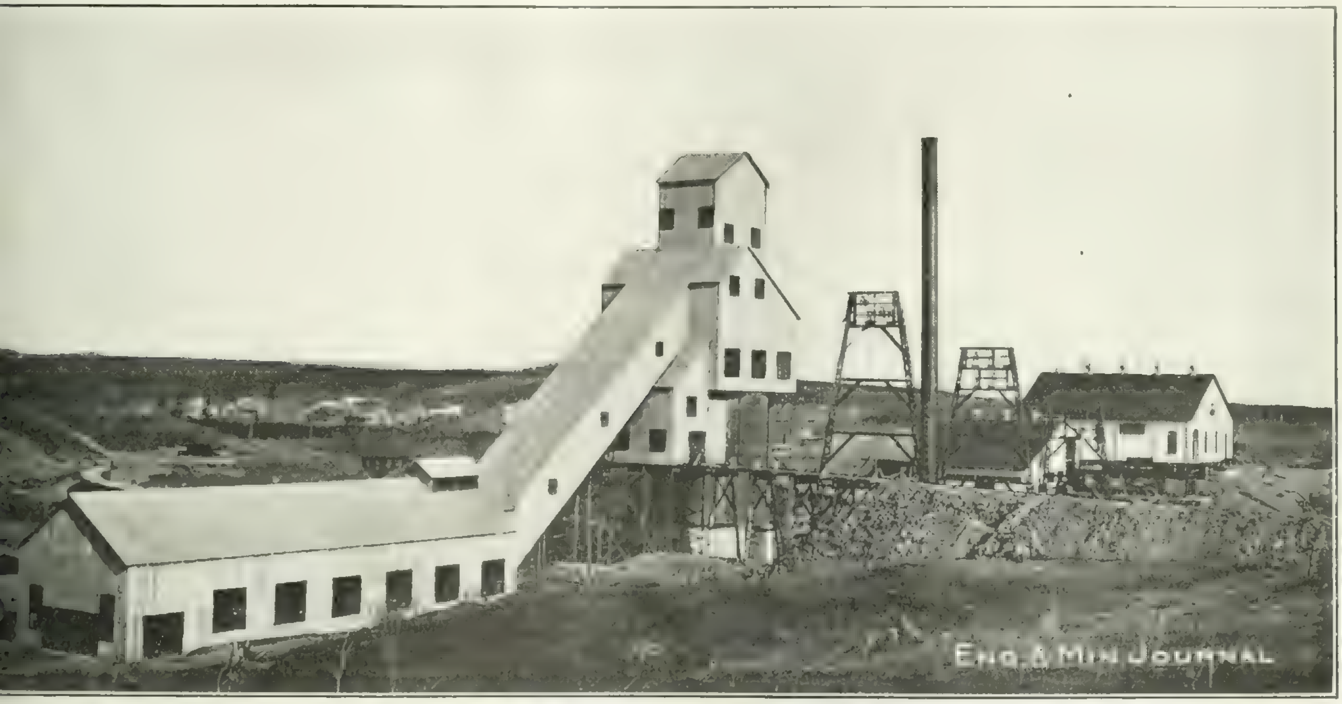
Importations in 1911 of crude platinum sands resulted in an estimated refined product of 27,500 oz. An additional amount was derived from imported ores and mattes, the total quantity refined being placed at about 29,140 fine ounces. The platinum imported and entered for consumption in the U. S. in 1911, including ores and manufactured products, was valued at $4,866,207, an increase of $1,212,543 over the 1910 figures.

Mining Copper at Lake Superior—VII

By Claude T. Rice

One-man drills are the principal hope for lower costs in conglomerate mines. In amygdaloid mines, the one-man drill, concentration of hoisting and haulage, and earlier robbing of pillars offer opportunity for improvement. Greater level intervals are being tried; also ore chutes extending through several levels to reduce hand tramming.

At the rock houses in the Lake Super- r Copper country the ore, which is ull of boulders both at the amygdaloid nd the conglomerate mines, is crushed own to about 4-in. size before being ent to the mills. At the Calumet & lecla mines, 24x48-in. Calumet crushers, f the Blake type, are used, while at the re houses of the other companies, 24x 6-in. crushers are the largest used, be- g generally of Farrell make. Large oulders are loaded in the skip, many of hich the men have to roll into the cars n planks. Indeed one of the character- tics of the stoping practice at the Lake opper mines is the large size of the ore at comes from the stopes, owing to the ct that in the flat mines the ore does ot have to be pulled out of box chutes through mill holes. There is generally 1 apron in the rock houses at the mygdaloid mines, so that the poor rock in be dumped directly into a separate n before reaching the grizzly that pre- edes the crushers, for at those mines a irge proportion of the poor rock is oisted to surface.



North Kearsarge No. 4 Shaft House

Since pillars are left in the stopes, in e hope that it will be possible to come ack later and rob them, there is no lace where poor rock can be stored un- erground to advantage. In some of the ines, the Mohawk for instance, poor ock walls are built up along the levels nd the waste rock is dumped into some f the old stopes, but most of the poor ock is hoisted to surface, owing to the fficulty of getting it to the worked-out stopes. The Calumet & Hecla company, after getting it on surface, is following the practice of hauling in trains all the poor rock that it cannot sell, to a raise connecting with old stopes near Osceola No. 13 shaft, and dumping the poor rock back into the mine.

The Rock Houses

The trap rock which is hoisted at the conglomerate shafts, is not mineralized so much as that at the amygdaloid mines, as it comes from outside the lode, and it therefore makes better building stone as well as better road material. In the ore houses of the conglomerate mines provision therefore is often made for crushing the poor rock into road material. Some of the mines have a steam hammer to aid in cleaning the mass copper that is picked out of the ore at the grizzlies, others use simply a drop hammer. These rock crushers are carried in the ore houses at a height of 40 to 50 ft. from the ground, so that there is a heavy strain on the frame of the building. Formerly the frame was made of wood but the newer ore houses are built with steel frames. The orebin rests on a masonry pier.

As will be seen, the ore houses are built with a low shed extending out from the hanging-wall side of the lode. In this, and on tracks, are kept the extra skips and the man-cars, which have 10 seats each holding three men. By means of counterweighted switches that are lowered to the skip tracks, the skip or the man-car is lowered to the track in this building, the other car connected to the rope, hoisted to the skip tracks and the switch raised out of the way again, permitting changes to be made quickly and easily.

Instead of a number of switches to throw the car from the overhead switch to one of the several tracks in the collar building, a transfer track is used in the North Kearsarge No. 4 shaft, and the floor of the whole house is laid in concrete.

The man-cars at the Calumet & Hecla mines are all equipped with electric storage batteries that furnish power to lamps in order partly to illuminate the car and to throw a light on the hanging of the shaft so that it can be seen easily and any loose pieces of rock readily detected while the men are passing through the shaft, but of course the primary object is to light up the station while the men are getting on the car.

One of the striking features of the Northern mines of the Lake Superior district is the absence of electric lighting underground on the stations and in the haulage ways. To one accustomed to seeing much electricity used about Western mines, the small use of electricity at these mines is a surprise. There is an electric hoist fitted with a Ward-Leonard control, used underground at the Red Jacket workings, the pumping at the central pumping station for the Calumet & Hecla mines is done by electricity and a few Ft. Wayne electric drills are used in the stopes of the Ahmeek mine, while the crushers at the Calumet & Hecla ore houses are run by electric motors, but in general comparatively little electricity is used. Future development will probably see a much more extended use of electricity at these mines.

FUTURE DEVELOPMENT

Having reviewed the general mining practice in both the amygdaloid and conglomerate mines in the part of the district where the dip of the lodes is so low that open-stope methods must be used and practically all the ore, as far as the amygdaloid lodes are concerned, is shoveled into the cars, it may be well to discuss the advances that are going to aid in decreasing the cost at these mines where already mining is suprisingly cheap.

There can be no doubt that many economies are going to be affected in Lake Superior mining in the near future, as only lately have the companies commenced in earnest to experiment in regard to supplies, types of rock drills and different methods of doing the operations, using trained men to keep track of the experiments so that the latter will show something definite and their outcome will not be a matter of individual opinion, as so often was the case in the past, when the mine captain had the most to say in regard to underground equipment and practice.

Probably the greatest economy that is to come in the near future will be due to the introduction of one-man machines in the stopes. The considerable economy in the cost of breaking the ore that will result in their use is assured by tests that have lasted over a year and it is now only a question of getting the men to use them without any friction arising. Some time must be taken to train the miners to their use, as it is no easy thing for one man to run a machine in these stopes that are from 9 to 20 ft. wide, but probably within two years the two-men drills will be the exception instead of the rule in stoping as well as drifting.

FUTURE HAULAGE AND HOISTING

Another economy that I think is approaching is greater concentration of not only the hoisting but also the haulage at the amygdaloid mines, to do away with the hand tramming. Rope haulage cannot well be used in the amygdaloid lodes because of the crookedness of the levels. The more expensive systems, except possibly haulage with gasoline locomotives when they are perfected for underground use, are out of the question unless the tonnage that is to be hauled is concentrated from several levels on a level below. A series of raises put up along the lode, at intervals of about 500 ft. would be a simple solution of the problem if only they would work, but the experience of the Calumet & Hecla company on the Osceola lode in shooting the ore from level to level indicates that the bottom of these chutes must have an angle of 40°. Still, the ore runs out of the stopes well when it is blasted and an angle of 38° is found sufficient. Sliding the ore down two levels at North Kearsarge No. 4 shaft, where bins are used for storing the ore in the shafts, is practiced and loading into the skips is done with measuring pockets. Of course some ore would cling in the chutes on these flat dips but if they worked they would offer a simple solution of the problem, as by cutting into the foot slightly at the bottom, to get a steeper slope for feeding the ore to the mouth of the chute, and by using air-operated arc gates, it should not be hard to load the cars even with fair sized boulders coming down.

THE CRITICAL ANGLE

There is, however, an angle at which it does not pay to try to slide the ore from level to level in a mine, and mining men with much experience in these mines say that 38° is too low a dip to pay for dumping the ore out of a car and loading it again into another car on another level. They consider that, once the ore is in a car, with the dip as low as 38°, the best thing is to lower it in cars to the other level through subshafts, as is the practice at the Red Jacket workings, and to follow the Red Jacket practice entirely except that electric haulage would be necessary owing to the crookedness of the lode. This is probably the best solution of the problem, but whether measuring pockets, or bins with measuring pockets should be used on these haulage levels, would depend largely on the strength of the hanging and whether the shaft is in the lode or in the foot wall. Some such solution, which does away with long hand trams, is coming. The attempt at concentrating the hoisting by shooting the ore down two levels, as at North Kearsarge No. 4 shaft, where a novel form of measuring pocket works admirably, or of having a chute placed at the edge of the shaft pillar to take the ore down five levels, as at Osceola No. 13 of the Calumet & Hecla, and then drawing it into a 7-ton car and loading the skip on that car, are only experiments that show what is being striven for. If the mining methods cannot be changed so as to permit of the concentration of the mining on fewer levels, then the tramming must be concentrated instead.

The level intervals, I think, can be increased with some gain in economy and operation. At first an interval of about 100 ft. was used but this has been increased at several of the mines to 125 ft. and I believe that it is now planned to develop the lowest 500 ft. of ground in the North Kearsarge No. 4 shaft by three levels. It seems to me that no drawback in the general mining operations would result if a level interval of 150 ft. were to be adopted in all the amygdaloid mines, except that it would be rather hard work packing the tools up to the top of the stope over a floor covered with broken ore. If the level interval is increased it will probably be found better to use chutes for cleaning out the stope as at the Mohawk, rather than to use the other methods where the distance that the ore must be moved down the stope plays an important part in the cost of operation.

PILLARS ARE LEFT

Another pecularity of the mining is that the hanging wall is left standing on pillars. The intention at many of the mines is to stope all the ore before the robbing of the pillars has commenced. Then the pillars are going to be mined retreating and as much of the ore saved as possible. In the meantime the hanging wall of these old stopes is getting bad and slabby, as the lime minerals in the rock have a tendency to slack and swell whenever the wall rock is at all broken. The floors of the old stopes are also being covered with dribblings of poor rock which will get mixed with the ores from the pillars if mining of the latter is attempted. The blasting in these old stopes will also cause seams to open in the hanging and large pieces will come down when work is resumed after several years have elapsed, either catching some of the miners or scaring them so badly that higher wages will have to be offered to induce them to scram.

Nothing is gained, after a depth of 800 or 900 ft. is reached, by leaving the hanging wall standing on these pillars, except that it is possible to go back into these old stopes and shoot up from the foot, ore once too low grade to mine but rendered profitable by later economies. This is a great advantage as has been shown in the South Kearsarge and the old Osceola workings. But it should be possible from now on at most of the mines, to take out of the floor of the stopes practically all the ore that it will ever pay to go back after, as the total cost of producing marketable copper in these ores has been reduced to approximately $1.30 per ton of ore hoisted, of which about 85c. is for underground mining, about 30c. being for actual ore breaking. This is cheap mining and a low cost of producing copper, so that the ore which now is left in the footwall must be extremely low in grade if the stoping is carried on properly. Of course there can be no doubt that further economies are going to result in the mining methods, probably along some of the lines I have suggested, but it is going to cost something to reopen some of the old levels and to get them into condition again for mining. Further, the dribblings from the hanging wall that are sure to result with the lapse of time, either will have to be cleaned out of the stope or else permitted to mix with these low-grade scrammings from the foot wall and the better grade coming from the pillars. This is certain to militate against the success of any such general scramming scheme.

Leaving Pillars is Dangerous

The principal trouble in leaving the hanging wall standing on pillars is that the drawing of the pillars is likely to cause difficulties when the robbing commences. Pillar robbing assumes the characteristic of caving methods, in that for the robbing to be successful it must not come in surges. It is essential that one be able to control the caving so that it will not, at any time, extend beyond where it is intended to, and the roof must come at approximately the time desired.

With a strong hanging wall like that characterizing most of the workings now under discusson, it is necessary to undermine a large area and to let it stand a long time before the first caving of any magnitude can be started. If the area of ground standing on pillars is small in proportion to the area that has not been touched, no harm is going to result to the mine when the general movement begins. But if most of the mine is standing on pillars, the general movement is apt to extend over a much larger area than was intended and to surge suddenly and unexpectedly; perhaps cracking pillars under a large area and making those workings unsafe to enter, if not closing them completely. A somewhat similar happening was the cause of the loss of the Atlantic workings only a few years ago. In that mine, owing to the strength of the walls, it had become the custom to mine the ore without leaving many pillars, and what pillars were left were small. Consequently in time, as the hanging wall did not follow down after the mining, there was an immense area of hanging in stress. Air blasts, due to caving of large areas, first appeared, then the real general movement began and it was so extensive that it could not be controlled. So the whole mine was lost. A peculiarity of these adjustments of the hanging wall is that to date they always have occurred on Saturday night or Sundays, when no mining was going on.

Systematic Robbing Necessary

The wisest procedure, therefore, seems to be to cut out the pillars when the mine is young, now that mining and other costs are so low, and the recovery of copper even in the low-grade mines is approaching 80%. In that way the caving of the hanging wall would be started when it could not do much damage to the mine, as little of it would be undercut, and by following up the first general cave with a systematic robbing of the pillars, the final caving could probably be made to follow closely upon the robbing of the pillars and at a fairly regular distance behind the scrammers, as the Cornishman would call the miners who were gouging the pillars. This, though, could only be accomplished by systematic work and with an even rate of advance in the robbing.

It will be noticed that other than the one-man drill, none of these suggestions apply to the conglomerate mines. The truth is that the mining practice on the conglomerate lode is about as far along as it can be advanced with the exception of the use of one-man drills, and the supplying of the men in these hot workings with ice water. Recently it has been found possible to follow the better grade of ore in the wide stopes and not take all the ore from hanging to foot in case some does not pay. Therefore, when the limit of profit is reached in the orebodies, after the change of drilling practice is introduced some other method of mining will have to be used that does not recover so much of the ore in the lode unless noteworthy reductions in surface costs are made. Possibly some form of the caving system will be found best applicable.

For the many kindnesses shown me while in the copper country and the information and assistance which they so kindly gave me, I wish to thank James MacNaughton, general manager, John Knox, general superintendent, and Allan Cameron, underground superintendent of the Calumet & Hecla company, F. W. Ridley, superintendent of the Centennial and Allouez companies, F. H. Haller, superintendent of the Osceola Consolidated, Fred Smith, superintendent and F. W. Hartman, engineer of the Wolverine company, and Willard J. Smith, superintendent of the Mohawk, as well as many of the mine captains.

Tin Deposits of Durango

According to an article by Manuel Rangel in Boletin Oficial de la Camara Minera de Mexico, ann. 3, no. 22, March, 1912, translated by the London *Min. Journ.*, in the Cerro de los Remedios, near the city of Durango, toward the southwest, are some thin contraction veins in rhyolite. The ore appears as small pockets of reniform tinstone; the surface is often covered with small octahedral crystals of an isomorphous mixture of cassiterite and hematite, a mineral invariably accompanying stanniferous deposits in Durango. These mines have been abandoned for a long time.

The mining district of Potrillos, Partido de San Juan del Rio, is well known; some of the veins were produced by fracture, and others by contraction, due to cooling. The filling is made of reniform masses of cassiterite, large kidney-shaped pieces being frequently accompanied by hematite and a reddish ferruginous clay, and associated with pyenite (a variety of topaz) in beautiful rhombohedral crystals, and, very occasionally, with durangite (a fluo-arsenate of sodium and aluminum) in translucid pyramidal (monoclinic) crystals having a beautiful orange-red color. This rare mineral was first met with in La Barranca mine, 18 miles northeast of Coneto, in quartz veins, 6 in. thick, which, when united to the walls, carries large clear crystals of durangite, but when the durangite is associated with cassiterite in a white pulverulent filling the crystals are small and dark.

Ten years ago the Potrillos mines were worked by the Pittsburgh & Mexican Tin Mining Co., which, after spending more than $200,000 gold, extracted only about 1000 tons of ore. About 20 claims are now being worked to advantage by Manuel Enríquez.

In the Sierra de Cacaria are various deposits of cassiterite accompanied by iron oxide. Similar deposits occur in other parts of the state, especially in the Partidos of Mezquital, Nombre de Dios and San Juan del Rio. In the Guadalupe mine (San Juan del Rio) the cassiterite is united with stannite (tin pyrites—the "bell-metal ore" of Cornish miners). In the bottom of the arroyos, tin placers derived from the veins occur, especially at Cacaria, and at Hornitos, Partido del Mezquital.

The import of mica into the United States still exceeds the domestic production, the value of the imports during 1911 being reported by Douglas B. Sterrett, of the U. S. Geological Survey, at $502,163, and the total value of mica produced in this country at $355,804. Most of the 1911 production came from North Carolina, South Dakota and New Hampshire. The principal mica-producing countries are India, United States, Canada, Brazil, Ceylon and South Africa.

Grinding Practice at McKinley-Darragh Mill, Cobalt

By J. G. Mueller*

The mill of the McKinley-Darragh-Savage Mines, Ltd., is the only mill in the Cobalt district, with possibly one exception, which has thus far gone in for coarse crushing in the batteries and the regrinding of a screen-separated oversize direct from the mortars for independent unit treatment.

The bypassing, around the batteries, of primary fines, i.e., mine and coarse-crusher fines, which will pass 0.125-in. screen aperture, is done to some extent in other mills, though the manner of its disposal after roughing treatment varies considerably. Under our system, material that has once passed around the battery never returns to it in any form. The contents are extracted as far as possible and it is then combined with one or another of the regular pulps below the batteries or, in the case of the finest slime, is bagged for shipment. All but minus 150-mesh material (our standard for slime) in the battery pulp passing a 0.375x0.187-in. aperture slot screen, is passed over an impact screen (8-mesh, 0.069-in. aperture) the oversize combining with the tailing from the primary-fines jig (the coarsest and leanest residue of the primary fines). The valuable metal in both products seems to exist principally in nuggets and minute leaf-silver particles with a small proportion of cobalt and smaltite, which exists in the battery oversize component only.

My theory for this condition is that owing to its toughness and to the tenacity with which it adheres to its gangue, when in minute particles, it is not liberated in the mortar. The more friable cobalt, however, disintegrates rapidly while splashing about in the mortar before being discharged. Hence this oversize is composed principally of barren country rock, conglomerate and slate, with native silver imbedded in or adhering to it and requiring only another coarse reduction for its liberation and comparatively simple concentration.

This theory seems to be sustained by the fact that the minus 150-mesh component of this material, after reduction in an 8-ft. Hardinge conical mill, averages 30% lower in value than its sand component, or plus 150-mesh material. The accompanying data are offered to show that a (Cobalt) pulp whose slime component runs lower in value than its sand component, is unusual if not quite contrary to previous experience in this section. These tests, I might state, are not single tests taken for the occasion, but are averages, in some cases covering regular weekly samples for screen analysis of the different pulps.

To proceed from where the two materials combine and leave the impact screen: The material passes through a jigging device which extracts loose nuggets and cobalt particles and then is semi-automatically fed to the conical mill, steel and brick lined, which runs 26½ r.p.m. and carries 4 to 5 tons of 4-in. pebbles. A 24-hour run of feed averages 33⅓ tons with 35 gal. of water per minute, and is composed of 23⅓ tons of battery product (oversize) and 10 tons of jig tailing. The battery product is divided into 55% on an 8-mesh (0.069-in. aperture) screen and 45% through 8 mesh. The jig tailing is divided into 35% on, and 65% through 8 mesh. Both show a trace through 40 mesh. The Hardinge-mill product gives a screen analysis and silver distribution as shown in Table I:

TABLE I—HARDINGE MILL PRODUCT

Mesh	%	Silver, oz per ton
+ 60	20	34.68
+ 80	15	29.00
+ 100	10	21.22
+ 120	10	16.53
+ 150	5	24.54
—150	40	23.80

An average of 15 tests over a period of 30 days on the minus 150-mesh overflow and the plus 150-mesh spigot product of the 30-in. cone, to which all the pulp passes from the conical mill, shows the minus 150-mesh component to assay 9 oz., against 13 oz. in the plus 150-mesh component or a difference in value of 30%, over an average of 15 tests, in favor of the plus 150-mesh component.

The battery pulp through an 8-mesh, 0.084-in. aperture slot screen in comparison, gives a screen analysis and silver distribution, as shown in Table II:

TABLE II—BATTERY PULP THROUGH 8-MESH SCREEN

Mesh	%	Silver, oz. per ton
+ 60	50	17.60
+ 80	8	23.72
+ 100	10	29.04
+ 120	2	34.00
+ 150	2	31.00
—150	28	26.96

These figures give content of 20.7 oz. on the 150-mesh against 26.96 for the minus 150 mesh, or a difference of 23% in favor of the minus component.

For supplementary comparison the tube-mill product, as shown in Table III, will indicate a similar scale of silver content in a pulp of much lower grade, i.e., 7 oz. Note the marked difference between the plus and the minus 150-mesh components in spite of its impoverishment by having undergone one sand-table treatment.

TABLE III—TUBE MILL PRODUCT AFTER CONCENTRATION

Mesh	%	Silver, oz per ton
+ 60	15	6.28
+ 80	15	5.52
+ 100	10	5.72
+ 120	9	6.52
+ 150	7	7.16
—150	44	8.20

These figures give a silver content of 6.3 oz. on 150 mesh, against 8.20 on the minus 150 mesh, or again a difference of 23% in favor of the minus component.

As previously stated, the total pulp from the conical mill passes to a 30-in. cone, the overflow passing into the trunk slime launder, while the spigot product is treated on a Deister table where an extraction of 75% is maintained, the tailing going to waste averaging 20% lower in grade than all other combined tailings. The concentrate averages 600 oz. per ton at a 60: 1 ratio of concentration.

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*Mill superintendent, McKinley-Darragh-Savage Mines, Ltd., Cobalt, Ont.

Progress of Basic Converting

Converting on basic lining has been making steady advances throughout the last three years until at present only about 20 per cent. of the copper produced in the United States is being converted in the old way. Doubtless the fear of litigation caused many operators to delay the adoption of basic lining. Some plants are using the old acid converter shells with magnesite-brick lining, but in the newer plants the large Peirce-Smith type converters have been adopted. According to the Peirce-Smith Converter Co., over 80% of the copper now produced in this country is being converted either in the Peirce-Smith type converters or on basic lining, under license, in the old acid shells. Installations of the large Peirce-Smith converters have been made at the following plants:

American Smelting & Refining Co. works at Garfield, Utah, Tacoma, Wash., El Paso, Tex., Baltimore, Md., and Perth Amboy, N. J.; Steptoe Valley Smelting & Mining Co., McGill, Nev.; Canadian Copper Co., Sudbury, Ont.; Cerro de Pasco Mining Co., La Fundicion, Peru; Braden Copper Co., Rancagua, Chile; Kyshtim Corporation, Department of Perm, Russia. Additional installations are also being made at the smeltery of the Tennessee Copper Co., Copperhill, Tenn., and at the new works of the American Smelting & Refining Co., at Hayden, Arizona.

Plants which are operating basic-lined converters of the old type are: Copper Queen Consolidated Mining Co. and the Calumet & Arizona Mining Co., Douglas, Ariz.; Old Dominion Copper Mining & Smelting Co., Globe, Ariz.; Detroit Copper Mining Co., Morenci, Ariz.; Arizona Copper Co., Clifton, Ariz.; United States Metals Refining Co., Chrome, New Jersey; Anaconda Copper Mining Co., Anaconda and Great Falls, Montana.

Argentine Mineral Exports

The mineral exports of the Argentine Republic had a value for 1911 of $545,551, according to the *Pan-American Union*, and were as follows: Copper bars, 645 metric tons; copper ore, 1492 (the value of these two items is about 73% of the total); wolfram ore, 584; borate of lime, 576; onyx, 381; mica, 15; vanadium ore, 217; lead ore, 103 tons; while all else had a value of only $2516.

A Water Cooled Blast Furnace

The most recent development in iron blast-furnace linings is the use of furnaces having inwalls with relatively thin linings, cooled throughout by a sheet or jacket of water. One of the earliest installations of this sort was a furnace constructed by Burgers at the Gelsenkerchen Works in Germany, in 1898, and the first installation of the sort in this country was made under the direction of James Scott, in 1908, at the Isabella Furnaces of the Carnegie Steel Co. Other noteworthy thin-lined furnace installations are those of the Illinois Steel Co., constructed and placed in operation early in 1909, and of the Tennessee Coal, Iron & Railroad Co., which was placed in operation during 1911. One of the most recent installations of this sort is that of the Detroit Iron & Steel Co.

Cost and details of altering an ordinary iron blast furnace into a water-cooled stack. Considerable economies shown in the operation of the remodeled furnace.

Note—Excerpts from an article in Engineering News, Aug. 22, 1912.

The Detroit Furnace

Two general systems of cooling have been used in connection with thin-lined furnaces, one in which the cooling water circulates in troughs riveted externally to the steel-plate furnace shell[1], and the other in which the cooling is effected by means of circular spray pipes extending entirely around the stack and located at such intervals as to maintain a continuous film of water over the entire shell. The former method is subject to the objection that the cooling water is applied to the shell under some external head which necessitates water-tight joints in the shell construction, for any water admitted to the interior of the furnace would immediately affect its operations and have a destructive effect on the firebrick lining. For this reason, among others, the circular-spray system was adopted for the Detroit Iron & Steel Co.'s furnace.

Early in 1911, this company found it necessary to completely reline their "A" furnace. The stack was originally built in 1902 and has been in continuous operation since that time with the exception of short intervals. The shell had become considerably warped or buckled, so that it was considered necessary, therefore, to provide a new shell if the furnace was to be put into first-class condition. It was decided, however, to reconstruct the furnace with a thin-walled water-cooled construction.

The original furnace shell was composed of nine rings, the top and bottom ones being ⅝ in., and the seven intermediate rings ½ in. and ⅜ in. in thickness. In spite of the warping or buckling, it retained enough structural strength to carry the load of the top structure comprising the charging apparatus, etc. It was accordingly decided to retain the old outer shell for this purpose and to build up inside of it a new thin brick lining with a steel shell of its own.

A sectional view of the reconstructed furnace is shown in Fig. 2. The inner shell is of ¾-in. steel plate throughout and is supported on an inner mantle ring carried on structural brackets attached to the original mantle columns, which were of substantial construction and in excellent condition. Three angle-iron rings are attached to the inner surface of the inner shell at different elevations to give support to the brick lining.

At the upper end of the shell of the furnace, cast-steel brackets were originally attached to the inside of the shell for the support of the platform. These brackets were retained in their original position, but their ends were cut off to give room for the erection of the new inner-shell top ring, and short lengths of angle iron were fastened across the cut-off end of these brackets as shown in Fig. 2. These angles are not attached to the inner shell, in fact a clearance of about ¼ in. is left between the top ring of this shell and the inner flange of the

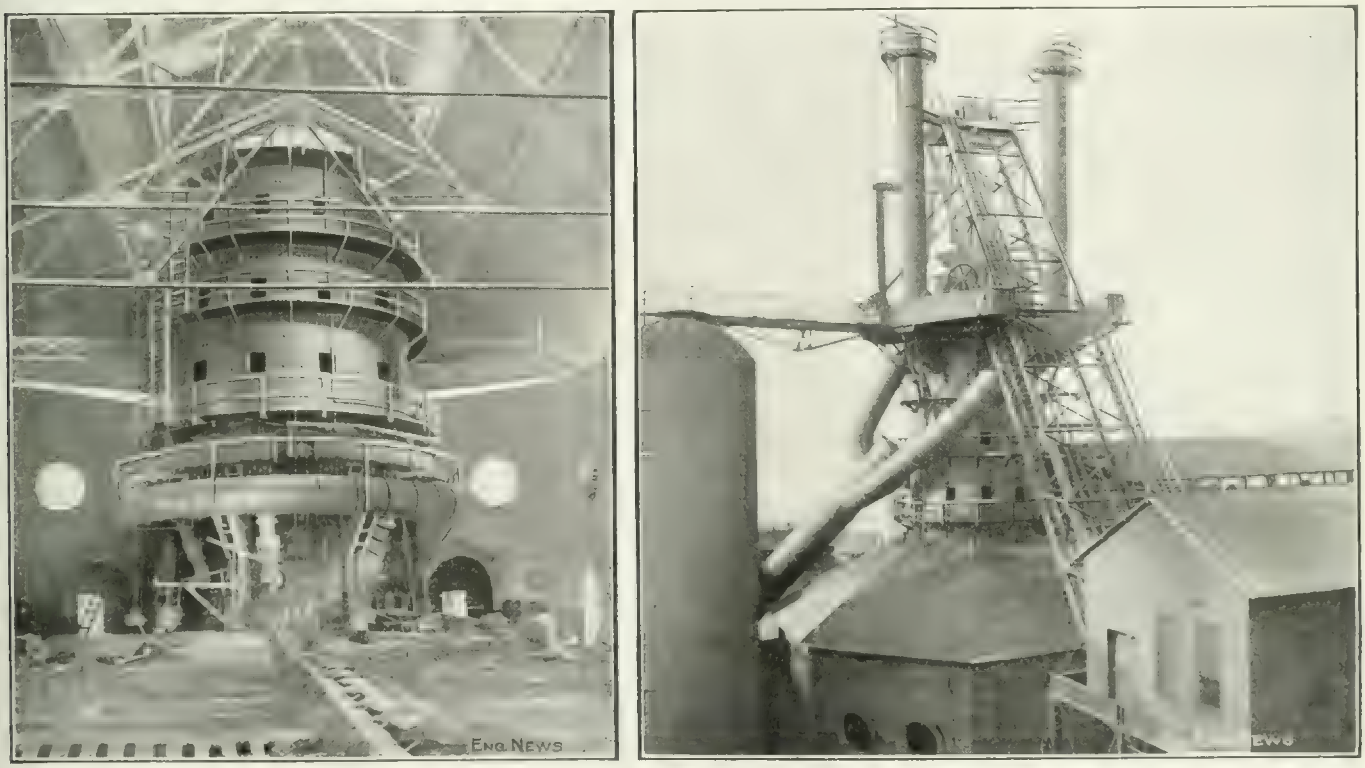

Fig. 1. Detroit Steel & Iron Co.'s Blast Furnace, Reconstructed with Water-cooled Thin Lining

angle. These pieces of angle iron are supposed to bear against the inner shell, if necessary, and maintain the relative alignment of the two shells.

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[1] Eng. and Min. Journ., p. 303, Aug. 17, 1912.

The entire inwall lining in the reconstructed furnace is 12 in. thick and composed of special hard-burned refractories adapted to the purpose. The overall height of the furnace is the same as in the original installation, but owing to the difference in thickness of the brick lining, it was found possible to make the hearth, bosh and stock line diameters 12 in. larger than those of the old furnace.

It should be noted that with the form of construction described, the inner and outer shells are left free for independent vertical movements due to expansion and contraction, and the outer shell, which is not subject to great changes in temperature, serves to hold the inner shell permanently in position at the upper end and prevents the hopper and top from becoming eccentric with respect to the lower end of the furnace.

In order to carry out this freedom of movement of the inner and outer shells, it was necessary to attach the downcomers (of which there are three) and the two bleeders to the inner shell only. In reconstructing the Detroit furnace, the downcomers were first connected to the inner shell by means of plate-work rings and were then cut free from the outer shell so as to allow the free expansion of the inner shell. The bleeders were attached directly to the inner shell and pass through openings in the outer shell. Most of their weight, however, is carried by brackets attached to the outer shell.

Cooling System

The spray system of cooling is used. As shown in Fig. 2, there are six circular spray pipes surrounding the inner shell of the furnace. These pipes have spray orifices, ⅛ in. in diameter, spaced 6 in. c. to c., and are connected to four vertical supply pipes, arranged to give the most uniform pressure possible at the spray orifices. Valves are provided in the connections to the supply pipe to permit any necessary regulation of the flow of water. In this way a film of water is maintained over the entire surface of the inner shell. The thickness of the film is increased by each circular spray as the water passes downward, giving the greatest cooling effect at the lower part of the inwall where the heat is greatest. A trough is attached between the two shells just above the upper mantle ring, in which the cooling water collects. Discharge openings from this trough are provided which connect to the sewer system.

Besides acting as a support for the charging platform and top structure, the outer shell of the furnace serves perfectly as a windshield for the water spray, making it certain that the film of water will be continuous over the whole surface of the inner shell. Six galleries are bracketed to the outside of the outer shell at the levels of the six circular spray pipes. Workmen, standing on the galleries, can inspect or reach the spray pipes, if necessary, through rectangular openings cut through the outer shell. These openings, of which there are twelve at each gallery level, can be seen in Fig. 1.

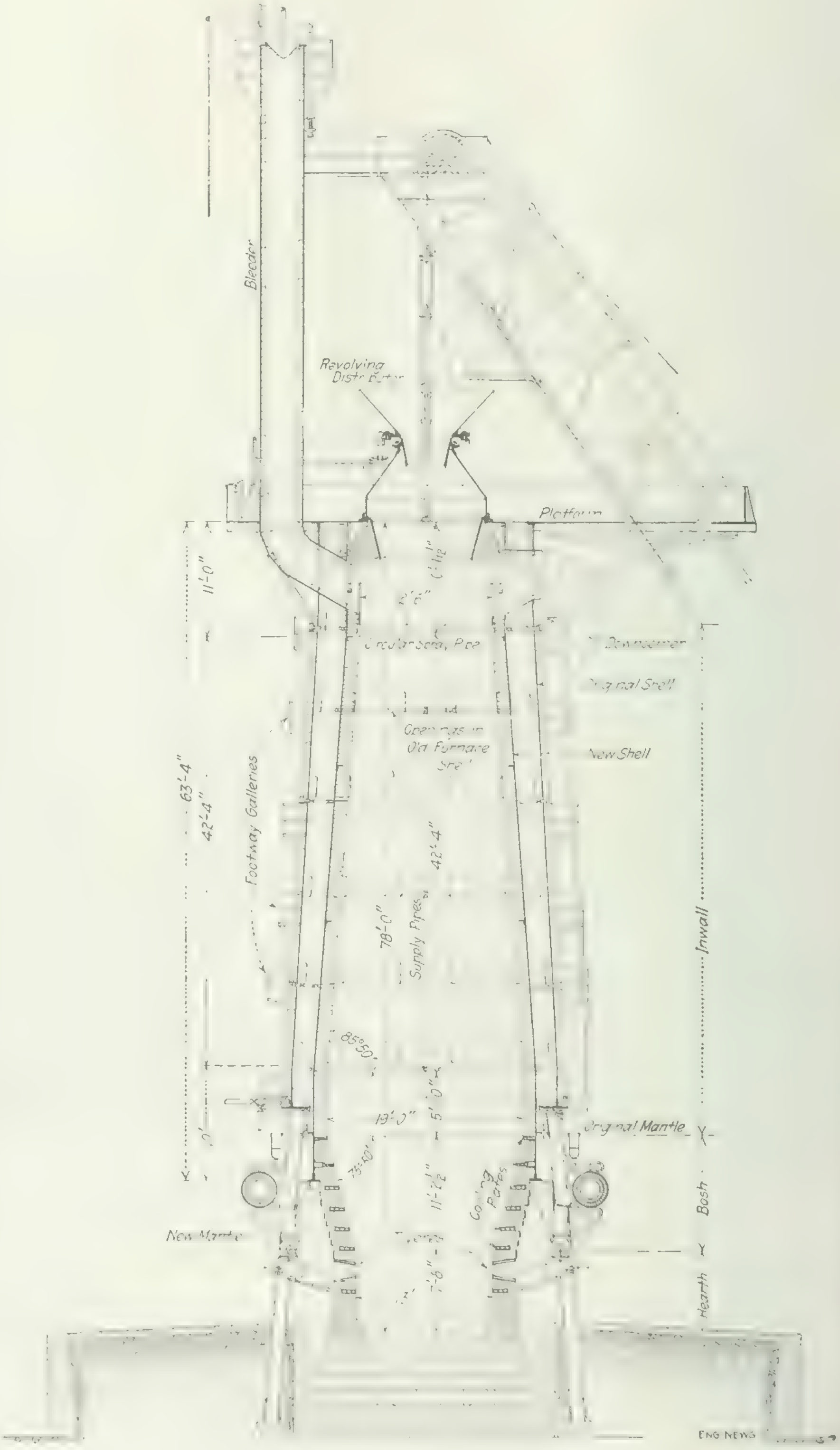

FIG. 2. SECTIONAL ELEVATION OF THE DETROIT WATER-COOLED BLAST FURNACE

Operating Results

The reconstructed furnace was blown in early in December, 1911, and has given since that time exceptionally good results in operation. We are informed by Arthur G. McKee, of Cleveland, Ohio, who had charge of the reconstruction work, that the tonnage has been increased about 24% with the reconstructed furnace compared with the average tonnage made by the original installation during the seven years previous. This increase he ascribes in part to the increased diameter of the stack, but also to the remarkable regularity of operation resulting from the water cooling.

The fuel used in this furnace has always been byproduct coke. When operated as a thick-lined furnace, it was impossible to carry a burden-to-fuel ratio of more than 1.7, but with the new construction this has been increased to over 2. The furnace is operated on merchant iron and has encountered the necessity of frequent change of product as is usual in furnaces making iron for the open market. The quality of the iron has been remarkably uniform, no difficulty being encountered in maintaining the sulphur contents under 0.04 with a range of silicon of from 0.75% to 3%. It is stated further that the furnace responds with great promptness to any changes of burden.

Cost of Reconstruction

One of the chief objections to the rebuilding of blast furnaces as water-cooled stacks has been the high first cost. This was due to the fact that with a thin lining it became necessary to provide a separate support other than the furnace shell for the skip bridge, top structure and platform, as well as for the inspection galleries outside of the shell. This supporting structure was usually made in the form of steel columns resting on the mantle ring and extending from there to the top platform. Mr. McKee estimates the cost of reconstructing a furnace by the method applied to the Detroit furnace as described at approximately $30,000 to $32,000—not materially more than is required for the relining of a thick-lined furnace. The amount given is for a furnace 20x80 ft. in dimensions. This cost covers the steel work, including the inner shell with its mantle and supporting columns, the galleries and all necessary alterations to the existing outer shell, connections of existing bleeders and downcomers, spray piping, brickwork and other incidental alterations. It is here assumed that the mantle columns are reasonably adapted to the support of the inner shell and that the outer or existing shell has sufficient strength adequately to support the load which it has previously carried without reinforcement.

The time necessary for converting a furnace of this size to a thin-lined installation, assuming that drawings are prepared and material and construction contracts placed before going out of blast, should be approximately nine weeks and should not exceed 12 weeks, unless unusual construction difficulties are encountered.

Reconstruction along the lines described provides to all intents and purposes a new surface stack, the useful life of which should fully equal the original installation. Relining can be accomplished over a long period of operation with a saving of from one-half to two-thirds of the corresponding cost for a thick-lined furnace and with a saving in time.

The reconstruction of the Detroit Iron & Steel Co.'s furnace was carried out under the direction of Mr. McKee under patents issued to M. McMurray, manager of furnaces for the M. A. Hanna Co., of Cleveland, Ohio.

Burmese Petroleum Industry

The production of petroleum in Burma during 1911, although less than the record year of 1909, shows a considerable increase over 1910, as appears from the accompanying tabulation. (*Daily Consular and Trade Reports*, July 25, 1912.)

BURMESE OIL PRODUCTION IN IMPERIAL GALLONS[1]

Fields	1910	1911
Yenangyaung	174,967,298	166,491,319
Singu	31,524,175	50,564,765
Yenangyat	4,942,308	4,476,074
Minbu	18,320	632,458
Kyaukpyu	33,544	36,970
Akyab	22,258	19,630
Thayetmyo		1,315
Total production	211,507,903	222,225,531
Total value	$3,958,820	$4,188,590

[1] British imperial gallon = 1.2 American gallons.

The Yenangyoung field annually decreases in production and will probably continue to do so, as this region has been worked to an almost destructive extent. The Singu field, for the first time in several years, increased its output. It is probably capable of a greater production than the figures seem to indicate.

The output of the Yenangyat field has steadily declined from 18,700,000 gal. in 1905, to 4,476,074 gal. in 1911. On account of topographical features this is an expensive field to work. Yenangyat oil contains little wax, and for that reason is not so valuable as the oil in other districts. "The falling off in production," according to Sir Thomas Holland, "is not necessarily a certain indication of failing resources, but it simply means that the companies concerned have devoted their main energies to richer areas."

In 1910 a rich stratum of oil was struck in the Minbu field by the Burma Oil Co. One well at a depth of 630 ft. had an initial output of 400 bbl. per day. The British-Burma Petroleum Co. is also working in this field.

The Indo-Burma Petroleum Co. is now drilling several wells off the Chindwin River in the direction of Kindat. Should oil be struck in working quantities, there would be a large increase in the production of Burma oil. A pipe line will have to be constructed to get this oil out, as there are no means of transportation.

The exports of petroleum and petroleum products from Rangoon during 1911, had an aggregate value of $17,864,920. The imports of American kerosene into Rangoon have increased from $193,374 in 1909, to $202,328 in 1910, and $276,557 in 1911. This steady advance is most satisfactory when it is considered that Burma is itself an oil-producing country. Up to the present, however, the Burma oil companies have not been able to produce a nonsmoking kerosene of high grade.

American oil is used almost exclusively by the European communities, while the natives use the cheap local oil. The increasing use of electric light in Rangoon and other cities of Burma is bound, however, to bring about a reduction in the use of American oil. The Burma Oil Co. has just put on the market its "Waterlily" brand, which is being extensively advertised throughout India as a "fine water-white oil, 150° fire test, equal in every respect to the best imported oils." At present this new kerosene has had no effect on the sales of American oils, but probably will do so in the future as it becomes better known.

Beaver Consolidated Mines

The Beaver Consolidated Mines reports for the quarter ended May 31, that 1244 ft. of development work were done, 855 ft. of drifting, 330 of crosscutting, 43 of sinking and 16 of raising. Stoping amounted to 1076.5 sq.yd. Results of development work have been satisfactory. The main shaft is now down 590 feet.

The mill ran steadily from Mar. 18, and two cars of concentrates have been shipped, one from the dump and one from above ground. A summary of the work from Mar. 18 to May 31 is: Tons milled, 3786; head assay, 26.1 oz.; tail assay, 4.1 oz.; cost per ton, $1.88; tons concentrates, 67.832; recovered, 84,438.4 oz.; extraction, 84.4%. Figuring on 52c. per oz., the net milling profit was $36,896. [The average price of silver at New York was over 58c. per oz. during this period.—Editor.] The mill was built to handle 50 tons per day, but is exceeding this.

The Erie Cobalt property, consisting of 40 acres, was purchased for $1500. Part of the property underlies Kirk Lake, which supplies the water to the Beaver mill, and it was to conserve water for milling purposes that the property was acquired.

It is estimated that there are 8,000,000.000 tons of mineable coal in the Black Mesa fields, of Arizona, says a U. S. Geological Survey bulletin, and probably 60,000,000 more in the Deer Creek field of the same state.

Sulphur Determination in Pyrites

By Albert M. Smoot*

*Ledoux & Co., 99 John St., New York

A new electrochemical method for the exact determination of sulphur in pyrites.

The heavy metals are removed by electrolysis from the solution, leaving a practically pure solution of sulphuric acid to be worked with. Disadvantages of the modified Lunge's method given, with a comparison of results by this and the electrolytic method.

Someone has wisely said that the commercial prosperity of a nation may be gaged by the amount of sulphuric acid consumed. Since pyrites is the raw material from which by far the greater proportion of sulphuric acid is produced, it also might serve as a guide to commercial prosperity, and the exact determination of the sulphur contained in it is important, not only on account of the large amounts involved in the purchase and sale of the ore, but also because exact knowledge of the sulphur tenor of the raw material affords a close control of manufacturing operations.

MODIFIED LUNGE METHOD

Heretofore the Lunge method, with or without certain modifications, has been generally used, at least in this country, for the determination of sulphur in pyrites. Briefly, this method consists in the wet oxidation of the finely ground pyrites with a mixture of hydrochloric and nitric acids, followed by evaporation to dryness on a steam bath, whereby the sulphides are converted to sulphates and free sulphuric acid. In order to expel all nitric acid, the dry residue is treated with excess of hydrochloric acid and again evaporated to dryness. The residue from the second evaporation is treated with a very little hydrochloric acid, dissolved in water and the iron is separated as hydrate by the addition of ammonium hydrate in excess. The iron hydrate is removed by filtration and thoroughly washed. The alkaline filtrate and washings, containing all the sulphuric acid, together with most of the copper and zinc which may have been present in the pyrites, is made slightly acid with hydrochloric acid and the sulphur is precipitated from the hot solution as barium sulphate by the addition of barium chloride. The barium sulphate is filtered, washed, ignited and weighed.

There is a wide-spread belief that the Lunge method determines only the available sulphur; i.e., the sulphur present as sulphides of iron, copper and zinc, to the exclusion of sulphide of lead and sulphate of calcium. As a matter of fact, it does nothing of the kind, since both sulphide of lead (after oxidation to sulphate) and sulphate of calcium, in the amounts in which they occur in any mineral likely to be marketed as pyrites, are fully soluble in the hydrochloric acid, water and ammonium chloride used in the method. The sulphur of these compounds is obtained in the final solution and the only sulphur not included is that which may have been present in the ore as baryte, heavy spar. This is a comparatively rare constituent of pyrite ore, and the sulphur contained in it is, of course, quite useless. Unfortunately, the precipitation of barium sulphate from alkali sulphate or ammonium sulphate solutions is not the simple operation that it seems to be; in fact, it is practically impossible to precipitate pure barium sulphate from such solutions and the sources of error are greater with ammonium than with either sodium or potassium salts. The causes and extent of these errors have been fully investigated by Allen and Johnston[1].

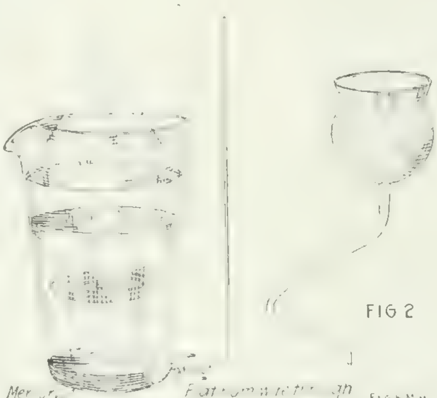

FIG 1 FIG 2

SULPHUR-DETERMINATION APPARATUS

These chemists have shown that the three principal sources of error are: (1) Solubility of the precipitate in acid liquids, the amount of solubility varying directly with the proportion of free acid. (2) Co-precipitation of alkali or ammonium sulphate and probably coprecipitation of acid sulphates of the alkalies or ammonia with the barium sulphate, the amount of the coprecipitated salts varying directly with the amount of alkali or ammonium chloride in solution. (3) Coprecipitation of barium chloride with the barium sulphate, the amount varying with the rate at which the precipitant is added to the sulphate solution.

The first of these errors is small, unless the amount of free acid present is unusually large, but it is always in the direction of low results. The second source of error also produces low results because a part of the sulphur is precipitated as alkali or ammonium sulphates, and inasmuch as both potassium and sodium have lower atomic weights than barium, the resulting precipitate will weigh less than if it were all barium sulphate. If ammonium is the base, the case is worse, because any ammonium sulphate is volatilized on igniting the precipitate.

The third source of error, occlusion of barium chloride, is always positive; it tends to counteract the first and second errors in two ways—by its own direct weight and by reaction, upon ignition of the precipitate, with the "free acid" of co-precipitated acid sulphates whereby barium sulphate is formed and hydrochloric acid expelled.

In the light of this knowledge, it is not difficult to see that correct results can only be obtained by the nice balancing of plus and minor errors against one another, and that, especially from ammonium-sulphate solutions, the results are apt to be too low. It is, however, quite possible, even in the case of ammonium-sulphate solutions, to obtain results which are practically correct, but this can only be attained by most carefully limiting the amount of ammonium chloride and free acid and regulating the manner of adding the barium chloride in such a way that the occluded precipitant will compensate for the occluded ammonium sulphate, which is lost on ignition or by using a correction factor.

Obviously, this empirical procedure is unsatisfactory. The "correcting error" or the addition factor must be based on careful determinations on mixtures of known compositions, under conditions which must always be exactly followed in every subsequent analysis; any departure from these conditions will tend to vitiate the results.

THE NEW ELECTROLYTIC METHOD

The following method for the determination of sulphur in pyrites depends upon the electrolytic separation of iron and all other heavy metals (except excess lead) from a solution produced by wet oxidation of the pyrites, by means of a mercury cathode, leaving a practically pure solution of the sulphur, as sulphuric acid, to be precipitated as barium sulphate.

The advantages of the method are: (1) In the purity of the solution to be precipitated. It contains no salts of any kind except such small amounts of sulphates of alumina, lime or alkalis as might be derived from the presence of these bases in the pyrites itself. Iron, copper, zinc, lead (to the extent of 10 or 12 mg.) and other heavy metals, are completely eliminated from the solution. (2) This condition is accomplished, not by the addition of chemical reagents which may be more or less impure and the use of which requires judgment and skill on the part of the operator, but simply by the action of the electric current which introduces no impurities or extraneous matters whatever. (3) By the action of the current under the conditions to be described, the solution is brought automatically always to precisely the same conditions. Precipitation of the barium sulphate is, therefore, conducted always under the same conditions and these are invariable and cannot be affected by inattention on the part of the operator. (4) The method is simple and easy, requiring little time. (5) So far as test analyses have been made by working on pyrites, pure sulphuric acid and pure salts, the results are shown to compare closely with theoretical requirements.

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[1] "The Exact Determination of Sulphur in Soluble Sulphates," Journ. Am. Chem. Soc., Vol. 32, p. 588.

When pyrite, FeS_2, is oxidized in the wet way, the sulphur products are ferric sulphate, $Fe_2(SO_4)_3$, and free sulphuric acid, H_2SO_4.

$$2\,FeS_2 + 15\,O + H_2O \qquad Fe_2(SO_4)_3 + H_2SO_4$$

Two molecules of pyrite produce one molecule of ferric sulphate and one molecule of H_2SO_4. Oxidizing agents may be completely expelled by evaporating the solution to dryness. Zinc, copper and lead, when present as sulphides, do not yield free sulphuric acid by oxidation, but only normal sulphates. Nevertheless, the wet oxidation of any commercial pyrites will yield free sulphuric acid proportional to the amount of FeS_2 present. The solution obtained by treating oxidized pyrites with water, after the volatile oxidizing agents have been expelled by evaporation to dryness on a steam bath is, then, a solution of normal metallic sulphates slightly acid with H_2SO_4. From such a solution, all of the heavy metals may be removed by electrolysis using a mercury cathode for the collection of the electro-deposited metals. After electrolysis, the liquid consists practically of pure dilute sulphuric acid.

Details of Manipulation

Treat 0.5 gram or half a factor weight (0.6868 gram) of the dried sample, ground through 80 mesh, but not finer, in a 250-c.c. beaker with 12 c.c. of a mixture of three parts of nitric acid (sp.gr. 1.42) and one part of hydrochloric acid (sp.gr. 1.20), to which four or five drops of bromine have been added. Cover the beaker with a well-fitting watch glass and let it stand at room temperature for half an hour. Transfer the beaker to a steam bath and heat it gently until all apparent action has subsided, then raise the cover and evaporate the liquid to dryness. To insure the complete expulsion of nitric acid, add 5 c.c. of hydrochloric acid to the dry residue, replace the cover and heat until all effervescence ceases, then raise the cover, wash it and the sides of the beaker with a little water and again evaporate to dryness. Further dehydration is unecessary.

Treat the residue with 25 c.c. of hot water and stir until it is disintegrated—complete solution is unnecessary. By means of a wash bottle, transfer the solution and residue to the mercury-cathode electrolytic-precipitation beaker shown in Fig. 1, dilute the solution to about 75 c.c., connect the beaker with a suitable source of current so that the platinum spiral serves as the anode and the mercury as the cathode and pass a current of 0.8 to 1.0 amp. through the solution for five or six hours. If desired, a weaker current may be allowed to act over night. Iron and all other metals pass into the mercury.

After the electrolytic separation is complete, wash down the funnel and the sides of the apparatus with a little water and decant the liquid into a 300-c.c. beaker. No special haste is necessary in this operation, since the electro-deposited metals are protected by the mercury and the acid solution is weak; consequently, there is little tendency for the metals to redissolve. Pour off the liquid as closely as possible (a siphon may be used if desired), wash the beaker and mercury with 25 c.c. of cold water, decant this into the main solution, repeat this operation four times. Pour the mercury into a small beaker from the "off side" of the electrolytic beaker and wash the electrolytic beaker out once with a wash bottle, paying particular attention to the lip.

The solution, of course, contains the insoluble matter from the pyrites. Filter it through an 11-cm. paper into an 800-c.c. beaker and wash the residue and paper four or five times with hot water. Dilute the solution to 450 c.c. (600 c.c. if half a factor weight of sample is taken), heat it to boiling and while boiling continues add 25 c.c. (34 c.c. for half a factor weight) of a 10% solution of barium chloride in a thin stream.

Method of Adding Barium Chloride

The barium-chloride solution is best added by means of the precipitation pipette, shown in Fig. 2. This is made of a large thistle tube, the stem of which is bent twice in such a way as to reach beneath the watch-glass cover of the beaker through the space at the lip, while the body of the pipette is supported on the watch-glass cover by a cardboard or wire frame.

The stem of the precipitation pipette should be drawn out so that 25 c.c. of liquid will be delivered in five minutes. All pipettes should be graduated to the same time delivery.

After precipitation of the $BaSO_4$, set it aside for several hours, until the solution is cold. Pour the clear liquid through an 11 cm. S. & S. No. 590 filter paper, decanting as closely as possible without disturbing the precipitate. Pour 100 c.c. of hot water on the precipitate and agitate the beaker thoroughly so that all of the precipitate is disturbed and comes into contact with the hot water. Let the precipitate settle for about 10 minutes and pour the liquid through the filter, decanting as closely as possible. Pour 100 c.c. more of hot water on the precipitate, agitate it and let it settle as before, decant the liquid through the filter, let the latter run dry, and then by means of a wash bottle, transfer the precipitate to the filter, clean the beaker with a rubber tipped rod and wash the precipitate and filter six times with hot water. Transfer the moist filter to a weighed platinum crucible, dry it over a low flame, burn the filter at a low temperature and ignite the $BaSO_4$ to constant weight.

A Gooch crucible may be used instead of the paper filter, washing by decantation in the same way and then five or six times on the Gooch. Time may be saved in this way if only two or three filtrations are to be made, but half a dozen filtrations and washings may be conducted at the same time if paper filters are used.

Composition of Barium-Sulphate Precipitate

The weighed barium sulphate obtained in this way is not absolutely pure. Invariably it contains a small amount of barium chloride, which repeated experiments have shown, is equivalent to from 0.06% to 0.09% of sulphur, on the basis of half a gram of pyrites.

Several investigators have shown that when pure dilute sulphuric acid is precipitated by barium chloride, some of the precipitant is always occluded by the precipitate. It cannot be removed by any amount of washing. But this occlusion is not necessarily productive of high results. The solubility of barium sulphate in water and dilute hydrochloric acid produces a compensating error, insufficient, it is true, fully to counterbalance the weight of occluded barium chloride, but which, under the conditions given herein, amounts to about 2 mg., equivalent to 0.05% of sulphur on the basis of 0.5 gram of pyrites. This has been determined by evaporating the filtrates and washings from barium sulphate precipitations to dryness in platinum, recovering the barium sulphate by redissolving the residue in water. Subtracting the minus error, due to soluble barium sulphate from the plus error due to occluded barium chloride, leaves a plus error of from 0.01% to 0.04%. The maximum final error represents 1.5 mg. of barium sulphate on the basis of 0.5 gram of pyrites, the minimum only 0.4 mg.

It is not difficult to imagine that these small weights may be accounted for by loss of the precipitate through incomplete removal from the sides and bottom of the large beaker, through slight loss during ignition, due to action of gases produced in burning the filter or through a slight reduction to barium sulphide by the action of the same gases on the precipitate. It is difficult to imagine that some such losses as these would not occur in handling from 1.4 to 1.8 gram of a heavy precipitate in large vessels, however carefully the work might be conducted. Presumably, there is a small minus error due to mechanical loss, which, in addition to the solubility error, practically counterbalances the plus error due to barium chloride. Whether this is the real explanation or not, it has been found in standardizing pure dilute sulphuric acid prepared for the purpose of checking this method, that barium sulphate precipitation gave results agreeing closely with titration by pure sodium carbonate and also with the ammonium sulphate method. In making this comparison, the weights of barium sulphate and ammonium sulphate obtained and the weight of sodium carbonate used, were calculated to the vacuum basis.

Results by the New Method

A few examples of the results obtained by the new method are included in the following tables. In comparing the new method with the modified Lunge method, the greatest care was taken in the latter to limit the amount of free acid and ammonium chloride present in the final solution. This was done by using only 0.3 c.c. of strong HCl in treating the dry residue after evaporating to dryness and by boiling out the excess of ammonia from the filtrate from the iron separation before adding the 0.5 c.c. of HCl required to produce the necessary acidity, but no correction factor was added to the results obtained by the modified Lunge method. In precipitating the BaSO$_4$, the same conditions of dilution and the same method of adding the barium chloride by means of the precipitation pipette were employed in both methods.

In the following experimental analyses, pure dilute sulphuric acid was the source of sulphur. The sulphur tenor per gram of acid was found by weighing as ammonium sulphate, by titration against pure sodium carbonate and by weighing as barium sulphate. The weights of BaSO$_4$, $(NH_4)_2SO_4$ and Na_2CO_3 were calculated to the vacuum basis.

By the ammonium-sulphate method, the sulphur value of one gram of acid was found to be 0.008996 gram; by sodium carbonate titration, 0.008988; by precipitation as BaSO$_4$, 0.008996 gram. The arithmetical average of these, 0.008993 gram, was taken as the standard.

Weighed quantities of the acid, equivalent to about the amount of sulphur which might be found in 0.5 gram of good pyrites ore were used. In each experiment 0.2[illegible] gram of pure metallic iron was dissolved in dilute nitric acid and added to the [illegible] acid, the mixture was evaporated on the steam bath to dryness and the remainder of the operation was conducted exactly as described in the method.

Sulphur taken Gram	Sulphur found Gram	Difference Gram
0 2478	0.2476	—0 0002
0 2527	0.2528	+0 0001
0 2511	0 2514	+0 0003
0 2347	0 2348	+0 0001

In the following experiments, the copper in pure recrystallized copper sulphate was determined electrolytically. This can be done easily with a maximum error of 0.05% of the copper contents equivalent to 0.013% on the basis of the salt. The relation of copper to sulphur was calculated and weighed quantities of the salt were dissolved in water and treated as described in the method.

Sulphur taken Gram	Sulphur found Gram	Difference Gram
0 2548	0 2547	0.0001
0 2544	0.2548	+0.0004
0 2542	0 2542	none
0.2550	0.2542	—0.0008

In the following experiments the new method was compared with the modified Lunge method, as described above, working in pyrites.

ANALYTICAL RESULTS ON PYRITES

Sample No.	Modified Lunge Sulphur %	New Method Sulphur %
1	47 78% 47 75%	47 96 48 02
2	49.91	50.01 (half factor weight)
3	49.64 49.64	49.83 49.87
	49 67 49.66	49.87 49.81

The effect of impurities was tested on ore No. 3. In the first experiment under this head it should be noted that the 5 c.c. of HCl used is practically eliminated on electrolysis.

EFFECTS OF IMPURITIES ON RESULTS

5 c.c HCl added before electrolysis	49 88
10 mg Pb added before dissolving...........	49.83
10 mg Pb and 5 c.c HCl, as above	49 85
10 mg. Pb and 5 c.c HCl	49 83
50 mg. Pb and 5 c.c HCl....................	49.52
50 mg. Pb. no HCl	49 30

Lead to the extent of 10 mg. in 0.5 gram of ore does not interfere with the accuracy of the method, as the lead sulphate is decomposed by electrolysis. If a little HCl is added to the solution before electrolysis, the decomposition of lead sulphate is promoted. As much as 40 mg. of lead does not appear to interfere with accuracy. The HCl is practically eliminated by allowing the current to act over night. More than 40 mg. of lead appears to be deleterious.

It will be seen from the above figures that the new method yields practically theoretical results when working on known quantities of sulphur. In comparison with the modified Lunge method—the determinations of which were made with the greatest possible care, but without the addition of any corrections—the new method is about 0.18% higher. The modified Lunge method without corrections is known to be a little too low.

Another feature of the new method lies in the possibility of determining sulphur volumetrically by titrating alkalimetrically the acid liquid either immediately after electrolysis or the liquid after removing sulphuric acid by precipitation with neutral barium chloride.

A few experiments indicate that either procedure will yield quite accurate results with pure pyrites ores, but the solution obtained by oxidizing the ore and evaporating to the dryness on the steam bath must be repeatedly dissolved in water and re-evaporated to eliminate every trace of HCl before electrolysis. The volumetric modification is, of course, not available in the presence of alumina or lime in the sample. The gravimetric method given above is generally applicable. It is recommended to those who may be interested in the accurate analysis of pyrites.

Mineral Paints in 1911

The production of mineral paints in 1911, is reported as follows, by the U. S. Geological Survey: Ocher, 11,703 tons; umber and sienna, 1005; metallic paint (ground natural oxides of iron, roasted carbonates of iron, blast-furnace flue dust, blue billy, etc.), 25,599 tons; mortar colors (ground blue billy slate, shale, culm, etc.), 7922; ground slate and shale not used as mortar colors, 16,510 tons. Except in the metallic-paint and mortar-color productions, which decreased by 3823 and 2038 tons respectively, these figures are almost the same as in 1910, the aggregate decreases in the other items amounting to 23 tons.

Usually a small amount of shale is distilled in the United States each year, but there was no production reported in 1911. Whiting was produced in only two states, Kentucky and Missouri. California, which usually reports a production, made none during the year. There was a production of 80,611 tons of pigments made from ores, which include sublimed blue lead, sublimed white lead, leaded zinc oxide, and zinc oxide. The franklinite ores of New Jersey are largely used for these pigments by the New Jersey Zinc Co., smithsonite by the Mineral Point Zinc Co., and Galena and blende are also used.

The production of chemically manufactured mineral paints is as follows: Basic-carbonate white lead, 132,612 tons; red lead, including orange mineral, 20,306; litharge, 25,190; lithopone, 16,866; Venetian red, 5773 tons.

A recent addition which has been made to the equipment of the Colorado School of Mines is a new 14-ft. Littrow spectrograph, purchased at a cost of $15,000, through the Vinson Walsh research fund.

Mining and Metallurgical Patents

A Classified List of New Inventions

A copy of the specification of any of these patents issued by the United States Patent Office will be mailed by "The Engineering and Mining Journal" upon the cereipt of 25 cents. British patents are sunnlied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

GOLD AND SILVER

AMALGAMATOR. Frank W. Lewis, McLeod, Mont. (U. S. No. 1,034,259; July 30, 1912.)

AMALGAMATOR. George H. Woodhouse, Seattle, Wash., and Wilfred L. Brown, San Francisco, Cal. (U. S. No. 1,034,051; July 30, 1912.)

DRY SEPARATOR AND AMALGAMATOR. Joseph B. Hartman and Philip O. Cummiskey, St. Louis, Mo.; said Cummiskey assignor to said Hartman. (U. S. No. 1,034,792; Aug. 6, 1912.)

GOLD FROM CLAY—Process for the Extraction of Gold from Clay. Jacobus Jan Willem Hendrik van der Toorn, The Hague, Netherlands. (U. S. No. 1,033,359; July 23, 1912.)

STAMP MILLING—Pneumatic Stamping Plant. Hans Charles Behr, Johannesburg, Transvaal. (U. S. No. 1,034,863; Aug. 6, 1912.)

STAMP SHOES—Method of Making Manganese-Steel Stamp Shoes. Frank A. Haughton, High Bridge, N. J. (U. S. No. 1,033,800; July 30, 1912.)

IRON AND STEEL

ALLOY STEEL—Process of Producing Alloy Steel. Albert E. Greene, Chicago, Ill., assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. (U. S. No. 1,034,786; Aug. 6, 1912.)

BLAST-FURNACE-COOLING DEVICE. Frank C. Roberts, Wynnewood, Penn. (U. S. No. 1,030,792; June 25, 1912.)

CONVERTER. S. B. Trumkin, Minsk, Russia. (U. S. No. 1,025,260; May 7, 1912.)

GAS WASHER. Mark W. Johnson, Jr., Birmingham, Ala. (U. S. No. 1,034,463; Aug. 6, 1912.)

HARDENING—Process of Case-Hardening Steel. Kirk Blake, Laporte, Ind. (U. S. No. 1,034,962; Aug. 6, 1912.)

MANUFACTURE—Process of Manufacturing Steel from Crude Iron. Henry D. Hibbard, Plainfield, N. J. (U. S. No. 1,035,120; Aug. 6, 1912.)

MANUFACTURE—Manufacture of Steel. William R. Walker, New York, N. Y. (U. S. No. 1,035,280, Aug. 13, 1912.)

REGENERATIVE FURNACES—Reversing-Valve for Regenerative Furnaces. Hugo Gille, Dusseldorf, Germany, assignor to Façoneisenwalzwerk L Mannstaedt & Cie., Aktiengesellschaft, Kalk, near Cologne, Germany. (U. S. No. 1,033,577; July 23, 1912.)

SHERARDIZING FURNACE. John Riddell, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,034,930; Aug. 6, 1912.)

SINTERING—Improvements Relating to the Sintering of Fine Ore Material. J. Gayley, New York. (Brit. No.. 23,038 of 1911.)

LEAD, ZINC AND OTHER METALS

ALUMINUM ALLOYS—Improvements in and Relating to Aluminum Alloys. G. J. Coles, Boston, Mass. (Brit. No. 6583 of 1921.)

LEAD—Process for the Manufacture of Arsenate of Lead. Felix Kaufler, Vienna, Austria. (Brit. No. 10,017 of 1912.)

LEAD—Production of Lead Compounds. Louis S. Hughes, Chicago, Ill., assignor to Picher Lead Co., Joplin, Mo. (U. S. No. 1,033,405; July 23, 1912.)

MAGNESIUM—Process of Manufacturing Magnesium Carbonate. Frank S. Young, Newark, N. J. (U. S. No. 1,034,330; July 30, 1912.)

NICKEL-COPPER MATTE—An Improved Method or Process of Treating Nickel-Copper Mattes. A. McKechnie, Birmingham, Eng., and F. G. [illegible], Smethwick, Eng. (Brit. No. 15,850 of 1911).

TIN—A Process for Reducing Stannic Acid. Zdenko Metzl, Rouen, France. (Brit. No. 27,606 of 1911.)

NONMETALLIC MINERALS

PETROLEUM—Oil-Well Apparatus. Carl. W. Davisson, Los Angeles, Cal. (U. S. No. 1,034,698; Aug. 6, 1912.)

PHOSPHATE ROCK—Art of Converting Phosphorites. Henry V. Dunham, Bainbridge, N. Y., assignor to Nacirema Chemical Co. (U. S. No. 1,034,090; July 30, 1912.)

POTASH—Process of Obtaining Potash from Felsdpar. James Millar Neil, Toronto, Ontario, Canada, assignor to Alexander M. Hay, Toronto, Canada. (U. S. No. 1,034,281; July 30, 1912.)

MINING—GENERAL

DREDGING—Improvements in Mounting and Operating Dredge Buckets. P. Mayer, Indianapolis, Ind. (Brit. No. 2233 of 1912.)

DREDGING-MACHINE. Issac Peterson, Oakland, Cal. (U. S. No. 1,034,501; Aug. 6, 1912.)

DRILL for Rock, Coal, and Other Material. Samuel S. Wyer, Columbus, Ohio, assignor, by mesne assignments, to Jeffrey Manufacturing Co. (U. S. No. 1,034,052; July 30, 1912.)

DRILL—Gasoline Rock Drill. Samuel S. Wyer, Columbus, Ohio, assignor by mesne assignments, to Jeffrey Manufacturing Co. (U. S. No. 1,034,053; July 30, 1912.)

DRILLING—A Mechanism for Intermittently Rotating the Drill Bit of Rock-Drilling Engines. J. G. Leyner, Denver, Colo. (Brit. No. 1344 of 1912.)

DRILLING—Improvements in and Relating to Rock-Drilling Engines. J. G. Leyner, Denver, Colo. (Brit. Nos. 1349, 1368 and 1383 of 1912.)

DRILLS—Front Cover for Rock Drills. Benjamin Cock, Camborne, England, assignor to Holman Brothers, Ltd., Camborne, England. (U. S. No. 1,035,083; Aug. 6, 1912.)

EXCAVATING BUCKET. James H. Murphy, St. Louis, Mo. (U. S. No. 1,033,822; July 30, 1912.)

EXCAVATING MACHINERY — Cast-Metal Dipper Front. Walter S. McKee, Glencoe, Ill., and Percival M. Vilas, Minneapolis, Minn., assignors to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,033,818; July 30, 1912.)

EXPLOSIVE—Safety Explosive. Norbert Ceipek, Vienna, Austria-Hungary. (U. S. No. 1,033,537; July 23, 1912.)

GALLERY FRAME FOR MINES. Wilhelm Binder, Altenessen, Germany. (U. S. No. 1,034,065; July 30, 1912.)

HOISTING—Valve Mechanism for Hoisting Engines. Sven T. Nelson, Chicago, Ill., assignor to Sullivan Machinery Co., Chicago, Ill. (U. S. Nos. 1,034,024 and 1,034,025, July 30, 1912.)

HOISTING BUCKETS—Dumping Appliance for Hoister Buckets. Asher Lambert, Newark, N. J. (U. S. No. 1,034,806; Aug. 6, 1912.)

SKIP. Lee Callahan, Los Angeles, Cal. (U. S. No. 1,033,670; July 23, 1912.)

TIMBER PRESERVATION—Process of Preserving Timber by Means of Phenolate Solutions. Friedrich Seidenschnur, Charlottenburg, Germany. (U. S. No. 1,034,652; Aug. 6, 1912.)

ORE DRESSING—GENERAL

BUDDLE—Automatic Discharging Ore Concentrating Revolving Buddle. E. C. Gray and E. S. King, Carn Brea, Eng. (Brit. No 21,415 of 1911.)

CLASSIFIER—Hydraulic Classifier. Lewis L. Beeken, Pittsburgh, Penn. (U. S. No. 1,035,145; Aug. 13, 1912.)

CONCENTRATION—Improvements in Ore Concentrating Tables. J. Rule, Camborne, Cornwall, Eng. (Brit. No. 14,081 of 1911.)

CONCENTRATOR. Ira Ferris Monell, Boulder, Colo. (U. S. No. 1,033,260; July 23, 1912.)

CONCENTRATOR—Endless-Belt Ore Concentrator. Enos A. Wall, Salt Lake City, Utah. (U. S. No. 1,033,219; July 23, 1912.)

CRUSHER—Ore-Pulverizing Machine. Matthew Arnold, San Jose, Cal. (U. S. No. 1,035,136; Aug. 13, 1912.)

CRUSHING—Adjustable Crusher-Head for Rock-Crushers. Edward L. Pemberton, New Haven, Conn., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,035,041; Aug. 6, 1912.)

ORE CRUSHER. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher & Pulverizer Co., St. Louis, Mo. (U. S. No. 1,034,552; Aug. 6, 1912.)

ORE-CRUSHER. Bruce W. Traylor, New York, N. Y., assignor to Traylor Engineering & Manufacturing Co. (U. S. No. 1,035,273; Aug. 13, 1912.)

ORE TREATMENT—Improvements in the Treatment of Ores. Murex Magnetic Co. and A. A. Lockwood, London, Eng. (Brit. No. 13,208 of 1911.)

SCREEN—Screening or Separating Machine. Thomas Leggett Sturtevant, Quincy, and Thomas Joseph Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,035,262, Aug. 13, 1912.)

SCREENING DEVICE. Orrice Ray Smith, Kellogg, Ida.; assignor of one-half to John Francis Carson, Kellogg, Ida.(U. S. No. 1,033,628; July 23, 1912.)

METALLURGY—GENERAL

ALKALI METALS—Manufacture of Alkali Metals. Heinrich Specketer and Wilhelm Hofmann, Griesheim-on-the-Main, Germany, assignors to Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany. (U. S. No. 1,034,320; July 30, 1912.)

CONVERTER for Metal. Alexander Zenzes, Berlin, Germany, assignor to Zenzes Converter Company, Chicago, Ill. (U. S. No. 1,035,295, Aug. 13, 1912.)

ELECTRIC SMELTING—Improvements in or Relating to the Production of Metals from Their Ores. J. Harden and Electric Furnaces and Smelters, Ltd., London, Eng. (Brit. No. 15,824 of 1911.)

ELECTRIC SMELTING FURNACE. Charles A. Weeks, Philadelphia, Penn. (U. S. No. 1,034,747; Aug. 6, 1912.)

EXTRACTION—Improvements in the Extraction of Metals from Their Ores. H. M. Leslie, Glasgow, Scotland. (Brit. No. 28,235 of 1911.)

FURNACES—Improvements in Rotary Drum Furnaces. P. Pfeifer, Berlin, Germany. (Brit. No. 5867 of 1912.)

ORE REDUCTION—Method of Producing Refined Metals and Alloys. Albert E. Greene, Pueblo, Colo., assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. (U. S. Nos. 1,034,784 1,034,785, and 1,034,787; Aug. 6, 1912.)

ORE REDUCTION—Process of Extracting and Refining Metals and Ores. Albert E. Greene, Chicago, Ill., assignor to American Electric Smelting and Engineering Co., St. Louis, Mo. (U. S. No. 1,034,788; Aug. 6, 1912.)

ROASTING—Improvements in or Relating to Mechanical Ore-Roasting Furnaces. John Harris, Sheffield, Eng. (Brit. Nos. 17,847 and 16,583 of 1911.)

ROASTING FURNACE — Mechanical Ore-Roasting Furnace. John Harris, Sheffield, England. (U. S. No. 1,035,186; Aug. 13, 1912.)

SCRAP—Machine for Compressing Sheet-Metal Scraps. John Dunn, Streator, Ill., assignor to Vulcan Detinning Company, New York, N. Y. (U. S. No. 1,033,089; July 23, 1912.)

SMELTING—Method of Operating Metallurgical Furnaces. George Hillard Benjamin, New York, N. Y. (U. S. No. 1,033,777; July 30, 1912.)

SMELTING FURNACE. Wallace H. Dow, Piedmont, Cal. (U. S. No. 1,032,745; July 16, 1912.)

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

H. C. Hoover is in New York.

Oscar Lachmund is in California on mine-examination work.

Frank H. Probert has returned from Europe and proceeded to California.

A. C. Perkins is in the Straits Settlements, installing dredging machinery.

W. E. Corey has returned to New York from a stay of several months in Europe.

Charles Kirchhoff has returned to New York after spending six months in Europe.

H. M. Crosman is now at the Tiro General mine, Charcas, San Luis Potosi, Mexico.

H. H. Johnson, of Johnson & Hoffman, has left London for British Columbia, on professional work.

A. B. Hermann, of Chicago, has been examining gold properties in the Manitou Lake district, Ontario.

George W. Maynard has gone to Arizonza to make an engineering examination in the Harqua-Hala district.

Sydney H. Ball has returned to New York, after having been in the northern Urals for two months on professional work.

William F. Ward, of Denver, has returned from Colombia, South America, where he has been examining placer ground.

A. E. Spriggs, of the Guatemala Mining & Development Co., which has a blanket-mineral concession in Guatemala, is in New York.

C. M. Derby, superintendent of the Natomas Consolidated, recently made a visit to Oregon on professional business for the company.

Minor C. Keith, president of the Abangarez Gold Fields of Costa Rica, arrived in New York, Aug. 22, after an extended visit to Central America.

Prof. Wilhelm Palmaer, of the Royal Institute of Technology, Stockholm, Sweden, is investigating the deposits of apatite in the Ottawa Valley, in Canada.

W. H Storms, state mineralogist of California, has returned from Highgrade, the new mining camp in Modoc County. Mr. Storms will make an official report on this camp

E. Gybbon Spilsbury, of New York, consulting engineer of the Southwestern Steel Corporation, is on a visit of inspection to the company's iron-ore properties in Texas.

Newton Cleaveland, of San Francisco, consulting engineer of the Natomas Consolidated, recently spent a week with his family in mid-August at the company's cottage, at Natoma.

L. D. Davenport has been placed in charge of the engineering department of the Oliver Iron Mining Co., at Mesaba, Minn., where that company is about to open up three new properties.

R. S. Botsford has gone from the Bogolovsk Estate to the Pavda Estate, in Russia. His present address is Kyshtim, Nicolaevo Pavdinsk Estate, Vyia Station, Bogoslovsk, R. T., Province of Perm, Russia.

Eugene Hawkins, acting superintendent of the San Francisco mint, assumed the duties of superintendent, upon the death of Edward Sweeny, Aug. 17. Judge Sweeny's successor has not yet been appointed.

W. Gillette Scott has returned to Bishop, Inyo County, Calif., after a long absence in the interest of good-roads building and the state highway, for which the California Legislature appropriated $18,000,000 in all.

J. M. Hill, of the U. S. Geological Survey, has completed his reconnaisance of Highgrade district in Modoc County, Calif., and left there, Aug. 15, for Reno, Nev., where he was to receive instructions from Washington.

A. L. Dickerman, recently appointed consulting engineer of the Mayflower and Old Colony properties, has taken up his temporary residence at Houghton, Mich., and is making a geological survey of the mines in connection with their further development.

Isaac M. Scott, for some years president of LaBelle Iron Works, Steubenville, Ohio, will resign in the near future to become president and active in the management of the recently organized Wheeling Sheet & Tinplate Co., which will build a tinplate plant near Wheeling.

OBITUARY

Oliver B. Mitchell died at Flushing, N. Y., Aug. 22, aged 48 years. He was born in England and came to this country when a young man, settling in New York. Later he went to Florida, and was for a number of years engaged in phosphate mining.

Walter Balfour Harrub died at Oakland, Calif., Aug. 16, of paralysis. He was 81 years old, and was born in Plympton, Mass., in 1830. He went to California on the ship "Pleiades," sailing from New Bedford, Feb. 19, 1849. He engaged in mining and other pursuits, and since 1874 has made his home in Oakland.

Edward Sweeny, superintendent of the U. S. mint at San Francisco, died of heart trouble at San Francisco, Aug. 17. He was born at Fall River, Mass., in 1853. He went with his parents to California at the age of six years. The family home, then and for many years, was in Redding, Shasta County. Mr. Sweeny was for eight years district attorney of Shasta County, and for 12 years superior judge. He was appointed superintendent of the mint on Sept. 19, 1907. The burial was at Redding.

Charles Camden died at Oakland, Calif., on Aug. 11. He was past 95 years old, and was born in England. He went to Shasta County, Calif., in 1850, and was married in 1852 to Miss Philena Tower, a member of the family which gave the name to the well known Tower House, between Redding and French Gulch. Camden was one of the owners of the Iron Mountain copper mine, which was purchased and operated by the Mountain Copper Co. He was a heavy stockholder in the Spring Valley Water Co., of San Francisco. He remained a subject of England until 1864, when he became a citizen of the United States because of his purpose to vote for Abraham Lincoln.

Societies and Technical Schools

American Chemical Society—Charles L. Parsons, secretary, removes from Durham, N. H., to Washington on Sept. 1; and the main office of the American Chemical Society will be in that city after the date mentioned, with address as Box 505, Washington, D. C. This is in preparation for the International Congress.

Institution of Mining Engineers—The twenty-third annual general meeting will be held in Birmingham, England, on Sept. 11, 1912. The following papers will be read: "Recent Legislation in Regard to Land and Mines," by Alexander Smith. "An Account of a Series of Explosions in the Bellorie Mine, Alberta, Canada," by John T. Stirling and John Cadman. There will be excursions on Sept. 12 and 13 to neighboring points of interest.

American Electrochemical Society—The twenty-second general meeting of this society will be held, Sept. 7, 9 and 10, 1912, in connection with the eighth international congress of applied chemistry, and the American Institute of Mining Engineers. The following papers promise to be of interest to metallurgists: F. A. J. Fitzgerald, Heat Losses in Furnaces; C. H. Von Bauer, Electrolytic Induction and Resistance Furnaces; P. Heroult, Recent Developments of the Electric Steel Furnace; A. E. Greene, Electric Heating and the Removal of Phosphorus from Pig Iron; R. Amberg, the Function of Slag in Electric Steel Refining; F. T. Snyder, Electric Smelting of Zinc Ore; J. O. Handy, Extraction of Copper from Sulphide Ores by Roasting, Leaching and Deposition; L. Addicks, Cathode Impurities in Copper Refining and their Sources; R. C. Wells, Mineral Electrodes; O. P. Watts, Electrolytic Nickel Solutions; Hofman and Waryukoff, Decomposition of Metallic Sulphates at Elevated Temperatures in a Current of Dry Air; N. S. MacCollum, A Novelty in Openhearth Practice; Ralph H. Sweetser, Blowing In Blast Furnaces; W. N. Lacey, Electrolytic Refining of Silver-Bismuth Alloys.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Aug. 21—The decision recently handed down by the Supreme Court of California reversing the Superior Court of Nevada County in the case of the Champion Gold Mining Co., *vs* the Champion Mines Co., giving to the appellant the right to insist upon the purchase of the mines at the contract price of $347,000, is not likely to disturb the present operations of the North Star Mines Co. which is developing the property under a purchase bond. Under the decision of the Supreme Court an injunction might lie against the owner of the mines and the work of development be delayed or terminated. The attorneys for the appellant are reported to have advised their client against such course, as the continued operation of the mines will benefit rather than work a hardship on the ultimate successful litigant, besides being a large benefit in the matter of the employment of men and disbursing of earnings in Nevada City and Grass Valley. Pending the consummation of the negotiations between the parties to the suit the owner of the property demanded that the purchaser pay the second installment of the 1909 taxes, $1600, in addition to the purchase price. This was refused and the owner brought suit to recover possession of the mines. The lower court instructed that a verdict be rendered in favor of the plaintiff, the Champion Mines Co. The defendant appealed to the Supreme Court, which held that the contract for purchase provided for a clear title to the mines, and that as the second installment of 1909 taxes had developed into a lien upon the property the appellee could not give a clear title until the tax installment was paid. In the meantime the owner of the mines entered into a bond with the North Star Mines Co. for the development, and an option of purchase provided the development should warrant the price, which is not definitely known. A large amount of development and new equipment have been undertaken by the North Star; and among mining men who should know there is no doubt of the purpose of the North Star owners to purchase the mines, provided the present litigation does not interfere with the progress of development. In the trial in the Superior Court the Champion Mines Co., plaintiff-owner, was required to present very little evidence, so that the full merit of the case was not divulged at trial. It is reported that this company, now that the question of the tax installment is disposed of by the Supreme Court will, upon retrial of the case in the lower court, adduce substantial evidence in support of the demand for recovery of full possession of the property. The interest of the district lies in the continuous operation of the mines and the ultimate purchase by the North Star, regardless of the outcome of the litigation. The mines are extensive and valuable and require large capital and scientific operation to make them profitable. The North Star is competent to operate the Champion profitably as few other owners could, because of its situation with relation to the North Star mines, and because of the intimate, practical knowledge of the company in this district.

Butte

Aug. 20—Patrick Clark, president of the Bullwhacker Mining Co., who recently arrived here from Spokane, accompanied by an engineer, has announced that extensive development of the property, which has been idle for several years, has been decided upon. In the mine there is a vein of low-grade ore, principally carbonate of copper, with which is associated little or no gold or silver. In the past ore has been mined through a shaft and conveyed by wagon to the smeltery, but it has been decided to change the method of mining to a steam-shovel system, as the ore is found within a few feet of the surface. Many tests have been made on the ore. It has been found to be an excellent leaching ore, and the company has planned to install a 5-ton leaching plant at once, which, if it proves practical, will be replaced by a larger one. Much ore has been blocked out in the property, but owing to the expense of hauling, and the comparatively small percentage of copper, it has not proved profitable.

Salt Lake City

Aug. 22—The prevailing sentiment of Utah mine owners and operators in regard to forming an independent organization for the protection and encouragement of the mining industry in this region, or of coöperating with the American Mining Congress to this end, is in favor of an independent organization. This is shown by answers received to cards and letters sent to mining men by a special committee, asking their opinion. It is reported that Bingham mine owners and operators have already pledged financial aid and moral support to such an organization.

Replies have been received from Utah's representatives in Congress, concerning the resolution adopted by the Utah mine owners and operators at the meeting of Aug. 2, protesting against the decision of the Department of the Interior in regard to the East Tintic application for patent. Senators Smooth and Sutherland and Representative Howell state they will take the matter up with the Secretary of the Interior, and urge a reconsideration of the case with a view of obtaining a more liberal construction of the mining laws.

The new legislative appropriation bill, making no provision for the United States assay office at Salt Lake City, Utah; Boise, Idaho; Helena, Mont.; Deadwood, S. D.; Charlotte, N. C.; and the Carson City mint passed the House Aug. 17, but was amended by the Senate, Aug. 19, so as to provide for the continuance of the assay offices at Salt Lake City, Boise and other Western cities. The appropriation for the Salt Lake office amounts to $15,400. The action of the House was based on the recommendation of the Secretary of the Treasury, advocating the abolishment of government assay offices, as unprofitable investments. The amendment by the Senate was based on the grounds that the offices were not founded as investments, but as conveniences to miners and others. The Senate committee on appropriations has restored the appropriations to the bill, and the Senate has voted to retain them. Final action has not been taken.

A number of improvements and additions are being made at the Arthur mill of the Utah Copper Co., at Garfield. The twelfth section of the remodeled mill was put into commission about the middle of July. The thirteenth unit is about half finished. The re-treatment plant for washing concentrates has been overhauled, and was started Aug. 9. The new concrete concentrate bins are nearly finished, and a pendulum sampler (two-story tower) to sample the tails has been built and is practically ready for operation. There is a new tail race from this to convey the tailings several hundred feet out to the dam. More water has been necessary with the starting of the additional units in the last few months and has been provided for by a new pipe line from the Magna pumping plant. This has been in operation a short time. Arrangements have also been made to pump water back to the mill, so that it can be re-used.

The double track of the Bingham & Garfield R.R. between the Magna and the Arthur mills has been completed. This will greatly facilitate the handling of the ore, etc. A new ball park has been built at Garfield for the employees of the Utah Copper mills and the Garfield smeltery.

Suit was filed Aug. 3, 1912, in the United States district court by the Silver King Coalition Mines Co. against the Keystone Mining Co., in which the plaintiff seeks to quiet title to rights in the Red Fox, U. J. Wenner and Bruser patented lode claims at Park City, to which the defendant is stated to claim title. The suit is brought on the basis of apex.

Negaunee, Mich.

Aug. 24—The Cascade Range is to have a new mine just southeast of the village of Palmer, where the Longyear company has been drilling for several years. The corporation is known as the Cascade Mining Co., and is controlled by Minneapolis men, including the Longyear interests. O. B. Warren, of Hibbing, Minn., will be general manager; Capt. Thomas Nicholls, formerly with Pickands, Mather & Co., on the Mesabi range, will be mine superintendent; H. J. Wessinger, of Duluth, who until recently was chief mechanical engineer of the Oliver Iron Mining Co., will have charge of the installation of machinery. A four-compartment shaft will be sunk 750 ft. and lined with steel sets. A steel headframe will be erected, also modern mine buildings and 25 dwelling houses. The ore to be produced will be soft hematite of good grade. The owner of the fee is the Pittsburgh & Lake Superior Iron Co., of which Clark Kirkpatrick, of Escanaba, is president and which owns a large acreage on the Cascade range. A 5-drill, Ingersoll-Rand air compressor has been purchased for sinking purposes; the sinking of the shaft will probably take more than a year.

On the eastern end of the Cascade range, the Heidelbach interests of New York, who own 360 acres, have been diamond-drilling for nearly a year. Considerable interest has been manifested in the work as mining men of the district have long held a theory that the Cascade range continues across the eastern boundary of the Heidelbach land and connects with the Swanzy range.

Houghton, Mich.

Aug. 23—Mention has been made in the JOURNAL of the scarcity of labor in the copper country. Conditions have not been exaggerated and are particularly pertinent as regards trammers. Good men for underground work are at a premium, but trammers are especially noticeable by their absence. The Isle Royale company is said to be contemplating the importation of 200 laborers from New England for tramming purposes. The Victoria mine, at the south end of the range, in Ontonagon County, is reported to be erecting 12 houses as an inducement to retain good, sober, married men as trammers. One must go back many years to find a parallel to this situation in this district.

Kingman, Ariz.

Aug. 23—A heavy storm which assumed the proportions of a cloudburst in the Hualapai Mountains did considerable damage to some of the roads leading from Kingman to the surrounding camps, and for a few days transportation was seriously impeded. The Lovin & Withers company, which has a number of outfits freighting to Gold Road and Oatman lost two heavy wagons; the men and teams barely reaching a place of safety in time to escape the flood.

M. W. Musgrove has recently returned from New York. His Eastern trip was for the purpose of interesting certain men in a project for damming the Colorado River near the place where it emerges from the Grand Cañon. He was authorized to procure the necessary engineer's report and last week accompanied Frank Culbertson to Grass Springs and Pierce's Ferry, to assist in making an examination. If the plan is carried out it will provide power for the mines of Mohave County at a lower cost of production than is at present possible.

Phoenix, Ariz.

Aug. 23—The bill generally known as the miners' lien law has been referred by petition to the people for a vote at the next general election. It was passed by the first state legislature, which was composed almost entirely of inexperienced men. The lien law passed the lower house unanimously, this house being dominated by the labor men, and the few who were not under this influence, were ignorant of the needs of the mining industry. When the bill reached the upper house, an attempt was made by the far-seeing members to amend the bill, so as to protect the prospector and the owner of the small mine, especially the small rich mine, that is peculiarly fitted for leasing. The principal objections to the law, which states that any miner working on a mining claim, and not receiving his pay, shall have a lien on the claim for the amount of his unpaid wages, are that it is unfair to the owner of a leased claim, and really does not protect the laborer, and will work to the disadvantage of all honest men whether miners or prospectors. In a long list of payrolls defaulted in Arizona in the last ten years, only one or two cases would have come under the provisions of such a bill so as to protect the miners; in most cases because the property was already subject to the lien of taxes or a prior mortgage, which must always remain a first lien against miners and all other subsequent incumbrances. Such a law will tend to make owners wary of leasing or bonding their claims, because there is a certain amount of danger. If a bond to pay the miners is exacted from the lessee, there is always trouble to get a satisfactory bond, where the parties have no mutual acquaintances, and the lessor will be apt to scrutinize the bond too closely. The lessee, on the other hand, after an experience or two, is sure to become discouraged, and drop out of the leasing class. And all this where there is scrupulous honesty on both sides. One of the most frequent results will probably be, that a lessee or bondee will be tempted to continue a losing venture beyond his means, because he knows that, whatever happens, his men will be paid; and men, thinking their wages safe by reason of the lien, will work along after default, and it is well known that labor under such conditions, is worthless. Another disagreeable feature is the grave doubt of the constitutionality of the law; a similar law in Wyoming has been set aside by the courts. However this may be, it is to hoped that the people will vote the law down, at least, until it has been amended to cure its obvious defects, and if such a law must be passed to curb dishonesty, that it be made to apply to all kinds of business and all kinds of debts; in other words, make it universal and fair—a square deal for all.

Toronto

Aug. 23—Samuel Price, mining commissioner for the province, has been instructed to make an investigation of the condition of underground labor in the mines of Ontario. His appointment grew out of an attempt to pass, during the last session of the provincial legislature, a bill for an eight-hour day for underground mines. The mine owners contended that mining in Ontario was in an undeveloped state and that while the bill might be proper and applicable to deep mines, that condition as a whole throughout the province rendered it impracticable. It was also contended that on account of the unskilled labor employed to a large degree, the time was not opportune for its enactment. Mine owners in the eastern part of the province particularly objected to the passage of the bill. They stated that there is no demand for it among the men. In view of these contentions the government felt that great care should be exercised before passing legislation of this kind, and that all possible information as to its effect should be obtained. Mr. Price will hold meetings in the different mining centers, and will give everyone an opportunity to present his side of the case. The effect of the eight-hour law where in force will be studied, and a report will be presented at the next session of the legislature.

The Mining News

The Current History of Mining

Arizona

GILA COUNTY

Southwestern Miami—Churn-drill hole o. 8 on this company's claims, which e to the southwest of, and adjoin the ive Oak mine, is 860-ft. deep in chalcoite-bearing schist. Chalcocite first apeared at a depth of 720 ft. in small uantities and is now reported to be in ommercial quantity. Hole No. 7 is 805 t. deep in mineralized schist, the sludge rom drilling being heavily iron-stained. Iole No. 6 is 825 ft. deep in schist.

South Live Oak—Churn-drill hole No. is 125 ft. deep in silicified schist carryng copper as silicate and oxide. The ole is on a hill near Needle Mountain, the northern end of the property, nearly mile from the first two holes. Water or drilling is pumped 7000 ft. through vertical distance of 700 feet.

Old Dominion—For protection against ne probable results of the recently nacted miner's lien law, this company as posted a notice requiring all lessees give a bond of $5000, which will work hardship in many cases.

Inspiration Consolidated—The contruction of the spur from the Arizona astern R.R. to this mine has been tarted with a force of 50 men, which is eing increased as rapidly as possible.

Miami—The two chilean mills in the rst unit of the concentrator are being eplaced with three 8-ft. Hardinge pebble nills. The fourth and sixth units are already equipped with the latter type of ne-grinding machinery and Hardinge nills will eventually replace chileans in ll six units.

SANTA CRUZ COUNTY

Sonora—This mine, owned by the Propsalte brothers, of Nogales, is being orked. Good silver ore is being taken ut, and packed on burros to the railroad t Nogales.

Red Cone—This mine was formerly nown as the Four Metals; the upper unnel is 425 ft. long, and has penetrated opper ore. The lower, which is to be the ain working tunnel, will cut the ore bout 200 ft. lower; the face is now 850 . from the portal. It is thought that by riving a few feet more it will cut the de.

Crescent—The tunnel on this property now a little more than 600 ft. long.

Duquesne—Shipments are being made the rate of six tons per day, and as soon as teams can be found, will be increased. The work is being done by Judge Trickey.

French—This old-timer has been bought by William A. Clark, who intends to sink a 500-ft. shaft, but work has not yet commenced. The mine has been a profitable producer.

Cunningham—The first payment has been made on this property.

Morning Glory—This property, owned by Christopher Wilson, of Patagonia, is shipping low-grade copper ore which is desired by the smelter on account of its iron. At present the ore is going to the Pioneer smeltery, at Tucson.

Wieland—This camp is shipping copper-silver ore to El Paso.

Augustus—This mine, generally known as the Pinal, has been sold by Yarick & McDonald to the Arizona-Pacific Copper Co., of which Col. O. P. Posey is president. T. J. Cunningham and H. E. Stevens are at present on the property preparing a report for the English contingent represented in the purchase.

Gray—This group, lying next to the R.R.R., has been leased to Hogan & McKutcheon, and work has begun.

R.R.R.—This mine, recently sold to N. L. Amster and associates, has shipped about 60 cars of ore since the purchase. It is proposed to increase these shipments as rapidly as possible.

California

CALAVERAS COUNTY

Jones—The 40-stamp mill and other buildings were burned Aug. 10. The fire originated in dry grass south of the mine. The mine and the mill had been idle for about five years. The fire spread to the Whittle mine, damaging timbering in the shaft and destroying the headframe. The buildings at the Meeker, Tulloch and Santa Anna were saved.

Missouri—This group of mines, including the Dolly Varden, Jack Peterson and Eltringham, an area of about 35 acres, has been sold to R. W. Stuck, of San Francisco.

ELDORADO COUNTY

Big Buzzard—There is a 5-stamp mill at this mine, on Negro Hill, owned by Darrington brothers, F. N. Major and Joe Foster.

HUMBOLDT COUNTY

Horse Mountain Copper Co.—Adjoining claims have been taken over by the company, the sellers taking stock as part payment.

Gem—This placer mine has ample water. Development work has been in progress since spring.

KERN COUNTY

A deposit of magnesite has been located at Bissel, about 11 miles east of Mojave station, on the Santa Fé, by B. M. Denison, of Tehachapi.

Antelope Valley Gold Mining Co.—A 100-ton Beer roller quartz-mill is being installed to work the old tailings dump.

Consolidated Mines Co.—The shaft is down 250 ft. and drifts are being driven at this and the 200-ft. level. An electric pump may be installed to remove the water from the Kenyon Wedge shaft adjoining, which is 550 ft. deep. The Galveston and Twin Brothers claims, which are part of the company's holdings, will be worked by lease by Ashford brothers. N. M. Kirkpatrick, of Los Angeles, superintendent.

Placer Gold Mining Co.—The new concentrator is in operation at this property, in the Stringer district. J. R. Metcalf, of Los Angeles, secretary.

NEVADA COUNTY

Gillespie—A 6-drill electric compressor is being installed at this mine, on the Champion contact. The shaft is 200 ft. deep and will be deepened 150 ft. Dan Mc. Gonigal, superintendent.

Union Hill—Tungsten ore of good quality is reported from this property, but has not yet been thoroughly developed.

Delhi—The first mile of the new 5¼-mile flume, to furnish power for operating the mine, is being completed, and it is expected that water will be flowing the entire length before snow falls. A dam has been built in the middle Yuba River, about seven miles above North Columbia. About 1400 hp. will be developed. Hamilton Eddy, of Nevada City, superintendent.

PLUMAS COUNTY

Crescent Hill—A 20-hp. gasoline engine and concentrator and other necessary machinery will be installed immediately. There is now a 20-hp. gasoline engine in use at the mine. W. E. Oddie, superintendent.

Moonlight—Will Boyden and A. D. McMillan have developed some good copper prospects here.

Colorado

CLEAR CREEK COUNTY

Silver Plume Mining & Tunnel Co.—At the annual meeting of the stockholders, Aug. 13, the old officers were reëlected. The company is driving a crosscut tunnel and drifting therefrom on two veins. A narrow vein of rich ore was recently opened in one of the drifts. W. H. Stephens, manager.

Gem—The double-drum hoist is now being installed at the new shaft house.

Mattie—During July the main shaft was sunk 20 ft. This work is the beginning of a policy of systematic development outlined by men now in control of the reorganized Little Mattie M. M. & P. Co. It is the intention to sink the shaft and drive levels to prospect the ground immediately below some of the old orebodies in order to determine their extension.

Capital—The mill is being remodeled and improved. A railway spur is under construction to connect with the Colorado & Southern tracks. This work will be completed in about 30 days. Regular shipments of milling ore are being made to local concentrating mills.

LAKE COUNTY LEADVILLE

An important strike is reported on the Columbine, situated on Sheep Mountain near Robinson in the Ten Mile district. A fairly wide vein of silver-lead ore is said to have been opened which gives high assays, and eight cars have been shipped to the smeltery. The strike was made on the Eureka claim in a drift from the shaft which is 220 ft. deep. John Irwin, resident manager.

Mt. Champion Mining Co.—Manager Smith states that the mill will be running in two weeks.

Louisville — Hanifen & Reynolds, lessees, are shipping 75 tons of zinc-sulphide ore per day. This comes from a level 400 ft. below the level of the Yak tunnel.

Dinero Tunnel—This property, on Sugar Loaf Mountain, is producing 250 tons monthly of good-grade ore.

SAN JUAN DISTRICT

Wild Boy—This property in Gold King basin is being developed under the management of W. M. Harrington. Some of the old workings have been cleaned out and retimbered, and are being advanced. A new level has been started above the present workings. The foundation for the new mill is completed, part of the machinery is on the ground and the plant will probably be in operation early in the autumn.

Little Dorrit—This group of properties in Bridal Veil basin is being reopened under the management of W. Z. Kinney, formerly of the Gold King mines at Gladstone, San Juan County. Men are now cleaning out old workings and placing the property in condition for further development. An air-compressor and drilling equipment will be installed. The main tunnel, which is now 1200 ft. long will be extended to cut the Lewis vein. The Lewis property adjoins the Little Dorrit on the north.

Morning Star—The Sunshine tunnel is being advanced to intersect the Magpie vein. Pipe lines have been extended and the water power is now sufficient for the operation of the air-compressor plant.

TELLER COUNTY—CRIPPLE CREEK

Isabella—A rich strike has been made by lessees at the 768-ft. level.

United Gold Mines Co.—The output of the various properties owned and leased by this company for the month ended July 31, was 32 carloads of ore.

Moffat Estate—The various Cripple Creek properties owned by this estate are under the management of Philip Argall & Sons who are now leasing them. Clark and Godfrey have a lease on the Roxana main shaft and T. Hendry and A. McClurg also have leases on blocks 3, 4 and 5. A. L. Watson, of Cripple Creek, and Andrew Elliott, of Victor, have leases on the Venture mine. The Victor mine is operated by the Western Investment Co. and its sublessees.

Stratton's Independence—The output is now about 400 tons per day of low-grade ore with 40 sets of lessees and 23 men on company account.

C. K. & N.—The output from the Rapp vein by M. I. Rapp & Co., lessee, is 25 cars per month.

Jerry Johnson—This mine on Ironclad Hill, under lease to Frand Caley, is shipping about 40 tons per day.

Acacia—The output from the South Burns shaft by the Burns Mining Co., lessee, is 10 carloads per month of medium-grade ore.

Last Dollar—Last month a new cable was installed which will permit the hoisting of ore from the twelfth level. A. May, of Colorado Springs, is the lessee with seven sets of sublessees. The output will now be about 15 cars per month. Frank Saunders, is superintendent.

Idaho

COEUR D'ALENE DISTRICT

Marsh—This mine is shipping 100 tons of ore per day to the leased mill on Nine Mile Creek, the output having recently been increased from 60 tons. A new 12-drill Ingersoll-Rand compressor and a 150-hp. motor are to be installed immediately. The old plant, consisting of a 10-drill compressor and a 100-hp. motor was not sufficient for development and regular mining work. As soon as the new plant is installed drifting will be continued on both the east and west ends of the 450-ft. level, which is the lowest i the mine.

Ajax—The lower tunnel has crossc the vein, and some good milling ore wa found. It will take much drifting, how ever, to reach a place under the be surface showing. The entire vein has n yet been cut. As soon as this has bee done, drifts will be driven both east an west.

Snowshoe—This company is still drif ing east on its orebody. A crosscut ha been run to the foot wall, showing body of good-grade sulphide ore. Th drift will be continued along the hangin wall and crosscuts will be run to the fo wall from time to time. All ore so fa developed is of excellent milling grad

Chicago—A report from Paragon stat that good concentrating ore has bee struck on the lower level at this propert

Terrible Edith—Two cars of ore, one zinc and one of lead ore, were shipp recently from this mine. All the ore hand picked, as the company has no co centrator. Both stoping and developme work is being carried on, and owing to t lack of milling facilities a large amou of good concentrating ore is accumula ing on the dump.

Michigan

COPPER

Oneco—Sinking has been temporari suspended at a depth of about 1200 and activities are centered in drifting the 11 and 12 levels. Some bunches good stamping ore have been exposed close proximity to the shaft. Results the extension of the drifts will be watch with interest as the drilling work carri on about two years ago resulted in t cutting of some rich cores.

Norwich—Operations are to be r sumed at this property which adjoins t Victoria, in Ontonagon County. Th property was worked several years a without revealing any ore of commerci grade, although much mass and hea copper was taken out.

New Arcadian—A compressor has bee started at this property and the stea drills will be superseded by air drill The shaft is down about 75 ft. and is b ing sunk on an amygdaloid formati which outcrops at the place where sin ing has been started and which lies b tween two other formations from whi well mineralized cores were extract during drilling operations.

St. Louis—This subsidiary company the Calumet & Hecla is doing develo ment work. Drifting is being done at t second and third levels. The shaft down below the fourth level and drifti is to be started from that level at onc

Calumet & Hecla—This company clearing a site for buildings at its smel ing location on the shores of Torch Lak at Hubbell, for the erection of an ele trolytic refinery. This plant will be about 250x150 ft. and in it the lower grades of mineral will be treated for silver. That product is now being treated at the company's Buffalo plant. This plant will be put in commission in 1913.

Iron

Maas—At this mine of the Cleveland-Cliffs Iron Co. underground operations which were suspended in December, 1910, have been resumed, and more men are being employed. Before the shutdown about 275 men were employed and the present force of 100 men will be gradually increased to this number as conditions warrant, two 8-hour shifts are now being worked. The mine was closed to permit the Foundation Co. to replace the wooden shaft with one of concrete, as that part of the shaft through the thick surface soil was badly out of line and so much water was coming in that it was feared that Teal Lake, near-by, was draining into the mine. Since the concreting was finished a year ago, the amount of water in the mine has been considerably reduced, but the underground operations were not resumed until recently, because of lack of demand for the ore. The mine is worked by the caving system and the shaft is 1100 ft. deep. S. R. Elliott, superintendent.

Richmond—At this open-pit mine on the Cascade Range two shifts are now being worked in place of one as formerly. By the end of the year, this mine will have shipped nearly 1,000,000 tons, practically all since 1899. The property consists of one 40-acre tract, the fee of which is owned by the Oliver Iron Mining Co., in common with other land comprising the middle portion of the Cascade Range. The lease of the M. A. Hanna company which operates the mine will run about five years longer.

Peninsula Power Co.—This Menominee Range power company has completed a concrete dam 600 ft. long and 42 ft. high on the Menominee River. The power house is nearly completed. A transmission line on four-post metal towers 40 ft. high, is being constructed to conduct current 30 miles to Iron River, where it will be sold to mining companies. It is expected that the water-power plant will be in operation by Oct. 1. The stockholders are Michigan and Wisconsin men.

Minnesota

Cuyuna Range

Virginia Mining Co.—In drifting from shaft No. 2 of the Barrows mine, a rich orebody was cut 30 ft. sooner than expected. Shaft No. 1 is down 80 ft. The pump is being taken out of shaft No. 2; what little water is in the shaft can easily be siphoned out. It is now thought that shipments from the Barrows mine will be made in September, and it will be the first shipper on the South section of the Cuyuna Range.

Mesabi Range

Three shovels are loading ore at the Genoa pit, and the No. 2 stockpile at the Gilbert mine is being shipped. It is said that the stockpile at the Pettit mine has been sold, and also a large portion of the Schley stockpile.

The Winston-Deere contractors, stripping on the Great Northern property, recently applied to the local lighting company to furnish sufficient light to permit operation by day and night crews.

There was a decrease in the ore movement from the Mesabi Range recently, owing to the congestion in delivery of ore cars at the mines and in dispatching at the docks at Duluth.

Carlson—This company is redrilling some ground in the Buhl district for the Arthur Mining Co., and is also doing some development work on its own properties on the Cuyuna Range.

Crosby Exploration Co.—The company has begun exploring for iron ore on the Keating property within the city limits of Crosby. The property is to the south of the Thompson mine.

Missouri

Joplin District

Wingfield—Many improvements are being made at this mine, north of the residence district of Webb City. Mule haulage is being installed and additional air lines are being laid.

Symmes Mill—This old mill at West Joplin has been taken over by Frank H. Danglade and associates. The mill now treats 200 tons per day and is to be remodeled to treat 350 tons; 70 acres of land have been leased and it is proposed to build two more mills as soon as the ground is developed.

General Lead & Zinc Co.—This company is building a mill at Gordon Hollow to treat ore from the old Sunshine Mine which is being reopened by prospectors.

Granby Mining & Smelting Co.—Nine churn drills are being operated, five in the Granby camp, two in an isolated region between Granby and Duenweg, two on leases already being mined, one at Oronogo and one at Chitwood.

Tanyard Hollow—A new concentrating plant of 150 tons capacity is being built on a lease of 26 acres. It is expected to be ready for operation in two or three weeks. A 650-ft. tramway is being constructed to connect the mill with a shaft in Gordon Hollow. The land has been drilled and ore found at a depth of 60 to 80 ft., one shaft being in ore at the mill and two others nearby.

Temagami—The sheet ground of this old mine in West Joplin, is to be worked after several months' idleness. The pumps have been started and the ground almost drained. Development will be conducted from a depth of 200 ft. Former operators have worked the upper ground where bodies of soft ore were encountered.

K. & W. Mining Co.—This company has completed the draining of the Mandarin workings on a 40-acre lease of the Riseling estate. Some ground breaking has already been done in some of the drifts, good-looking ore being revealed.

Montana

Butte District

Tuolumne—This company has successfully negotiated with the Anaconda for treatment of its second-class ore at the Washoe smeltery, and is now shipping about 50 tons of first-class, and 250 tons of second-class ore daily. Second-class ore has never been shipped before while first-class ore has been shipped as fast as mined. Second-class ore, therefore, accumulated. Shaft sinking has been resumed and will be continued from the 1800-ft. to the 2000-ft. level.

Raven—The sinking of the shaft from the 1500-ft. to the 1700-ft. level has been completed, and a station is being cut on the bottom level. The company is planning to crosscut to the vein. If work on this level does not prove the existence of commercial bodies of ore, the prevailing opinion is that it will mean the final closing of the property. Mining, principally by lessees, is being done in a small way in the upper levels, and occasional shipments of ore are made.

Deer Lodge County

Butte & Georgetown M. & M. Co.—This company, owning placer ground in the Georgetown district, is carrying on extensive development work. A portion of the ground is being hydraulicked, and the first cleanup of the sluice boxes was recently made with satisfactory results. On the banks of Georgetown creek, which crosses the property, a shaft is being sunk to bedrock, to explore the old channels of the stream, of which three have been discovered, separated by hardpans of clay. When bedrock is reached drifts will be run to explore the width of the channel. Plans are being laid for the construction of a dredge this autumn. The work now being done is to demonstrate the feasibility of buying a modern dredge.

Georgetown Gold Mining Co.—At this mine 400 ft. of tunnel has been completed by Benson & Gabrielson, who have the work under contract, and it is probable that an immediate continuation will be ordered at a meeting of the directors to take place shortly. Charles Bostron, part owner and manager of the Ore Fino mine, is in charge of operations.

Baltic Combination—Work is progressing steadily at this mine in the Georgetown district. A Webb gas engine for hoisting has been purchased and will be installed at once.

Butte & Anaconda Consolidated Mining Co.—This company is operating a property on the edge of Georgetown townsite. Buildings are being erected, and supplies brought in for continuous development work. John Stanhall, of Anaconda, is managing operations.

Hidden Lake—The investigation of the property which was started some time ago by men holding an option, is still being carried on. The main vein has been traced by shallow cuts and shafts for 2000 ft., and gold discovered in most of the workings.

FERGUS COUNTY

Barnes-King—This company is preparing to open the Santiago mine in the Kendall district. This was a producing mine several years ago. The Barnes-King mill will be used to treat the ore.

War Eagle—Operations have been resumed at this mine at Maiden, and two carloads of ore have been shipped, one to Salt Lake City, the other to Kansas City.

JEFFERSON COUNTY

Boston & Corbin—Regular shipments of ore have have been made during the last two months from the property of this company in the Corbin district, and nearly all the expenses of the extensive development work being done there are being met from the proceeds. Although actual work has not yet been started on the new concentrator, the plans have been approved by the directors, and contracts are to be let shortly.

Sunlight—Preparations are being made to open this old mine near Whitehall, an inspection of the property having just been made. Plans call for the installation of new and improved machinery in the concentrator.

Nevada

CLARK COUNTY

Yellow Pine—The new concentrating machinery for the addition to the mill is now on the ground, and will be installed during the coming month. The electrification of the two pumping plants supplying the mill is now almost completed, and the change in power will be made about the first of the month. Orders have been placed for five additional 10-ton cars for service on the company's narrow-gage railroad.

Alice—A. J. Robbins, manager of this property, which adjoins the Yellow Pine on the south, states that lead-zinc carbonates have been found in the shaft at a depth of 350 ft. The ore also contains copper and silver. A carload has been shipped as a trial lot.

Bullion—Tursick & Munzeberg, lessees of this property, have two cars of high-grade lead-carbonate ore ready for shipment. Messrs. Yount and Fayle, of Goodsprings, have a bond on the property.

Ninety-nine—Shipments of copper ore from this property will be resumed at once. It is also rumored that the company will erect a sampling mill at Jean, which will handle custom ores, as well as its own product. J. B. Jenson, manager.

Clark County Lead & Zinc Co.—This company was recently organized and incorporated in Los Angeles, to effect a consolidation of several properties in the western portion of the district, with a view to erecting a concentrating mill to treat the lead and zinc ores from the various properties. A fair tonnage is blocked out in the mines.

COMSTOCK LODE

Union Consolidated—A change in the management was made recently at a special meeting of the directors. B. F. Shaw retired as president and director, and J. H. Goldman, of San Francisco, was named in his place on the board. John Landers was elected president and Whitman Symmes, mine manager, in place of C. E. Julihn. Mr. Symmes was also elected superintendent of the Union shaft. The company plans extensive exploration below the 2500-ft. level, and a new compressor to double present equipment, has been ordered jointly by the Union Consolidated, Mexican and Sierra Nevada companies.

Ward Shaft—The United Comstock Pumping Association, operating this shaft, has decided to discontinue deep pumping at this place for the present and devote its energies largely to the North End mines, through the C. & C. shaft. The Ward shaft will not be abandoned, and water will be held at the present level, just below the 2100 station, where there are three Scranton pumps. Further efforts to unwater the shafts to the 2475 level have been discontinued.

C. & C. Shaft—The new vertical centrifugal pump was lowered this week to the 2500-ft. level of the shaft, and is now being tested. Within a week, it is expected that this pump will be put into commission, raising the water from the sump to the 2310 station pump.

Consolidated Virginia—Plans are being considered relative to exploring the ground north and south from the shaft on the 2300-ft. level, which will be possible soon after the new pumps are doing regular service at the C. & C. shaft. A station is also to be cut out at the 2400-ft. level, and the territory adjacent thereto prospected for the first time.

Ophir—A shipment of 45 tons of concentrates was made last week to the Selby smeltery, it being the clean-up from a run of 1500 tons of second-class ore at the Kinkead mill. The shipment was valued at $35,000. The southwest drift on the 2500-ft. level has cut the vein again, porphyry and quartz of low assay being found in the face.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Aug. 15, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,500	110,369
Tonopah Belmont	3,225	72,166
Montana-Tonopah	1,029	33,892
Tonopah Extension	1,060	32,513
West End	825	23,814
Midway		380
MacNamara	462	11,397
North Star		130
Mizpah Extension		40
Jim Butler	100	100
Totals	10,201	284,801
Estimated value	$255,025	..

WHITE PINE COUNTY

Giroux—Present production is about 900 tons per day, all of which comes from the underground workings of the Morris and Bunker Hill shafts. The new bins at the Morris will have a capacity of 1600 tons of ore.

New Mexico

A rumor has gained credit in Albuquerque, that Phelps, Dodge & Co. is negotiating with the Santa Fé R.R. for that part of the road extending from Rincon to Silver City, with a branch from Whitewater to Santa Rita and Fierro. That line does not contribute much to the Santa Fé system, but would be valuable to the Phelps-Dodge company and to its railroad system, because of its large holding of valuable mining property at Fierro and in the Burro Mountains, at Tyrone and Leopold. Phelps, Dodge & Co. state that there is absolutely no ground for the rumor.

GRANT COUNTY

Savanna Copper Co.—The Pacific No. 2 mine of this company, in the old gold-mining camp of Pinos Altos, is being operated under lease to Frank C. Bell and A. L. Wright. A new shaft is being sunk to a depth of 100 ft., in virgin ground. The old tunnel has been cleared out, and the work of stoping is now in progress. A winze is being sunk to connect with the tunnel for ventilation. Pay ore in commercial quantities is being taken from the shaft, winze and tunnel, and shipments are being made at the rate of one car per week to the El Paso smeltery.

Mangas Development Co.—It is understood that arrangements are practically completed for the resumption of work by this company in the Burro Mountains.

SOCORRO COUNTY

Tri-Bullion Smelting & Development Co.—High-grade copper ore, containing gold and siver, has been found on the 300-ft. level of the Nit mine. The find was made 500 ft. east of the shaft and is of interest because it is the first large vein of commercial copper ore that has been found in the vicinity of Kelly.

Utah

JUAB COUNTY

Tintic shipments for the week ended Aug. 16 amounted to 205 cars.

Eagle & Blue Bell—Raising is now being done from the 1350-ft. level to connect with the upper ores, and when this is completed will facilitate the handling of both ore and waste through this outlet. A contract for an ore house large enough to hold 300 tons has been given to Alexander McDonald and work will be started at once.

Uncle Sam—The special stockholders' meeting called for Aug. 7 was postponed until Aug. 21, owing to lack of a quorum. It is proposed to increase the stock from 500,000 shares to 750,000, to be applied to the acquisition of the Richmond-Anaconda property.

Grand Central—A dividend of 5c. per share, amounting to $30,000, has been declared, payable Aug. 25. The last dividend was paid in December, 1911, and brought the total to $1.410,000 paid up to that time. Ore has been found on the 2300 level. This carries gold and silver, but no copper, and as far as opened is not of shipping grade. Drifting is in progress on this level to get under orebodies opened on the level above. The 2300 is one of the deepest levels in the district.

Utah Ore Sampling—The Silver City plant of this company is now being operated.

May Day—Shipments of zinc ore were started Aug. 20.

Iron Blossom—The cave opened recently has not been explored, but enough work has been done to show that it contains some ore. A drift is being driven on a lower level to get under this ground.

PIUTE COUNTY

Bully Boy & Webster—The new 100-ton mill, in Bullion Cañon, should be running at normal capacity within the next few weeks.

SALT LAKE COUNTY

Montana-Bingham—The tunnel of this company recently penetrated soft ground with a large increase in the flow of water. Timbering has been necessary. The face shows mineralization, and is thought to be in the neighborhood of the Quinn fissure.

Columbus Extension—The vein, recently cut, shows mineralization, chiefly iron, at some places. It is being drifted on in search of oreshoots.

Peruvian—The control of this property, at Alta, has recently changed hands, being taken by Messrs. Ryan and Thompson, of Salt Lake City, from the Clay estate. The property adjoins the South Hecla on the southwest, and extends over Bald Mountain on to the American Fork slope. About 400 ft. of development has been done.

Columbus Consolidated—Several cars of concentrates will be shipped this month.

South Hecla—The winze in the west drift on the Dwyer level is down 81 ft., and is stated to be in ore, carrying copper, silver and gold. The south drift on the Wedge fissure is being continued, and is still in mineralized ground.

SUMMIT COUNTY

Park City shipments for the week ended Aug. 17 amounted to 3,610,600 pounds.

New York Bonanza—A shipment of 33 tons of ore from this property is on the way to market.

Daly—A small force has been put at work and this will probably be increased. A station was recently cut between the Daly and the Daly West mines on the 2100-ft. level. There is a block of ground in this neighborhood upon which little prospecting or development has been done.

Silver King Coalition—It is reported that work has been started in driving a new adit from Nigger Hollow to tap the lower levels of this property.

TOOELE COUNTY

Shipments are being made by some of the Dry Cañon mines.

Lion Hill Consolidated—Shipments from this property have been started over the new 9½-mile branch railroad from Ophir to St. John; 18 men are at work. Tests on low-grade ore are being made with a view to possible milling operations. Development is being done in the Chloride Point tunnel and incline. A shipment of 50 tons was made recently from a new orebody encountered in this ground. Another shipment is nearly ready for the market. Lower-grade ore than formerly can now be marketed, on account of the better shipping facilities, as compared to the wagon haul formerly necessary.

Cliff—Steady shipments are being made from this property, which is much benefited by the new railroad.

UTAH COUNTY

Utah Black Marble—This company has recently secured a number of claims covering marble deposits in Spanish Fork Cañon.

Washington

The American Smelting & Refining Co. is making preparations for improvements at the plant, at Tacoma.

Blue Jim—Work is to be resumed at this mine, near Metaline, Stevens County. A power plant will probably be installed.

Phoenix Gold & Copper Co.—This company is considering the installation of a compressor plant and other machinery on its property, near Curlew, Ferry County. George Ilse, of Spokane, president.

North Washington Power & Reduction Co.—This company will soon begin work on the transmission line from Republic to Grand Forks, for supplying the mines in that vicinity with electric power.

Imperial—Among other improvements being made at this mine, near Chewelah, Stevens County, hoisting machinery is being installed.

Consolidated Gold Mines & Reduction Co.—This company has been organized and has taken over the property of the Golden Eagle company, near Blewett, Chelan County. The plant will be overhauled, and men placed at work at once. F. S. Earnest in charge.

SNOHOMISH COUNTY

Del Campo—A compressor plant and other machinery are being installed at this mine, in the Monte Cristo district.

Florence Rae—A paystreak of chalcopyrite was recently uncovered on this property, near Everett. Nicholas Rudebeck, manager.

Eclipse—The new compressor and machine drills recently installed at this mine, near Silverton, are now in operation. The ore is gray copper rich in silver.

Wisconsin

PLATTEVILLE DISTRICT

The Red Jacket mining property and fee to 157 acres has been purchased by the Mineral Point Zinc Co. The tract embraces old mining ground that has produced large quantities of smithsonite. The mine was formly operated by the Madison Mining & Development Co. and is four miles north of Montfort.

New Mexico Mining Co.—Lease to the Tracy farm has been obtained and an option taken on the Old Mexico mining plant by a Milwaukee company incorporated under the above title.

Galena Iron Works Co.—This company is moving the Kohinoor mill to the Hodge mine.

Wisconsin Zinc Co.—This company is installing 1000 ft of Lawson aerial tramway at the Winskell mine near Shullsburg.

Trego—Since resuming work a few weeks ago, a big sheet of zinc ore has been discovered in the floor of the main drift. This mine was previously operated by the Monarch Mining Co. The lease is now held by the Wisconsin Separating Company.

Belmont—Prospecting is again underway at this property, which lies just northeast of the Empire.

Harms—A local company has taken over the George Harms land, south of Platteville, and is sinking a shaft.

Vandeventer—Shipments are again being made from this mine, which is under lease to R. Fox & Co.

Canada

British Columbia

Idaho-Alamo—W. E. Finch, of Spokane, Wash., and associates, are doing development work on this group of mines in the Slocan district. The lower old tunnels of both mines are being extended, and a low-level adit is being driven to cut the Alamo vein at 450 ft. greater depth. Both properties were large producers of silver-lead ore in previous years, and on both there is much virgin ground.

Noble Five—Four main levels and several intermediates have been driven on the Deadman vein of this group on Cody Mountain, in the Slocan district. Both silver-lead and silver-zinc ore have been opened in considerable quantities on all levels. The ore generally is high grade, the zinc ore exceptionally so for this part of the province. A carload shipment was recently sent to Bartlesville, Okla., and more ore will soon be shipped.

British Columbia Copper Co.—This company has taken under option of purchase the Eureka mine, which is about nine miles from Nelson, West Kootenay. It is stated that there is a fair tonnage of ore in sight, containing copper and some gold and silver.

Motherlode Sheep Creek Mining Co.—During July, 1860 tons of ore was crushed in 29½ working days. The heads assayed $17.28 per ton; 97.98% of which was recovered. The total production of gold and silver was worth $31,497; the working costs totaled $12,210.

British Columbia—Atlin District

North Columbia Gold Mining Co.—This company has been operating its own holdings on Pine Creek and also those of the Atlin Consolidated Mining Co. Since the commencement of the season, a force of about 50 men has been employed, and about 14 monitors are in constant use. Several shipments of gold have been made. This company does not suffer from shortage of water. Surprise Lake, about 16 miles long, is being utilized as a reservoir. J. M. Ruffner, manager.

Birch Creek Hydraulic Mine—At this mine, on Birch Creek, the early part of the season was occupied in moving and reinstalling plants in a position to give increased pressure. Since the completion of this work, steady progress has been made, but piping has been somewhat retarded through extreme shortage of water. Cleanups maintain the usual average, and several shipments have been made. H. Peplow Pearse, manager.

Ontario

Silver Islet—This property, on the north shore of Lake Superior, which was at one time a producer, but has been idle for many years on account of flooding, is to be reopened.

Ontario—Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Aug. 23, and for the year to date, are:

Beaver	24.51	244.26
Buffalo	29.95	738.39
Casey Cobalt		212.15
City of Cobalt		855.26
Cobalt Lake	26.06	523.82
Cobalt Townsite	37.85	1,045.16
Chamb.-Ferland		257.05
Coniagas		1,351.46
Crown Reserve	26.54	351.10
Drummond		330.30
Hudson Bay	62.80	502.86
Kerr Lake	30.30	504.93
La Rose	32.60	2,261.86
Lost and Fourd		15.00
McKinley-Darragh	29.40	1,769.49
Nipissing	30.96	1,475.44
O'Brien		345.62
Penn.-Canadian	29.70	29.70
Provincial		22.22
Right of Way	30.61	210.62
Timiskaming		744.93
Trethewey		353.89
Wettlaufer		229.04
Totals	391.28	14,424.58

Ophir—Development work to date has failed to open any high-grade ore. Much milling ore has been found on the 300-ft. level.

Penn.-Canadian—This company, which is operating the old Cobalt Central mine, is shipping high-grade ore. The mill is being overhauled, and will be operating soon.

Ontario—Porcupine

Dome—The daily average of ore crushed during July is, semi-officially, stated at about 350 tons, the highest tonnage for any one day being 386 tons. A block of ore directly below the big mound of quartz on the surface has been opened in the crosscut at the 200-ft. level and will be connected with the mill by a raise. The Golden Stairway vein will be connected with the second level at the main underground workings by a drift through which the ore will be conveyed to the crusher.

Dome Extension—The result of development has so far been disappointing. The crosscut driven at the 230-ft. level to the contact of the quartz-porphyry with the slate, discovered numerous quartz stringers, but they appear too small and broken to yield pay ore. Drifting from the Eastern shaft, which is down 100 ft., discloses ore showing gold, but the grade is low.

Mexico

Jalisco

San Pedro Analco—The U. S. Smelting, Refining & Mining Co., has an option on this mine. If the purchase of the property is made a hydro-electric plant will be built. The Negociacion Minera de San Pedro Analco built a dam across the Santiago River for such a plant some time ago.

Mexico

Esperanza—During the month of July the mill was in operation 28 days, crushing 5999 tons of ore and treating 14,349 tons of tailings, from which bullion was produced worth $99,646. Receipts from rents and other sources amounted to $619 bringing the total up to $100,265. The working expenses including developments and marketing of bullion were $72,761; the allowance for depreciation of plant was $5000, the New York office expenses $197, a total of $77,958, leaving a difference of $22,307 or £4576. As the London expense was £250, the net estimated profit was £4326.

Nuevo Leon

Peñoles Mining Co.—This company has purchased the Palomas mines, and is contemplating the purchase of the Cabrillas and Mariposas properties, all in the same district.

Sinaloa

Potrero—It is reported that machinery and building material for the construction of a 60-ton stamp mill has arrived at Guaymas and is being hauled from Casal 35 miles to this mine, where a fair tonnage of gold ore is said to be ready for the mill. There are about 50 men employed in the mine. J. J. MacNervey, superintendent.

Sonora

San Antonio—This property at San Antonio de la Huerta, in the Yaqui Valley, may soon be a producer. Some ore has been blocked out and is ready for extraction. A branch railroad, seven miles long, connecting with the terminus of the Southern Pacific of Mexico at Tonichi, is being constructed, the grading already being completed. Several hundred men have been working steadily and over 2000 ft. of development work has been done monthly for some time.

Cerro de Plata—This property is 30 miles east of Imuris. It is said that development is being attended with excellent results. E. B. Holt, manager.

Gueriguito—This mine is 35 miles below Nacozari, and in a short time the company will install an oil engine to furnish power for the mill.

Duluth-Sonora—It is reported from Duluth, Minn., that development operations will be resumed at this mine by Oct. 1. No work has been done on the property during the last three years.

Africa

Transvaal

Gold production in the Transvaal in July was 766,338 oz., being 12,402 oz. more than in June, and 57,080 oz. more than in July, 1911. For the seven months ended July 31, the total was 4,605,405 oz. in 1911, and 5,311,245 oz.—or $109,783,434—in 1912; an increase of 705,840 oz. this year. The number of negro laborers employed at the end of July was 207,256, a decrease of 5317 from the previous month.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Aug. 28—The seaboard bituminous trade shows increasing activity. Sales are larger and prices are firmer, though there has been no general advance. Coastwise trade is active.

The anthracite companies are still working hard to make up the shortage resulting from the stoppage of production in April and May. Demand is strong and deliveries cannot be made as fast as they are wanted. The last of the summer discounts goes off Sept. 1, and seaboard prices will then be at the full schedule.

In the West trade is also active and prices are firmer. Consumers are beginning to put in stocks for winter, and the demand for steam coal is good. The Lake trade is moving well so far as bituminous coal is concerned, though anthracite shipments are still much behind last year.

Anthracite shipments in July were 6,285,153 long tons, being 1,481,088 tons more than in July, 1911, and the largest shipments were reported in a summer month. The shipments, however, have not yet made up the shortage caused by the April-May stoppage. For the seven months ended July 31 the total was 40,113,648 long tons in 1911, and 32,382,132 in 1912; a decrease of 7,731,516 tons, or 19.3%, this year.

Coal and coke tonnage of all lines of the Pennsylvania R.R. east of Pittsburgh and Erie, seven months ended July 31, short tons:

	1911	1912	Changes
Anthracite........	6,817,754	5,525,010	D. 1,292,744
Bituminous.....	23,162,859	26,175,168	I. 3,012,309
Coke	6,064,148	7,451,340	I. 1,387,192
Total........	36,044,761	39,151,518	I. 3,106,757

The total increase this year was 8.6%. The decrease in anthracite was due to the stoppage of mining in April and May.

Coal passing through Sault Ste. Marie canals, season to Aug. 1, short tons:

	1911	1912	Changes
Anthracite......	938,432	505,225	D. 433,207
Bituminous	5,899,591	5,981,229	I. 81,638
Total.	6,838,023	6,486,454	D. 351,569

The total decrease this year was 5.1%; being entirely in anthracite.

Belgian Coal—Coal production in Belgium, six months ended June 30, was 11,546,670 metric tons in 1911, and 11,135,290 in 1912; decrease, 411,380 tons. Stocks at mines, June 30, 1912, were 627,220 tons, a decrease of 255,150 tons from last year.

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for the use of steamships in foreign trade, seven months ended July 31, long tons:

	1911	1912	Changes
Coal ...	36,373,517	33,215,189	D. 3,158,328
Coke	545,210	474,086	D. 71,124
Briquettes .	981,094	827,228	D. 153,866
Total exports .	37,899,821	34,516,503	D. 3,383,318
Steamer coal. ...	11,090,042	9,758,398	D. 1,331,644
Total....	48,989,863	44,274,901	D. 4,714,962

Imports of coal for the seven months were 12,551 tons in 1911, and 179,398 in 1912; increase, 166,847 tons.

IRON TRADE REVIEW

New York, Aug. 28—The iron and steel trades continue to show the same degree of activity that has characterized them during the past month. Takings on contracts are large, and new buying is strong in almost all lines. It is claimed that the buying is almost entirely for consumption and that there is very little speculative business. This view seems to be corroborated by the fact that sales are not discouraged by the gradual creeping up of prices; and also by the prevalence of some urgency for early deliveries.

Throughout the steel industry, interest centers in deliveries. There is very little new buying for late delivery, but heavy specifications on contracts continue, and there are many fresh purchases of small lots for early delivery, sometimes at premiums above current quotations, though the amount of premium business is usually greatly exaggerated. It must be remembered that present open quotations represent large advances over prices which large buyers are paying on the bulk of their deliveries.

Production of steel is now fully up to the June rate, and represents practically all the effective capacity, though full outputs are not always secured, on account of the scarcity of labor. While the labor shortage is serious in all sections, it is probably most acute in the East. Yesterday's advance of $1 a ton in wire products makes Pittsburgh prices as follows: Wire nails, base, $1.70; plain wire, 1.50c.; painted barb wire, 1.70c.; galvanized barb wire, 2.00c. The wire mills have been only moderately busy and the advance is expected to stimulate specifications on old contracts, particularly as the active fall season is approaching. Nails are still $7 a ton below the high point of 1907, although they are $2 a ton above the low point of 1909 and $4 a ton above the low point late last year, the lowest since 1899.

Buying of pig iron has been heavier, some large contracts for basic pig having been placed in the Central West, while foundry iron has sold freely in the East. Prices are firmer, and a general advance of at least 25c. per ton can be reported on almost all kinds of iron. Many contracts now being made run over the first quarter of next year.

Birmingham

Aug. 26—The market is stronger in Southern territory, and quotations are going up. While $12 per ton for No. 2 foundry is still named, $12.25@12.50 is also asked for fourth-quarter contracts, and the higher figure will soon be general. Stocks of pig iron are down to a low point now, and increased production will soon be necessary. Two additional furnaces will be put in blast before long.

Steel works at Ensley and Gadsden are running well and more orders are reported coming.

Chicago

Aug. 27—The iron market continues firm with sales of pig iron quiet but making a good aggregate volume, and the demand for finished products heavy. There is now a tendency of melters to buy for first-half needs, at the prices of the furnace agents, which in general are 50c. over prices for corresponding material delivered in the last quarter. Some No. 2 Southern foundry iron is being sold in small lots for early delivery at $12 Birmingham, which means $16.35 Chicago, but $12.50 is the ruling price on first-quarter deliveries and $12.25 is said to represent some sales extending over the first of the year. Northern No. 2 foundry iron holds to $15.50@16 at furnace, which means about $16@16.50 delivered. Charcoal iron brings $16.50@17, Chicago, and is in good demand.

A few sales of between 1000 and 2000 tons of pig iron have been recorded, but most of the business is in small lots bought often. Inquiries on first-quarter and first-half supplies are numerous and it is evident that the larger melters will buy on any indication of a turn upward in prices. Some furnace agents seem so confident of the future that they hold out for $13 on Southern No. 2 on business distributed over the first-half and $16 as a minimum for Northern No. 2 similarly delivered.

The local mills continue so crowded to meet deliveries up to the first of the year that little new business is solicited and while contracts for 1913 supplies are gradually increasing, there is much uncertainty about them. For railroad supplies and structural material the demand is large and steady. Iron bars hold to 1.40c. with soft-steel bars at 1.48c., with the demand in excess of the supply so far as local mills are concerned. Plates, sheets and minor lines are very strong.

Cleveland

Aug. 26—Movement of ore on the Lakes continues heavy, though there has been some delay to vessels from fogs and bad weather.

Pig Iron—Sales have been heavy and some large contracts for basic are reported placed on a sliding scale, which is not quoted. Bessemer is quoted $15.15@15.30; No. 2 foundry, $13.75@14.25; gray forge, $13.25@13.75, Lake Superior charcoal, $16.25@16.50, all Cleveland delivery.

Finished Material—Buyers are pressing for early deliveries, and some premiums are being paid. Prices are strong. Jobbers report a heavy demand all around, and have generally advanced prices for material from store.

Philadelphia

Aug. 29—Consumers of pig iron in territory which looks here for supplies have apparently become somewhat alarmed over the extraordinary demand and the rapid disappearance of stocks. This is shown by the large number of pressing inquiries from small consumers, who are readily paying the advanced prices ranging from 25 to 50c. per ton. The greatest activity in sight is in steel-making grades for winter delivery. Makers of basic pig are less disposed than two weeks ago to accept business for first quarter next year. No serious difficulty, however, will interfere with final satisfactory arrangements. Makers will insist on at least present outside quotations. Nearly all the mills in this district have arranged for further supplies of forge iron, in some cases orders extending throughout the first quarter. Buyers of No. 2X foundry have been particularly active in looking after fourth-quarter necessities and several southern furnaces have succeeded in securing a fair share of the business that is drifting into the market. Quotations for No. 2X foundry are $16@16.25; gray forge, $15.50@15.75. Low phosphorus is picked up at $20.50 per ton.

Steel Billets—Billets are again under active request, with an advance of at least $1 per ton. A minimum price for openhearth today is $25.40 per ton.

Bars—While no open advance in bars has been made, buyers are forcing prices upward fractionally and steel bars are decidedly higher. Jobbers are especially anxious to obtain deliveries on supplies ordered some time ago on which the mills are rather slow.

Sheets—Sheets have also advanced in a premium way for early deliveries and manufacturers have been obliged to divide up and accept only a part of the business offered and make the best promises they are able as to the rest.

Pipes and Tubes—The same stringent conditions heretofore mentioned prevail in all branches of this industry. The consumption of tubes is heavier than for two or three years. The smaller tube-using plants are being heard from and delivery is more thought of than price.

Plate—Premiums have characterized the business in plates placed this week. The regular advance amounts to $1 per ton, in most cases.

Structural Material—Large local requirements have been recently covered and other large requirements are standing in line wherein deliveries cover the last quarter of this year and the first of next. There is a general hustling to place orders.

Scrap—The pressure for railroad No. 1 wrought and other kinds of desirable scrap has stimulated the dealers to renewed efforts. The supply is barely equal to the demand.

Pittsburgh

Aug. 27—The advance in wire products made on Aug. 26, by the American Steel & Wire Co., and immediately followed by the independents, is the fourth $1 a ton advance since the low point which occurred at the beginning of last December. In an advancing market for wire products the question is not what is the current price, but how much tonnage the mills will admit at lower-priced contracts. The present advance, to a $1.70 basis for nails, will probably eliminate all contracts at $1.60 or under.

Prices of steel products are very firm all along the line, and there are reports that plates and shapes may advance another $1 a ton shortly. The independents are all quoting 1.40c. on plates and shapes. The Steel Corporation has not made a formal advance, but is accepting little if any business at 1.35c. In bars the Corporation is selling to a limited extent at 1.30c., but in jobs where deliveries run into next year it is demanding 1.35c. The independents as a rule are quoting 1.35c. as a minimum. The sheet market is strong and an advance is likely within 30 days. There is fresh demand for tinplate.

Ferromanganese—Effective yesterday, an advance of $2.50 was made by the English producers of ferromanganese, making the price $53.50, Baltimore, with $1.95 freight to Pittsburgh. There was fairly heavy covering for the first half of next year before the advance to $51, and the great bulk of the first-half consumption is now under cover. Prompt metal commands substantially the same price as contract.

Pig Iron—The local market has suddenly displayed a strong advancing tendency, following the slow stiffening which has been in progress for months. It is doubtful whether any round tonnage of bessemer could be secured at $14.75, Valley, or basic at $14, Valley, although these are the regular quotations. In foundry iron the $14 price has not only disappeared, but sales have been made for first quarter at advances over the higher price now ruling for this year. One sale of a round tonnage of No. 1 foundry was made late last week at $15.50, furnace, equal to $15 for No. 2, for delivery over the first quarter, and the seller is maintaining a minimum price of $14.50 for this year and $15 for first quarter. While there is no more iron at $14, furnace, there is probably a little to be had at $14.25, and the market for foundry iron is quotable at $14.25@14.50 for this year and $15, furnace, for first quarter, prices delivered Pittsburgh being 75 to 90c. higher, according to freight rates. The market for other grades is strictly on a Valley basis: Bessemer, $14.75@15; basic, $14@14.25; malleable, $14, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh. It has developed lately that the furnaces now in operation are quite well sold up for this year and there are few idle furnaces in position to get into blast.

Steel—Practically famine conditions prevail in steel, and consumers are paying fancy prices for small lots, as they cannot always secure all they need on their regular contracts. A sale of a small tonnage of openhearth billets was made within the past couple days at within a few cents of $25, delivered in this district. The regular market is quotable about the same as last week, subject to premiums on small lots for quick delivery: Bessemer billets, $22.50; bessemer sheet bars, $23; openhearth billets, $23; openhearth sheet bars. $23.75@24, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are quiet at $25@26, Pittsburgh, with the tendency toward the higher figure.

Sheets—The market is firm at the regular quoted prices, there being probably not a single mill willing to shade anything, but occasionally jobbers are offering limited tonnages at cut prices, a common occurrence when the market has had several successive advances. About 85% of the sheet mills are in operation, this being as many as can be run with the present supply of steel, and labor so scarce. We quote: Blue annealed, 10 gage, 1.50c.; black sheets, 28 gage, 2.05c.; galvanized, 28 gage, 3.15c.; painted corrugated, 2.20@2.25c.; galvanized corrugated, 3.10@3.20c., both for 28 gage.

Connellsville Coke—There does not

seem to have been any further contracting since last report, but sales have been made of about 10,000 tons of prompt furnace coke at $2.25. The sales of prompt coke in the past three weeks have been largely to furnaces already provided with contracts, the furnaces apparently wishing to accumulate a little surplus against possible interruptions to their shipments later in the year. Both prompt and contract furnace are quotable at $2.25, but some operators are holding contract at $2.35 or higher. Foundry coke is $2.40@2.75, according to brand and delivery.

St. Louis

Aug. 26—Business is more active, with larger sales. For Southern No. 2 foundry $12 Birmingham, or $15.75 St. Louis, is asked, with intimations that a 25c. or 50c. advance may be expected. Northern No. 2 is quoted at $15.75, and an advance is expected. Business in steel products is improving.

Iron Ore Trade

Out of the total shipments of 7,600,233 tons of iron ore from the Lake Superior region reported in July, 6,086,254 tons, or 80.1%, were delivered to Lake Erie ports.

Little or no new business is reported in the East. Furnaces are generally supplied for the year, and neither sellers nor buyers are inclined to contract yet for next year. Ocean freights on foreign ores are still at a high level.

German Ore Trade—Imports and exports of iron and manganese ores in Germany six months ended June 30, metric tons:

	1911	1912	Changes	
Iron ore, imp	5,095,877	5,677,719	I.	581,842
Iron ore, exp. .	1,292,841	1,089,628	D.	203,213
Manganese, imp. .	210,470	192,040	D	18,430
Manganese, exp	2,537	3,135	I	598

Imports of slag and slag products in 1912 were 614,112 tons; exports were 52,125 tons.

Foreign Iron Trade

German Iron Production—The German Iron & Steel Union reports the production of pig iron in the German Empire in June at 1,418,445 tons, or 45,232 tons less than in May. For the six months ended June 30 the total make was, in metric tons:

	1911	1912	Changes	
Foundry iron ...	1,534,625	1,552,551	I.	17,926
Forge iron.. ...	279,293	268,792	D.	10,501
Steel pig	850,423	1,037,902	I.	187,479
Bessemer pig.....	169,325	193,763	I.	24,438
Thomas(basic)pig	4,848,973	5,371,624	I.	522,651
Total..	7,682,639	8,424,632	I.	741,993

Total increase this year, 9.7%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

Belgian Production—Pig-iron production in Belgium six months ended June 30 was: Forge, 16,555; foundry, 46,959; basic and bessemer, 1,058,047; total, 1,121,561 metric tons; an increase of 97,561 tons over last year.

Metal Markets

New York, Aug. 28—The metal markets are generally unchanged, except that there is rather more firmness in most lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal		Exports	Imports	Excess	
Gold					
July	1912..	$ 7,263,624	$ 3,747,869	Exp.	$3,515,755
"	1911..	2,178,088	2,594,653	Imp	416,565
Year	1912..	40,660,460	29,012,211	Exp.	11,648,249
	1911..	15,429,650	36,367,679	Imp.	20,938,029
Silver					
July	1912..	6,591,054	3,449,716	Exp.	3,141,338
"	1911..	5,275,008	3,920,794	Exp.	1,354,214
Year	1912..	40,260,276	28,713,965	Exp.	11,546,311
	1911..	39,718,211	25,881,395	Exp.	13,836,816

Exports from the port of New York, week ended Aug. 24: Gold, none; silver, $771,754, chiefly to London. Imports: Gold, $575,102, from South America and Mexico; silver, $114,912, largely from South America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. The supplies arriving went to the Bank of England, with the exception of a reservation for India.

Platinum—The market is rather quiet and there is some talk of lower prices, but they have not yet materialized. Dealers still ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

Our Russian correspondent writes, under date of Aug. 15, that sales of platinum continues small in comparison with those in the same season of the previous year. The tendency of the large producers is not to lower the prices in any event. From Paris it is reported there are large stocks of platinum held by the Compagnie Industrielle du Platine, which controls 85% of the platinum produced in Russia. Small lots of platinum can be obtained in Ekaterinburg at a low price. Officially the prices remain unchanged. The metal is quoted in St. Petersburg at 37,500 rubles per pood; at Ekaterinburg 9.80 rubles per zolatnik, both for crude metal, 83% platinum. These prices are equivalent to $36.75 and $36.85 per oz., respectively.

SILVER AND STERLING EXCHANGE

Aug.	22	23	24	26	27	28
New York....	62⅜	62¼	62¼	62	61⅝	61¾
London .	28$\frac{11}{16}$	28⅝	28⅝	28$\frac{9}{16}$	28⅜	28$\frac{7}{16}$
Sterling Ex	4.8720	4.8720	4.8715	4.8715	4.8730	4.8725

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The market has ruled dull with lower tendency, touching 28⅜d. on Aug. 27, but closes steady on Indian Bazaar buying at 28$\frac{7}{16}$d. in London.

Exports of silver from London to the East, Jan. 1 to Aug. 15, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes	
India.. ...	£5,100,600	£5,010,700	D.	£ 89,900
China	890,400	933,500	I.	43,100
Total	£5,991,000	£5,944,200	D.	£ 46,800

Exports of gold from London to India in July were £1,327,494. For the seven months ended July 31 the total was £8,851,351, an increase of £2,011,366 over last year.

Coined silver in the United States, Aug. 1, as estimated by the Treasury Department: Standard dollars, $565,368,367; subsidiary coins, $170,680,698; total, $736,049,065. Of the dollars $487,825,000 are held in the Treasury against silver certificates outstanding.

Copper, Tin, Lead and Zinc

NEW YORK

	Copper		Tin	Lead		Zinc	
Aug.	Lake Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
22	17½ @17¾	17.45 @17.55	46⅛	4.50	4.37½ @4.42½	7.05 @7.15	6.90 @7.00
23	17⅝ @17¾	17.50 @17.60	46¼	4.50	4.40 @4.42½	7.10 @7.20	6.95 @7.05
24	17⅝ @17¾	17.57½ @17.60	46¼	4.50	4.40 @4.42½	7.10 @7.20	6.95 @7.05
26	17⅝ @17¾	17.57½ @17.60	46¼	4.65	4.55 @4.60	7.10 @7.20	6.95 @7.05
27	17⅝ @17¾	17.57½ @17.60	46¼	4.65	4.55 @4.60	7.10 @7.20	6.95 @7.05
28	17⅝ @17¾	17.57½ @17.60	46½	4.65	4.55 @4.60	7.15 @7.20	7.00 @7.05

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Following the sporadic purchases by Europe at the end of our last week, the market steadily acquired a firmer tone and about Aug. 23 became active and strong. Since then a large business, running to millions of pounds, has been transacted, both for foreign and domestic shipment, the latter apparently predominating, and upon most of this business the full price of 17¾c., delivered, usual terms, was realized. The European consumers had been out of the market for over two months, and it is noteworthy that their orders now call for early shipment. Further large orders from Europe are anticipated. In this country, consumption is excellent and seems to be limited only by the capacity to turn out manufactured goods. At the

LONDON

Aug.	Copper Spot	Copper 3 Mos	Copper Best Sel'td	Tin Spot	Tin 3 Mos	Lead, Spanish	Zinc, Ordinaries
22	79½	79 7/16	84½	209½	208	19¾	26½
23	79½	79 7/16	84½	210½	209¼	20	26⅝
24	....	..				....	....
26	79½	79⅜	84½	210¼	209¼	20¼	26⅝
27	79¾	79⅞	84¾	210¼	209	20¼	26¾
28	79½	79¼	84½	211½	210⅞	20½	26¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

close, Lake copper is quoted at 17⅝@17¾c.; electrolytic copper in cakes, wirebars and ingots at 17.57½@17.60c. Casting copper is quoted nominally at 17⅜@17½c. as an average for the week.

The market for standard copper has been firm, and has fluctuated within comparatively narrow limits, spot and three months holding around £79 10s. While for some time past, three months' copper has been selling at or below the price of spot, during the last few days there is again a contango, the market closing at £79 10s. for spot, and £79 15s. for three months.

Copper sheets have been advanced 1c. and are now 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 8063 long tons. Our special correspondent gives the exports from Baltimore at 2741 long tons for the week.

Tin—The market has been strong and advancing, due more to the purchases on part of the dealers in Europe than to those of American consumers. The latter, at the moment, seem to be well supplied by the arrival of shipments which had accumulated on account of the dock strike. The statistical position of the metal is a strong one, and it is reported that the output of the Straits during the second half of this year is not likely to show the same increase which the first half year showed. Consumption the world over is good. Prices have fluctuated from 46c. to 46½c., at which latter figure the market closes.

In London, the market on Aug. 22 hung around £209 10s. for spot and £208 for three months. It advanced about £1 on Aug. 23, and held this advance for the next few days. The market closes strong at £211 10s. for spot, and £210 17s. 6d. for three months.

Lead—Consumption is excellent, and the statistical position of this article is a strong one. On Monday, Aug. 26, the principal producers advanced their price to 4.65c., New York, and there is a good demand at the higher level. Lead at St. Louis is selling at 4.55@4.60 cents.

In Europe, the market is very firm, and the scarcity for early shipment continues. At the close, Spanish lead for early delivery is quoted £20 10s., and English £20 12s. 6d. per ton.

Spelter—The market is without special feature. There has been a fair business done at slightly higher prices, and at the close St. Louis is quoted 7@7.05c., and New York 7.15@7.20 cents.

The London market is firm, and prices have advanced slightly, good ordinaries being quoted at £26 15s., and specials at £27 per ton.

Base price of zinc sheets is $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—Business is active, but metal is still rather scarce for early delivery. The current quotation is 24¼@24½c. per lb. for No. 1 ingots, New York.

Antimony—The market is firm and sales are good. Prices are strong except for occasional small sales in liquidation of purchases made before the recent advances. Cookson's is quoted 8.60c. per lb.; Hallett's and U. S., 7.95@8.05c., while 7.65@7.75c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Business is fair, but prices are a little easier. New York quotations are $42 per flask of 75 lb. San Francisco, $41.50 for domestic orders and $39 for export. The London price is 5s. lower, at £7 15s. per flask, with the same price from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80 per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The quotation continues at 700 marks per 100 kg., f.o.b. works in Silesia, Germany. This is equal to 75.6c. per lb., at works.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Spanish Metal Exports

Exports of metals and minerals from Spain, five months ended May 31, as reported by *Revista Minera*, in metric tons:

Metals	1911	1912	Changes	
Pig and manuf. iron	20,525	25,013	I.	4,488
Copper..............	6,360	9,297	I.	2,937
Copper precipitate.	6,924	5,609	D.	1,315
Lead................	65,435	76,524	I.	11,089
Zinc................	620	1,302	I.	682
Quicksilver....	1,028	1,472	I.	446
Minerals				
Iron ore............	3,549,263	3,465,357	D.	83,906
Manganese ore....	13,914	11,003	D.	2,911
Copper ore.	172,344	72,787	D.	99,557
Lead ore............	1,335	1,571	I.	236
Zinc ore............	63,926	48,651	D.	15,275
Pyrites..............	980,694	1,188,375	I.	207,681
Salt................	247,783	277,388	I.	29,605

Pyritic ores are now classed as pyrites unless they carry 2.5% or over in copper. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 24—The high price of zinc sulphide ore was $60, the base per ton of 60% zinc $53@57. Zinc silicate sold on a base of $30@31 per ton of 40% zinc. The average price, all grades of zinc, was $51.04. The high price of lead was $59, the average, all grades, $56.22, there being a lighter demand, with lower prices on medium- and lower-grade ores.

SHIPMENTS, WEEK ENDED AUG. 24

	Blende	Calamine	Lead Ore	Value
Webb City Carterville	5,659,680	.	949,950	$185,010
Joplin........	3,814,360	....	288,100	115,150
Galena.	714,930	......	132,820	23,445
Duenweg.	697,270	......	96,640	22,220
Jackson	727,230		..	20,560
Miami.......	421,120	......	154,080	14,835
Alba-Neck....	443,140	....	12,750	13,200
Granby	103,470	468,650	9,200	9,970
Carl Junction	262,640	.		7,870
Oronogo...	262,860	.	....	7,185
Spurgeon		315,390	44,330	6,285
Springfield...	197,500	.	....	5,725
Cave Springs.	181,570	....	5,600	5,055
Sarcoxie .	156,340		......	4,065
Lawton.......	150,000	.....	......	4,275
Aurora .		128,920	...	2,315
Wentworth .	61,350	....	......	1,195
Totals	13,853,460	912,940	1,695,470	$448,760
34 weeks...	351,942,250	21,796,970	60,032,230	$11,168,035

Blende val., the week, $386,600; 34 weeks, $9,169,289
Calamine, the week, 14,490; 34 weeks, 330,912
Lead value, the week, 47,670; 34 weeks, 1,668,334

MONTHLY AVERAGE PRICES

Month	Zinc Ore Base Price 1911	Zinc Ore Base Price 1912	Zinc Ore All Ores 1911	Zinc Ore All Ores 1912	Lead Ore All Ores 1911	Lead Ore All Ores 1912
January.....	$41 85	$44.90	$40.55	$43 54	$55 68	$58 92
February....	40 21	45 75	39 16	43 31	54 46	52 39
March.	39.85	51 56	38 45	49.25	54 57	54.64
April	38 88	52 00	37 47	50 36	56 37	54 18
May	38 25	55.30	36 79	53.27	55 21	52.45
June.........	40.50	55 88	38 18	54 38	56 49	55 01
July.........	40 75	58 85	38 36	56 59	58 81	58 83
August	42 50		41 28	.	60 74	.
September ..	42 63		41 29	. ..	59 33	...
October	42.38	..	40 89	.....	54.72	..
November...	45.40		43 25	.	57 19	
December.	44.13	..	40 76	..	62 03	...
Year.	$41.45		$39 90	....	$56.76	... ..

NOTE Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Aug. 24—The base price paid this week for 60% zinc ore was $52@55. The base price paid for 80% lead ore was $56@58 per ton.

SHIPMENTS, WEEK ENDED AUG. 24

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	796,200	. . .	521,800
Mineral Point	712,230	. .	. .....
Highland	636,000	.	..
Platteville	583,600	.....	196,700
Shullsburg	530,000		....
Hazel Green	380,000	. . .	.
Galena	324,900		
Harker	304,370		
Cuba City	216,920		237,000
Rewey	83,000		
Linden	80,000		..
Total	4,647,220		955,500
Year to date	133,819,380	5,887,420	22,326,37

Shipped during week to separating plants, 2,936,450 lb. zinc ore.

Other Ore Markets

Rates on Manganese Ore—Cancellation recently by the Central R.R. of New Jersey of the privilege to shippers of imported manganese ore, of having the ore crushed at Elizabethport, N. J., and thence reshipped at the import rate, increased charges on the reshipped ore $1.40 per ton. The Interstate Commerce Commission regards this advance as unreasonable and on Aug. 22 suspended it until Dec. 21.

New Caledonia Ores

Exports of ores from New Caledonia, as reported by the *Bulletin du Commerce*, of Noumea, for the six months ended June 30, were 23,842 metric tons of nickel ore and 25,992 tons of chrome ore. Shipments of metals were 1675 tons of nickel matte.

Chemicals

New York, Aug. 28—The general market reports some increase in activity.

Arsenic—Spot supplies are still scarce. Only small supplies of English and Mexican material are in the market. Quotations are $5 per 100 lb. for spot; while futures, at $4@4.50 per 100 lb., are rather neglected.

Copper Sulphate—The demand is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is rather quiet, but prices are maintained, chiefly on account of high ocean freights. Spot is quoted at 2.50c.; futures are higher, 2.52½@2.55c. per lb. being asked for October-November deliveries; 2.57½c. for December, and 2.60c. for January and later.

Potassium Salts—Exports of potassium salts from Germany, six months ended June 30, metric tons:

	Total	To U.S.
Crude salts	609,390	270,769
Potassium chloride	150,285	98,210
Potassium sulphate	45,519	16,885
Pot-magnesium sulphate	38,126	4,572
Total	843,320	390,436

Comparisons with 1911 cannot be made, owing to changes in the official classification this year. The exports to the United States were 46.3% of the total.

Mining Stocks

New York, Aug. 28—On Aug. 21 the dullness of the Exchange was only relieved by the continued activity in copper shares. Amalgamated at 88¼ made a new high record since 1910. Chino, Tennessee and Utah made fractional gains. The Curb coppers were active also, Greene-Cananea and Braden leading.

On Aug. 22 there was an increase of 125,000 shares over Monday's sales, but there was a general, though unimportant, decline in prices. Amalgamated sold up to 88⅜. The Curb market was mixed. Old Standard Oil was quoted at $1080 bid. Greene-Cananea was again strong.

On Aug. 23 trading was without special interest. The coppers fell off slightly. On the Curb trading was also sluggish.

Aug. 26-28 there were few changes in the market, the Exchange being irregular and without definite tendency. On the Curb copper stocks were fairly active and firm, the general tendency being upward. Cobalts sold well, at small advances. There were moderate dealings in other mining stocks, at firm prices.

At auction in New York, Aug. 22, the following sales were made: Camp Bird Mining Co., 50 shares, $6 per share; California-Nevada Copper Co., $7500 bonds, 5½% of par; 750 shares, $5 par, $5 for the lot; U. S. Steel Corporation, $2,000,000 bonds, 102⅝% and interest; Colorado Fuel & Iron Co., 50 shares preferred, $100 per share.

Boston, Aug. 27—The copper-share market received quite a push in the increasing of the Calumet & Hecla dividend from $10 to $12 quarterly. It has resulted in giving confidence to the situation and is being reflected almost daily in the share market. Many stocks have risen to the highest price of the year, and the air is surcharged with optimistic sentiment.

Calumet & Hecla made the equivalent of a $25 advance, selling at $550, ex-dividend. Calumet & Arizona and North Butte have been the most conspicuous stocks, both making record prices for the year. Calumet & Arizona is up $82.50 on increased dividend prospects. There have been unconfirmed reports that the Amalgamated would take these and other mines over in due time.

A sharp rise in Old Dominion Mining shares to $61, the highest price for many years, also gives encouragement. Copper Range also attracts attention with its $6 rise to $63.75. Granby is another strong spot. Other strong spots have been Boston & Corbin and Santa Fé.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	May	June	July
Alaska shipments	1,720,391	4,134,569	2,224,441
Anaconda	25,800,000	. .	....
Arizona, Ltd.	3,500,000	3,300,000	3,200,000
Copper Queen	7,024,087	7,622,730	7,708,147
Calumet & Ariz.	4,424,000	4,160,000	4,748,000
Chino	1,275,850	1,474,979	2,945,000
Detroit	2,092,478	1,959,634	2,194,090
East Butte	1,445,000	. ...	.....
Mammoth	1,760,000	. .	. ..
Mason Valley	1,520,000	1,438,580	1,500,000
Nevada Con.	6,063,462	5,913,832	6,084,274
Ohio	685,000	665,000	....
Old Dominion	2,180,000	2,130,000	. ....
Ray	2,924,913	3,004,195	2,985,965
Shannon	1,461,000	1,270,000	1,446,000
South Utah	236,884	162,335	142,555
United Verde*	2,500,000	2,500,000	.. ....
Utah Copper Co.	9,564,919	8,772,742	10,602,000
Lake Superior*	21,250,000	15,600,000	19,500,000
Non-rep. mines*	8,400,000	8,300,000	8,970,000
Total production	105,830,984	..	
Imports, bars, etc.	25,836,519	24,262,292	.. .
Total blister	131,667,503		
Imp. in ore & matte	6,110,226	8,404,936	
Total American	138,107,729	....	. . .
Miami†	2,676,702	2,683,310	3,027,710
Brit. Col. Cos.:			
British Col. Copper	875,000	996,000	1,026,000
Granby	1,914,460	1,888,400	. ..
Mexican Cos.:			
Boleo†	2,260,160	1,851,920	2,386,480
Cananea	4,600,000	4,310,000	4,000,000
Moctezuma	2,892,521	3,176,819	3,094,016
Other Foreign			
Cape Cop., S. Africa	754,880		
Kyshtim, Russia	.	.	. ....
Spassky, Russia	694,400	757,120	795,200
Famatina, Argen.	......	....	..
Tilt Cove, Newf'd.	123,087	....	.. .
Exports from:			
Chile	3,696,000	9,856,000	8,960,000
Australia	7,840,000	8,176,000	8,288,000
Arrivals in Europe‡	9,976,860	12,667,200	14,114,240

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U. S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VII, 1911	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,894,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,161,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331

VISIBLE STOCKS

	United States	Europe	Total
VIII, 1911	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,380
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,689
VI	49,615,643	117,801,600	107,417,232
VII	44,335,004	108,186,000	152,521,047
VIII	50,280,421	113,299,200	163,579,621

Curb trading has picked up with Davis Daly a strong feature. Nevada-Douglas is also strong. Alaska Mines stock, when issued, is quoted around $7.25@7.50, with $5 paid. It is expected that allotments will be cut down materially as the subscription demand has been heavy.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0.10
Belmont, Ida	July 22	Aug. 22	0.002
Black Pine M. & M., Utah	Aug. 29	Sept. 19	0.00¼
Cedar Talisman, Utah	Sept. 14	Oct. 3	0.00½
Con. Imperial, Nev	July 28	Aug. 21	0.01
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Dalmatia, Ida	Aug. 24	Sept. 21	0.002
Dennemora, Ida	July 20	Aug. 20	0.002
Eagle Mt., Ida	July 31	Aug. 22	0.00½
Empire, Ida	Sept. 23	Oct. 23	0.002
Hilarity, Ida	Sept. 5	Oct. 5	0.002
Horseshoe Ida	Aug. 8	Aug. 30	0.002
JohnnyGold M.&M.Co., Utah	Aug. 30	Sept. 20	0.00¼
Laclede, Ida	Aug. 1	Aug. 24	0.003
Lone Star, Nev	July 20	....	0.02
Manhattan Red Top, Nev	July 12	......	0.01½
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
New Hope, Ida	Sept. 3	Oct. 3	0.002
New Reliance, S. Dak.	...	....	0.01
Oreano, Ida	July 18	Aug. 19	0.001
Reindeer, Ida	Sept. 7	Oct. 5	0.003
Sandstorm-Kendall, Nev	July 8	......	0.01
Seven Troughs Mon'h, Utah	Aug. 10	Aug. 30	0.0½
Silver Mt., Ida	July 15	Aug. 15	0.002
Smuggler, Utah	Aug. 20	Sept. 20	0.00½
Springfield, Ida	July 30	Aug 31	0.002
Tonopah North Star, Nev	July 15	....	0.02
Twin Star, Ida	Aug. 31	Sept. 28	0.02

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171		24.428	24.082	.
September	53.295	52.440	.	24.567	24.209	.
October	55.490	53.340	..	25.596	24.594	....
November	55.635	55.719		25.680	25.649	...
December	54.428	54.905	..	25.160	25.349	....
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK Electrolytic 1911	NEW YORK Electrolytic 1912	NEW YORK Lake 1911	NEW YORK Lake 1912	London, Standard 1911	London, Standard 1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.098	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.031	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405		12.634		56.266	
September	12.201		12.508		55.253	
October	12.189		12.370		55.170	
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.973	

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	[illegible]	July	42.400	44.519
February	[illegible]	[illegible]	August	43.319	
March	40.157	[illegible]	September	39.755	.
April	[illegible]	[illegible]	October	41.185	
May	43.115	[illegible]	November	43.125	..
June	[illegible]	[illegible]	December	44.655	
			Av. Year	42.281	..

[illegible] cents per pound

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500		4.406	......	14.260	.
September	4.485		4.356	......	14.744	. .
October	4.265		4.139	......	15.332	.
November	4.298		4.181	......	15.821	.. .
December	4.450		4.332	......	15.648	.
Year	4.420		4.286		13.970	. .

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953		5.803		26.801	.
September	5.869		5.719		27.750	. .
October	6.102	.....	5.951	...	27.256	. .
November	6.380	. .	6.223	.	26.795	......
December	6.301	.. ...	6.151		26.849	. .
Year	5.758		5.608		25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No 2 Foundry 1911	No 2 Foundry 1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	..	14.00		14.47	
September	15.90		13.57	...	14.40	.
October	15.43	......	13.44	..	14.34	
November	14.92	..	13.30	.....	14.25	
December	15.15	.	13.10	. ..	13.90	. .
Year	$15.72		$13.94		$14.49	. .

STOCK QUOTATIONS

COLO. SPRINGS Aug. 27

Name of Comp.	Bid.
Acacia	.05
Cripple Cr'k Con.	.01¾
C. K. & N	.16
Doctor Jack Pot	.06¼
Elkton Con	.67
El Paso	1.15½
Findlay	.07½
Gold Dollar	.18½
Gold Sovereign	.02
Isabella	.21¼
Jack Pot	.04
Jennie Sample	.06½
Lexington	.008
Moon Anchor	.009
Old Gold	.04
Mary McKinney	.70½
Pharmacist	.01½
Portland	.99
Vindicator	.85
Work	.01½

SALT LAKE Aug. 27

Name of Comp.	Bid.
Beck Tunnel	.09
Black Jack	.12
Cedar Talisman	.00¼
Colorado Mining	.19½
Columbus Con	.20
Crown Point	.02¼
Daly-Judge	5.75
Grand Central	.57
Iron Blossom	1.25
Little Bell	.30
Lower Mammoth	.04¼
Mason Valley	12.00
May Day	.16
Nevada Hills	2.00
New York	.03
Prince Con.	1.65
Silver King Coal'n	2.75
Sioux Con	.05
Uncle Sam	.17
Yankee	.11

TORONTO Aug. 27

Name of Comp	Bid	Name of Comp	Bid
Coniagas	7.15	Hollinger	12.50
Hudson Bay	69.00	Imperial	.02
Temiskaming	.37	Pearl Lake	.16
Wettlaufer-Lor.	.44	Porcu. Gold.	.26
Apex	.02	Porcu. Tisdale	.01
Central	‡5.56	Preston E. D.	.02
Crown Chartered	.07	Rea	.20
Doble	.40	Standard	.00½
Dome Exten	.09	Swastika	.08
Foley O'Brien	.15	West Dome	.05

SAN FRANCISCO Aug. 27

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.09	Belmont	9.85
Belcher	.40	Jim Butler	.68
Best & Belcher	.08	MacNamara	.24
Caledonia	1.60	Midway	.58
Challenge Con	.09	Mont.-Tonopah	2.22½
Chollar	.10	North Star	.16
Confidence	.75	West End Con	1.67½
Con. Virginia	.53	Atlanta	.26
Crown Point	.45	Booth	.07
Gould & Curry	.03	C.O.D. Con	.11
Hale & Norcross	.12	Comb. Frac	.05
Mexican	2.90	Jumbo Extension	.42
Occidental	.50	Pitts.-Silver Peak	.90
Ophir	.91	Silver Pick	.11
Overman	.81	St. Ives	.30
Potosi	.03	Tramp Con	‡.02
Savage	.07	Argonaut	‡2.00
Sierra Nevada	.16	Bunker Hill	‡4.50
Union Con.	.73	Central Eureka	.34
Yellow Jacket	.41	So. Eureka	‡2.90

N. Y. EXCH. Aug. 27

Name of Comp.	Clg.
Amalgamated	88½
Am. Agri. Chem.	59½
Am.Sm.&Ref.,com	87¾
Am.Sm.&Ref.,pf.	109¼
Am.Sm.Sec.,pf.B	87¼
Anaconda	46⅜
Batopilas Min	1½
BethlehemSteelpf	73¼
Chino	39⅝
Comstock Tunnel	‡10½
Federal M. & S., pf.	45
Goldfield Con	3¼
GreatNor.,ore.,ctf.	45¼
Guggen. Exp.	59⅞
Homestake	95½
Inspiration Con	19
Miami Copper	29½
Nat'nalLead,com.	60½
National Lead, pf.	107½
Nev. Consol.	22⅞
Pittsburg Coal, pf.	98⅜
Ray Con	21¾
Republic I&S,com.	28½
Republic I & S. pf.	91¼
SlossSheffi'd com	56
Sloss Sheffield, pf.	100
Tennessee Copper	43¾
Utah Copper	66¼
U. S. Steel, com	74¾
U. S. Steel, pf.	113½
Va. Car. Chem.	47¾

N. Y. CURB Aug. 27

Name of Comp.	Clg.
Barnes King	‡.40
Beaver Con	.46
Braden Copper	7¼
B. C. Copper	5⅛
Buffalo Mines	‡1.45
Caledonia	.40
Con. Ariz. Sm.	⅝
Davis-Daly	2¾
Diam'field-Daisy	.7
Ely Con	.22
Florence	1¼
Giroux	6
Gold Hill Con.	5/16
Greene Cananea	10⅛
Greenwater	.05
Internat. S. & R.	‡124
Kerr Lake	2 11/16
Keystone	2⅜
La Rose	3
McKinley-Dar-Sa.	2
Min. Co. of A. new	3
Motherlode Gold	1
Nev. Utah M. & S.	.01
Nipissing Mines	8¼
Ohio Copper	13/16
Pacific Sm. & M.	7/16
South Live Oak	1¼
South Utah M. & S.	⅝
Standard Oil (Old)	‡1110
Stand'd Oil of N.J	409
Stand'd Oil Subs.	525
Stewart	1 5/16
Tonopah	7 1/16
Tonopah Ex.	2¼
Tri-Bullion	½
Tularosa	1
Union Mines	‡3/16
United Cop., pfd.	10
Yukon Gold	3⅝

LONDON Aug. 28

Name of Com	Clg.
Camp Bird	£1 9s 3d
Dolores	1 10 0
El Oro	0 14 3
Esperanza	1 11 10½
Mexico Mines	7 5 0
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 6 3

BOSTON EXCH. Aug. 27

Name of Comp.	Clg.
Adventure	8½
Ahmeek	‡345
Algomah	5½
Allouez	46¾
Am. Zinc	31¼
Ariz. Com., ctfs.	5¼
Bonanza	‡.40
Boston & Corbin	7⅜
Butte & Balak	‡3 1/16
Calumet & Ariz	82¾
Calumet & Hecla	555
Centennial	22⅞
Con. Mercur	‡.03
Copper Range	60⅜
Daly West	‡5
East Butte	14
Franklin	11½
Granby	57
Hancock	28½
Hedley Gold	19⅞
Helvetia	1
Indiana	18½
Island Cr'k, com.	55
Island Cr'k, pfd.	‡91
Isle Royale	36¼
Keweenaw	1¾
Lake	36
La Salle	6½
Mass	7
Michigan	‡2½
Mohawk	‡60⅞
New Arcadian	‡4½
New Idria Quick.	‡6⅞
North Butte	34½
North Lake	5¾
Ojibway	‡4
Old Dominion	60¼
Osceola	‡118
Quincy	92½
Shannon	16¾
Shattuck-Ariz.	20½
Superior	47½
Superior & Bost.	1⅞
Tamarack	43
Trinity	‡6¼
Tuolumne	2 15/16
U. S. Smelting	45¾
U. S. Smelt'g, pf.	50
Utah Apex	2¼
Utah Con	12
Victoria	‡3
Winona	‡5¼
Wolverine	107
Wyandot	2

BOSTON CURB Aug. 27

Name of Comp.	Last
Bingham Mines	3 9/16
Boston Ely	1 1/16
Boswyocolo	.02
Butte Central	7 5/16
Cactus	11
Calaveras	2⅞
Chief Cons	1 15/16
Corbin	.90
Cortez	1
Crown Reserve	3¼
First Nat. Cop.	2 1/16
Majestic	¼
Mazatan	‡¼
Moneta Porc	‡.05
Nevada-Douglas	3¼
New Baltic	2½
Oneco	1¾
Raven Copper	.29
Rhode Island Coal	18
San Antonio	‡3
S. W. Miami	6
South Lake	9½
Trethewey	.40
United Verde Ext.	.37
Vulture	‡5

‡Last quotation

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres ROB'T MCKEAN, Secy
505 Pearl St., New York

Monadnock Bldg., Chicago
6 Bouverie Street, London E C
Unter den Linden 71—Berlin, N W 7

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94. SEPTEMBER 7, 1912 No. 10

A Movement in Silver

Silver is now selling at the highest price reported since 1907, the recent advances having been due in part to speculative activity, and in part to an actual demand for the metal from India, and to the probable increase in the demand for China. The speculative activity has been based largely on the belief that the Indian Government would soon be obliged to buy largely for coinage purposes, the reserve of silver rupees having been drawn down to a point which seemed low in view of the probable demand for money to pay for the good crops of the present year.

This anticipation has proved to be correct, but the result has not been altogether pleasing to the powerful group of Eastern speculators which has been carrying heavy stocks of silver in London and in India for some time. It now appears that the Indian Government, with unusual shrewdness, had been anticipating its needs and had been buying silver quietly on the open market for some time. There were some suspicions as to its action, but the fact was not fully known or accepted until a week ago, when the steamers to Bombay and Calcutta carried out shipments amounting to £750,000—about 6,050,000 oz.—on government account. It is understood in London also that further large shipments will be made soon. This movement has caused some surprise, but it has entirely frustrated an attempt by the Indian speculators to corner the market and force the government to pay a high price for the silver it needed.

There need be no surprise at the action of the India Council, since the supplies of silver on the market have been sufficient for all needs. It is evident that the government had no difficulty in buying all it needed without outside assistance. The only surprising point is that the purchases were carried out so quietly, and that there was no leakage of information, for which the Indian syndicate was so anxious.

What is to become of the heavy stocks carried by the Syndicate is rather an interesting problem. The supply of the metal is larger than any speculative group can gather in, as has been shown by the result, and it is likely to be increased by the fact that Chinese banks are just now inclined to be sellers rather than buyers. It looks very much as if the Syndicate would suffer, now that it has missed the point for which it has waited so long.

Alarm in Sonora

The most alarming news of the Mexican insurrection, in so far as American mining interests are concerned, has come during the last week from northern Sonora, where three important mining places have been involved. El Tigre was threatened, but the attack was averted by the determined show of resistance by the Americans there. Guerrilla fighting has been going on in the vicinity of Nacozari, and the situation at Cananea, with which communication has been cut off, is described as grave. The trouble in this part of Mexico arises from the marauding of remnants of Orozco's army, which in bands of some hundreds each are scouring the country for plunder like some bandit parties of earlier days in Mexico. About the only difference now is that there are more of them, but of political purpose there is no more now than then. Having exhausted the resources of the native ranches, they now look with cupidity upon the possessions of American miners and will take them if they dare.

It is chiefly a question of the number of Americans at any one place to resist. These Americans may have nothing whereof to complain to this country, having gone into Mexico with the knowledge that they were entrusting their lives and money to the conditions of a turbulent, foreign land, but, of course, they have the sympathy of us all and they are so near the border that it is easily conceivable that armed assistance may be rendered and that international complications may easily arise. The events at Cananea a few years ago, when volunteers from Arizona rushed to the scene, are fresh in mind.

Competition in Sulphur

The success of the plans to operate a sulphur-bearing "dome" on the Texas coast, about 40 miles southwest of Galveston, will alter the unique position that the Union Sulphur Co. has occupied for about 10 years in the sulphur industry of this country. The geologic features surrounding the Texas deposit are supposed to be almost identical with those at Sulphur, La., and while lying at greater depth, the Bryan Heights dome owned by the Freeport Sulphur Co., has the advantage of being nearer to tidewater and of having a larger sulphur-bearing area, which careful drilling has indicated to contain a deposit of sulphur running into millions of tons. A production from this property at the rate of the present Louisiana output would be likely to disturb the market for this mineral.

The Freeport Sulphur Co. is now completing its initial plant on Bryan Heights, but it must still demonstrate that it can use the Frasch process, both physically and legally. This process, though simple in principle, required the solution of important practical details to make it an operating success. However, with the capital and brains behind the Texas enterprise, there seems little doubt that all legal and operating difficulties will be eventually solved.

Since 1903, the Union Sulphur Co. has had the American field practically to itself and has enabled Mr. Frasch to reap a richly deserved reward, the price of sulphur having been maintained at about the former figures of $20@22 per ton by agreement with the Italian *consorzio*, which desired to protect the Sicilian miners from an invasion of American sulphur in Europe.

The Texas company may experience a period full of the initial difficulties incident to any new operation but, assuming that it will not be required to pay royalty for the use of the Frasch process, there would seem to be little doubt of the ability of the Freeport Sulphur Co. to compete in the open market with the Louisiana producer.

These two companies will, on the basis of present estimates, be able to supply more than the present requirements of the American market. The question then arises as to whether a price war will ensue or whether the two interests will come to an amicable agreement as to how the market shall be distributed and extended.

Assuming commercial competition between the two companies, the Texas operation will have a far-reaching effect upon the sulphur industry, both directly and indirectly; directly, in the possibility of reduced prices for sulphur and its more extended use in the industries; indirectly, the new operation will be a stimulus to the exploration of other domes of the Gulf Coastal Plain, and even though the present operation should not be competitive, the development of other deposits will eventually bring the production of sulphur to a competitive basis. Just now the world seems much interested in sulphur; the daily press, even, has during the last few months been full of announcements of sulphur explorations in various countries. Important changes are undoubtedly in prospect in this industry, but the development, equipment and marketing of a large tonnage of sulphur is not an operation that may be instituted at short notice nor undertaken with small capital.

A Field for Improvement

The wide application of the cyanide process has naturally had a strong tendency toward improvement of details of procedure. Almost every operation connected with the process has had the attention of specialists bent on bettering every detail of the work. In spite of all this effort there still remains one detail that has resisted the efforts of improvers. We refer to the melting of the precipitate, the final step in the process of putting into the form of bullion the metals contained in the ores. The method of melting the precipitate differs, at the present time, very little from what was used in the first mills built for cyaniding.

Variations have been proposed and some of them have been tried sufficiently to justify the claims made for them. A noteworthy example is the treatment devised some years ago by P. S. Taverner, of South Africa. In this process the precipitate is melted in a reverberatory furnace with litharge, the result being a lead bullion carrying the precious metals. This bullion is subsequently cupelled in an appropriate furnace, leaving a clean, high-grade product. The process is, in fact, a magnified assay. The method indicated that great savings were possible, yet one hears little of the process now. The tilting, oil-fired furnace is a development of recent years, but users now are claiming that it offers no advantages either in cost or ease of manipulation. The electric furnace seems to have worked well at Lluvia de Oro, but few mines are so favorably situated with respect to cheap and excessive electric power.

The operation is crying for improvement, a statement that may be proved by questioning anyone in charge of such work. The physical hardship of working about the hot, inconvenient furnace now in use, is evident to anyone acquainted with cyaniding. Beside, the operation is wasteful, unduly protracted and costly. The field is open and an improvement will be welcomed.

The Lead Market

With lead selling in Europe in the neighborhood of 4.50c. per lb. and in New York at about the same price, we experienced a condition that has not previously prevailed for many decades. No wonder the leading American interests had to raise their price. If they hadn't, the pesky foreigners might have been buying some of our lead.

The reason for the remarkable rise in Europe is undoubtedly to be found in an excellent demand and a halting supply. No noteworthy new sources of lead have been developed in a long time, while the consumption of lead is increasing constantly.

The present condition of the markets may convince American lead miners that a reduction of the tariff on lead may not be such a dreadful thing after all, but probably it will not alter their demand for its maintenance, because even if the European price should continue to run close to the American, the tariff will always exclude the foreign product, while we shall be free to export the domestic when we want to get rid of a surplus, just as in the case of spelter.

The stock of the Alaska Gold Mines Co. recently offered to the public was greatly over subscribed, showing that there is plenty of money available for mining issues in which there is confidence.

By the Way

Commenting on the "sootability" of Pittsburgh, *Graphite* says that 40% of the dust in that city is soot, and that its citizens wear plain black soots, with stripes when it rains.

Melting cyanide precipitate is not a pleasant occupation at best, but some ways of doing it are more unpleasant than others. One operator refers to the oil-fired furnace as an "all-fired" nuisance.

Prof. Henry M. Howe, in welcoming the delegates to the International Congress of Testing Materials, addressed the representatives of each country separately, first greeting the Germans and Frenchmen in a few words in their own anguages. When he came to Russia, Scandinavia, and the Oriental nations, ie returned to English, but the delegates rom Hungary, Italy, and Spain were velcomed in their respective tongues.

Sept. 4 was the thirtieth anniversary f the beginning of commercial incan- escent lighting. On Sept. 4, 1882, Thomas . Edison started in operation the world's rst central station. At three o'clock in ie afternoon, in an old brick building, converted warehouse, in lower Pearl t., New York, steam was turned into a ingle dynamo and current was sent rough underground cables into about 00 lamps distributed throughout a ter- tory of a square mile, bounded by Wall, pruce and Nassau Streets, and the East iver.

The remarkable industrial expansion Germany has been partly responsible r the great consumptive demand for the etals, but there are signs that there may a check to this. Capital is undoubt- lly under a great strain in Germany d there are fears that an unpleasant terruption may be impending. Words warning have been uttered by such au- orities as the presidents of the Reichs- nk and of the Deutsche Bank. Many rsons in Germany are regarding these cassandran or merely amusing, but om this distance they will be regarded th due seriousnes, especially as it is own privately that the situation in ermany is viewed with concern among ancial circles.

"In my youthful days," said a dis- guished mining engineer, "I wrote borate and lengthy reports, of which vas very proud. Some of them were cellent treatises on engineering sub- ts. But my pride had a fall when I nd that my clients never read them. s developed during one of the usual erviews when I was asked to sum- rize verbally my opinions. At the ie time I learned that all they wanted know was how much the mine could per annum, how long it could pay what it was worth. I thought they ht to want to know more, but ap- ciated that they didn't and ever afterward I governed myself accordingly." However, we do not think this is properly to be taken as advice. The engineer will best write a report in "telegraphese" for his clients and a full report for the information and criticism of other engineers if necessary.

A wireless-telegraph equipment capable of sending messages 2500 miles is being shipped to Fort Egbert, Alaska, by the United States Signal Service. This will be a 10-kw. set, one of the longest range wireless sets in use by the Government, and will be shipped in duplicate so that no serious interruptions to service will occur from the breakage of any part that could not be quickly replaced in the Alaskan wilds. Fort Egbert is at Eagle City near the head waters of the Yukon on the eastern boundary. There are other long-distance wireless stations at Fort Gibbon in central Alaska where the Tanana joins the Yukon, and at St. Michaels on the western coast, so that wireless communication will be possible at all times across the territory. The Homestake mine, in South Dakota, as well as some others, has wireless apparatus in use and an installation was, we understand, at one time considered at the Lucky Tigre mine in Sonora. With the distressing conditions now prevailing in Sonora, wireless sets at El Tigre, Nacozari, Cananea and other camps would be of great service in communicating the actual conditions to anxious friends.

Russian labor has been a subject much to the fore among engineers who have to do with operations in that country. The assassination of Horace H. Emerich at Kyshtim and the disturbing conditions at Lena Goldfields have caused many mine managers elsewhere to be quite satisfied with their operating conditions. That there is some docile and efficient labor in the Tsar's domain, however, is evidenced in a letter written by John Power Hutchins, who reports some remarkably cheap hand-washing of gravel in the Trans-Baikal country. Mr. Hutchins has just finished a series of examinations for the Cabinet of the Tsar in the Nertchinsk region, and sends a view of a typical gravel-washing plant in which the gravel is hand-loaded into horse carts and hauled to the plant. The coarse tailing is hauled away by other carts, and the fine tailing washed away by water in some plants, but in others it also is hauled to the dump by carts. "Not much chance here for dredges," remarks Mr. Hutchins, "with labor at 50 to 75c. per day, the total working cost is often only 30c. per cu.yd. in frozen ground."

And now a mining stock is to be dragged into the mire of the police-gambling scandal of New York. A youth, according to the *Times*, approached Lieutenant Becker's wife with a request for $260 and a letter containing an offer of valuable information and a mining-stock certificate which was to be collateral for the money advanced. The letter read: "Dear Mrs. Becker: Am unable to meet you today, but am sending a messenger to whom you can give the money. I am being followed and can't be too careful. I am inclosing a stock certificate of the Tonopah Mining Company which you can hold as collateral. Will bring two people to see you tomorrow evening at 8.10 p.m. I need the money badly—very badly—in order to carry out my plans. Do not lose the stock certificate as it is very valuable. A friend in haste. * * * P. S.—These two people have something on Jack Rose which will be of great help to you in your trouble. (Signed) J. H. W." As a matter of fact, the stock certificate inclosed was for 500 shares of Tonopah Gold Mountain Mining Co.'s stock made out in the name of R. B. Frisbie. We believe there was such a company once, but the young man must have spoken truly when he wrote that he needed "the money badly—very badly."

Brokerage houses continue to be large holders of copper shares. The Boston *News Bureau* publishes a list of the largest shareholders in several Lake Superior companies on Dec. 31, 1911, from which the following are taken: In Hancock Consolidated Mining Co.: Paine, Webber & Co., 23,620 shares; St. Mary's Mineral Land Co., 20,000; John D. Ryan, 4750; Hornblower & Weeks, 3825; C. D. Autremont, Jr., Duluth, 2000; W. A. Paine, Boston, 2000; E. Ryan & Co., Calumet, 1900; Fitzgerald, Hubbard & Co., 1840; R. L. Day & Co., 1360; W. H. Thurston, Boston, 1285; Joseph Hoatson, Calumet, 1100; P. Roberts, Calumet, 1050; R. F. Berton, New York, 1000; C. A. Congdon, Duluth, 1000; W. E. Corey, New York, 1000; C. Head & Co., 1000; H. Oliver, Pittsburgh, 1000; C. J. Paine, Boston, 1000; G. E. Tenor, Pittsburgh, 1000; Hayden, Stone & Co., 980; N. F. Leopold, Chicago, 900; J. D. Cuddihy, Calumet, 637; J. L. Harris, Hancock, 600; C. D. Fraser, New York, 550; U. S. Trust Co., New York, 500. In Centennial Copper Co.: Calumet & Hecla, 43,440 shares; Paine, Webber & Co., 3806; C. E. Morey, trustee, Boston, 1200; Jackson & Curtis, 1110; Tucker, Hayes & Co., 1105; C. Briggs, Calumet, 1000; Lee, Higginson & Co., 895; Estabrook & Co., 850; J. R. Williston & Co., 790; Hayden, Stone & Co., 730; Hornblower & Weeks, 640; Fitzgerald, Hubbard & Co., 615; Parker-Morse Co., 610; E. W. Sparrow, New York, 600; Pearmain & Brooks, 565; Daniell Investment Co., Laurium, 550; Parkinson & Burr, 506; D. Hodgson, Montreal, 500; E. A. Kimball, Lynn, 500; F. H. Rice, Boston, 500; C. M. Turner, Lansing, 500 shares.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Byproduct Coke Ovens

A list of byproduct coke ovens operating in the United States on Jan. 1, 1910, was given in the JOURNAL of Mar. 9, 1912, which I brought up to Jan. 1, 1911, in a letter in the JOURNAL of Apr. 20, 1912. It is now possible to revise this list to Jan. 1, 1912.

In addition to the list previously given, *Koppers* ovens have been erected at Joliet, Ill., by the Coal Products Manufacturing Co.; *Semet-Solvay* at Waukegan, Ill., by the North Shore Gas Co.; and at Cleveland, Ohio, by the Cleveland Furnace Co.; *United Otto* at Wyandotte, Mich., by the Michigan Alkali Co., and at Hamilton, Ohio, by the Hamilton Otto Coke Co.

These additional names I take from one of the Geological Survey bulletins.

H. J. MARTIN.

New York, Aug. 21, 1912.

Food Supplies for Miners

Prospecting extremely tight placer gravels at Las Quebradas, Guatemala, with an Empire drill, proved to be such heavy work that the native Guatemaltekan was utterly unequal to the task. Only the strongest American, Jamaican and Martinique negroes lasted more than a few weeks. To get and keep this class of labor, in an isolated camp, away from the attractions of the neighboring banana farms, it was necessary to offer better inducements than could be obtained elsewhere in the country. High wages proved to be little or no attraction as they only meant a few minutes longer in the gambling houses on pay day. After numerous experiments the mess was reorganized and the menu made to conform as far as possible to lines suggested by the men themselves.

The result of 14 weeks' operation, ending July 1, feeding on the average of 30 men, follows; the amounts given are the weekly consumption per man. Black beans, 1.4 lb.; plantain, 3 lb., approximately; ground provisions (sweet potatoes, cassava, etc.), 3 lb.; lard, 0.5 lb.; flour, 5.0 lb.; rice, 2.1 lb.; sugar, 1.3 lb.; coffee, 0.3 lb.; salt, 1.0 lb.; baking powder, 0.17 lb.; meat (beef), 10 to 15 lb. The meat is taken at live weight and much of the salt was used in preserving it. Immediately after killing the beef was cut from the bone, in long strips about 1¼ to 2 in. wide and ½ in. thick, and placed in strong brine. After about two days it was hung on ropes in the sun and thoroughly dried, in this way the meat was kept as desired.

The unusually large proportion of beef may surprise the average North American who regards meat as a food to be eaten sparingly in the tropics. No bad effects were noted from its use, and on the contrary as soon as the news that all the meat desired was provided, no more trouble was experienced in getting and holding men. The local cost of live beef was between 3 and 4c. per pound. Circumstances forced the use of baking powder, which could be eliminated if yeast were available.

It is probable that the consumption of food per man would have been somewhat reduced had the operations extended over a longer period and a suitable, steady force of men picked out, as it was very apparent that when a man had been in camp for a few weeks and had been "fed up" his appetite approached the normal.

H. L. CARR.

New York, Sept. 3, 1912.

Cyaniding Troubles and Remedies

I have read with interest the article by Herbert A. Megraw on "Cyaniding Troubles and Remedies," in the JOURNAL for Aug. 17, 1912, and would respectfully call attention to a printer's error on page 311, third column, seventh line, where the word "cyanides" has been used in place of "cyanicides."

In the same column there is a statement which is puzzling me. It is as follows: "Where the whole product is reduced to such a point that it may be treated as a slime, that is, making a total slime product, the whole reducing system of operation must be carried out in water."

There must be an error of some kind in this statement or it must be capable of a different interpretation from the one I put on it, for in this camp and Pachuca, not to speak of others, I can mention a large number of mills that are treating an all-slime product and crushing and doing all the work of reduction in cyanide solution.

C. E. RHODES.

El Oro, Mexico, Aug. 24, 1912.

I have noted with interest the remarks of C. E. Rhodes with reference to my article in the JOURNAL of Aug. 17, 1912. In regard to the apparently untrue statement to which attention is called, I would like to say that this sentence was not intended to be read alone, but depends upon the general surrounding text, and in particular upon the preceding sentence where I said: "Grinding in water has some disadvantages which must be taken into account when such practice is under consideration."

The following sentence was intended to refer only to cases where part of the reducing operations were carried out in water, the conclusion being that in this case, all the grinding must be done in water. Perhaps it would have been better had I said that where it is necessary to carry out a portion of the grinding in water it would be impracticable to regrind in solution. In view of the fact that regrinding is necessary for making a total slime product, that statement would have covered the ground.

I wish to thank Mr. Rhodes for calling attention to this matter and giving me the opportunity of clearing up a point upon which there may have been some misunderstanding.

H. A. MEGRAW.

New York, Aug. 30, 1912.

The Ton

I think E. W. Parker has misconstrued my letter in the JOURNAL of July 6. I am aware, as he states in the JOURNAL of Aug. 3, that in many industries the usual weights are in long tons. But personally I do not think it always true, that "whatever is, is right." Mr. Parker, as statistician in charge, should know better than anyone else the time spent in converting 227,513,809 lb. into long tons, or in adding 432,132 lb. to 423 long tons, 5 cwt. 6 lb., or in a number of other problems which may present themselves.

What I meant to imply in my former letter, is that we have broken away from £, s. and d., and that it might be well for the Geological Survey to throw its influence, which is certainly of very great weight, on the side of a rational ton of 2000 lb. for everything. It has, as I implied before, struck me that the use of the long ton is increasing. The disadvantages are obvious. Isn't it up to the Geological Survey to do something to rationalize our measures, even if Maryland, surrounding Washington on three sides, does choose to legalize the long ton?

AMERICAN.

Chicago, Ill., Aug. 20, 1912.

Lake Superior Institute Meeting

Special Correspondence

At the seventeenth annual meeting of the Lake Superior Mining Institute held at Houghton, Mich., papers on mine safety, concrete shaft construction, rock-house practice, and copper-mining problems from a geologic standpoint were read. Excursions were made to near-by copper mines where features of the surface equipment were studied.

The seventeenth annual meeting of the Lake Superior Mining Institute, held in Houghton, Mich. and the copper country on Aug. 28, 29 and 30, 1912, was well attended and was probably one of the most instructive ever held. At this meeting many excellent papers were delivered and a notable interest was displayed by the members in the discussion that followed.

MICHIGAN SMELTERY VISITED

The work of the institute began Wednesday with an excursion to the Michigan smeltery, where Copper Range, Mohawk and Wolverine ores are treated. There the smelting practice was briefly studied and the pouring of the copper and the casting of it by a Walker machine was watched.

From the Michigan smeltery the train proceeded to the Copper Range mines. First the Nordberg four-stage compressor at Painesdale was inspected. This is said to be one of the most economical compressors in the world. Steam at 250-lb. pressure is used, as the 350-lb. boiler pressure planned in its design was too much of a strain on the boilers to be withstood efficiently. After the steam plant was inspected, the party visited the machine and blacksmith shops, where the method of handling and sharpening the drills attracted attention. A few members were well enough posted to go to the master mechanic's office to see how the drawings and specifications were filed, shop patterns kept track of, and the blueprint system of ordering followed out. The details of the practice at this shop are fine indeed, and the shop worthy of extended study.

From the Champion property the train went to the Baltic mine where the rock-house practice and the method of changing the skips, loading stulls 14 ft. or so long and from 15 to 24 in. in diameter, were seen, and the general layout of the shaft house studied. The change house was also visited.

In the evening after a short address by the president, F. W. Denton, in which he referred to the general conditions of the industry in the Lake Superior districts, the institute began the consideration of the different papers prepared for the meeting. The members and guests were all supplied with advance copies, and the writers of a paper merely had to introduce the discussion by giving a synopsis of the paper.

SAFETY INSPECTION AT CLEVELAND-CLIFFS

The paper by William Conibear on the "System of Safety Inspection of the Cleveland-Cliffs Iron Co.," brought out a lively discussion. The important part of the system is the way that the inspector is made to watch the bosses and men, and the men and bosses in turn to watch the inspector. It is not so much the installation of safety appliances that promotes safety, but the enforcement of rules made possible by close inspection. Already a reduction of 20% in the number of serious accidents has resulted. Mr. Duncan says that a study of the records of the Cleveland-Cliffs company for many years shows that only 4% of the accidents would have been prevented by the safety appliances since installed.

GOOD FIELD FOR PROSPECTING

Dr. Alfred C. Lane, former state geologist of Michigan and professor of geology at Tufts College, then read a paper on "The Unexplored Parts of the Copper Range of Keweenaw Point." He noted how few of the possible carriers of copper in the region had been prospected. He called attention to the fact that almost all the prospecting so far had been where it would be cheapest, in the regions where the covering of glacial drift was thin, but that genetically there was no reason why more copper should occur under such areas than under other areas of the series more deeply and completely covered.

He also called attention to the fact that the effect of cross fissures on the mineralization had as yet received little attention in the copper country. He gave expression to an observation that has been noted by others to apply to other classes of copper deposits, that the copper is often found in the places of sluggish circulation rather than in the open fissures and that such a fact must be borne in mind when prospecting the cross fissures. Doctor Lane then noted certain parts of the region especially worthy of prospecting and, in closing, expressed the opinion that the future of the copper peninsula was as promising as at any time in the past for the finding of large bodies of copper, only the prospecting would be more costly and tedious.

The next paper was the one read by Dr. L. L. Hubbard on "Foot-wall Shafts in Lake Superior Copper Mines." This was an interesting paper on the proper placing of the shaft. Doctor Hubbard's main argument was the loss of profit on ore tied up in shaft pillars. Figures were given showing the profit resulting from the releasing of this tonnage. The discussion of the paper was interesting. Mr. Lawton was called on for his opinion on foot-wall shafts as gained by experience in the Quincy mine near-by. He and Professor Sperr then got into a discussion as to whether the leaving of ore over a foot-wall shaft was advisable or not. Mr. Sperr apparently has some reason with him when he maintains that the leaving of the ore pillar over the shaft concentrates the weight there. The truth is that local conditions control this placing of the shaft entirely. It is the failure to recognize certain fundamentals of mining that made so apropos the words with which the president, Mr. Denton, closed this interesting discussion: "It is evident that the safe place for a shaft is yet to be found."

H. T. Mercer briefly outlined his paper on "Some Applications of Concrete Underground." This paper called forth some discussion and the meeting closed, Edwin N. Cory's article on "Raising Shaft at Rolling Mill Mine" being read by title only.

Thursday morning a special train took the institute to the Calumet & Hecla mill, at Lake Linden, where the power plant, mill, pump house and regrinding plant were visited. There the visitors had a chance to see much large machinery and to observe how fine much of the metallic copper was in the conglomerate ores and the reason that fine grinding was so necessary to get the last of it. The members also had an opportunity to observe the Woodbury jig in action, the Calumet & Hecla installation of this jig being the most important one in the world. In the fine-grinding plant the different fine-grinding devices could be seen, these being largely chilean mills with one conical and one regulation tube mill being tested against them. The conical mill, I understand, is as promising as any of them. A notable feature was the large wheels for handling the tailing.

CONCRETE SHAFT SETS AT AHMEEK

From Lake Linden the special went to the Ahmeek mine, where the rock-house practice was observed and the manner of making the concrete "timber" sets used in the shafts of that property was noted. It was an excellent idea of the management to have a complete shaft set put up and bolted together on surface where it could be observed carefully. The caps are divided in half, so that they weigh about 1000 lb. each. Three men are able to lift them in place. Once in place, the whole set, after being bolted and bound together, is secured to the walls of the shaft by concreting the space between the set and the walls of the shaft. Concrete slabs are used for the lagging. A fireproof shaft is thus obtained. The first cost of the concrete sets is less than that of timbers at Ahmeek, but I doubt whether they cost less in place. At Ahmeek a train of cars loaded with mass copper, two pieces of which weighed over ten tons each, was standing on the tracks ready to go to the smelter. The size of the masses was notable, although, of course, not ranking with the one recently found in one of the Copper Range mines.

Descending Skip Used to Compress Air

From Ahmeek the excursionists went to Electric Park, where luncheon was served. From there the visitors were taken to the Franklin Junior property, where the new style of hoist, devised by Mr. Edwards, the manager of the property, and worked out as to details by Mr. Nordberg, was observed. With this device, the hoisting is done with one unbalanced skip. In lowering, the hoist is made to act as a compressor and pump air into a receiver, thus breaking the skip in its descent. With this air the load is returned about 700 ft., or about one-fifth the depth of the hoisting shaft, which is 3300 ft.; owing to the unbalanced weight of the cable, which is 1½ in. in diameter, this represents about one-third of the work. When the pressure has fallen in the receiver to 80 lb., a valve opens in the steam pipe leading from the boilers to the receivers, and the rest of the trip is completed, running on a mixture of air and steam. The system works well, but as yet the efficiency has not been tested.

The skip holds 10 tons, having a capacity of 223 cu.ft. and weighs about 7 tons, making it the largest in the world. After viewing the boilers and engines, the skip was studied as to construction and the ore house visited. A notable point in the rock house was the abruptness of the dump tracks, which rise almost vertically from the tracks, which dip at about 47 degrees.

The speaker of the Thursday evening meeting was Dr. J. A. Holmes, of the Bureau of Mines. He outlined the purposes of the bureau and its aims, stating that information gathered by it was treated confidentially and given forth in such a way as to aid the mining public and yet not injure the individual mining companies. The two aims were to eliminate unnecessary waste and protect the lives of men following mining. His address was well received and greatly applauded.

Friday Session

Friday morning the rest of the papers of the meeting were taken up at the Michigan School of Mines. E. B. Wilson, editor of *Mines and Minerals*, read an article on "Mine Sanitation," which led to some discussion. Then the papers of T. C. De Soller and H. T. Mercer on "Rock-House Practice" were read by title, as was that of Edward Koepel, on the "Intakes at the Champion and Trimountain Mills." "The New Franklin Hoist," a brief description prepared by R. H. Corbett to enable the members to understand the workings of this innovation which they visited at the Franklin shaft, also was read by title, as was F. W. Sperr's paper on methods of mining iron ore. O. P. Hood outlined his paper on "Balancing Rock Crushers."

Dr. L. L. Hubbard then gave a resumé of his paper on the influence of the thickness and contour of the foot-wall beds on the mineralization of the copper-country lodes. In this paper he emphasized the importance of fracturing and open spaces due to crushing rather than blowholes in the genesis of the ore, assigning to the amygdules or blow holes, as their main function in the mineralization, the important feature of determining the lines of weakness along which the flows failed, so as to allow entrance of the mineralizers. His studies in the district led him to think that the mineralization, at least as far as the precipitation of the copper is concerned, is due mainly to reduction of pressure caused by the slipping and crushing of the rock along these lines of weakness. Then Doctor Hubbard outlined his views on the importance of the ancient topography upon the mineralization, especially in the Ojibway. It is an original idea, to which Doctor Lane took exception.

Prof. F. W. Sperr outlined, by means of drawings and a model, the ease with which it was possible to lose the lode in the Lake Superior mines if the fracture was not closely studied. Doctor Hubbard called attention to the possibility of detecting the direction of movement along fault planes by rubbing a pencil over a paper placed on its surface, so as to accentuate the visibility of the scratches on the walls of the slip.

After the reading of the resolutions on the death of Graham Pope, a former president of the institute, the meeting closed with the reading of committee reports and the election of officers and new members. The increasing importance of this institute is well shown by the fact that it shows a gain of over 10% in membership this year. The officers chosen to serve during the ensuing year are as follows: President, Penticost Mitchell, Duluth, vice-president of the Oliver Iron Mining Co. Vice-presidents, W. P. Chinn, McKinley, Minn., of Pickands, Mather & Co.; Francis Webb, Gilbert, general manager of mines of Republic Iron & Steel Co. in Lake Superior district; R. E. Edwards, of the Atlantic mine. Managers, Charles H. Baxter, Loretto; W. H. Johnston, Ishpeming; G. S. Barber, Bessemer. Secretary, A. J. Yungbluth, Ishpeming. Treasurer, E. W. Hopkins, Commonwealth. The 1913 meeting of the institute will be held on the Mesabi Range.

August Mining Dividends

Mining dividends paid by 21 United States mining companies in August amount to $1,643,544, disbursements by coal, iron, metallurgical and holding companies to $11,062,887, and by other North American mining companies to $763,441.

United States Mining Companies	Situation	Per Share	Total
Alaska Mexican, g.	Alas.	0.35	63,000
Alaska Treadwell, g	Alas.	0 75	150,000
Alaska United, g	Alas.	0.50	90,100
Bunker Hill, Con., g	Calif.	0.07½	10,000
Bunker Hill & Sull. ,l.s.	Ida.	0.20	65,400
Colo. Gold Dredging, g.....	Colo.	0.25	25,000
Fremont, g..........	Calif.	0.02	4,000
Frontier, z	Wis.	2.00	2,500
Golden Cycle, g.......	Colo.	0.02	30,000
Grand Central	Utah	0 05	25,000
Hecla...	Utah	0.02	20,000
Homestake, g	S.D.	0.50	109,200
Miami, c	Ariz.	0.50	332,470
Morning Star Con., g	Calif.	0.25	
Mohawk, c	Mich.	2.50	250 000
Parrot Silver & Cop., c	Mont.	0.15	34,477
Pittsburgh-Idaho, l..	Ida.	0.04	32,120
Tenessee, c	Tenn.	1.00	200,000
Tom Reed, g............	Ariz.	0.05	45,478
United, c	Wash.	0.01	10,000
United Verde, c	Ariz.	0.75	225,000
Wasp No. 2, g	S.D.	0.02	10,000
Yellow Pine, g.	Nev.	0.02	19,000

*Dissolution dividend.

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
Amalgamated Copper, c....	Mont.	1.00	1,538,879
Cambria Steel............	Penn.	0 62½	562,500
Greene-Cananea,.....	U.S.	0 25	618,828
Inter. Nickel, pfd..........	U.S.	1.50	133,689
Inter. Sm. & Ref. Co...	U.S.	2.00	200,000
Island Creek Coal, com....	U.S.	3 50	525,000
Jeff. & Clfd. C. & I., pf....		2 50	37,500
Lehigh Coal & Nav. Co..	U.S.	2 00	482,930
National Carbon, pf.......	U.S.	1 75	78,750
St. Mary's Min. Ld. Co....	Mich.	1 00	160,000
U. S. Steel, pfd...........	U.S.	1 75	6,304,919
Va.-Car. Chem., com.......	U.S.	1 50	419,886

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Amparo, g.s.	Mex.	0.03	60,000
Buffalo, s	Ont.	0.03	30,000
Conagas, s	Ont.	0 45	360,000
Crown Reserve, s	Ont.	0 05	88,441
Dominion Coal	N.S.	3.50	175,000
Standard Silver-Lead, s.l..	B.C.	0 02½	50,000

The increased price of copper is again shown in the dividend of the Mohawk Mining Co., which has increased its dividend from $1 to $2.50, although Tennessee's rate dropped 50c. from $1.50. Other than this there were no important changes during the month.

Mining dividends paid by United States mining companies making public reports amount to $36,226,119 for the first eight months of 1912, and for mining, metallurgical and allied companies, to $110,502,282.

Caving System in Chisholm District—I

By L. D. Davenport*

The method of developing the iron-ore mines of the Chisholm district of Minnesota is illustrated by a description of the development of a hypothetical mine but which is typical of the system employed on the Mesabi range.

The orebodies in the Chisholm district of Minnesota are large, shallow, trough-shaped deposits with no appreciable pitch locally. The ore itself is a soft, earthy hematite mixed with some limonite. It is, however, sufficiently compact so that small drifts will stand without timbering for several years.

In order to describe more clearly the methods of developing an underground mine, let us consider the Nels property, an imaginary 40-acre tract, which has been developed according to the methods used in this district. The "forty," like all others previous to development, has been explored by churn and diamond drills, cross-sections through the drill holes have been made, and from them top and bottom contour maps have been worked out.

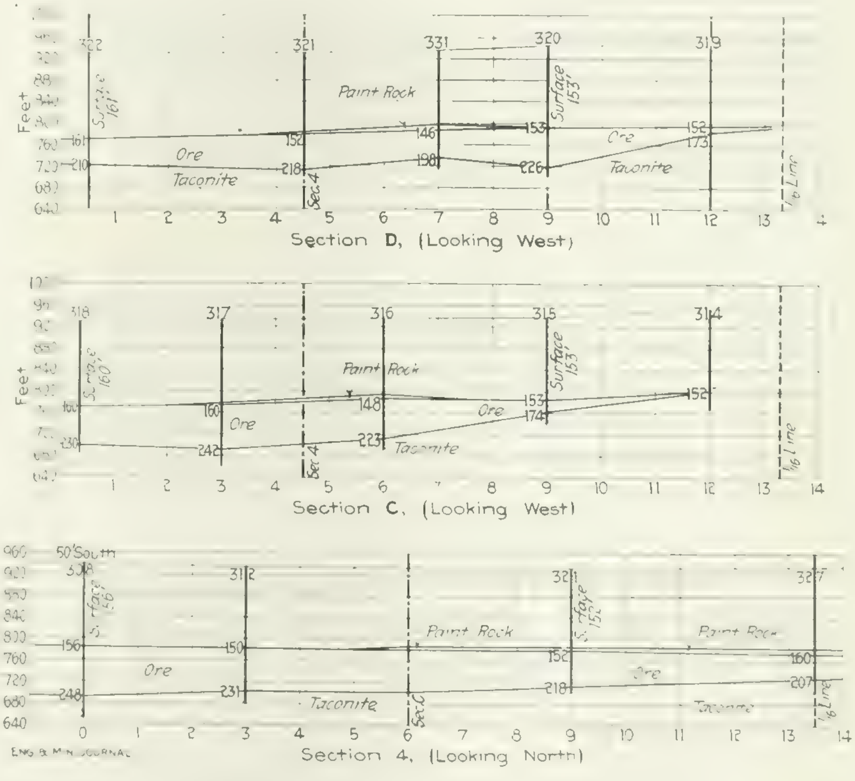
SHAFT PLACED WHERE ORE IS DEEPEST

These ore-contour maps show the orebody to be in a shallow trough running approximately east and west, the greatest depth being at the western end. Accordingly, the shaft was sunk at this end of the trough through the orebody to the taconite[1] below. It was placed in the deepest part of the ore, since in this position it drains the entire orebody and can be used for hoisting until the mine is completely worked out.

The shaft is vertical, 6x18 ft. inside, and has three compartments, two skipways, 5x6 ft., and a ladderway, 7x6 ft. The corner studdles, end pieces and wall plates are 12x12 in. square timber, and the center studdles and dividers are 6x12 in. The shaft sets are placed 5 ft. apart on centers, as is customary in good ground. Sollars are placed in the ladderway at 15-ft. intervals, and 16-ft. ladders are set between them.

In determining the site of the main tramming level, there are two principal points to be considered: First, it should be as near the bottom rock as possible, so that the greater part of the ore will be mined above it; second, it should be at such an elevation that with a grade of say 0.5% (or whatever is considered necessary for drainage and tramming), it will encounter the bottom rock at the point from which it is desired to handle ore from the levels above. Where the pitch of the formation is steep, it may be necessary to use two levels for tramming in order to hold close to the bottom rock and still cover the territory desired.

Having determined the elevation at which the main level is to start from the shaft, the next step is to cut in the station, pocket and pump room. Ordinarily, there should be 40 ft. of shaft below the main level, 20 ft. for the pocket, 10 ft. for the skip pit, and 10 ft. for the sump, although a sump does not necessarily have to be the full size of the shaft.



CROSS-SECTIONS OF THE NELS IRON MINE

Wherever possible, the pump room should be on the same elevation as the bottom of the pocket, so that the skip tender can also look after the pump, thus saving a man.

In the Nels mine, the station on the main level is 20 ft. long, 11 ft. high and 16 ft. wide. The top of the pocket is 11 ft. wide along the shaft, and extends back 16 ft., the full width of the station, where it drops vertically 3 ft. and then slopes to the shaft at a point 20 ft. below the level. The pump room is an 8x8-ft. drift extending south from the ladderway for 15 ft., the bottom being on the same elevation as the bottom of the pocket. The skip pit is sunk into the rock for 10 ft. below the bottom of the pocket, and a cushion of heavy timber is made for the skips to rest on. The sump is 6x6 ft., and is sunk in the ladderway 15 ft. below the skip pit.

TWO PARALLEL MAIN DRIFTS ARE DRIVEN

The main level was driven on a 0.5% grade starting at the shaft with an elevation of 712 ft. The accompanying map shows the two parallel drifts 10x9 ft. inside, running east, 90 ft. apart on centers. These two main drifts are connected at 150-ft. intervals with loop drifts 8x9 ft. inside.

The rock was encountered in the bottom of the north drift at about 1050 ft. east, and in the south drift at about 1160 ft. east. From these points east around the last loop, it was necessary to take up from 2 to 3 ft. of rock in the bottom, to maintain a uniform grade.

In some of the mines in this district, when a "horse" of taconite is encountered, it has been found cheaper to drive several hundred feet through solid rock, than to put in an incline from a higher level, and use a small steam hoist.

The two main drifts in the Nels mine were driven by two gangs of four men, two working day shift and two working night shift in each drift. The average rate of drifting was about 100 ft. per month. These gangs put in the open sets for the loops, and then continued the

*Oliver Iron Mining Co., Mesaba, Minn.

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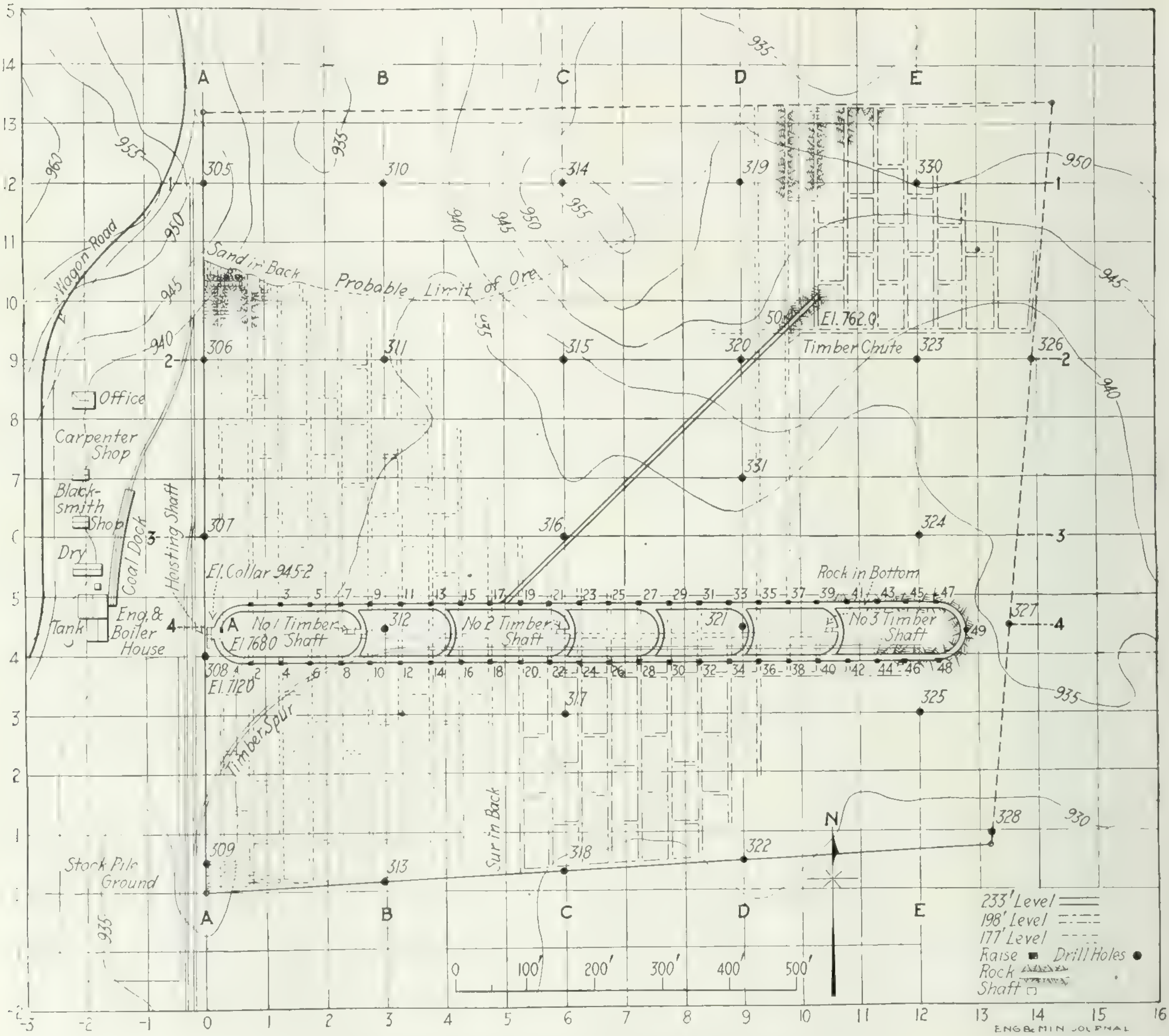
[1] A name proposed by Winchell for the cherty or jaspery, but at times calcareous or more or less quartzitic rock that incloses the soft hematites of the Mesabi Range in Minnesota.

straight drifts while the loops were put in by a third gang. As soon as the main-level drifts were 80 to 100 ft. away from the shaft, another gang started putting up raises, No. 1 and No. 2, etc. Plank chutes were built in the bottoms of these raises and fitted with iron stoppers or "quarter-pans." A fourth gang was started driving a 6x8-ft. drift for timber due east from the ladderway of the shaft, at an elevation of 768 ft., which was called the 177-ft. level, as determined from the cross-sections. This gang dumped their ore directly into the skip from the ladderway, until they struck the raise 16 ft. from the shaft, which was put up at the back of the station. This raise is planked up when it passes through the station, so that the ore from the sublevel runs directly into the pocket. As they drove east, they put in open sets for crosscuts, at 50-ft. intervals, which were later extended to intercept the raises from the main level. When the first gang on this sublevel had advanced sufficiently, more gangs were started driving the crosscuts, which were 6x7 ft., to the north and south.



Map of Nels Mine, an Ideal Iron-ore Property

Auxiliary Shafts Cut by Sinking and Raising

While the sublevel was being developed gangs on the surface were sinking the timber shafts through the surface to the top of the ore, putting in the timber as they went down. After the first loop was finished, a gang drove a drift from the center of the loop west into the pillar, and raised to meet the timber shaft which had been sunk through the surface. This raise was about 4x4 ft., which was trimmed to the full size, and timbered after holing through to the shaft. This No. 1 timber shaft is 6x6 ft. inside, and cribbed with round timber. Timber shafts No. 2 and No. 3 were put down in the same way. These two last are two-compartment shafts 6x9 ft. inside, having a 6x6-ft. timberway and a 2½x6-ft. ladderway timbered with regular 12x12-in. square timber sets, and 6x12-in. dividers, as in the hoisting shaft.

The cross-sections show a "horse" of taconite extending into the orebody from the east property line, leaving a narrow channel of ore which runs northeast through pits 316 and 320. Accordingly, a branch drift was turned off from the north tramming drift at about 500 ft. east, and driven northeast following this channel.

Drifts Are Driven Along Property Lines

This drift struck the bottom rock at 900 ft. east. A raise, No. 50, was then located directly north of raises No. 37 and No. 38 (on the main tramming drift) and extended to the capping. A 6x7-ft. drift was run east from the raise at an elevation of 762 ft. (determined from cross-sections), and crosscuts were turned off at 50-ft. intervals, to correspond to the development already begun on the south. A small drift was driven along the property line which, although not used for actual mining purposes, eliminated any chance of trespass on this sublevel. It is the usual practice to run small lease line drifts on each sublevel, before stoping is started, but when the slice drifts run parallel to the property line, it is not so necessary. For example, see drift north of raise *A*, where slicing has been started.

The timber drift on the 177-ft. level diven east from the shaft struck "paint rock" and soft slate in the back, at about 800 ft. east, but by cutting into this capping from 1 to 2 ft., the drift was extended to No. 3 timber shaft. The drifts north from raises *A*, No. 1 and No. 3, struck the shore line between 1000 and 1100 ft. north. The term "shore line" is used to denote the edge of the ore formation, where the ore pinches out between the capping and the bottom rock. The drifts south from raise No. 18 had surface in the back for the last 15 ft., and the drift south from raise No. 20 on the same level was cut off by the surface 100 ft. from the raise; therefore, gangs were started drifting south from raises No. 20 and No. 22, 12 ft. below the 177-ft. level, and the development was carried on toward the east, as shown by the map. The drift north from raise No. 37 on the 177-ft. level was used for a timber drift. All the timber required in the northeast corner of the mine on the 198-ft. level was brought up to this drift and dropped down the inclined timber chute to the level below.

Development Limited by Capping

On account of the dip of the capping, it was not possible to carry the development of the 177-ft. level farther east than the drift north of raise No. 37. The timber for the workings on the 198-ft. level on the south side was lowered down the raises No. 20, No. 22, etc., from the upper level. The east and west timber drifts connecting the shafts were timbered with regular drift sets, i.e., a cap and two posts to each set. These sets were placed either 5 or 7 ft. apart on centers, according to the ground, and 6- or 8-ft. lagging was used to steady the back. This drift and all others, which were to stand for several years, were carefully timbered to prevent their caving. The north and south drifts were timbered only as far as the raises, for beyond them the level would soon be mined out. Below the top level, it is necessary to timber all drifts to prevent their crushing on account of the weigh of the caved ground above.

There are a few general rules always followed in this district. Wherever possible the grade should not exceed 0.5%. All pillars should be 50 ft. from center to center of the slice drifts. All slice drifts should be directly below the corresponding drifts on the level above. The general surface lay-out is shown on the map. The arrangement of the mine buildings, tracks, etc., are typical of this district. The timber yards are over the pillar between the main tramming drifts, since this is the last part of the mine to be worked out.

(To be continued)

Normal and Reverse Faults

The data available for identifying reverse faults are few enough, and it is advisable that the greatest care should be taken in their observation, says Ernest K. Hall (*Aust. Min. Stand.*, June 13, 1912) in commenting on the indications that may be used for distinguishing normal and reverse faults.

In metal mines it is seldom possible to learn whether the country in the hanging wall of a fault has been raised or depressed, by matching unconformable rocks on each side of the fault. The country rock is often homogeneous, and even when unconformability exists, the section shown by the mine opening is so small that it rarely affords help. This evidence, however, amounts to absolute proof when it is obtainable, and is about the only evidence that could be called certain.

There are other indications which may serve as guides in the absence of certainty. A bending up of the hanging wall or bending down of the foot-wall selvage toward the bending plane in a normal fault and a converse bending in a reverse fault is one of these indications. This bending is sometimes seen on only one side of a fault and in many cases it does not appear on either. Sometimes the bending is so pronounced that it may change the dip or strike of an orebody and may be encountered before the existence of the fault is suspected.

Striæ on the walls of the fault plane are often present, especially when the walls are well defined. They are due to projections or loose stones between the moving surfaces. Definite grooves usually begin deep and narrow, becoming more shallow and wider as they progress. The sharp end points to the direction from which the dislocated rock has moved. This may be misleading if there has been more than one movement, as the later movement, although the lesser, will leave striæ indicating its own movement and confusing or obliterating the earlier and more important throw.

Fragments or boulders of ore occur in the fault channel and constitute a valuable clue. It may occur, however, that a reverse movement has left boulders in two directions, thus rendering the information of decidedly less value.

The majority of reverse faults dip at lower angles than 45° and the lower the angle of dip the more likely is the fault to be reverse. It is probable that the majority of faults dipping at less than 20° are reverse, and without strong evidence to the contrary it is well to assume that such is the case when laying out search work. On a mining field when a number of faults are known, the character of a newly cut movement plane may be more intelligently considered in the light of the known character of already studied faults.

The amount of brecciation is no accurate guide to the amount of throw of a fault, for while a large amount of débris undoubtedly shows much movement, still this movement may have been more or less compensatory in each direction, resulting in little throw together with a large amount of brecciation.

In searching for orebodies which have been moved by a fault it is recommended to cut entirely through the faulted zone and drive parallel with the fault plane in the solid country in the direction in which the orebody is supposed to lie. If the distance is great crosscuts may be run into the fault zone at convenient intervals in order to be sure of its presence and to investigate its character.

When several faults are present within a comparatively small area, it is usually true that there is one major fault and other subsidiary ones subject to the same governing characteristics in less degree. There may be a series of fault throws in one direction resulting in step faults. Where such faults occur in frequent steps there is little difficulty in picking up each one, but the operation may be so costly as to prevent the profitable exploitation of the deposit.

Railway Routes in Alaska

It is pointed out by the U. S. Geological Survey in an advance chapter from *Bull.* 520, "Mineral Resources of Alaska, 1911," that the full industrial development of inland Alaska can be brought about only by constructing railways to some of the open ports on the Pacific. The region which would be developed comprises about 200,000 square miles in central Alaska, or more than one-third the entire area of Alaska.

The three routes now in use for reaching Fairbanks, and other inland districts, are available for but four months of the year. Central Alaska has less than 300 miles of railway, not over 600 miles of wagon road and probably less than 1000 miles of trail. Three possible routes of approach for railways from the Pacific to central Alaska are indicated: (1) From Lynn Canal, by way of the Chilkat, Alsek, White and Tanana River basins; (2) by way of the Copper and Tanana basins; (3) by way of Kenai Peninsula and Susitna and Tanana River basins. Within these general zones there are several alternate routes.

Chronology of Mining for August, 1912

Aug. 1—An explosion of gas occurred in the colliery of the Washington-Wheatland Coal Co., at Wheatland, Ind., injuring five men, two fatally.

Aug. 2—A premature explosion on the 17th level of the "D" shaft of the Newport mine, at Ironwood, Mich., killed one miner and injured another.

Aug. 3—Festivities celebrating the centenary of the Krupp iron works at Essen begun.

Aug. 8—An explosion in the Lothringen colliery near Gerthe, Germany, killed 111 and injured 20 men.

Aug. 12—Announcement was made of the organization of the Alaska Gold Mines Co., to acquire control of the Alaska-Gastineau Mining Co., owning large, low-grade gold deposits near Juneau, Alaska.

Aug. 13—An explosion in the Abernant colliery, 28 miles from Birmingham, Ala., killed 37 men.

Aug. 27—Four miners were killed by blackdamp in the Frontier colliery, at Linden, Wis.

Aug. 29—The powder factory at Monte Chiari, near Brescia, Italy, where the explosive Imperialite was made, exploded, killing Marquis Imperiali, the inventor of the explosive.

Aug. 30—A wooden platform collapsed at a colliery at Gelsenkirchen, in Prussia, allowing six men to fall down the shaft, five of whom were instantly killed.

International Congress of Applied Chemistry

More than 500 chemists went from New York to Washington on Tuesday, Sept. 3, 1912, for the inaugural meeting of the eighth International Congress of Applied Chemistry, where they will be welcomed by President Taft. They will return on Thursday, Sept. 5, for the real business of the session.

Societies holding joint sessions with the International Congress of Applied Chemistry are: Society of Chemical Industry; American Chemical Society; American Electro-Chemical Society; Verein Deutscher Techniker; American Peat Society; International Association for Testing Materials; and American Institute of Mining Engineers.

The Chemists Club at 52 East Forty-first St. is headquarters for the visiting chemists and the annual meeting of the Society of Chemical Industry was held there Tuesday, Sept. 3. After President Mitchel, of the Board of Aldermen, had extended a welcome, the election was held, which resulted in the choice of Prof. Marston T. Bogert, of Columbia University, as president.

The society, which is of British origin, has had only three other American presidents, the last of whom was Acting-President Ira Remsen, of Johns Hopkins University. The society's medal was awarded by proxy to Sir William Crookes, the octogenarian chemist, whose name is associated with radium and X-ray investigations.

Some of the distinguished men in the field of applied chemistry who are attending the congress from abroad are Dr. Giacomo Ciamician, Bologna; Dr. Berthold Sassow, Leipzig; Etsuzo Yamamura, Tokio; Dr. F. Raschig, Ludwigshafen; Dr. Gabriel Bertrand, Paris; Dr. Samuel Eyde, Christiana; Dr. Carl Duisberg, Elberfeld, and William Henry Perkin, Manchester, England.

International Association for Testing Materials

The sixth triennial congress of the International Association for Testing Materials convened on Tuesday, Sept. 4, 1912, in the auditorium of the Engineering Societies Building, New York. About 600 engineers, representing 27 countries, registered before noon. Henry M. Howe presided, and speeches of welcome were made by Brig.-Gen. William H. Bixby, Chief of Engineers United States Army; Gov. John A. Dix; and Comptroller William A. Prendergast, of New York.

Some of the delegates are: Alfred Deinlein, Chief Engineer of the Austrian Ministry of Commerce; Ernest Reitler, Engineer and Inspector of the Austrian Royal State Railways; Emile T. Camerman, Chief Chemist of the Belgian State Railway Administration; P. Christophe, Chief Engineer of Bridges and Roads at Brussels; Herman Hubert, Belgian Inspector General of Mines; Louis Breda, Engineer in Chief of the Belgian State Railways; Dr. W. C. Unwin, president of the British Institution of Civil Engineers; Dr. Archibald Denny of the famous shipbuilding firm of Denny Bros. of Dumbarton, Scotland; Lieut. E. Rung, representing the Danish Ministry of War; M. Le Chatellier, Inspector General of Mines for France; M. Mesnager, French Chief Engineer of Mines; Profs. Gary, Heyn and Hinrichsen of the Royal Prussian Testing Bureau; Privy State Councillor Jaeger of the Prussian Ministry of Commerce and Trade; First Councillor of Construction Jahnke of the Prussian Railway Administration; J. Marx, president of the Hungarian State Railways; A. Fodor, Chief Engineer of the Hungarian Board of Public Works.

Prof. Modesto Panetti of the Royal Polytechnic School of Turin, Italy; Shohe Tanaka, Director of the Bureau of Experiments of the Japanese Government Railways; N. C. Ihlen, former Norwegian Minister of State; Gabriel Smith, Director of the Harbors of Norway; N. Belebubsky and S. Kareicha, Privy Councillors and professors in the Russian Institute of Engineers of Ways of Communication; Prof. Douchan Thonitch, Director of the Servian Institute for Testing Materials; Don Rudesindo Montoto y Barzal, Commander of Engineers of the Laboratory of Materials of the Corps of Engineers in Spain; Col. Augusto Larzabal of the Spanish Artillery; Prof. F. Schule of the Swiss Federal Technical High School, and John Oskar Roos of the Technical High School, Stockholm, Sweden.

Investigation of Alaska Coal Field

A Seattle dispatch states that 35 men from the U. S. Bureau of Mines sailed for Alaska on Sept. 2, 1912, to investigate the value, extent and availability of the Bering River coalfields for the use of naval vessels. The weather conditions in Alaska at this time of year are decidedly unfavorable, with almost continuous rain and snow.

It is reported from Juneau that 300 of the 1100 Alaska coal claims have been canceled by the General Land Office. In most cases the cancelation was caused by failure to make application for patent within the time specified by law. A few claims in the Bering River field were canceled because it was charged that they were not made in good faith. As a result of the indictment of Frank Watson, the promoter of a group of claims in the Matanuska district, in March, 1911, for conspiracy to defraud the United States, 43 claims have been canceled. Charges of fraud or failure to apply for patent are pending against many other Alaska coal claims.

Trouble in Mexico

Disquieting rumors of impending attacks by Mexican rebels upon Americans residing in Cananea, El Tigre and Nacozari in Sonora have been published frequently in the press within the last few days. While it has been impossible to corroborate many of the dispatches, the reports indicate that bands of rebels were marching on or planning attacks on these camps.

There are about 70 Americans at El Tigre and it is stated that a band of several hundred rebels was marching to attack the place, but changed its plans on learning that there was to be armed resistance by the Americans. It has been said that there has even been fighting at Nacozari, but the reports received have been vague. At Cananea a larger American population, possibly numbering 500, is preparing to offer resistance should an attack be made by the large band of rebels said to be marching toward the town. The rebels are reported to have burned the bridges on the railroad connecting Cananea with Naco Ariz., and to have cut the telegraph wires.

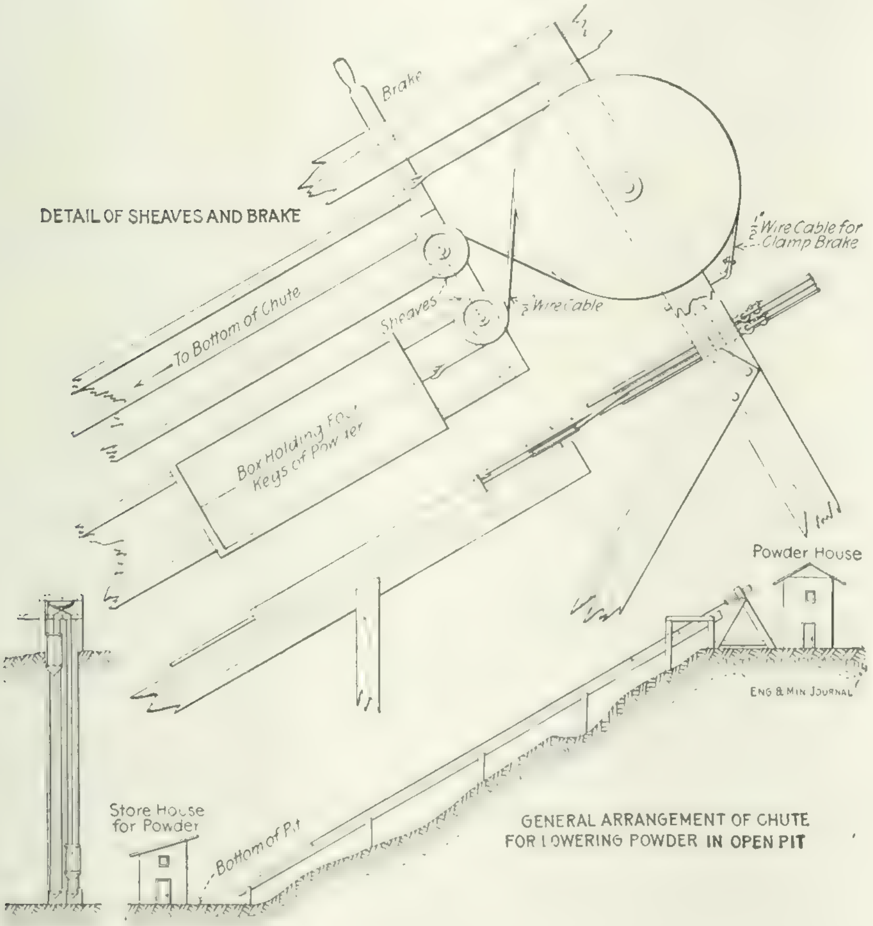
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Powder Chutes for Open Pits

By B. M. Concklin*

A unique arrangement has been installed in several of the open pits upon the Mesabi range for the purpose of saving time and facilitating the distribution of black powder to points within the pits. The arrangement is simple in itself, consisting of two greased slides in which run two triangular shaped boxes made to carry from four to six kegs of black powder, and an arrangement of sheaves at the top of the slides as shown in the accompanying engraving. The operation is accomplished by means of gravity, the loaded box carrying the empty one to the top. The speed is regulated by means of a brake shown in the engraving.


DETAIL OF SHEAVES AND BRAKE
Brake
3/8 Wire Cable for Clamp Brake
To Bottom of Chute
Sheaves
3/8 Wire Cable
Box Holding Four Kegs of Powder
Powder House
ENG & MIN JOURNAL
Store House for Powder
Bottom of Pit
GENERAL ARRANGEMENT OF CHUTE FOR LOWERING POWDER IN OPEN PIT

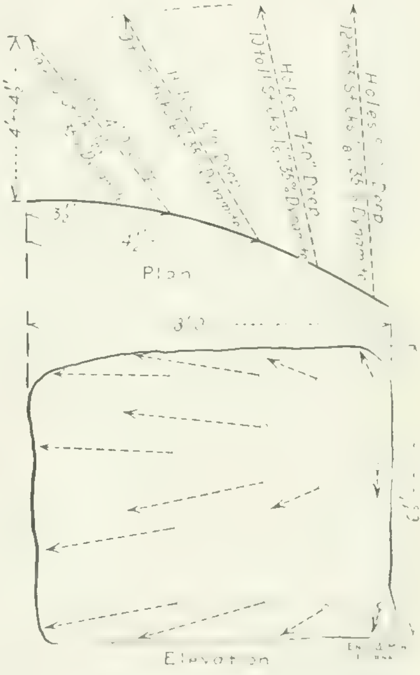
Where the pits are deep and the lower levels are inaccessible, except by long and steep climbs, this contrivance has been the means of a considerable saving of time and money as well as acting as a safety device for the prevention of possible explosions when the powder is thrown over the banks into the pits.

Drift Round in Flat Sediments

In the accompanying sketch is shown the side-cut drift round that is used in the lead district of southeastern Missouri for driving in the flat-dipping dolomite that forms the country rock in the mines. The drifts are driven about 6½ ft. high and 8 ft. wide. Other types of rounds have been tried. In one of the mines where Leyner drills are used, the Leyner center, pyramidal cut has been tried, but it did not prove as satisfactory as the side cut. The Western drifting cut, in which the holes are drawn from the bottom with lifters to take up the bottom bench lift under the cut, has also been tried, but the side-cut has more than held its own.

Only at the mines of the Desloge Consolidated is a different cut used. There, when drifting in ore, a center V-shaped cut is used in the drift, and a drift 11 ft. wide and 6½ ft. high is driven. This cannot be advanced quite so fast as the smaller drift, but the ore coming from it is broken much more cheaply owing to the much smaller amount of dynamite used per ton of ore broken or per foot of advance.

The reason that the side-cut proves so satisfactory in this sedimentary formation is the fact that the holes, owing to flat dip of the limestone bed, are always kept in the same bed. Consequently, the holes are easier to drill and break better as they are in rock of the same character for the entire depth. Where drilled downward there is frequently a tendency for the holes to "bull-ring" through breaking out in the weaker beds and leaving the more resisting beds standing. This causes the holes that follow to break less efficiently, and the entire round is often held up when this happens.



Method of Placing Drift Holes in Desloge Mines

One-man drills, chiefly 2½-in. Sullivan, are used although at one mine many Leyners are used, and a few butterfly, 2¾-in. Ingersoll-Rand drills are being introduced. Two of the one-man drills are used in a drift, one mounted on each side of a vertical column. With two drills a round can be drilled and blasted in one shift. In drifting the drilling is done only on day shift, and the machine men always have a clean shift to start with. A one-man machine will drill about 40 ft. of drift in average ground, taking out the time required in setting up and loading and blasting. A Leyner drill has often been known to put in a drift round in a shift with one man running it in the mines where that type of drill is used.

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*Mining engineer, Great Northern Iron Ore Properties, Bovey, Minn.

With this side cut, the round is alternated from one side to the other so that in about three rounds the face of the drift is squared up. A round will square up from 4 to 4½ ft. per shift, and the average speed of drifting in the district is about 90 ft. per month of 26 days. Generally from 11 to 14 holes will break a round as shown in the accompanying diagram of a drift round. About 20 lb. of dynamite per foot is used in such a drill about 40 ft. of hole in average by a round. The cost of driving is about $10 to $11 per ft., of which cost about 25% is for labor. This cost, though, only takes in the direct charges pertaining to drifting, such as breaking, shoveling, tramming, drill upkeep, air and explosives.

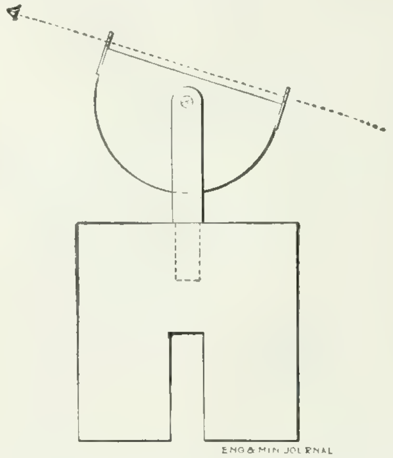
Setting Out Undergronnd Work

By H. G. Henderson*

The mining surveyor has not, as a rule, sufficient command over actual practical mining operations, his duty being to lay out the work so that the miner can follow his directions. He should not, therefore, be held responsible for any delay or damage which may occur, due to departure on the part of the operator from the directions given. Frequently it is desirable to check the work as it proceeds, to make sure that the men thoroughly understand their directions. Even where absolute control is secured, it is not always easy to cope with the ignorance or carelessness of workmen. The surveyor is frequently put to much inconvenience by the stupidity of the workmen, especially when a number of different pieces of work are in progress at the same time and it is only possible to inspect each job at distant intervals of time. The effect is to run up unnecessary expense in case of mistake, which makes the matter important.

In one case the surveyor had laid out a crosscut in a given direction, and having seen that all was well for 50 ft. he hung two plumb lines from the "back" or roof of the crosscut and then instructed the workmen how to proceed. On revisiting the works some three weeks later he found that the advanced end of the crosscut was some fifteen feet out of its proper line. He put the foreman of the gang under cross-examination and found that this man had taken up a position midway between the two sights, and as near as he could judge, in a line with them, and had used the foremost plumb line for his line of sight. Unfortunately, as might have been expected, his position was not in a straight line between the two points, and the result was that the farther the crosscut was driven, the greater the error became.

In order to prevent a mistake of the same kind in future, the surveyor took a length of straight pipe, four feet long, and suspended it from the "back" in such a way that it was rigidly supported. He then fixed nails in the front end of the tube to correspond with the cross hairs of a telescope. At the other end of the tube he inserted a wooden plug and drilled an eyehole in the center. This arrangement made a rough-and-ready telescope pointing along the proper line, which the crosscut should take. When it was necessary for the foreman to see whether the work was progressing in the right direction, he sent a laborer to the advanced end of the crosscut with a light and this was moved about until it was sighted by the foreman at the eyepiece of his telescope. This device is easily understood and is a valuable adjunct to operations which have to be carried out by more or less unskilled labor.



Device for Maintaining Alignment in Underground Work

It cannot be too strongly impressed upon mine managers that the difficulties of the surveyor are by no means at an end when he has completed and computed his work. It is frequently necessary to contrive special means to enable the miner to carry out the work in accordance with the surveyor's directions, and it will, therefore, be of interest to describe a method employed in a large mine where it was desired to hole a rise to a shaft which was being sunk, the combined rise and sink being over six hundred feet. After a careful survey and accurate setting out of the bearing and inclination both for the rise and also for the continuation of the shaft, which was at that time eight hundred feet deep or more, it became apparent that if a successful "hole" was to be obtained, something more reliable than the ordinary plumb lines would have to be employed. In this work, although the respective bearings might be truly maintained, there was a grave danger that the contractor would not only fail to rise and sink at the necessary inclination, but might also get the shaft twisted. To prevent this, the surveyor instructed the mine carpenter to construct a wooden dial according to the following description:

A piece of hard wood about 6 in. diameter and 5 to 6 in. thick was taken, and this represented the horizontal plate of an ordinary miner's dial. A cut was then made about 3 in. deep and 1½ in. wide along the diameter of the wooden dial. On the top of this plate and at right angles both to it and the cut was fixed a piece of thin wood in the form of a quadrant similar to that of an ordinary dial, the quadrant being attached to the dial by means of a slotted wood pillar. To the quadrant were attached sights constructed of tin plate, the whole arrangement being shown in the drawing. When the surveyor had this dial finished to his satisfaction, he proceeded underground to the bottom of the shaft, and there had two small holes or niches cut in the sides at right angles to its bearing. In these holes he placed a bar of iron 1½ in. square, the holes being cut in such a manner as to insure that the bar was level and that the exact center of the bar coincided with the center of the shaft. On this bar he placed his dummy dial by fitting the bar into the cut in the bottom of the hardwood block, and this cut was made just sufficiently larger than the bar to obtain an easy fit without rocking or play of the wooden block from end to end along the bar. The quadrant of the dummy dial was then set to the required angle of the rise, which was in this case 70 deg., and was secured firmly into this position. It will be seen that a sight was given by looking through the two sight holes in the dummy dial, which would give not only the bearing of the rise and sink, but would also control the inclination. The method adopted enabled the contractor not only to check the bearing and dip of the shaft in the course of sinking, and also of the rise being put up against it, but by moving the dials as required along their respective bars, every inch of the work could be controlled and all twisting avoided. This simple piece of apparatus will, in many cases, be found to be of considerable value in mine work where comparatively unskilled labor has to be relied upon.

It was suggested by Hugh F. Marriott at a recent meeting of the Institution of Mining and Metallurgy, that the deflection of deep boreholes may in part be due to a corkscrew-like action, which, if his surmise is correct, might be remedied by using reverse rods and alternating the direction of rotation.

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*Principal, Truro School of Mining, Truro, Cornwall, England.

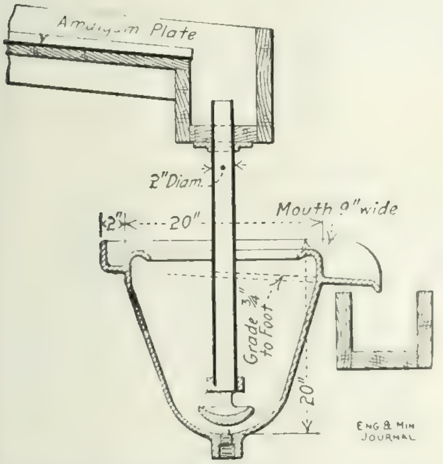
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Mercury Trap for Amalgamation Tables

The mercury trap shown in the accompanying illustration was formerly used in many mills on the Rand to save any amalgam or mercury that might flow with the pulp from the bottom end of the amalgamation tables. As shown in the illustration the pulp from the amalgamation tables discharges into a transverse trough or launder attached to the lower end of the table. This launder slopes both ways towards the center, from which the pulp is drawn off through a short vertical pipe, the upper end of which extends about one inch, above the bottom of the launder and thus the launder and pipe constitute the first mercury trap.

The short vertical pipe terminates in the large cast-iron bowl shown in the accompanying illustration and described in "A Text-Book of Rand Metallurgical Practice." To the bottom end of the pipe is attached a fixture shaped like an inverted mushroom, which diverts the stream of pulp upwards. The particles of amalgam and mercury collect either in the concavity of this attachment or in the bottom of the cast-iron bowl. The overflow from the top of the bowl is collected by a peripheral launder that encircles the iron bowl and is a part of the same casting.

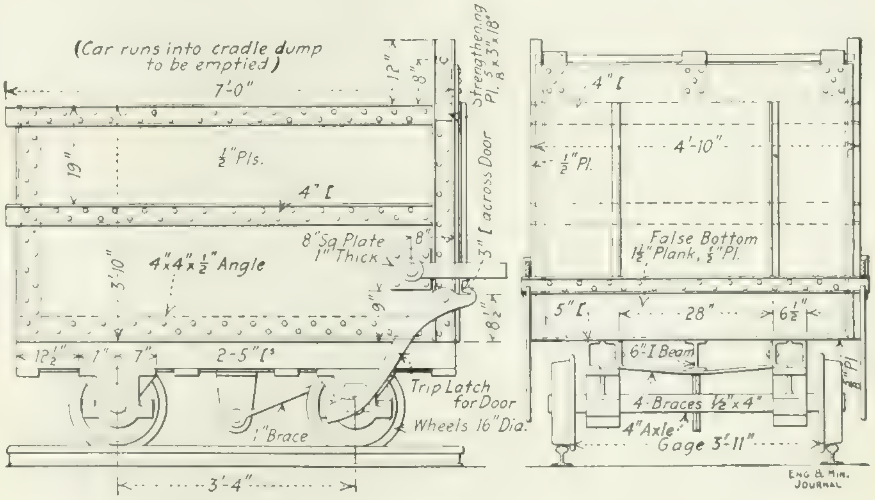


Cast-iron Mercury Trap Used on the Rand

At the present time these bowls are not used in many of the mills on the Rand. Since the general introduction of tube milling, the escape of mercury and amalgam in particles of appreciable size has been greatly reduced, as shown by the fact that but little collects in the launder carrying the overflow of the tube-mill classifiers, and such particles are not now to be found in the sand charges. Furthermore the various cone classifiers and dewatering cones ahead of the tube mill act as efficient mercury and amalgam traps, and any amalgam that passes through the tube mill circuit, will be caught upon the shaking amalgamation tables over which the product from the tube mills is passed.

Car for Mechanical Haulage

A tram car for mechanical haulage used between the shaft and the rock house, at one of the Lake Superior copper mines, is shown in the accompanying illustration. The car is rigidly built with channel irons around the top and with channels used as stiffeners to the side and end plates to withstand the impact of ore when dumped from the mine skips. The cars are usually dumped by running into a cradle dump, several types of which have recently been described in the Journal. The details of construction of the skip are apparent from the illustration.



Surface Car Used at Some Lake Superior Mines

At the Copper Queen mines, in 1910 it required one gallon of fuel oil to generate 86.5 lb. of steam; by increased efficiency during 1911 it required one gallon of oil for 97.5 lb. of steam. The total amount of steam generated per day was 705,969 lb. in 1910, and in 1911, 629,751 lb. per day.

Governing a Hydro-Electric Generator

The use of water to drive electric generators has now become so widely extended, especially in mining operations, that it may be interesting to refer briefly to some practical experiences in connection with hydro-electric plants. It will usually be found that such a plant runs satisfactorily, and with the apparatus which is now on the market for governing the turbine, the difficulty of maintaining constant frequency and speed even under widely fluctuating loads, has been minimized. At the same time it cannot be denied that from time to time cases arise where trouble of a very serious nature is experienced in governing due to causes which could only be discovered as a result of practical operation.

In one case there was persistent hunting in a hydro-electric set which was caused by the governor operating on small valves. These valves repeatedly became choked with silt. In order to overcome this difficulty, an attempt was made to clear the water by filters, but although they had the effect of screening off the coarser particles, no advantage was gained so far as the fine sand and mud were concerned, and without involving the outlay necessary for settling tanks, it would have been impossible to cope thoroughly with the difficulty by this means. Finally the choking became so bad that the hunting caused the governor to be knocked off, reliance thus being placed upon hand operation.

This state of things could not of course be allowed to continue indefinitely, so an arrangement was devised and fitted which consisted of a small electric motor driven from the exciting circuit of the main electric generator, and this motor was operated by a switch controlled by the governor. The position of the governor determined the speed forward or backward or the shutting down of this auxiliary motor, and inasmuch as the motor opened or closed the bypass of the main turbine, an effective method of dealing with variations of the load was devised. Before this, nozzle governing had been adopted, but it was found that the motor arrangement proved far more satisfactory and was therefore used. This hint may be of value to other engineers in charge of water-power plants who may have been troubled with difficulties due to bad governing caused by sand or mud in the water.

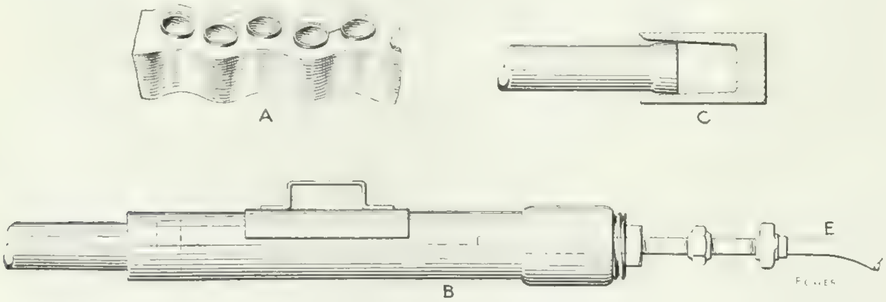
Replacing a Tube Header

Mine operators using a Babcock & Wilcox boiler in mines remotely situated will be interested in the following description of a repair of a tube header, as recently described in *Power.*

A new tube header cracked as shown at *A*, in the accompanying illustration As all the tubes were practically new, it was decided to remove the header without disturbing the tubes in the header on the opposite end. Each was temporarily blocked to retain its original position, and small holes were drilled in the header between the tubes. By driving drifts and chisels into these holes, the header was easily broken and removed.

The expanded ends of the tubes were then reduced by heating in a homemade forge, as shown at *B*. This forge was made of old pipe and fittings, and a charcoal fire supplied with compressed air through the hole *E* gave good results. The forge was placed over the tube ends until they were heated to a cherry red, after which they were drawn by placing the tube *C* over the ends and hammering it. This tube tapers slightly, and by using a coarse taper in starting and a slight taper in finishing, the work can be quickly done.

Each tube was drawn to a ring gage of the original diameter of the tube, then the new header was placed over the tubes which were expanded in the usual manner. The opposite end did not need re-rolling. This process took less time than cutting out the tubes and replacing them and both headers.



Section of Cracked Header, Improvised Forge and Reduction Tool

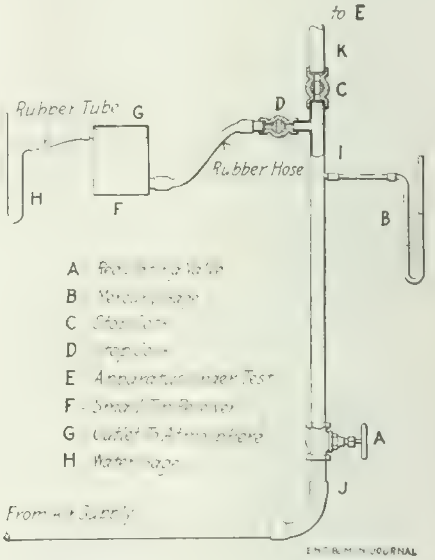
Measuring Small Quantities of Low Pressure Air

It is frequently desirable to measure the quantity of air used in metallurgical operations, as in air agitation. In order to accomplish this easily, and without resort to expensive apparatus, G. S. Weymouth, of the Great Fingall mine, has designed the apparatus shown in the accompanying illustration, as described in the *Monthly Journal* of the Chamber of Mines of Western Australia.

The method consists in substituting temporarily an equal flow of air under conditions which allow of easy measurement. The only disadvantage is that the flow of air must be diverted from the point of application for half a minute, while the measurement is being made. In the figure *A* is a valve regulating the air to the required pressure; *B* is a mercury gage; *C* and *D* are stop-cocks; *E* the apparatus under test; *F* a small tin receiver connected by rubber hose to *D; G* is a round orifice in a tin plate for air outlet, and *H* is a water gage with a range of about 12 in. to allow for occasional rushes of air while manipulating the cock *D*.

A low-pressure supply being required at *E* say, 5 lb. per sq.ft., and the cock *C* being open and *D* closed, the regulating valve *A* is opened until the gage *B* indicates the required pressure. The valve *A* should not be touched again during the test. The height of mercury on *B* is marked; and to measure the quantity of air flowing at this instant, the cock *D* is opened and *C* closed; *D* is then gradually closed until the gage *B* reads the same as before. In this way the total substituted resistance to the free flow of air is equal to that of the apparatus being tested, the pipe *A* to *I* in both cases acting as an intermediate receiver with constant in- and out-flow as provided by the gages. The height of the water gage is now taken, and the area of the outlet orifice noted; the cock *C* is opened and *D* closed, the gage *B* reading the same as before. This is a check on the constancy of flow during the testing period. The velocity through the orifice *G* is that due to a head of air equivalent to the pressure on the water gage, and is: $\sqrt{2gh} =$ ft. per sec., *h* being the height of the motive column (head) in feet. Reducing to inches of water, and simplifying, this becomes: $\sqrt{\text{in. water}} \times 66.1 =$ ft. per sec. The coefficient of flow for such an orifice being 0.64 owing to the contraction of the flow near the edges, the actual mean velocity over the full size of the orifice becomes: $\sqrt{\text{in. water}} \times 42.3 =$ ft. per sec.

In the author's experiments the effective velocities for an orifice of 1 in. sq. area, at pressures up to four inches water gage, were tabulated, with the corresponding discharges of cubic feet of free air per minute. All subsequent readings for different sizes of orifice were simply referred to this table. Removable screwed caps were used on the receiver, with orifices of 0.125, 0.25 and 0.5 sq.in. area, these being simple fractions of 1 sq.in.



Device for Measuring Low-pressure Air

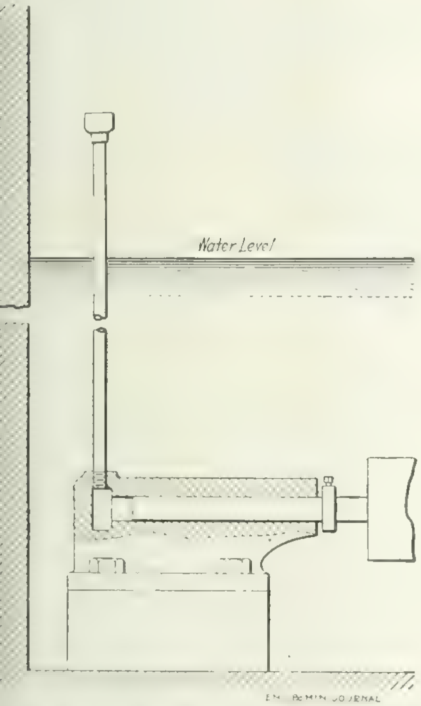
These different orifice sizes were used to keep the water-gage readings within reasonable limits, and covered all measurements up to 7 cu.ft. per minute with ⅛-in. pipe fittings. Pipe sizes do not come into the calculations, provided they are large enough to carry the quantity of air. The receiver *F* need be only of sufficient size to reduce the kinetic action of the air to a negligible quantity and give a true reading on the water gage.

In the author's actual experiments the receiver *F* was a tin of about one quart capacity. For air-lifts consuming about 50 cu.ft. per min. a 5-gal. can was used, with orifices of 0.5, 1, 2 and 4 sq.in. area. The pipe fittings in this case were 1 in. No difficulty was experienced in measuring quantities between 0.5 and 60 cu.ft. per min. By substituting a high-pressure gage at *B* readings can be taken at any pressure. A little experience soon gives the proper size of orifice to use.

An Under-Water Bearing

In the accompanying drawing is shown he details of a type of bearing for the hafts of the submerged wheels of the lrag conveyors for dewatering concenrates at the Desloge mills in the lead listrict of southeastern Missouri.

The bearing is closed at one end, being ored from a cored casting having an enargement cored in it at the closed end of he bearing opening. This enlargement ater serves as an oil receptacle. This, in urn, connects with a hole in the center of boss on the top side of the bearing, vhich is tapped at the upper end to take ¾-in. pipe. Wings extend outward by neans of which the bearing is bolted to ts supports. The front of the bearing asting is faced. Side play of the shaft s prevented by a collar at each end of he shaft.



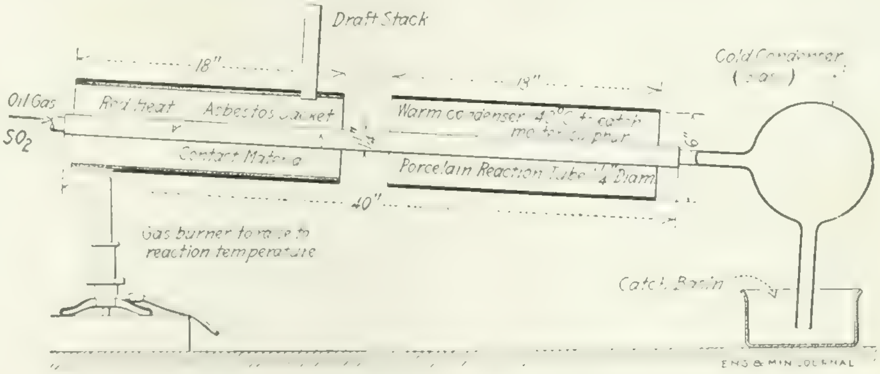
ubmerged Bearing for Drag Conveyor

A pipe is screwed into the hole leading o the oil receptacle. This pipe is quipped with a reducer at its top, so as o make it easier to pour oil down the ipe. As the specific gravity of the oil s about 0.9, the oil pipe must extend bove the water in the tank in which the earing is used a little more than oneinth of the submergence of the bearing. hen when oil is poured into the oil cup t the top of the pipe, the column of oil vill be heavier than the water that is tryng to work into the bearing, and the oil vill work out through the bearing, washng out any grit, until finally the column f oil is just balanced by the water presure and friction. With the two pressures alanced, and the overflow of the water ept constant, practically no grit can vork back into the bearing. In this way submerged bearing can be kept lubricated and grit be prevented from working into it. The bearing must be open only at one end to obtain the best results.

Laboratory Apparatus for Thiogen Process Tests

The apparatus employed by Prof. Stewart W. Young in laboratory tests of the thiogen process for reducing oxides of sulphur in blast-furnace gases to elemental sulphur is illustrated by the accompanying diagram. This apparatus is the same as was employed in the demonstration at Stanford University, before representatives of the Department of Justice, Bureau of Mines and copper smelters, on May 3, 1912. The construction differs materially from that of the experimental flue plant in operation at the smeltery of the Penn Mining Co. which was described in the Journal of May 4, 1912. The application of the process also differs, but the results are apparently the same.

In the laboratory apparatus a porcelain tube 1¼ in. diameter, about 40 in. long, forms the reaction chamber extending through the center of two iron pipes, each about 18 in. long and about six inches diameter. The first of these iron pipes is lined with asbestos, forming a jacket to retain the reaction temperature. The second pipe forms a warm condenser kept at 140° C., to catch the molten sulphur. The reaction tube is connected to a cold condenser of glass which catches the overflow sulphur. A gas burner at the bottom, near the front end of the jacket pipe, is provided to raise the heat in the porcelain tube to reaction temperature. A draft stack or pipe is attached to the top, near the front end, of the jacket. The reaction tube, which is kept at red heat, is supplied with plaster of paris as contact material.



Laboratory Apparatus for Thiogen Process Test

The laboratory practice differs from that of the experimental flue in that gas generated from crude petroleum is used instead of vaporized crude, and sulphur dioxide without the accompanying gases of the blast furnace. The sulphur dioxide is first turned into the reaction chamber, and then the oil gas is turned in. The reaction chamber has been previously heated to red heat. In this chamber, in the presence of the contact material, the sulphur dioxide becomes reduced to sulphur. The greater portion of the sulphur accumulates in the warm condenser. The temperature is kept just above that of the melting point of sulphur. If this condenser is not sufficient to collect all the sulphur a portion passes on and is condensed, together with the water vapor in the cold condenser.

Lubricants and Lubricating

A grease may be defined as a plastic or soft solid which cannot be driven by pressure alone from between any two rubbing surfaces. Its resistance to shearing is small; consequently it will form thick lubricating films even when loads are heavy and speeds moderate. At high speed a grease does not compare favorably with oils, the friction resistance being much greater; hence, except for special bearings, greases are giving way to blended oils.

Greases are usually made by thickening a mineral oil, fixed oil or fat with a soap of lime, soda or lead, more or less water being emulsified with the oil and soap. In some cases solids such as black lead, French chalk and mica are also added. Greases are liable to be adulterated with excessive water and with nonlubricating solids, such as China clay and gypsum.

The corresponding property in the case of liquids which prevents them, as lubricants, from being easily pressed out, is called oiliness. This property seems to be in no way a function of the viscosity of the liquid; hence the viscosity of an oil does not furnish an index of its lubricating value. For ordinary speeds, moderate loads and good lubrication it is no doubt the degree of fluidity which principally determines the value of a lubricant for any particular purpose, but when the speeds are slow or very high, the loads great, or the lubrication imperfect, oiliness as well as viscosity plays an important part in the reduction of frictional resistance. The property of oil-

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Note—Abstract of paper by Robert Jeffrey, read before the Practical Refrigerating Engineers' Association, at Houston, Tex.

iness is generally possessed most markedly by the animal oils, less so by those of vegetable origin and least of all by some mineral oils. It is on this account that fixed oils are frequently added to mineral oils, for they give the latter the property in which they are most deficient.

The viscosity of lubricants varies considerably with the temperature, so that an oil which as long as the journal runs cool is sufficient to carry the load properly, may become so fluid if the temperature rises that the rubbing surfaces tend to grip. With known animal or vegetable oils the viscosity may be used for determining the probable purity, but with the various mineral oils which have a great range of viscosity, it is necessary to specify the degree of fluidity required when ordering them.

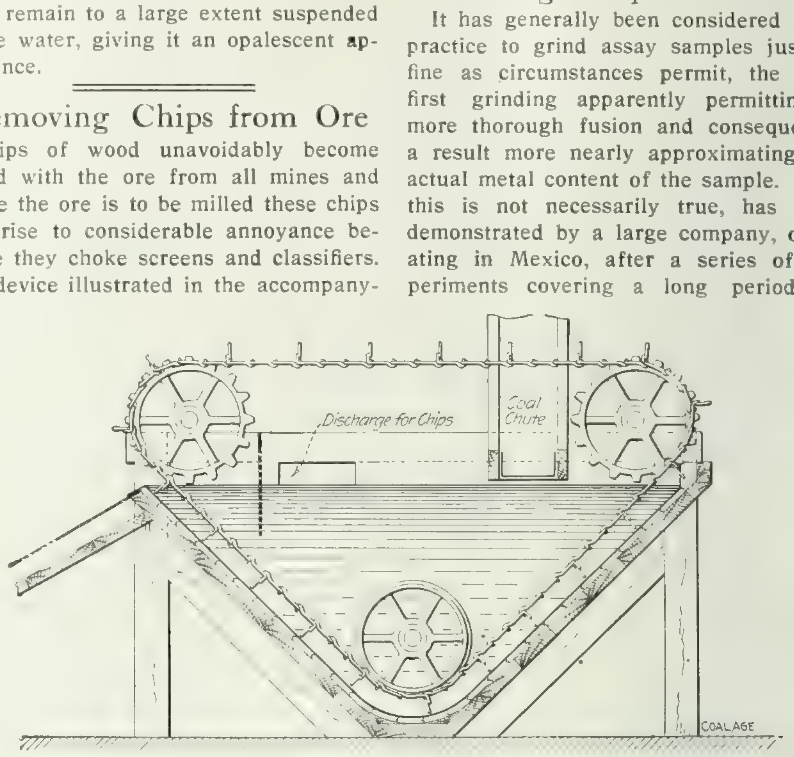
Pure mineral oils are suitable for pressures below 70 lb. per sq.in. with free lubrication, where the surfaces in contact are such as do not readily grip one another. With increasing loads the proportion of fixed oils which it is desirable to add must also increase if satisfactory results are to be obtained as regards friction and wear.

With a good mixture the tendency to gum is checked, the oil remains fluid and cotton waste saturated with it is much less liable to fire spontaneously. Not all mineral oils can be adulterated, however. Solid hydrocarbons are present in some and when vegetable oils are intermixed the solids separate out as a precipitate and cause trouble by clogging. Often a lubricant is condemned when the trouble is not with the lubricant but with impurities accidently introduced into them. Engineers frequently go around their engines and pour oil into the ends of the bearings or even remove the oil pads and pour directly upon the bearing surfaces. This introduces grit at the point where it can easily get between the rubbing surfaces. Lubricants as given out for use should be carefully strained through wire or cotton gauze when drawn from the tank.

Vegetable and animal oils are unsuitable for cylinder lubrication, as in contact with steam at high temperature they undergo chemical changes resulting in the formation of fatty acids which give rise to serious corrosion. Fatty oils, however, when mixed with mineral oils in quantities not exceeding 5 to 20%, do not seem to be open to these objections and the lubrication of parts which have to carry heavy loads is greatly improved by the addition of such oils. When surface condensers are used and condensed water is again passed into the boilers, care must be exercised to prevent the passage of oils used for lubrication of the cylinders into them. Tallow, suet, castor oil and other animal and vegetable lubricants must not be used in such cases, even in small quantities, for the acids liberated by the action of heat and water vapors pass into the boilers and cause serious corrosion. These acids cannot be separated from the water by merely allowing it to rest for a time in a tank. They remain to a large extent suspended in the water, giving it an opalescent appearance.

Removing Chips from Ore

Chips of wood unavoidably become mixed with the ore from all mines and where the ore is to be milled these chips give rise to considerable annoyance because they choke screens and classifiers. The device illustrated in the accompanying sketch was originally designed for removing chips from the coal produced from the mines of the Burnside colliery of the Philadelphia & Reading Coal & Iron Co., states *Coal Age,* but there seems to be no reason why it could not be used as effectively in removing chips from ore. The apparatus consists of a V-shaped tank filled with water, and a double-strand scraper line. Coal or ore is led into the tank by a chute which terminates at the water level. It, of course, settles to the bottom of the tank and is carried up by the flights of the scraper line, being discharged over a perforated screen plate to remove the small quantity of water which accompanies it. The flights are notched and perforated to prevent their discharging a large amount of water. The chips which are brought in with the ore float on the surface. Water is being constantly fed into the tank and runs off at a rectangular opening in the side, causing a current in that direction, which carries the chips with it.



Apparatus for Removing Chips from Coal or Ore

A partition of perforated screen plate is inserted just behind the forward sprockets of the conveyor line and carried down well below the surface of the water. This prevents the pieces of wood from floating over and mingling with the ore at the place where it is discharged.

The construction of the machine is simple and inexpensive, the power required is small, and the necessary water can, of course, be used over and over again, a number of times, from the point where it is discharged.

Grinding Samples for Assay

It has generally been considered good practice to grind assay samples just as fine as circumstances permit, the very first grinding apparently permitting a more thorough fusion and consequently a result more nearly approximating the actual metal content of the sample. That this is not necessarily true, has been demonstrated by a large company, operating in Mexico, after a series of experiments covering a long period of time. The method of making these experiments was simply the grinding of every sample, in the ordinary routine of work, through screens of different mesh and making a duplicate assay on each different grinding. The screens used varied from 20 to 200 mesh and the experiments covered about a year. As the laboratory was an exceptionally large one, doing work for a number of mines and mills, the total number of operations was great enough to establish definite facts for the class of ore operated upon.

It was found that a maximum metal product was recovered from samples which had been ground to pass an 80-mesh screen. Those ground to pass 60- and 70-mesh were generally lower in metal product, while those ground through 120-, 150-, and especially 200-mesh screens invariably returned a less quantity of metal.

The lower results obtained on fine grinding are difficult to understand, the only satisfactory theory being that the 80-mesh grinding was sufficient to allow all the silver and gold to be acted upon during fusion while finer grinding introduced sufficient quantities of barren foreign matter, from the grinding apparatus, to materially lower the proportional metal content. The low results obtained from the coarsely ground samples are naturally explained by supposing that the coarse grains of ore were not sufficiently acted upon to recover their entire metal content.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Aluminum-Cerium Alloys

That aluminum may be greatly improved by alloying with it metallic cerium in small quantities has been shown by W. Borchers, of Aix-la-Chappelle, who has been granted a patent for the process, according to London *Min. Journ.*, July 6, 1912. The ductility of the metal is increased six or seven times and its resistance to snapping doubled by alloying with it 0.1 to 0.2% cerium. When the amount of cerium is up to 0.2% the texture of the metal is firmer and denser than with ordinary aluminum, and will ring with a clear, bell-like tone. The alloy fills the finest moulded designs and is suitable for foundry work. It stands mechanical treatment well on account of its high ductility.

Rolls vs. Stamps on the Rand

The suggestion of replacing gravity stamps on the Rand with rolls has again been brought forward. James A. Yule, the new president of the South African Institution, in his inaugural address, last month, said that prior to the tube mill becoming a generally accepted unit, the gravity stamp proved to be the most economical machine for fine grinding in one operation. By elimination of amalgamation in the battery, and the adoption of the tube mill as a crushing unit, the position of the gravity stamp had been altered. He thought that two- or three-stage crushing could be introduced, the product from the last stage being cubes of ½ in. and less; this product to pass through rolls, the rolls to crush to the fineness required by the tube mills, say to pass a screen having 9 or 12 holes to the square inch. The water requirements would be reduced in such a plant, and all amalgamation would be abandoned. The capital cost of such a plant would be considerably less than that of the present-day plant, besides which, Mr. Yule contends, that there would be a great reduction in attendance, power, labor and repair costs.

Combustion of Gases

The following data, taken from *Le Genie Civil*, July 27, 1912, will prove of special interest in view of the present work on surface combustion, although it also has some significance to the ordinary uses of gaseous fuel.

The maximum and minimum calorific powers are simply upper and lower limits of trustworthy observations. The thermic power is the calories given off by the combustion of a cubic meter of a completely combustible mixture of air and gas. The speed of combustion is in a mixture of air and gas carrying 2% of oxygen in excess of that required. The temperature of the Bunsen-burner flame is that given when using the gas without preheating.

GAS COMBUSTION CONSTANTS

	Acetylene C_2H_2	Benzene C_6H_6	Ethylene C_2H_4	Methane CH_4	Hydrogen H_2	Illuminating Gas	Carbon Monoxide CO	Water Gas	Unenriched Producer Gas
Wt in kg per cu m at 0°C, 760 mm	1.162	3.486	1.252	0.715	0.089	0.52	1.251	0.86	1.26
Max. calorific power, cal. per cu m	13,881	36,016	14,966	9,547	3,062	5,000	3,055	2,600	1,100
Min. calorific power, cal. per cu m	13,398	34,566	14,000	8,581	2,578	4,600	3,055	2,400	1,060
Volumes air required in burning	11.942	35.827	14.334	9.556	2.389	5.75	2.389	2.5	1.0
Thermic power as defined below	1,035	938	913	813	760	681	901	686	530
Mean Bunsen-flame temperature, deg C	2,400	2,400	2,400	2,400	1,900	1,740	1,740	1,775	1,300
Speed of combustion meters per sec	6.15	6.15	6.15	0.60	4.50	1.25	2.00	2.00	2.00
Kindling temperature in free air, deg C	406 to 440	406 to 440	542 to 547	650 to 750	580 to 590	580 to 590	644 to 658	644 to 658	644 to 658

Acid Resisting Alloys

It is reported that Prof. Borchers of Aix-la-Chapelle (*Engineer*, July 26, 1912), has produced alloys of iron which will resist entirely the action of acids, while the articles produced can be manipulated by the usual workshop methods. The new alloys are prepared by adding from 2 to 5% of molybdenum to an alloy of ferrochrome, which contains no carbon or very little, and not less than 10% of chromium. An alloy which contained only 36% of iron, against 60% of chromium, was found to be insoluble even in boiling nitric acid, while it possessed all the usual qualities of iron and could be worked in the usual way. Not quite such favorable results were obtained by adding titanium and vanadium.

It is claimed in *Metal Industry*, Aug. 12, 1912, that if bismuth, 2 parts; copper, 5 parts; silicon, 1 part, be melted and added to 92 parts of melted aluminum, this alloy will resist acid. [Although nothing is said to indicate it, we suppose cuprosilicon must be used.—EDITOR.]

Unique Arsenic Deposit in Corsica

For a considerable period the orpiment and realgar mine of Matra, in Corsica, has been explored (*Min. Journ.*, July 27, 1912, abstr. from *Echo des Mines*). This unique vein possesses a width varying up to 13 ft., which is remarkable for such a vein. Shafts have been sunk and levels driven so as to ascertain the fact of its continuity. The arsenic market is regulated, just at present, by the supply of mispickel, and if an important deposit of natural orpiment and realgar can be worked, instead of transforming mispickel by an expensive process into colored pigments, a great change will be effected.

Reagent for Molybdenum and Tungsten

According to Kafka (*Zeit. Anal. Chem.*, p. 482, 1912), if a drop of saturated mercurous-nitrate solution be added to a solution to be tested for molybdenum or tungsten, and then followed by one to 1.5 c.c. of concentrated hydrochloric acid and an excess of potassium iodide, and the mixture shaken until the mercurous iodide redissolves, a blue color is given by either molybdenum or tungsten. With the former, the addition of potassium thiocyanate gives a blood-red color; with molybdenum solutions too weak to give the blue coloration, an orange color, which may be extracted with ether, results on adding this reagent.

Nitrates from Atmospheric Nitrogen

In a recent article on the fixation of atmospheric nitrogen, E. K. Scott (Proc. Royal Soc. Arts, p. 645, 1912), says that no less than 200,000 hp. are now used in the Birkeland-Eyde process, while it is expected that 300,000 hp, more will be utilized by 1916. The process has been greatly improved by the substitution of earthenware for quartz packing, thereby greatly reducing the size of the absorption towers. There are also factories operating, or in process of construction which will produce 250,000 tons per annum of calcium cyanamide.

Importance of Cuban Iron Ores

The iron-ore deposits of Cuba have increased materially in importance in the last few years, the production amounting now to more than 1,000,000 tons annually.

The *Iron Trade Review*, Aug. 22, 1912, in calling attention to this subject, gives the production for 1909 as 968,858 tons; for 1910, 1,429,349 tons and for 1911, 1,162,787 tons. The largest operations are controlled by the Pennsylvania Steel Co., with its companion company, the Maryland Steel, and the Bethlehem Steel Co. The full furnace operations at the works of these companies indicate a heavy movement of this ore over the remaining months of this year.

An interesting recent development in the Cuban ore situation is the offering and absorption of more than 200,000 tons of merchant ore from that country. This is the heaviest movement that has yet taken place in Cuban merchant ore.

The increased shipments from the Mayeri deposits are supplying the Pennsylvania Steel Co., with an increased amount of high-grade mineral, this contributing to the offering of some south coast ores on the open market.

The favorable analysis of the Cuban ores, together with their proximity to Eastern works and a low customs duty, gives them some important advantages. A rebate on exported manufactures from this ore gives the manufacturers a decided advantage in bidding for foreign trade.

Solution of Gold in Cyanide

The solution of gold by potassium cyanide solution requires the presence of an oxidizing agent and is retarded or entirely prevented by the introduction of hydrogen ions into the liquid. (*Journ.* Russ. Phys. Chem. Soc., p. 567. 1912; abstr. *Journ.* Soc. Chem. Ind., July 31, 1912). Hydroxyl ions do not favor the solution and in excess may exert a retarding influence. In a neutral medium (i.e., one to which neither acid nor alkali has been added), the solution of the metal is not appreciably affected by the following oxidizing agents: quinone, sodium stannate, potassium bromate, iodate, and chlorate, mercuric cyanide, and cupric chloride, but is accelerated by potassium perchlorate, permanganate, and periodate, ammonium sulphate, sodium peroxide, potassium sulphate, sodium sulphate, bromine, potassium ferricyanide, and potassium carbonate. The relative accelerations produced by these substances in $N/100$ solutions are as follows: potassium perchlorate, 1; potassium periodate, 2; potassium carbonate, 2; ammonium sulphate, 3; potassium sulphate, 4; sodium sulphate, 4; sodium peroxide, 4; potassium ferricyanide, 5. The velocity of solution of the gold is increased by increase of the concentration of the oxidizing agent to a certain limit and may be diminished by further addition. The combined action of two oxidizing agents present together is less than that of the more effective of them. The addition to potassium cyanide of sodium chloride, mercuric cyanide, cupric chloride, or cobalt chloride has either no influence or a retarding one on the rate of solution of gold.

Protectors for Glass Stopcocks

A device to prevent glass stopcocks from slipping out and breaking, is described by W. O. Snelling (*Journ. Ind. Eng. Chem.*, August, 1912). This consists of a hard-rubber clip, the blank for which is cut from $^{5}/_{64}$-in. hard rubber in the form shown in Fig. 1. This is then softened in hot water, and bent to the desired form, which it retains on cooling. The clip is attached as in either Fig. 2 or Fig. 3. The first type is removable, the second is not.

The above device simply stops slipping out, but does not prevent loosening. To avoid this, it is suggested that glass cocks be made a little longer and a groove ground in them, into which a rubber rubber band can be slipped, as shown in Figs. 4 and 5. This is nearly invisible, out of the way of the operator, and readily removable.

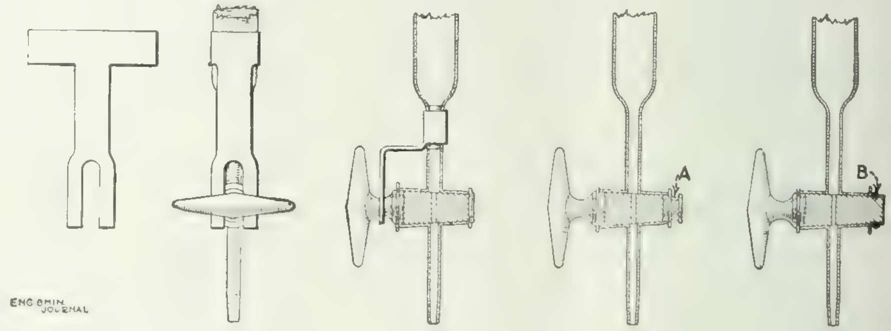


FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5

Protectors for Glass Stopcocks

Constitution of Thomas Slag

According to recent researches (*Z. offentl. Chem.*, p. 221, 1912), tricalcium phosphate heated to 1100° C. largely loses its solubility in citric acid, and regains it after being melted. Consequently the most soluble product is obtained when just sufficient lime is added in the Thomas process to form tricalcium phosphate. An excess forms tetracalcium phosphate, which is insoluble. This condition may be corrected by adding silica, forming calcium orthosilicate and converting the tetrasilicate into trisilicate. The calcium silicate often dissolves metallic oxides and in consequence assumes different colors at different times.

Peruvian Bronze Axes

Analyses and micrographic investigation have recently been made on some bronze axes, of the Inca period, found in eastern Peru (*Am. Journ. Sci.*, August, 1912). The analyses of three axes were as follows:

	No. 1	No. 2	No. 3
Sn	12.03	5.58	3.36
Cu	88.06	93.94	96.44
Fe	0.08	none	trace
Ag	none	0.65	none
S	0.35	0.08	0.23
Pb	none	trace	none
	100.52	100.25	100.03

The microstructure seemed to show conclusively that the original alloy was heated to a temperature considerably over 500° C., and forged hot, or heated over 500° C., quenched suddenly and forged cold. Scleroscope tests on the edges gave: No. 1, 26; No. 2, 18; No. 3, 18; regular cast brass, 11 to 12; while a new ax carrying 12% Sn, and 88% Cu, and worked with frequent heatings above 500° C., and sudden quenching, gave 36 hardness.

Aluminum as a Substitute for Tin

Experiments made with a view to bringing aluminum to a liquid condition capable of being spread when cold, over any dry surface, have according to statements in the German press, (*Min. Journ.*, June 22, 1912), been crowned with success. The composition is applied like paint, with a brush, and gives an appearance similar to dull silver coating. It is said to be an excellent rust preventive, possessing resistance to heat up to 500.° C. It is also stated to be elastic, durable, proof against atmospheric influences, and a perfect substitute for tin in plating.

A New Sulphur Operation in the South

By Richard H. Vail

The Freeport Sulphur Co. is completing a plant on the Bryan Heights "dome," near the mouth of the Brazos River, Texas, where it is proposed to produce sulphur by the hot-water process, the original Frasch patent having expired. These plans, if followed out, will have an important bearing on the industry, and break the monopoly now existing in the production of sulphur in this country. Development of other deposits may follow.

The monopoly enjoyed by the Union Sulphur Co., of Louisiana, in the production of sulphur in the United States will, it is expected, be broken this year by the commencement of operations in Texas by the Freeport Sulphur Co., which is now erecting a plant on the Texas coast, as a result of two years of exploratory work started by the Brazos Syndicate. As previously reported[1], the new syndicate backed by ample capital has acquired 10,000 acres of land at the mouth of the Brazos River, about 40 miles southwest of Galveston. The operations of this syndicate will be of much importance to Texas, but are of special interest to the mining world by reason of the development of the sulphur deposit in the Bryan Heights "dome," a low mound rising about 25 ft. above the level of the surrounding plain.

Bryan Heights Dome Favorably Situated for Economic Production

Bryan Heights is one of the characteristic "dome" formations of the Gulf Coastal Plain and is ideally situated for the economic production of sulphur, being only one-half mile from the gulf coast and within about 3½ miles of the harbor of the Brazos River, where the commercial center of Freeport is to be established.

The sulphur is to be recovered by melting *in situ* with superheated water and pumping the molten sulphur to the surface with the Pohle air-lift system—approximately the process patented by Herman Frasch, though differing in the details of its application. The original Frasch patent relating to the melting of the sulphur underground expired in 1908. A number of later patents relating to certain details of operation were taken out and some of these are still in force. Success in the use of the hot-water process by another company will have an important bearing on the sulphur industry and will doubtless stimulate the early development of other dome formations of the Gulf Costal Plain.

The Freeport Sulphur Co. is the outcome of two years' exploratory work, in which the syndicate managers state that over $150,000 was spent. After the Bryan Heights deposit was decided upon, land was acquired for a distance of 7½ miles on the west bank of the Brazos River, and the broader general plans of the syndicate were developed. These include the establishment of a port, railroad and steamship connections, the building of a bridge across the Brazos River, the laying out of the town of Freeport, the erecting of a 2000-bbl. sugar refinery, establishing a national bank, stores, warehouses, etc., besides the sulphur operation above mentioned, which in itself is an enterprise of no small proportions when all the contingencies involved in production and marketing are fully considered.

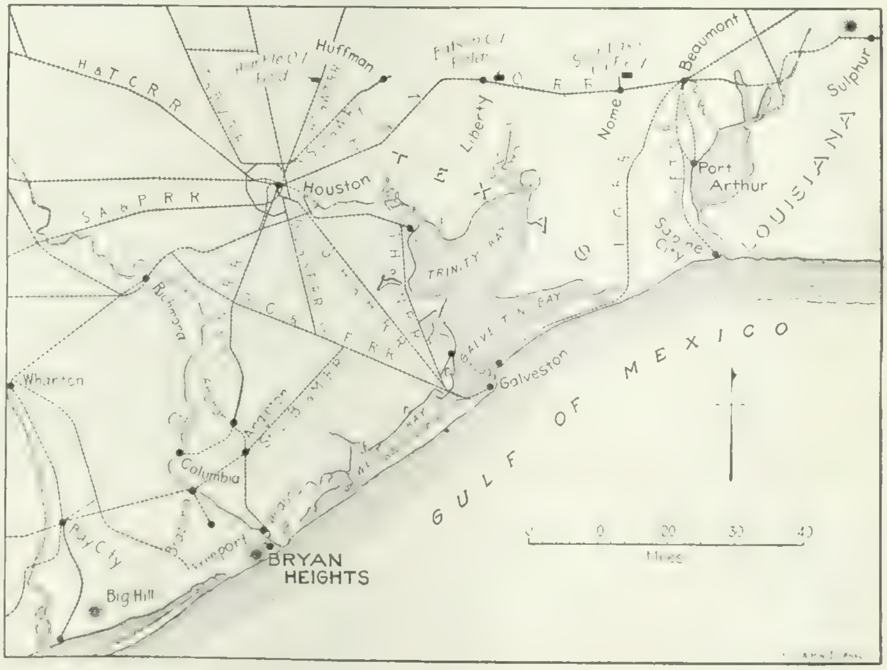
Enterprise Strongly Backed

Evidence that the syndicate is amply able to finance and manage these operations is afforded by a glance at the important names included in the personnel of its members. Among those who joined the syndicate were the following well known New York men:

F. A. Vanderlip, James Stillman and Samuel McRoberts, of the National City Bank; E. P. Swenson, of S. M. Swenson & Sons; Sidell Tilghman, of Tilghman Bros.; the late Edwin Hawley; F. Q. Brown, of Redmond & Co.; R. T. Wilson; John Hays Hammond, and A. Chester Beatty. Messrs. Vanderlip, Swenson and Tilghman have acted as syndicate managers, disbursing all funds until the various subsidiary companies were formally organized and prepared to take charge of their respective operations.

Besides the townsite company, banking corporation, etc., a terminal company will be chartered that will give free access to any railroad as well as free dockage, thus making Freeport literally a free port. The terminal company will undertake such railroad construction as may be necessary for suitable connections, and a bridge is being built across the Brazos River to Velasco to connect with the Houston & Brazos Valley R.R., in which the syndicate has an interest. It will thus connect Freeport with Angleton, 18 miles distant on the Brownsville branch of the Frisco System, and with the International & Great Northern R.R. at Anchor, 22 miles from Freeport.

As may be gathered, the operations of the syndicate will have an important effect on the commercial development of this portion of Texas. Iron-ore deposits exist within 130 miles of Freeport, this distance being almost identical with the rail haul of Mesabi iron ores to Pittsburgh. It is understood that negotiations are now in progress for the early development of these deposits for which Freeport is expected to be the outlet. Harbor improvements were begun at the mouth of the Brazos River a number of years ago; jetties were built, but the Boston company interested in the development of the Brazos country was unable to carry out its project. By removing what silt has accumulated in the river channel, a good harbor can be immediately provided.



Sketch Map, Showing Three Domes Which Contain Important Sulphur Deposits

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[1] Eng. and Min. Journ., Jan. 27, 1912.

A Large Tonnage of Sulphur in the Bryan Heights Dome

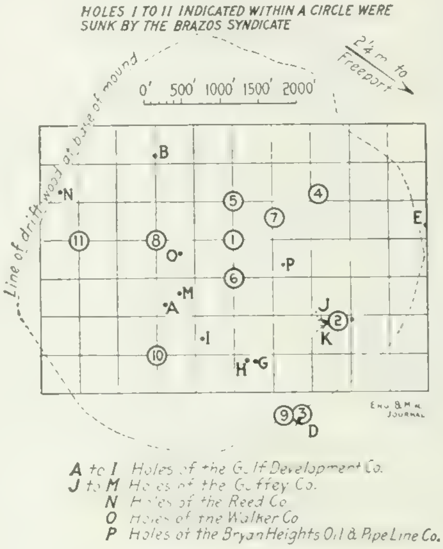
When the dome formations in the South were being drilled for oil, sulphur was encountered in a number of instances, but little attention was paid to this fact. Indeed, such deposits were of no commercial importance prior to the development of the Frasch process, and since Mr. Frasch's great success, the process has been protected by patents, none of which expired until 1908. There was consequently little inducement to determine whether any of the other sulphur occurrences were of economic importance.

Bryan Heights was drilled for oil by five different companies; about 16 holes, most of them for oil, were put down by these companies. Some gas was encountered and a little oil, but neither in commercial quantities. Logs of these holes, however, show that sulphur was encountered practically in every instance. But a single diamond-drill core remained in evidence; consequently, when the deposit was being developed by the Brazos Syndicate, 11 new holes were drilled on the dome at the various places indicated by the black circles on the accompanying sketch. Ten of these holes were drilled with a core drill, giving cores that have indicated a tonnage of sulphur running into millions of tons; the exact tonnage that is commercially recoverable is difficult to estimate but it is apparent that there is in the Bryant Heights dome a sufficiently large deposit of sulphur to be made the basis of an important commercial operation. Indeed the conditions of operation are so favorable that should the company choose to do so, it could probably compete with importers of Spanish pyrites in the manufacture of sulphuric acid.

The company does not care to supply details of the results of drilling, other than to say that about 760 ft. of gravel, "gumbo" and cap-rock were encountered; then about 150 ft. of sulphur-bearing limestone, dolomite and gypsum; there were some beds of pure sulphur varying in thickness from a few inches to 7 ft.; the sulphur ceased at from 900 to 1100 ft., being succeeded by pure gypsum and rock salt, to which no commercial importance is at present attached.

Details of an Early Drill Core

Owing to the concentration of sulphur operations into the hands of a few and the policy of secrecy that has been maintained, it has been necessary to draw from a number of outside sources for information required to round out certain details of the present situation in sulphur. Kirby Thomas, in an independent report on Bryan Heights property in 1910, gives the results of the earlier drilling, and of the No. 4 or "D" hole drilled by the Gulf Development Co. with a diamond drill. This single core may be higher or lower than the average, but as it was the most specific evidence available, it was carefully examined by Mr. Thomas, who reported as follows: "This core shows 174 ft. of sulphur formation, of which 35 ft. is limestone and gypsum, showing sulphur estimated at less than 10%; and 85 ft. of gypsum and limestone with 10 to 50% of sulphur; 54 ft. of the core is missing, which indicates that the soft friable sulphur and gypsum in this much of the hole did not core. I examined all the 120 ft. of core inch by inch and made a sight estimate by bulk that more than one-third would run 20% or better, and that about 50 ft. would run 10% or better; about 20 ft. was barren limestone or gypsum."


HOLES 1 TO 11 INDICATED WITHIN A CIRCLE WERE SUNK BY THE BRAZOS SYNDICATE
2¼ m to Freeport
0' 500' 1000' 1500' 2000'
Line of driftwood at base of mound
B
N
5
4
7
E
11
8
O
1
P
6
M
A
J
2
K
I
10
H
G
9
3
D
Eng. & M. Journal
A to I Holes of the Gulf Development Co.
J to M Holes of the Guffey Co.
N Holes of the Reed Co
O Holes of the Walker Co
P Holes of the Bryan Heights Oil & Pipe Line Co.

Sketch Showing Drilling on Bryan Heights Dome

The driller's log of this hole, beginning at a depth of 818 ft., is as follows:

LOG OF WELL NO 4—GULF DEVELOPMENT CO.

818 to 844	Limerock, sulphur and gypsum
844 to 900	Gypsum and sulphur
900 to 925	Gypsum and small amount of sulphur
920 to 925	Limerock and sulphur
925 to 960	Gypsum and traces of sulphur
960 to 988	Limerock and sulphur
988 to 997	Limerock and pyrites
997 to 1034	Gypsum
1034 to 1039	Limerock and pyrites
1039 to 1067	Sand rock
1067 to 1086	Salt rock

Note Hole lost all water at about 915 ft and while working the hole, a small amount of black sulphur water would flow. The rock in this hole was badly broken and considerable core was ground up, amounting in all to 62 ft

The Freeport Steaming Plant

The first unit of a plant to have a capacity of 120,000 tons annually was designed and is now being constructed by Westinghouse, Church, Kerr & Co., of New York, under the direction of Cloyd M. Chapman, engineer in charge, and Homer Burns, superintendent of construction. The new plant will have four 750-hp. Stirling water-tube boilers which will be operated at 100% overload, delivering steam at 100-lb. pressure to three Blake jet-type marine heaters where the water that is to be pumped underground to melt the sulphur, will be heated to about 330° F. The large supply of water necessary for regular operation, approximating 2,400,000 gal. per day, will be pumped by 13 Platt Iron Works pumps. Six water wells have been driven on the flat outside of the sulphur area and other wells are being sunk to augment the present supply of water. For compressed air, there will be two Ingersoll-Rand compressors, one operating at from 350- to 700-lb. pressure and the other at 100-lb. pressure. The latter machine is to supply air for pumping water from the wells on the flat. Fuel oil will be used under the boilers and it is expected that about 900 bbl. of Tampico oil per day will be burned at the present plant. The company has erected at the mouth of the Brazos River a 55,000-bbl. steel tank, from which a 4-in. pipe line leads to the steaming plant. Affiliated interests of the Freeport Sulphur Co., own oil properties in Mexico and can deliver oil at Freeport under a very small freight charge.

Texas Operations to Begin Early in the Autumn

The Freeport Sulphur Co., expects to begin the production of sulphur early in the autumn. Benjamin Andrews will be chief engineer and the drilling of the sulphur wells will be under the direction of A. Webber; both were formerly connected with the operations at Sulphur, La. The Bryan Heights product will be taken by rail to the Freeport dock. An affiliated steamship line is to be established and in this way the company will be able to make satisfactory delivery of its product to Eastern ports.

The Sulphur Industry

The sulphur industry in this country really began with the epoch-marking process invented by Herman Frasch, for which in 1911 he was awarded the Perkin medal. This invention made possible the utilization of the deep-lying sulphur deposits of the Gulf Coastal Plain. Other sulphur deposits of the United States, such as are operated in a small way in Wyoming, Nevada and Utah, are disadvantageously situated with respect to transportation of products to other than local consuming centers. The sulphur production of the United States remained insignificant until 1903, when the Union Sulphur Co., succeeded in placing its operation in Calcasieu Parish, Louisiana, on a commercial basis, producing during the year about 35,000 tons of sulphur. Since 1904, the commercial requirements of the United States have practically been met by the Union Sulphur Co., 90% of the stock of which is controlled by Herman Frasch, the estates of H.

McK. Twombly, Abram S. Hewitt, W. H. Tiers and Edward Cooper and H. L. Severence.

Cost of Louisiana Sulphur

The cost of producing sulphur in Louisiana by the Frasch method is currently reported to be about $5 per ton at the mine. Kirby Thomas in discussing this subject in the report referred to above says: "The court records in the Louisiana State Tax case against the Union Sulphur Co., show that up to the middle of 1907, the profits of the company had been $4,545,077, on a production of 561,014 tons, including the small output of the earlier years when the process was being perfected. The selling price in New York has been maintained at about $22 per ton for some time. The mine cost of production at Sulphur, La., is reported to be about $3 per ton, but from various data it is apparently in excess of this amount, perhaps $6 per ton. The large operating expense is for fuel to heat the water introduced in the wells to melt the sulphur. The cost of installing a well was given in the Louisiana State case as $7102 and the daily cost of "steaming" $565; the average daily yield was reported at 203 tons and the average yield per well 8363 tons. The Sicilian mines have a higher cost equivalent to about $16 per ton, New York, as the conditions of operation are less favorable."

SULPHUR AND PYRITES IN THE UNITED STATES

year	Sulphur Production long tons	Imports long tons
1900	3,147	167,696
1901	(*a*) 241,691	175,210
1902	(*a*) 207,874	174,939
1903	(*a*) 233,127	191,032
1904	127,292	129,532
1905	181,677	84,339
1906	294,153	74,241
1907	293,106	22,523
1908	369,444	21,136
1909	239,312	30,589
1910	255,534	30,833
1911	265,664	29,144

(*a*) Includes the production of pyrites

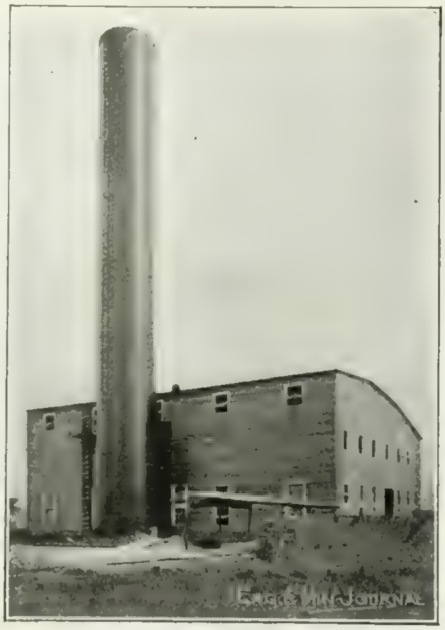
year	Pyrites Production long tons	Imports long tons
1900	204,615	322,484
1901	(*b*) 241,691	403,706
1902	(*b*) 207,874	440,363
1903	(*b*) 233,127	420,410
1904	207,081	422,720
1905	253,000	511,946
1906	261,422	598,078
1907	247,387	627,985
1908	222,598	668,117
1909	247,070	688,843
1910	241,612	803,551
1911	299,904	1,006,310

(*b*) Includes the production of sulphur

The growth of the sulphur industry in the United States is well presented in the accompanying statistics, taken from reports of the U. S. Geological Survey, showing the production of sulphur and also that of pyrites with which it is somewhat in competition in connection with the production of sulphuric acid. The statistics of the production of sulphur prior to 1904 are confused by the fact that sulphur and pyrites were reported together, the sulphur production being small at that period. The column showing the sulphur imports gives a better idea of the steady decline of the Sicilian predominance of the American market. The exports of sulphur from the United States amounted last year to over 28,000 tons, so that the United States may be said to be producing all the sulphur that it at present consumes in this form.

Sulphur Equivalent of Imported Pyrites Is about 400,000 Tons

It will be noted, however, from the tables showing the production and importation of pyrites that this country still imports a large proportion of raw materials used in the production of sulphuric acid. Pyrites is used almost exclusively for the purpose of manufacturing sulphuric acid and only about 300,000 tons are mined in this country, while over 1,000,000 tons are imported. The sulphur content of the imported pyrites is equivalent to about 400,000 tons, from which it will be seen that there might be a large field for the utilization of American sulphur should the conditions of production and transportation permit it to be sold in competition with pyrites, the price for which ranges from about 10 to 13c. per unit of sulphur.



Steaming Plant at Bryan Heights

Sulphur can undoubtedly be produced from favorably situated dome deposits using the Frasch process at prices ranging from $5 to $10 per ton delivered at the seaboard. This country has been consuming the equivalent of about 750,000 tons of sulphur annually.

Should the market for sulphur—which is principally used in the paper-making, bleaching, sulphuric-acid and powder industries and in agriculture—fail to expand with the new production, an effort will doubtless be made to invade the acid-making field, now largely held by pyrites especially where great purity is not required.

The Sulphuric Acid Field

The chief use of sulphuric acid in this country is in the manufacture of acid phosphate for fertilizer. For the making of the acid, the pure sulphur would have decided advantages over either pyrites or acid in freight charges to interior points. Thus, one ton of pure sulphur would make about 3 tons of pure acid, while one ton of pyrites will make only about 1.4 tons of pure acid; in terms of 50° H_2SO_4, the relative figures are about 4.8 : 2.3. The acid field would not be conquered in a day, however, as there are existing contracts and investments in pyrites-burning equipments that must be considered. Besides the natural inertia of the industry, there is likely to be hesitancy about installing any new equipment in this field until the possibilities of the Newberry-Fishburne calcining process—converting phosphate rock into citrate-soluble phosphate by calcination with lime or an alkaline salt—have been fully determined.

CONSUMPTION OF SULPHUR IN THE UNITED STATES

Source	1908	1909	1910
	long tons	long tons	long tons
Domestic sulphur and sulphur content of pyrites..............	469,613	350,494	362,703
Imported sulphur.....	21,136	30,589	30,833
Sulphur content of imported pyrites (*c*)....	300,653	309,979	361,598
Total domestic consumption	791,402	691,062	755,134

(*c*) based on average sulphur content of 45%.

The principal sulphur producing countries of the world are, in the order of their production: Italy (Sicily), United States and Japan. Sulphur is produced in a smaller way by a number of other countries, but these operations are not of international importance. There are, however, important known deposits in various places, such as in Northern Africa, the Caucasus and Transcaspian Territory, Mexico, Chile, and in a number of islands of the Pacific Ocean.

Producing Sulphur in Louisiana

In 1865, while boring for petroleum in Louisiana, a deposit of sulphur was discovered at a depth of about 500 ft. An Austrian, a French and several American companies each attempted to sink a shaft through the overlying gumbo and quicksand, but without success and with some loss of life, due to inrushing water charged with hydrogen sulphide. Finally, in 1890, Herman Frasch, at that time a process expert for the Standard Oil Co., applied his genius to this problem. He concluded that the sulphur could be melted *in situ* with superheated water and pumped to the surface while in molten condition. After many difficulties Mr. Frasch succeeded in putting his method in operation on a large and deservedly profitable scale. The working costs are the lowest obtained anywhere in the world, with the possible exception of the practically pure volcanic deposits. such as are mined in Japan. The latter, however, are handicapped by the high cost of transport to market.

At the presentation of the Perkin medal to Mr. Frasch, some interesting facts regarding the operation near Sulphur, La., were authoritatively announced for the first time by Mr. Frasch and other officials of the Union Sulphur Co. In view of the interest now being taken in sulphur production, it seems worth while to review some of the principal features of the Louisiana operation. At the time Mr. Frasch undertook the development of the Louisiana deposit, the dome formations of the Gulf Coastal Plain were little understood. In view of information received from the various companies, he believed that sulphur could be found anywhere in reasonable proximity to Sulphur Mine, where the land was still held at a high price in spite of the repeated failures. Accordingly he purchased land about 1½ miles from Sulphur Mine and drilled a well 2000 ft. deep without finding anything. Four wells were drilled before he reached the conclusion that the sulphur was all within the area then owned by a New York company, which was by this time glad to part with its property.

The sulphur-bearing area is nearly circular in shape and comprises about 52 acres. The wells are sunk in groups, the individual wells being placed 50 to 100 ft. apart. In the wells, a 10-in. pipe is sunk to a depth of approximately 500 ft. According to report, this hole is continued to a depth of about 630 ft., with a 9⅞-in. drill and an 8-in. perforated liner is inserted to the bottom of the hole. Then a 6-in. pipe, reduced to 5 in. through the liner and perforated at the bottom, is inserted. A 3-in. pipe, also perforated at the base, is then run to the bottom of the 6-in., and a 1-in. pipe to the bottom of a 3-in. Water superheated to 335° F. is then pumped down the outer two annular openings and after two or three days sulphur is raised through the 3-in. pipe by means of compressed air from the 1-in. pipe.

The molten sulphur is raised to a height of about 70 ft. above the surface and delivered into plank bins about 65 ft. high and usually 150 ft. wide and often 250 ft. long. Blocks of sulphur have thus been formed containing 150,000 tons. The sulphur as it comes from the wells is over 99½% pure. The output of the wells varies from 200 to 500 tons of sulphur per day, and, in one case, a single well produced over 73,000 tons. When it is desired to ship the sulphur, the planking of the bins is removed and the sulphur is blasted and loaded into cars by locomotive cranes fitted with 2-ton grab buckets. It is then sent by rail to Sabine, Tex., where dock-loading facilities permit the loading of a 7500-ton steamer in 12 hours.

ABOUT 7,000,000 GAL. OF WATER USED DAILY

Owing to the porous nature of the sulphur-bearing rock, an enormous volume of water is required for melting the sulphur. The average daily consumption of water is about 7,000,000 gal., which is obtained from a pumping station on the Houston River, about six miles from the mine. The Union Sulphur Co. has about 130 boilers arranged in eight batteries, representing a total boiler capacity of about 25,000 hp. One of the interesting features of this large power equipment is that but a small proportion of the steam generated is used for power.

The fuel consumption amounts to about 700 bbl. of oil per day at each battery, and the average yearly consumption is over 1,000,000 bbl. In the rear of each battery are the pumps and superheaters. The latter are vertical, cylindrical receptacles, about 4 ft. in diameter and 16 ft. high, containing a series of shallow trays. The water runs over these trays and is thus brought into intimate contact with live steam from the boilers.

INTERIOR OF STEAMING PLANT OF FREEPORT SULPHUR CO., SHOWING BOILERS, HEATER AND PUMPS IN COURSE OF ERECTION

OPERATING DIFFICULTIES

When the first sulphur was melted by Mr. Frasch's process, an ordinary deep-well pump was used for bringing the molten sulphur to the surface. Much difficulty was experienced with the valves, on account of the high specific gravity of the sulphur and the corrosive action of the mineral itself. Zinc and aluminum, the only two metals not seriously corroded by liquid sulphur, proved too soft to resist the shock of the pump stroke and it was not until compressed air was successfully applied to this part of the operation that Mr. Frasch felt that commercial success had been achieved.

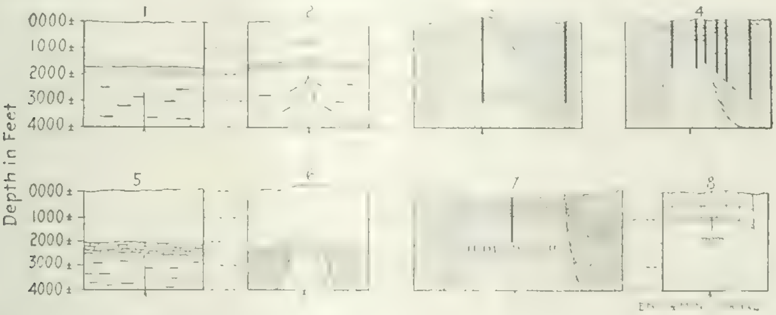
Other unforseen difficulties arose. Wells were lost by the parting of the pipes. As the sulphur melted out, the rocks and overlying sands would settle, the grip of the sand and earth pulling the pipe in two and the well would be lost. A 12-in. pipe, telescoping the 10-in. pipe obviated this difficulty. The life of wells was also increased by lining the hole drilled through the rock with an 8-in. perforated pipe. All wells, however, are eventually lost by caving.

Wild, cold water caused some wells to cease producing. This was first obviated by pumping in sawdust with the melting water. After pumping in about 30 cars of sawdust, one well again began producing and 39,000 tons more of sulphur was obtained before caving of the rock broke the pipes. This idea was expanded in several ways. Whenever a well breaks, the company dynamites the 10-in. pipe in the quicksand above the rock; the sand follows into the cavity and fills the space formerly occupied by the abstracted sulphur. In time, the clay of the surface slowly drops into the place of the quicksand, and, in some cases, the subsidence has amounted to 80 ft. In order to maintain the pressure necessary to prevent the superheated water from breaking into steam, the volume of sulphur extracted below must be replaced by earth. To do this a dredge with a capacity of 4000 cu.yd. per day became necessary, and its operations have resulted in numerous reservoirs on the outskirts of the property.

SICILIAN SULPHUR

In Sicily, which is still the most important producer of sulphur, the industry through over-production got into such a demoralized condition that six years ago it was made a government monopoly. The entire output must now be sold to the Consorzio Obbligatorio per l'Industria Zolfifera Siciliana. The statistics of production for the year ended July 31, 1911, as recently reported[2], were as follows: Total production, 391,978 metric tons; exports, 456,227; stocks on hand, 534,603 (a decrease of 61,525 tons); buying price, $17.466 per metric ton; selling price, $18.225; average cost of raw sulphur at the mines, $10.61; transport to point of shipment, $0.96; warehousing and loading, $0.96 per ton.

The sulphur in Sicily is found chiefly in an argillaceous limestone, associated with gypsum and bituminous marl. The sulphur-bearing rocks occur[3] in the form of immense lenses rather than as extensive beds, as this term is commonly understood. There are usually three or four layers of sulphur-bearing material of variable thickness and width. The richer deposits carry from 15 to 20% sulphur, but occasionally individual deposits are known to have 50% or even up to 80% or 90% of sulphur. Ore carrying less than 8% is not considered workable. The ore is mined in a primitive manner and is treated in a variety of ways, the greater amount being treated either in ovens or the so called *calceroni;* and a smaller amount is melted out of the ore by means of superheated steam; some ore is roasted in heaps, and the sulphur which accumulates at the bottom is collected in shallow pools. This method, however, recovers only about 33% of the sulphur in the ore. The cell oven is superseding the other methods, though the use of superheated steam is also growing.



FIGURES REPRESENTING THE ORIGIN OF DOME STRUCTURE BY CRYSTALLINE GROWTH—AFTER HARRIS, ECON. GEOL., VOL. IV

Figs. 3, 4 and 7 represent actual domes. Fig. 3, Petite Anse; note the secondary salt mass penetrated by the drill. Fig. 4, Anse la Butte. Fig. 7, Drake's Saline in northern Louisiana; a somewhat modified type of dome structure with a comparatively thick rigid layer above the salt-forming locus. Figs. 1, 2, 5 and 6 are hypothetical sections representing the early stages of dome growth. Fig. 8, calcium-sulphate deposit with secondary deposit at about 2000 ft.; hypothetical.

DOMES OF THE GULF COASTAL PLAIN

The so called "domes" of the Gulf Coastal Plain occur in a region that is monotonous topographically and stratigraphically. The irregularities in the contour of the surface are often discernible with difficulty; some of the domes are represented by low mounds not exceeding 10 ft. in height and they are of limited area, say from 200 to 2000 acres. The rocks of the region are Cretaceous, Tertiary and Quaternary sediments which, west of the Mississippi, dip gently in a southeasterly direction. Local uplifts occur, the structure of which is well presented in the accompanying sections by Prof. G. D. Harris who has given these structures much study and from whose writings quotation has been freely made. These remarkable uplifts have been styled "domes" but this term refers to the structural rather than to the topographic feature; the newer domes along the gulf border are really domes topographically as well as structurally, but the older domes to the north are apt to be topographically plane, or even concave. It was a number of years before the existence of these quaquaversal uplifts was recognized, and their full commercial importance was not realized until Capt. A. F. Lucas who had been exploring the salt deposits of Louisiana became convinced that such domes might also contain commercial deposits of sulphur and petroleum. His theory was proved in a spectacular manner in 1901 at the Spindle Top dome where a great gusher was brought in as a result of drilling he had inaugurated. Those who disregarded this theory and drilled outside the dome failed to find the "lateral extension of this oil field," as Mr. Frasch had failed to find the extension of the sulphur-bearing area when he sunk wells 1½ mi. from Sulphur Mine.

ORIGIN OF THE DOMES

The origin of the domes was a subject of much discussion by geologists and engineers who were at work in the South, prominent among whom were Hilgard, Lerch, Lucas, Veatch, Hill, Hayes, Kennedy, Hager[4] and Harris. In his 1907 report[5] to the Geological Survey of Louisiana and in a more recent contribution to *Economic Geology,*[6] Harris discussed these structures at length. The domes are considered as having formed: (1) By precipitation due to decrease in temperature; (2) by lifting the overlying rock and earth by the power of growing crystallization. On the latter point, it may be remarked, there is not complete agreement. Harris notes that the domes in the main occur at the crossing of hypothetical or actual fault lines, naturally a point of weakness that would be utilized by any gaseous or liquid substance seeking relief upward; saturated mineral solutions cooling normally at the rate of 1° C. for every 90 ft. of ascent would reach a point where they could no longer retain all the salts. He estimates the power exerted by the growing crystals as sufficient to lift 3000 to 5000 ft. of Quaternary clay and sand.

ALIGNMENT OF DOMES

The individual domes commonly show an elliptic plan or an alignment suggestive of common relations to some feature of general deformation. Prairie Mamou dome is on a line with the Five Islands of Louisana; Spindle Top, Sour Lake, Batson and Davis are ranged along a parallel line; High Island, Big Hill and Spindle Top form another well defined dome line.

Aluminum in France

The formation of the Southern Aluminum Co., and its affiliation with L'Aluminum Française has already been noted (ENG. AND MIN. JOURN., June 22, 1912, p. 1212). Further details of the parent company now become available. The capital of L'Aluminum Française will be 17,000,000 francs, and it has acquired exclusive rights throughout the world to the Serpek process, hitherto controlled by the Société des Nitrures.

The Serpek process consists in treating alumina with air and coke in the electric furnace, forming aluminum nitride. This product is then treated with caustic soda, forming sodium aluminate and ammonia gas. From the sodium aluminate is made pure alumina, from which aluminum is made by the usual electric processes, while the ammonia is neutralized with sulphuric acid to produce ammonium sulphate for manure. The Société des Nitrures acquired the Mulhausen plant of the Swiss holders of the patent in 1910, and had experimented further at a new plant, near St. Jean de Maurienne.

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[2] Daily Consular and Trade Reports, Aug. 21, 1912.

[3] Die wichtigsten Lagerstaetten der Nicht-Erze, by O. Stutzer; Borntraeger Bros., Berlin, 1911.

[4] "The Mounds of the Southern Oil Feilds," by Lee Hager; Eng. and Min. Journ., July 28 and Aug. 4, 1904.

[5] Bull. 7, La. Geol. Surv., 1907.

[6] Econ. Geol., Vol. IV, 1909, pp. 12-34.

L'Aluminum Française intends establishing works utilizing 40,000 hp. for this process, and it is said, will erect rolling and wire mills near Chambéry. It is hoped to reduce the cost of alumina from 200 francs to 50 francs per ton, which will mean a saving of 300 francs per ton of aluminum.

Mines in the Mogollon District, New Mexico

By W. Weston*

That an important mining camp exists in the Mogollon district in New Mexico, at the south end of the Mogollon Range, is apparently not generally known, although rich ore was discovered there in 1895. For many years after rich gold-, silver- and copper-bearing ore was discovered by Sergeant Cooney, U. S. A., then stationed at Fort Bayard, the hostilities of the Apaches prevented development, and only in late years has actual mining been done.

Production from Four Mines

Up to 1905, the production was about $5,000,000 in gold, silver and copper, mainly from four mines, the Little Fanny mine, now owned and operated by the Socorro Mines Co., the Helen Mining Co., now the Treasure Mining & Reduction Co., owning the Confidence and other claims, the Ernestine Mining Co., owning the Last Chance claim, and the Mogollon Gold & Copper Co., owning the Cooney mine.

In 1905, all the mines except the Ernestine were closed, owing chiefly to lack of transportation and the low price of metals, but in 1909 the great success achieved by Ernest Craig, chief owner and manager of the Last Chance mine of the Ernestine company, who introduced uptodate methods, machinery, cyanidation and concentration, instead of pan amalgamation, revived the whole district, and now all the mines are producing again.

Ore Lower Than $7 Not Profitable

The mines are 85 miles from the Sante Fé R.R. at Silver City, N. M., and as the general average of the ore is low, only a comparatively small tonnage was rich enough to bear the costly transportation to the smelters. As far as can be ascertained, the general average of the ores is about $20, and at present $7 ore is about the lowest that can be treated at a profit and that only with the strictest economy and uptodate appliances.

The Treasure Mining Co. has the advantage of the others in owning water power. The other companies use fuel oil for power purposes, which cost about 16c. per gal., f.o.b. mine. Lumber is $45 per M., and miners wages $3, $3.50 or $4 for machine men, and wagon freight on supplies from Silver City to Mogollon is $1 per 100 lb. The fare on the automobile line is $16, so it may be seen that costs are somewhat high.

Principal Mineral is Argentite

The Confidence and Last Chance vein, on which the Treasure company and the Ernestine company are situated, and which is about one mile in length, is a quartz, calcite vein in a shattered zone of andesite. The principal valuable minerals are argentite in the Confidence, while in the Last Chance, where rich ore is being mined 1200 ft. below the apex, the principal minerals are argentite, chloride of silver, and iron pyrite carrying gold; black oxide of manganese also shows in the rich ore. The average width of the vein is eight feet, although some of the stopes widen to 25 ft. The ratio of silver to gold is 2: 1. There are also veins in this district in which copper predominates, as for example, the Cooney vein of the Mogollon Gold & Copper Co. The mine was idle for a long time, but is producing again. In the Blue Bird vein of the Treasure company, which is adjoining parallel vein to the Confidence, a 60-ft. shaft shows fine specimens of bornite, chalcocite tetrahedrite and aburite. In 1903 and 1904 the shipments of the Mogollon Gold & Copper Co., were valued at $185,000, of which $138,000 was copper.

The Treasure Mill

The Confidence vein of the Treasure company, near Glenwood, of which Herbert Root is manager, is developed by a tunnel 2000 ft. in length with a shaft sunk 450 ft. below the tunnel level, about 80 tons per day are being sent daily to the mill on Whitewater Creek, four miles distant, by ore wagons over a good mountain road. There are 20 stamps in the mill, dropping about 105 times per minute, and crushing 4 tons per stamp through 18-mesh screens in cyanide solution, 4 lb. per ton of water. The pulp is concentrated, then cyanided. In the mill there are three Wilfley tables. The concentrates are classified in Akin classifiers, the slimes are settled in round vats, 22 ft. diameter, having continuous overflow, and the sands carried to leaching vats 24 ft. in diameter. The slimes are agitated by compressed air in vats 10 ft. in diameter by 20 ft. high. The solutions from slime and sand vats are carried direct to five zinc boxes. The precipitates are smelted in Case oil furnaces. Water delivered through a pipe line 1¼ miles long is used under 400 ft. head to develop power. There is also a steam plant at the mill.

The Ernestine company, owning the Last Chance mine, near Mogollon, and of which A. H. G. Palmer is manager, is the banner producer and original reviver of this once almost defunct district. The mine is developed by a tunnel with a mill at its portal, but a shaft has been sunk 500 ft. below the tunnel level and drifts extend from it, the lowest workings being in rich ore 1300 ft. below the apex. The mill is treating 100 tons per day. The ore is trammed to a 9x15-in. Blake crusher and then goes to the 40 stamps, 30 of them being run steadily. The ore is crushed in a solution containing about 4 lb. of sodium cyanide per ton. From the stamps the pulp goes to five standard concentrating tables. Here the heavier sulphides and raw pyrites are saved and the resulting concentrates shipped to the smeltery at El Paso, Tex. The tailings from the tables go to a Dorr classifier where the sands are separated from the slimes, the former going to a series of eight sand vats, where they are leached for about a week and then sluiced down a creek. The slimes are treated in five conical-bottom tanks, and when thoroughly agitated and decanted they then go to the Moore-process building, where the dissolved gold is extracted and the tailings sluiced down the creek, the same as the sands. The precipitates are smelted in a Steele-Harvey furnace burning crude oil.

The Socorro Mines Co., near Mogollon, of which H. F. Harris is general manager, operates the Little Fanny and Champion claims, on a vein parallel to the Confidence and Last Chance. There is an uptodate mill on the property, in which 30 stamps are dropping. The character of the ore is similar to that from the Confidence and Last Chance.

Universal Chemical Co.

The Universal Chemical Co. has been incorporated to proceed with the manufacture of agricultural phosphates from phosphate rock by the Newberry-Fishburne process, described in the Journal of Aug. 31. The new company is financed by Southern and New York interests, among which are White & Co., of 25 Pine St., New York. The capitalization is $30,000,000 and a bond issue of $7,500,000 has been authorized. The first plant, plans for which are now under way, will be erected in Tennessee. The announcement of the plans and the exact situation of the plant, together with the names of the officials of the company, is expected within a few weeks.

Sulphuric Acid Strengths

The strengths of the ordinary commercial grades of sulphuric acid are as follows: 50° Bé. acid contains 51.04% of SO_3 or 62.53% of H_2SO_4; 60° Bé. acid contains 63.7% SO_3 or 78.04% H_2SO_4; 66°, 79% SO_3, 97% H_2SO_4.

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Costs at the Erie Mine

By S. H. Brockunier*

At the Erie mine in Nevada County, California, great economies were effected by rearranging the stamp mill, substituting mule for hand tramming, using a shrinkage instead of the square-set stoping method, and adopting more efficient drilling machinery. The costs were reduced to $1.29 per ton of ore mined and milled.

It has been suggested that the reduction in costs of mining and milling attained at the Erie gold mine might interest others. Claim is not laid to anything original, but merely to persistence in the working out of the many problems, which were encountered.

The mine is situated in the Eureka mining district, Nevada County, Calif., and is at an elevation of 5000 ft. above sea level. The main vein lies within slate, about 300 ft. west of its contact with granite; all the veins are wide and the conditions are favorable for low working costs.

Veins are in Slate Near Granite Contact

The property was worked on a small scale in the early 60's, and in 1878 was transferred to the London & California Mining Co., which company sank the main shaft 400 ft., and operated on a more extensive scale, but upon losing the pay shoot at the lower level, operations were discontinued. Since then the property has passed through various ownerships. One of these built a stamp mill at the 500-ft. level, and drove a tunnel 1700 ft. into the mountain. None of the owners, however, connected the lower with the upper workings nor were they successful in rediscovering the lost pay shoot.

When the present company purchased the property, it found, in addition to the abandoned works, a good 20-stamp mill, the stamps of which weighed 1350 lb. each, a 12x12-in. Smith-Vaile compressor, 1¼-ton steel mine cars, three 3-in. air drills in bad condition, three small hammer-drills and the usual complement of mining tools.

The new owners planned to connect the lower tunnel with the upper workings, drain the old mine, demonstrate the possibility of an extension of the old shoot into the lower workings, to mill any ore found, and ascertain the cost of working, recoverable gold, etc. We need not dwell on the first year's operation, it was neither economical nor profitable.

When the present management assumed charge the lower and upper workings had been connected, the mine drained and some satisfactory ore had been found, but, considering the equipment and conditions, the cost of mining and milling, which was $3.60 per ton, was excessive.

The power for mine and mill was derived from pelton waterwheels operated by water under a 330 ft. head from the Bloomfield ditch. The cost of this water was 10c. per miners' inch, or about $4.50 per hp. month. The cost of hauling from Nevada City was $20 per ton, cost of sawed lumber $29 per 1000 ft., of round poles for stulls and timbers 1½c. per linear foot, lagging 2½c. each, headboards 3c. each, cordwood for heating $1.90, charcoal 15c. per bushel, blacksmith coal $45 per ton delivered, ties 2½c. each.

The mining was in soft ground, which was easily broken and handled, but the hanging wall was so tender that our foreman was afraid of it, and timbered the whole mine excessively, using square sets in the wider stopes instead of leaving pillars. Labor was largely composed of Italians and Austrians, with Americans in mill and shop and Cornish shift bosses. The pay per eight hours was: Miners, $3; helpers, carmen and surface men $2.75; millmen, blacksmiths, mechanics and shift bosses, $3.50. Board was $26 per month.

Fine Crushing Cause of Low Stamp Duty

Our first study was of the mill, which we found crushing 60 tons per day through 40-mesh screens, with a drop of 4 in., discharge of 8 in. and a recovery of 65% of the gold in the mill heads. Changing the slope of the amalgamating plates from one to two inches per foot slightly increased the saving. Screen analyses showed an excessive amount of fines, especially aggravating where so much clay was present; this was remedied by increasing the size of the screen aperture and lowering the discharge. These changes also increased the mill capacity.

The rock breaker was situated above the middle of the bin; the two outside batteries therefore received all the clay and fine rock, while the two middle batteries were fed with all the quartz and hard rock. In working this out we found that we could use coarser screens on the two outside batteries, the idea being to get the slime from the softer rock out of the battery as quickly as possible.

The final arrangement was: Six-inch drop, 100 drops per min., 5 in. discharge, 20-mesh needle-punched screens on the two outside batteries and 24-mesh needle-punched screens on the two middle batteries. With this arrangement and 12 gal. of water per min. per battery we increased the crushing capacity of the stamps to 100 tons per 24 hr., with an average saving of 80% of the gold. At times during a six-months run we attained a stamp duty of seven tons, and at other times, when the ore was well oxidized, a saving of 100% of the assay value. Both capacity and saving was of course dependent upon the character of the gangue being milled, the quality of the gold, and whether old or new shoes and dies were being used.

Results in the Mill Depended Upon Millmen

After much trouble with poor millmen we agreed to pay $3.50 and board, and thereafter secured millmen capable of keeping output and saving up to the maximum; although we did have some trouble getting men who would amalgamate dry enough for this ore; every time we put new millmen on we could detect a loss in our tailings samples.

After ascertaining what we could do in the mill, we started in to build the mine up to the mill capacity. As the ore in sight was at low ebb we had to increase our development so rapidly that this item became our heaviest burden. However, we were fortunate enough to encounter large blocks of ore, which, while low grade, seldom averaging over $3 per ton, enabled us to end the fiscal year with three months milling at full capacity, and thus reduce our total costs to a figure which promised good results.

While this work was going on we were installing concentrators, a larger compressor, replacing old bunk houses etc. In Table I is shown the total costs for the first six months, and costs per ton, excluding the construction, which was charged to capital account.

The labor during this period averaged:—

Development: 8 miners, 2 carmen, 1 blacksmith, 1 boss; total 12 men. Stoping: 8 miners, 10 carmen, 4 timbermen, 1 blacksmith helper, 1 boss; total 24 men. Milling: 3 millmen, 2 rock breaker men, 1 utility man; total 6 men. Administration: 1 superintendent, 1 foreman, 2 office men; total 4 men.

The grand total was 46 men employed. The costs given in Table I included all taxes, insurance and salaries, but nothing for amortization or sinking fund.

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*General manager, Erie Consolidated Mines Co., Gaston, Calif.

Many Economies Effected in the Mine

This was a fairly creditable showing, but during a shutdown of the mill, caused by a shortage of water, a large block of ore was developed, which did not average as high as the others, and a campaign was undertaken to see if $2 rock could not be made profitable.

All the ore was hand trammed, and more efficient work seemed possible in this direction. Therefore the main tunnel, which was 1700 ft. long, was selected for a study of the trammers and their methods. It was found that a man loaded a 1¼-ton car at the chute, took it out, dumped it, and returned in from 35 to 45 min., which made the cost of tramming on that level 18c. per ton. The track was then leveled, some curves reduced, cars put in good shape, and mules tried. It was found that a man and a mule got out four tons in 45 min., equivalent to a cost of 10c. per ton. Putting men back on the cars in the shift opposite the mule, selecting our men and showing them how to make time, we found that they could now make the round trip in 20 min., or at a cost of 14c. per ton. Thus we had effected a saving, by handpower of 4c. per ton and by mule power of 8c. per ton.

TABLE I. TOTAL EXPENSE AT ERIE MINE FROM JULY 1, 1910 TO JAN. 1, 1911.

(During this period of 184 days, the mill ran 130 days and 13,587 tons was milled.)

Month	Tons	Construction	Administration	Supplies		Labor		Total except construction
				Mine	Mill	Mine	Mill	
July	1,308	$2,686.20	$642.27	$1,857.83	$345.71	$1,998.12	$303.10	$5147 03
August	1,319	1,975.81	803.24	1,317.77	259.66	2,922 39	452.91	5,755 97
September	2,113	2,843.98	993.67	364.83	393.66	2,826.65	551.35	5,130 16
October	2,713	886.68	637.37	816 98	369 41	3,280.09	500 38	5,604 23
November	3,089	184.78	583.87	852.74	274.66	2,945.54	502.49	5,159.30
December	3,045	630.29	631.65	302.50	320.00	2,986.52	553.14	4,793.81
Total	13,587	$9,207.00	$4,292.07	$5,512.65	$1,963.10	$16,959.31	$2,863.37	$31,590.50
Monthly Average	32,264		$715.34	$918.77	$327.18	$2,826.55	$477.23	$5,266.08

Output milled per mill day of 24 hours, 104 tons.

Average costs per ton, distributing administration; Development, $0.84; stoping, $1.02; milling, $0 46; total per ton, $2.32.

Similar tactics throughout the mine enabled us to reduce our force of trammers sufficiently to save a total of 20c. per ton on all ore trammed. During these experiments we found that a car which held one ton was the maximum size that one man could handle profitably on our track and grades.

A study was then made of the miner and his methods. By directing the placing of the holes to better advantage, and cutting down the amount of dynamite used, a decided saving per ton was effected. Substituting one-man butterfly-valve Ingersoll drills for our old 3-in. piston drills, not only reduced the cost of labor, but increased the rapidity of our development work. Up to this time the stoping had all been done by hand, the nature of the vein lending itself admirably to this class of work. However we decided that a great saving could be effected here, so we discarded our cheap hammer drills, which we found entirely too expensive to keep in repair, and substituted No. 8C. Waugh stoping drills. The work performed with these drills during one year's hard service has been wonderful, and the repair bill has been practically nil. By the use of these two styles of drill and persistent hammering at efficiency, we succeeded in dispensing with eight more miners and yet did quite as much work. We could easily count on 30 to 40 tons of ore per drill in the stopes and could call on the 2½-in. drill for from four to five feet per shift in drift or crosscut, which amounted to 45 ft. of hole drilled.

Shrinkage Stoping Displaces Square Sets

Finally we changed our foreman and also our method of mining, by discontinuing all square sets and substituting the shrinkage method of stoping, with only an occasional stull when the hanging would get too flat or too tender to be safe. Wherever possible we left pillars of ore to support the hanging. As soon as a stope was completed up to the next level we drew it, and allowed the hanging to cave. In work of this character it is necessary to keep the raises and drifts without the zone of caving; with our hanging wall we do not think it would be safe to stope large blocks of reserve ore, but the development can be kept far ahead of the mill. This method effected one of our greatest economies, and so far it has been unaccompanied by accident.

By taking the utility man out of the mill, and making the day rock-breaker man assist the blacksmith, we still further reduced the costs; and by eternal vigilance we reduced the force to the following:

Administration: 1 superintendent, 1 office, 1 foreman; total 3 men. Mine: 8 miners, 8 carmen, 1 blacksmith, 1 shift boss, 1 compressor man; total 19 men. Mill: 3 millmen, 2 rockbreakers; total 5 men. This is a grand total of 27 men producing 3½ tons of ore per man.

The monthly results of all these changes on a three-months' run and on the basis of 100 tons per day milled was as shown in Table II. The supplies included power etc. and the total cost was therefore $1.29 per ton, to which should be added 21c. for sinking fund and 21c. for amortization of plant making total cost per ton $1.71. These costs can be sustained in the future, except the development, which should be 35c. per ton, but it is now necessary for the company to drive a lower tunnel and open more ore reserves, which cost would be taken care of by the 21c. sinking fund. Arrangements are now being made to carry this project through and when it is done steady mining on a large scale can be undertaken.

TABLE II—EXPENSES OF THREE-MONTHS' OPERATIONS AFTER EFFECTING ECONOMIES

Operation	Labor	Supplies	Total	Per ton of Ore
Developing	$ 382.10	$ 136.80	$ 518.90	$0.17
Stoping	1350.90	486.10	1837.00	0.61
Milling	558.30	300.88	859.18	0.29
Administration	570.00	95.20	665.20	0.22
Total	$2861.30	$1018.98	$3880.28	$1.29

Summarizing the net results attained on a basis of 100 tons per day were: Reduction in employees, from 46 to 27 or saving of 19 men; reduction in developing per ton, from 84 to 25c. or saving of 59c.; reduction in stoping, from $1.02 to 68c. or saving of 34c.; reduction in milling, from 46 to 36c. or saving of 10c.; a total reduction in costs from $2.32 to $1.29 or $1.03 per ton.

Gold Production of Seward Peninsula

The gold produced in Seward Peninsula, Alaska, for 1911 had a value of $3,100,000, which was a decrease of about $400,000 compared with the figures for 1910. This falling off, according to the U. S. Geological Survey, is attributable to three main causes. A decrease in the amount of winter mining; a general decrease in the number of mining operations, excepting dredging; the handling of low-grade material. All these causes may be referred more or less directly to the exhaustion of the known rich bonanzas before enterprises have been established capable of handling cheaply the large amounts of low-grade material which are known to exist on the peninsula.

Consul W. J. Yerby, of Sierra Leone, reports that through a proclamation issued by the protectorate government of Northern Nigeria, West Africa, the whole of the Nassarawa Province was declared open to prospectors on May 1, 1912

Historical Sketch of Ocampo Mines

By Robert Linton*

The discovery of gold ore at Ocampo was made about a century ago, the tale being that an angry mule herder searching for a rock to throw at his animals picked up a piece of "bonanza." The camp was prosperous from the start and is credited with a large production.

Ocampo, the head of the district of Rayón, is about 200 miles from the city of Chihuahua, in the Sierra Madre mountains, the particular part of the range being known as the *Alta Tarahumara*. The early history of the camp—like that of most of the rich *antiguas* of Mexico—is a record of a bonanza period when fortunes were easily made without employing any but the crudest and most extravagant methods. The recent reopening of the mines by the Sierra Consolidated Mines Co. has again attracted attention to this famous old camp, and the present sketch is intended to record a few historical notes of interest regarding it.

ORE DISCOVERED IN 1818

The discovery of the mining camp was as follows: In the year 1818 there was an uprising of the Indians of Onavas and the Mayo River. They planned to massacre all the Spaniards who were living among them. In the Tacupeto Valley there lived a Spaniard, José de Herrero, a merchant and miner, whose personality had made him many friends in the neighborhood. A native of the country, José María Coronado, who had been born in Moris, and who enjoyed a high prestige among the river tribes, being certain that Herrero was in danger by remaining where he was, gave him warning and helped him to escape, accompanying him himself with his men to his old home at Moris, where Herrero then settled.

As Herrero had a taste for mining, he began investigating the possibility of opening some mines in the vicinity of the town, which was then a small and purely agricultural community. His first discovery was, however, wholly accidental. He was accustomed to pasture his mules in a large box cañon above the town, and one day when his foreman went out to bring them in, five were missing. He sent the others in by his men and started out to hunt the missing five in person. After a long search he finally came upon them, and, angry at the trouble they had caused him, he picked up a rock to throw at them. As he did so he noticed it was heavy and had a yellow, metallic appearance, and remembering that his employer was prospecting for mineral, he brought it in and showed it to him. Herrero saw at once that it was gold ore. He gave the man $50 and went with him to the place where he had found it. After some search they found the vein, which outcropped showing free gold. He named the mine "El Refugio del Rosario," and this was the original discovery of the camp.

Herrero remembered how his life had been saved by Coronado and sent for the latter to come over from Tacupeto and share his good fortune, which he did the same year. He was astonished at the richness of the mine and the activity he found there, for there were already 14 *tahonas* (the crude native mills of that time) running, and a considerable population engaged in mining. Herrero had in the few months made a fortune. From the part that he gave to Coronado the latter is said to have made as much as $3000 in a single day.

THE TOWN OF OCAMPO

BALVANERA DISCOVERED BY A MULE HERDER

A number of mules were used in connection with this business and they were usually sent to pasture over the ridge into a cañon to the east called the Barranca de Las Cuevas, also the Barranca of the Hermit, because for some years a monk from the Cajurichic mission had lived alone in one of the caves there. It was in this cañon that the town of Ocampo was subsequently built. The mules were looked after by an Indian who used to take them down along a ridge now called the Descubridora (Discovery) or Balvanera. One day he noticed an outcrop showing *oroche*, or a mixture of native gold and silver. He communicated his discovery to a friend at El Refugio who was mining on his own account, and began quietly bringing over each day a small amount of *oroche* which was added to the Refugio product and sold as such. The secret could not be kept long, however, and soon numbers of others moved over to the Balvanera and began mining.

Chief among these was Tomás Bon, a Frenchman and an experienced miner. It was he who named the camp. After he had decided to settle there he brought in his family, and as they reached the dividing ridge and looked down into the deep barranca below them where the new mines lay, his wife exclaimed: "Jesus María! what a deep barranca!", which prompted Bon to say, "We will call it the mining camp of Jesus María," and the town bore this name until a few years ago, when it was changed to Ocampo.

OWNERS COULD NOT BUY CANDLES MORNING THE BONANZA WAS STRUCK

The Balvanera soon began producing more ore than the Refugio, and, in consequence, the greater part of the population moved over to the vicinity of the new discovery. Soon other mines were found—Jesus María, El Rayo, Santa Ana, Santa Eduviges and Santa Juliana. The last originally comprised three mines that were worked separately, the Santa Juliana proper on the north end, the Compromiso in the middle and the Providencia on the south. Although the Santa Juliana mine eventually developed into the most important producer of the camp, the early operations were discouraging. The Compromiso mine yielded good profits, but the Santa Juliana, which was owned jointly by several partners, did not make expenses. The owners had about lost faith in the property, but two brothers named Ontiveras, who were Zacatecan miners, insisted that with a little more work the mine would surpass the Compromiso. But the mine had gotten into such bad repute that the owners could scarcely be induced to put more money into developing it, and it is said that on the morning of the day when the bonanza was broken into, Pedro Ontiveras had a great deal of difficulty in raising a dollar to buy candles with. This bonanza was found in 1825.

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*General manager, Sierra Consolidated Mines Co., Ocampo,, Chih., Mex.

Originally Ores Were Ground in Tahonas and Smelted

At this time amalgamation was unknown here and the treatment was simply by grinding in *tahonas* and melting down in the crude melting furnaces of that time. These small treatment plants lined the arroyo and made large profits for their owners. The fame of the camp spread through the country and attracted miners who came from as far south as Zacatecas, Aguas Calientes and Jalisco. Among these was a Zacatecan who understood amalgamating and he obtained permission to treat the tailings from one of the *tahonas,* owned by Tomás Rivera. The latter was no little surprised to find that the Zacatecan with only a few days' treatment of these tailings, cleaned up 20 bars of bullion containing 16,000 oz. of silver. It is needless to say that the new process found immediate favor.

It was a period of prodigality, as was a natural result of conditions attendant upon mining such rich orebodies. While the operators made fortunes, the miners as well appear to have helped themselves quite plentifully to the abundance within reach. Many amusing stories are told of these early days. On one occasion one of the miners obtained permission to give a dance in the plaza, and in order that the plaza might be made ready for the occasion he had it washed down thoroughly, not with water, but with mescal.

By 1832 a large town had been built up, local government established, schools, business houses, churches, and at the same time the population had gained a reputation for solidity and good behavior which it retains to the present day. By that time the Santa Juliana mine had been worked down several hundred feet and being now below the level of the arroyo, a considerable flow of water was encountered. As the grade of ore had also lowered, and the cost of operations had increased with the deeper mining, the operation of the mine involved greater and greater difficulties. By 1834 work had been stopped. In this year a Spaniard named Sevilla put $25,000 into the enterprise, and the mine was actually unwatered, but another heavy flow again drowned out the workings, and the mine caved. The property was abandoned, and lay idle for over 50 years. It must be considered that at this time all the work was done by hand. No machinery had been brought in, and in spite of this the Santa Juliana mine had been worked to a depth of over 800 feet.

Santa Eduviges Bonanza Treated in Arrastres and Vasos

Meanwhile the Balvanera, Refugio, Santa Eduviges and a few smaller mines were still being worked in a rather desultory manner, and a few years after the Santa Juliana was abandoned a new bonanza was found in the Santa Eduviges. This mine was owned at that time by R. Siquieros, who packed the ore on burros to his *Hacienda Carmen* about two miles distant, where it was treated in arrastres and *vasos.* The oreshoot was large and portions of it extremely rich. It made a fortune for the owner in spite of the fact that a considerable portion of the richest ore never reached his arrastres. The shoot was called the *Plaza de Gallos* (cock-pit) because the miners were accustomed to hold cock fights there on holidays, each miner wagering his accumulation of "high grade" on the result.

Santa Juliana and Belen Mills, Ocampo District

First Foreign Company Formed in 1886

The mines were operated in this manner until 1886 when the first foreign company entered the camp. The Refugio Mining & Milling Co., in that year acquired the Refugio del Rosario mine and brought in the first mining machinery that was ever used here, also equipment for a 20-stamp mill. This machinery was all packed in from Alamos, about 300 miles distant, through extremely rough country. The company was composed originally of Omaha and San Francisco men, but the latter sold out after a time, leaving the Omaha men in entire control and with the active management of the operations. The advent of the Refugio company was followed by a revival of activity over the whole camp. In 1887, Carlos Conant relocated the Santa Juliana mine and organized the Santa Juliana Mining Co. Pumping and hoisting machinery was installed, the mine unwatered, and cleaned out, a 20-stamp mill built, and the property became again the leading producer of the camp. The mine was worked in this period down to a total depth of 1100 ft. The Rincón and Guadalupe mines were also acquired by this company and some ore obtained from them. In the same year that the Santa Juliana was relocated, José Dolores Solis located the San José mine and began working it in a small way. Solis died and about 1890 John J. Waterson, who had been connected with the Refugio company, leased the property and began active mining, treating the ore in arrastres at the *Hacienda de Quintana,* where the Waterson mill now stands. The operations were profitable from the start, and Waterson soon built a 10-stamp mill which a few years later was enlarged to 20 stamps. In 1902, Waterson sold the property to an English company, which still owns it, although it has not been operated for about two years.

The Belén mine was opened in 1892 by John R. Darroch, who organized the Belén Mining Co., composed principally of the Omaha men that controlled the Refugio company. Subsequently the ownership of the Refugio mine passed to the Belén Mining Co. The same company also acquired the Matulera mine, which had been located in 1887, but was still merely a prospect when the Belén company acquired it.

The Latest Bonanza on Santa Eduvices

Early in the '90s Senator Tabor, of Colorado, acquired the Santa Eduviges mine and spent considerable money in reopening it, and extending the work to greater depth. The results were unsatisfactory, and he sold the property to Chihuahua men. The latter had scarcely commenced work when a new bonanza was struck that yielded a handsome profit. In 1901 the Balvanera Mining Co. was formed and acquired the Balvanera, Santa Juliana, Guadalupe and Rincón mines. The company produced some bullion, but operated only a short time.

The mills of this period recovered the metals by concentration and amalgamation. The recovery must have been very low, from what few records exist, probably not over 50% to 60% was saved. The mills represented a long step in advance over the old *tahonas* and arrastres, but required high-grade ore to yield a profit in running them.

Transportation and Power Problems

The camp had reached the point where, in order to render the operation of the mines possible, costs had to be reduced and modern methods adopted. To accomplish this, transportation facilities were required, so that efficient machinery could be brought in, and cheaper power had to be provided for use in the mines and mills, which could only be solved by a consolidation of the properties. A good wagonroad was built in 1906 from Ocampo to Temósachic on the Mexico-Northwestern R.R. Some of the mines were operated on a small scale, but were closed down eventually, and when the Waterson company, which continued running until September, 1909, closed down, the camp was entirely idle for several months. The Sierra Consolidated Mines Co. had meanwhile been organized by T. F. Cole and J. B. Cotton, and purchased the most promising and important Ocampo properties, together with some others in near-by camps. This company began operations late in the same year, and has since been engaged in carrying out a comprehensive plan of development of the orebodies that have yielded such rich mines in the past. It will readily be understood that the situation demanded a radical departure from the methods of the old companies in order to place operations on an efficient and economical basis. To provide proper power the Sierra Consolidated Mines Co. has built a steam-driven electric-generating station at Durazno, situated on its timber lands (of which it owns over 80,000 acres) from which place the current is transmitted to Ocampo at 22,000 volts and distributed to the various mines and other places where it is used. A central compressing station has also been built with pipe lines extending to the mines that are now under development.

A New 100-ton Mill

The results of the development work have been sufficient to justify the installation of a new mill of 100 tons capacity, which should be in operation before the close of 1912. This mill will be the standard equipment for all-sliming cyanidation, consisting of stamps, tube mills, Pachuca agitators and Oliver filter.

Cyaniding had been introduced at El Salto mill in 1907, and about the same time also adopted by the Waterson company. The results obtained in the short time these companies continued to operate after this were much more satisfactory than had been obtained by amalgamation, and demonstrated that the Ocampo ores are readily amenable to this method of treatment

It is, of course, impossible to make any but the most general estimate of the production of the Ocampo mines. Men who have been connected with the operations longest estimate it at around $100,000,000. The largest production was in the early days when the richest bonanzas were worked. However, recent operations, even with the inefficient machinery at hand, have yielded much bullion and this output would have been greatly increased with modern mining and milling equipment. The orebodies are persistent in depth, and no producing mine appears ever to have been closed down because the oreshoot had been exhausted.

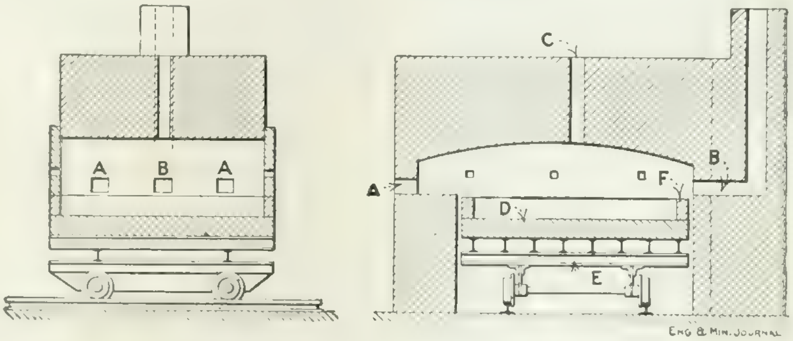
Mineral Output of New Caledonia

The New Caledonian 1911 mineral production is given by *Metaux et Alliages*, June, 1912, as: Nickel, 120,659 metric tons of ore, and about 3000 tons of matte; chrome ore, 82,806 metric tons. The blast furnaces of the Thio works were blown in in December, 1911, and the Société le Chrôme has completed a great hydro-electric installation, so that it is believed that the value of the mineral output may triple in 1912. The cobalt industry still shows no sign of life, owing to the amount of that metal recovered in Canada.

The West Sintering Process

A process for sintering iron-ore fines has been worked out by James G. West, assistant superintendent of furnaces, at the Edgar Thomson works of the Carnegie Steel Co., at Braddock, Penn. The process which recently has been patented, consists of agglomerating or sintering the fine materials while falling in a fine stream through an opening in the roof of a reverberatory furnace to a movable hearth below. The falling stream is so highly heated that the particles of ore sinter together and form a thoroughly sintered layer immediately upon falling on the hearth. The process is an intermittent one, each cycle being terminated when the movable hearth has been loaded with as deep a layer of sintered material as it can carry.

As shown in the accompanying halftone, the sintered material has a texture like a volcanic tuff, that is, it is porous or spongy. It seems to be well suited for smelting either in the blast furnace, or in the open hearth; the main object of producing these lumps of agglomerated Mesabi ores is for openhearth service.



Sections of West Ore Sintering Furnace

As shown in the sketch, the furnace consists of a roof and sides with a longitudinal vault or passage through which the trucks carrying the movable hearths, may pass. The sides of the furnace are equipped with a number of burners. *A*. A series of passages *B* in one side of the furnace connect with the stack. Extending vertically through the roof, is the opening *C*. The hearth *D* is made of suitable refractory material, supported upon the truck *E*. Each furnace is provided with several such trucks with the hearth prepared ready to be pushed into the furnace vault.

In operation, a layer of the fine ore or flue dust is laid upon the hearth, to a depth sufficiently thick to insure that the ore will not stick to the refractory bottom, the thickness of this layer being sufficient to prevent it being entirely heated to a plastic state. The furnace bottom is further prepared by building a wall *F* along the marginal edges of the top surface of the hearth. Refractory clay, stone or brick or other suitable material having heat resisting qualities equal to those of the materials to be treated, are employed for this purpose. When the hearth has thus been prepared, it is moved into the vault of the furnace and curtain doors are lowered to cover both ends of the vault. The burners at the side of the furnace are then lighted and the furnace hearth or bottom is heated to the desired temperature, after which, the sintering operation is begun. A stream of finely divided ore or other material is caused to flow into the furnace, the material passing through the opening *C* in the top of the furnace, and is spread over the hearth in regulated quantities. A sheet or stream of finely divided solids is thus brought into intimate contact with the highly heated products of combustion within the furnace, while falling from the opening in the furnace roof to the surface of the furnace hearth or bottom. The materials are heated sufficiently to become soft or plastic so as to partly fuse and stick together. The materials as deposited upon the bottom of the furnace, are spread over the surface of the hearth by means of a rabble or other suitable tool which is inserted in the openings provided for that purpose in the doors used to close the ends of the vault. In this way the materials are distributed over the hearth in a layer of approximately even thickness.

Material Sintered by West Process

By feeding regulated quantities of the material an agglomerated mass is gradually built up upon the hearth, until the full carrying capacity of the hearth truck has been reached. Then the doors at the end of the vault are opened and the truck or hearth carrying the sintered material is pushed out, and a new truck ready for a new layer of material is pushed in and the vault doors are closed again; the process is then continued. The other truck is allowed to cool, and when the material on the hearth has become sufficiently cool, the mass is lifted from the truck and broken into pieces of the size desired for charging into the blast or openhearth furnace.

Greenside Mine, England

London Correspondence

The Greenside mine is situated about one mile from the head of Ullswater Lake, Westmoreland, on a spur of the Helvellyn Range. In the tourist season it can easily be reached from Penrith by coach and boat and in the winter season from Troutbeck station, distant about 10 miles south over a good road.

J. H. Murchinson in his pamphlet on British lead mines written in 1875 states:

> A private local company has worked this mine for 50 years. There are three adits: Top, middle and lower. A continuous run of ore ground was found in the top and middle adits for a length of nearly 200 fathoms. In some places the lode has been 60 ft. wide. About 60,000 tons of lead have been raised, producing 40,000 tons of smelted lead and 600,000 oz. of silver worth £800,000 and £150,000, respectively, while the profits were £300,000.

Mine Opened About 1769

The above figures show that one ton of galena contained 10 oz. of silver. Postlethwaite Keswick states[1]:

> This mine was first opened about 120 years ago, but not extensively. The present company began operations about 90 years ago and drove several tunnels, one of which was driven 1200 ft. before the vein was intersected. The vein runs north and south with a dip to the east of 35°. There are several east and west crosscourses, which have no effect on the vein save to throw it to the west a few feet. The foot wall or "lying cheek" is fairly well defined, but there is no regular hanging wall. The gangue is quartz and a light gray felsitic rock (not unlike some of the limestones) through which strings of galena are interspersed, sometimes in the upper levels for a width of 50 or 60 ft. Of late the ore seems to be concentrated to a width of 8 or 9 ft.

At the time of my visit the main tunnel had been extended in the hill 1.5 miles and a shaft had been sunk 105 fathoms. The blacksmith shop, for the sharpening of the drills, and the repair shops, etc., are at the portal of the tunnel. Six rock drills were at work, supplied from a compressor driven by an electric motor fixed underground about two miles from the generating station. The compressor also furnishes power for pumps and small sump hoists. By reason of ample storage facilities there is no scarcity of water, not even in summer, for the generation of electricity.

The ore is loaded into cars of 20-cu.ft. capacity and hauled by an electric locomotive to the portal of the tunnel where it is dumped into open bins, into which sprays of water play and wash the ore. The coarse ore is broken by means of a Blake crusher; the fines pass through a trommel and are elevated to the jig house. The "roughs" are hauled over an incline to a Blake-Marsden crusher, through which they pass to a set of fluted rolls, and to two sets of Cornish rolls. The shells of these rolls wear well and uniformly considering that the gangue is quartz.

The product of the rolls flows to Green jigs (four-plunger type) which take the coarsest ore. All the jigs used are Greens, most of them of the three-compartment type. The trommels follow in succession, so as to carry and divert the ore into respective jigs. The "raff" is then conveyed to a separate roll crusher in No. 2 jig shed. After being treated by the jigs, the "chats" or rejects are crushed in a battery of three California stamps (400 lb.) and the pulp is treated on two Record tables, driven by a small turbine.

Slime Plant Efficient

The slime department has of recent years, been kept well to the front, and more attention is being paid to the treatment of slime than any other branch of metallurgy. It is comparatively easy to concentrate coarse gold, silver, copper, cassiterite, blende, galena, fluorspar, barite, etc.; the losses in concentration are principally due to the slime. The management has paid much attention to the slime and has erected a new building, well constructed, well lighted well arranged, well cleaned with ample space for two additional Records.

The slime is further treated on two Luhrig tables, supplemented by six belt tables, and finally on two concave, and one convex buddle. These buddles in some places are not great favorites, on account of the endless handlings of the "seconds" or "middlings," as no matter how many times they may be treated, they are "seconds" still and nothing else. Here, however, these buddles do good work, although in the open, as they have the faculty of saving the last slime, which is most difficult to treat, and concentrate it to 80% lead.

Slime galena is rather difficult to treat and there is no machine, no matter how carefully handled that can save all. Good machinery and skilled attention will do much to minimize loss. Galena has a high specific gravity, usually much higher than the associated minerals, yet it floats, and a few pounds in a creek or river have the faculty of making much display, like the proverbial "gilt on the gingerbread."

The crude ore from the mine carries 7.5% of lead and is dressed up to 82% for the smelter. The jig screens vary from ⅜-in. holes to No. 26 conical punched copper sheets (Cornish gage).

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[1] "Mines and Minerals in the Lake District," 1889.

The ore after it leaves the crusher is automatically treated, gravitating from one machine to another, and from one department to another, so that but little labor is required. The mill is built on the slope of a hill. But little water is used for the concentration, although plenty is available. The capacity of the mill is 60 tons per day of 12 hours, concentrating 1850 tons per year to an 82% product.

THE SMELTERY

The smelting works is situated in the midst of the dressing department, and has a capacity of about 12 tons of smelted lead every 24 hours. A reverberatory furnace to drive off the sulphur n the concentrates is in operation 24 hours per day. There are four Scotch-hearth furnaces of limited capacity compared with the big furnaces of 500 or more ons capacity which may be seen at work n other countries. The furnace flue is ver a mile in length, and is on the hill-ide with no pasture or much vegetation o destroy. The flue is provided with manholes conveniently placed so that when there is an accumulation of flue ust a stream of water is directed into he flue, and the dust washed into ectangular pits or tanks, just below nd adjoining the smeltery floor. Over-ow tanks are arranged so as to allow he flue slime to dry preparatory to melting. It was estimated that the flue ust awaiting treatment contained 100 ons of smelted lead. This lead commands a ready sale, one firm having ought the output for many years.

ELECTRIC PLANT

The first electric plant erected in 1891 as a 600-volt, direct-current type. This as since been replaced by an alter-ating-current plant of 2000 volts. The urrent is transformed inside the mine, wo miles from the generating station, o 600 volts supplying power to two large oists, two pumps, the air compressor r the rock drills as before mentioned nd a motor generator for the use of e locomotive for a 250-volt circuit, rough two overhead conductors fixed to e roof of the adit. The pumps and oists were the first electrically driven achines ever fixed in any metalliferous ine in this country, and the electric locomotive still holds that record and has een at work since 1893, drawing a load 12 trucks averaging 18 tons.

I am much indebted to the manager, . H. Borlase, for giving permission to o over the mine and for providing the ata, also to the assistant, Mr. Grenfell, r showing me over the works.

A crystal of spodumene (lithium-uminum silicate) was found in the Etta ine, Black Hills, S. D., which was 42 . long, with a cross-section of 18 feet.

Platinum Electrodes of Light Weight

Owing to the high price of platinum, Gooch and Burdick, of Yale University, have been directing their attention to substitutes for platinum electrodes (*Am. Journ. Sci.*, August, 1912). The ordinary method for making gas electrodes does not produce sufficiently adherent platinum films on the glass to use for wet analysis. A more closely adherent film may be obtained by applying a viscous mixture of glycerine and dry chlorplatinic acid with an asbestos swab to glass previously raised to a temperature sufficient to volatilize the glycerine immediately. The resulting film of metal is then burned into the glass at the softening point of the latter.

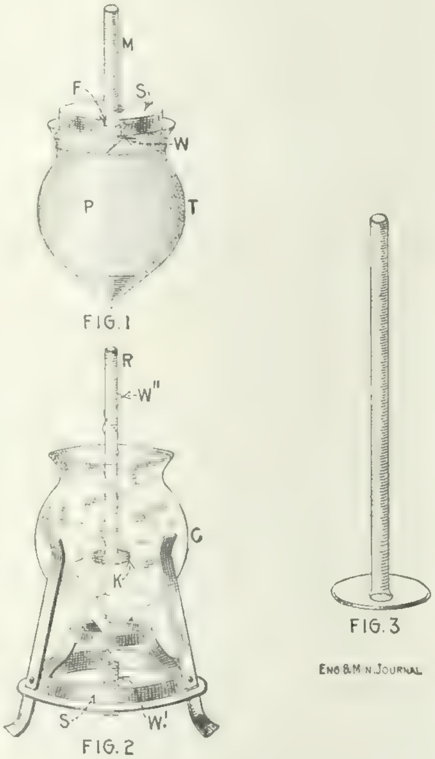

FIG. 1

FIG. 2

FIG. 3

Eng & M'n Journal

ELECTROLYTIC APPARATUS

The best electrodes made in this manner were obtained by platinizing the outer surface of the thistle of a lead-glass thistle tube, 3.5 cm. in diameter. This is slipped on a rubber stopper carried by the shaft of a motor and is used as a rotating cathode.

In the accompanying illustration, Fig. 1, *T* is the thistle, with platinum coating *P*. *W* is a wire making electric connection with the platinum film, with *F*, a piece of platinum foil, which in turn makes connection with the motor shaft, which carried the current for deposition. Good contact between the wire and foil is obtained by squeezing them between the stopper and thistle tube. The anode is a piece of platinum foil, and electrolysis is carried on in a 50-c.c. beaker.

While results obtained with this apparatus were good, there was a tendency for the film to disintegrate during cleaning, and possibly also during deposition, as the results were slightly low.

ELECTROLYSIS IN A WEIGHABLE CELL

Better results were obtained by using a weighable cell, as shown in Fig. 2. *A* is a small piece of platinum foil for anode, *W'* its connection, *C* is the cathode consisting of a disk of platinum gauze or foil, 1 cm. square, carried by a rod of glass, *R*, fused into the meshes of the platinum or into a central hole in the foil, an arrangement which gives great rigidity without the use of much platinum. The electrical connection is made to the motor shaft by wire *W''*, after clamping the class rod to it. The stand *S*, of spring brass, holds the cell during electrolysis. A similar one, of aluminum, holds it on the balance pan.

In using this apparatus the cell is washed, dried and weighed. The material for analysis, not over 15 c.c. in bulk, is placed inside, and the solution electrolyzed while rotating the cathode at about 300 r.p.m. The thistle is covered by a split watch glass during electrolysis. In experiments about ⅛ gram of copper was electrolyzed in 20 min., using about two amperes.

At the end of the electrolysis the cathode was disconnected from the shaft, and washed in the cell. Any loose particles are allowed to settle, the spent electrolyte decanted, and the deposit washed by decantation, and cell, electrodes and deposit weighed.

WEIGHABLE CELL WITH FILTER

However, it was difficult to wash by decantation without loss, so a new piece of apparatus was devised. This is a filter tube, Fig. 3, made by fusing the end of a lead-glass tube to a little disk of platinum foil perforated by a sharp point, the rough edges of the perforations being turned outward. By applying the suction of the filter pump to the open end of the tube, and dipping the disk end into an asbestos emulsion, an asbestos felt is deposited upon the perforated disk. The tube and filter can be dried, and even ignited without difficulty.

The filter is dried and weighed with the cell, and the electrolysis performed. The liquid is then drawn off through the filter, and the deposit washed. Stand, cell, cathode and filter are then dried and all weighed together. There is not over 1.1 gram of platinum used in the apparatus.

While it can be used as a non-rotating device, the results are more reliable, and more quickly obtained when the cathode is rotated.

The Mining Index

A Classified Bibliography of the Current Literature of Mining and Metallurgy

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COAL AND COKE

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19,684—AIR—Notes on the Analyses of Mine Air Conducted at the Lewis Merthyr Consolidated Collieries, Ltd., Trehafod. J.W. Hutchinson and Edgar C. Evans. (Colliery Guardian, July 19, 1912; 2⅓ pp., illus.) Paper before So. Wales Inst. of Engrs. 40c.

19,685—BOILER CHARGING—Die Kesselbekohlanlage der Zeche Zollern II der Gelsenkirchner Bergwerks A. G. Pietrowski. (Zeit. des Vereines Deutsch. Ing., July 20, 1912; 4 pp., illus.) Coal-feeding plant for the boilers of Zollern II Colliery of Gelsenkirchen M. Co., Westphalia.

19,686—BRITISH COLUMBIA—Notes on the Groundhog Coal Basin, Skeena District, B. C. G. S. Malloch. (Trans. Can. Min. Inst., Vol. XV, Part 1, 1912; 3 pp.)

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19,688—COAL CUTTING—Power Consumption of Coal Cutters. G. W. Thomas. (Mines and Minerals, Aug., 1912; ¾ p.) 20c.

19,689—COKE—Die Entwicklung der Koksdarstellung auf den Steinkohlenbergwerken in der Grafschaft Schaumburg. Finze. (Preus. Zeit. f. B. H. u. S., 1912, Part 2; 23 pp., illus.)

19,690—COKE—Improved Coke-Oven Practice. (Mines and Minerals, July, 1912; 1¼ pp., illus.) Use of crushed coal, electric pullers and loaders and leveling machines. 40c.

19,691—COKE—The Kros Regenerative Coke Oven. Alfred Gobiet. (Coal Age, July 20, 1912; 2 pp., illus.) 20c.

19,692—COKE OVEN—The Muller By-Product Coke Oven. Eugene B. Wilson. (Mines and Minerals, Aug., 1912; 2¾ pp., illus.) A description of the construction and operation of an improved coke oven possessing a number of novel features. 40c.

19,693—COKE-OVEN GASES—Ueber die Prufung des Kokerei-Rohgases auf seinen Gehalt an Nebenerzeugnissen. E. Jenkner. (Stahl u. Eisen, July 11, 1912; 4 pp., illus.) Testing of crude gases from coking ovens for by-products. 40c.

19,694—COKE-QUENCHING and Loading Devices. (Coal Age, Aug. 3, 1912; 1 p.) 20c.

19,695—COLORADO—Central Coal Fields in Colorado. F. W. Whiteside. (Coal Age, July 6, 1912; 3¼ pp., illus.) 20c.

19,696—COST OF MINING—The Increased Cost of Mining Anthracite. W. D. Owens. (Mines and Minerals, Aug., 1912; 1 p.) A comparison of the present mining conditions with those existing thirty or more years ago. 20c.

19,697—DEPOSITION—An Occurrence of Coal Which Bears Evidence of Unusual Conditions Accompanying Its Deposition. Jesse E. Hyde. (Journ. Geol., May-June, 1912; 15 pp., illus.) Describes a unique occurrence of coal at Sommerset, Ohio. 60c.

19,698—DRILLING—L'Emploi des Marteaux [illegible] dans L'Exploitation [illegible] de Houille. A. Jacquelin. ([illegible] des Ingenieurs Civils de France, [illegible], 1912; 3 pp., illus.)

19,699—DUST—History of Coal-Dust Explosions. Eugene B. Wilson. (Mines and Minerals, July, 1912; 7 pp.) 40c.

19,700—ELECTRICITY in Brown Coal Mines. (Coal Age, Aug. 3, 1912; 3½ pp., illus.) 20c.

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PETROLEUM AND NATURAL GAS

19,853—CALIFORNIA—Growth of the Petroleum Industry in California. William H. Storms. (Min. and Eng. Wld., June 22, 1912; 2½ pp., illus.) 20c.

19,854 — HUNGARY — Natural Gas in Hungary and the Gas Well at Kis Sarmas. A. Strobl. (Journ. Soc. Hungarian Engrs. and Architects of America, July, 1912; 6 pp., illus.) 40c.

19,855—NATURAL GAS; Its Properties, Its Domestic Use, and Its Measurement by Meters. P. F. Walker. (Bull. Univ. of Kansas, Vol. XIII, No. 16, July 1, 1912; 38 pp., illus.) A report published by the Public Utilities Commission of Kansas.

19,856—PERU—La Industria del Petroleo en el Peru. Juan Velasquez Jimenez. (Anales de la Sociedad Cientifica Argentina, Mar., 1912; 46 pp., illus.)

ECONOMIC GEOLOGY—GENERAL

19,857—ANGLE MEASUREMENT—Eine praktische Ausrustung fur die Winkelmessungen bei der geologischen Feldarbeit. Hirschl. (Zeit. f. prakt. Geol., July, 1912; 1 p., illus.) A practical equipment for the measurement of angles in geological field work.

19,858—BRITISH COLUMBIA—Rainy Hollow, B. C. and Southwestern Yukon. E. Jacobs. (Can. Min. Journ., July 15, 1912; 5¼ pp., illus.) 20c.

19,859—ECUADOR—Sketch of the Geology of Ecuador. W. A. Wolf. (Min. and Sci. Press, July 27, 1912; 2 pp., illus.) 20c.

19,860 — ITALY — Die Erzlagerstatten von Traversella in Piemont, Italien. Muller. (Zeit. f. prakt. Geol., June, 1912; 31 pp., illus.) The ore deposits of Traversella in Piedmont, Italy. 40c.

19,861—NEW ZEALAND—The Geology of the Dun Mountain Subdivision, Nelson. James Mackintosh Bell, Edward de Courcy Clarke and Patrick Marshall. (New Zealand Dept. of Mines, Geol. Surv. Branch, Bull. 12, 1911; 80 pp., illus.)

19,862—ORIGIN OF ROCKS—The Value of Certain Criteria for the Determination of the Origin of Foliated Crystalline Rocks. II. J. D. Trueman. (Journ. Geol., May-June, 1912; 16 pp.) 60c.

19,863—PENNSYLVANIA—The Geology of South Mountain at the Junction of Berks, Lebanon, and Lancaster Counties, Penn. H. N. Eaton. (Journ. Geol., May-June, 1912; 13 pp., illus.) 60c.

19,864—SERVIA—Die Kupfererz- und Limonit-Lagerstatten von Majdan-Pek in Servien. Wendeborn. (Zeit. f. prakt. Geol., July, 1912; 14 pp., illus.) The copper ore and limonite deposits of Majdan Pek, Servia. 40c.

19,865—SOUTH DAKOTA—Contribution to the Study of the Pre-Cambrian Rocks of the Harney Peak District of South Dakota. Gordon S. Duncan. (Bull. A. I. M. E., July, 1912; 12 pp., illus.) 40c.

MINING—GENERAL

19,866—ACCIDENTS—Die todlichen Verungluckungen beim Bergwerksbetrieb in Oberbergamtsbezirk Dortmund im Jahre 1911. (Gluckauf, June 22, 1912; 2¾ pp.) Fatal accidents in mining in the Dortmund district. 40c.

19,867 — ACCIDENTS in Transvaal Mines, with Special Reference to Falls. James Chilton. (Journ. Chem. Met. and Min. Soc. of South Africa, June, 1912; 4½ pp.) Author's reply to discussion. 60c.

19,868—ALABAMA—Statistics of the Mineral Production of Alabama for 1910. Charles Arthur Abele. (Geol. Survey of Ala., Bull. 12, 1912; 51 pp.)

19,869 — ARGENTINA — Mining Prospects of Argentina, South America. R. W. Ellis. (Min. and Eng. Wld., July 27, 1912; ½ p.) 20c.

19,870—BAILING TANK—Self-Discharging Bailing Tank. M. G. Sohnlein. (Eng. and Min. Journ., July 20, 1912; ¾ p., illus.) 20c.

19,871—BLAST—Methods of Making a 350,000-Cu.Yd. Blast at Piedra, Cal. (Engineering and Contracting, July 24, 1912; 1 p., illus.) 20c.

19,872—BOLIVIA—The Mines of Bolivia. C. F. Z. Caracristi. (Mex. Min. Journ., Aug., 1912; 2¾ pp., illus.) 20c.

19,873—CAGES—Mine Cages at the Desloge Consolidated. C. T. Rice. (Eng. and Min. Journ. Aug. 24, 1912; 1 p., illus.) 20c.

19,874—CAVING SYSTEM of Mining in America. J. Bowie Wilson. (Eng. and Min. Journ., Aug. 10, 1912; 1¾ pp.) 20c.

19,875—CHANGE HOUSE at Franklin Furnace, N. J. (Eng. and Min. Journ., Aug. 24, 1912; 2 pp., illus.) 20c.

19,876—CHURN DRILLING in Shaft Sinking. Tom McCormac. (Min. and Sci. Press, July 13, 1912; ¾ p.) 20c.

19,877—CONCRETE COLLARS for Mine Shafts. (Eng. and Min. Journ., Aug. 10, 1912; 1¾ pp., illus.) 20c.

19,878 — DUST — New Apparatus for Sampling Air for Dust. E. J. Laschinger. (Journ. Chem., Met. and Min. Soc. of South Africa, May, 1912; 4¼ pp., illus.) 60c.

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19,881—EXPLOSIVES—The Effect of Stemming on the Efficiency of Explosives. Walter O. Snelling and Clarence Hall. (U. S. Bureau of Mines, Tech. Paper 17, 1912; 20 pp., illus.)

19,882—FIRE PROTECTION—A Gravity Water System. John W. Powell. (Coal Age, June 22, 1912; ½ p.) 20c.

19,883 — FRANCE — Die franzosische Bergwerksindustrie im Jahre 1910. (Gluckauf, July 20, 1912; 5¼ pp.) The French mining industry in 1910. 40c.

19,884—GAS IGNITION—Ignition of Gas by Minature Electric Lamps With Tungsten Filaments. H. H. Clark. (U. S. Bureau of Mines, Tech. Paper 23, 1912; 5 pp.)

19,885—HAULAGE—Determination of Generator Capacity for Mine Haulage. E. B. Wagner. (Coal Age, June 22, 1912; 1 p., illus.) 20c.

19,886—HOISTING—Mine Hoisting Systems Compared. R. R. Seeber. (Eng. and Min. Journ., Aug. 3, 1912; ¾ p.) Remarks on a previous article by B. V. Nordberg. 20c.

19,887—HOISTING on Inclines. Arthur O. Gates. (Eng. and Min. Journ., Aug. 17, 1912; 1 p., illus.) 20c.

19,888—HOISTING ROPES—Die Sicherheit der Forderseile. Speer. (Gluckauf, July 20 and 27, 1912; 43½ pp., illus.) Continuation of article previously indexed. 60c.

19,889—INSPECTION at Beaver Consolidated Mine. (Eng. and Min. Journ., Aug. 17, 1912; 1¼ pp., illus.) 20c.

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19,892—MINE EXAMINATION—Geology Applied to Mine Examination. Ira B. Joralemon. (Eng. and Min. Journ., Aug. 10, 1912; 2¾ pp.)

19,893—MINING METHOD—Mining by Timbering and Filling at the Homestake Mine. Albert L. Toenges. (Mines and Minerals, Aug., 1912; 2¾ pp., illus.) 20c.

19,894—NEW JERSEY—The Mineral Industry of New Jersey for 1911. Henry B. Kummel. (Geol. Surv. of N. J., Bull. 7, 1912; 37 pp., illus.)

19,895—ORE DOCK—Method and Cost of Constructing a Concrete and Steel Ore Dock for the Duluth & Iron Range R. R. Leland Clapper. (Engineering and Contracting, July 17, 1912; 3¼ pp., illus.) 20c.

19,896—ORE DOCKS—Construction of Permanent Ore-Loading Docks—I and II. C. A. Tupper. (Min. and Eng. Wld., Aug. 3 and 10, 1912; 6¾ pp., illus.) 40c.

19,897—PANAMA CANAL—Le Canal de anama. A. Dumas. (Genie Civil, May , June 1 and 8, 1912; 31 pp., illus.) To be ntinued. $1.

19,898—PHILIPPINE ISLANDS—Min- al Resources of the Philippine Islands Arthur. (Min. and Eng Wld., July 20, 12; 2 pp., illus.) 20c.

19,899—PRODUCTION—Silver, Copper, ead and Zinc in the Central States in 11. Mine Production. B. S. Butler and P. Dunlop. (Advance Chapter from ineral Resources of the U. S., 1911; 82 .)

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9,904 —SHAFTS—Two Concrete-Lined ne Shafts at Annabelle, W. Va. F. C. ld. (Coal Age, July 13, 1912; 2½ pp., us.) 20c.

9,905—SOUTH DAKOTA—Water Pow- Possibilities of the Black Hills, W. R. tnam. (Pahasapa Quart., June, 1912; pp., illus.)

9,906—STOPING—Advantages of a Le- Stope. H. Y. Russel. (Eng. and Min. urn., Aug. 10, 1912; 1 p.) 20c.

9,907—TIMBERING—Notes on Stope mbering. (South African Min. Journ., ne 15, 1912; 1 p., illus.) 40c.

9,908—TRANSVAAL—The Benguella ilway. A. Shortened Route to the ansvaal. J. Hartley Knight. (Eng. g., July, 1912; 7 pp., illus.) 40c.

9,909 — TUNNEL — Determination of obable Rock Temperature in a Conti- ntal Divide Tunnel. E. Lauchli. (Eng. ., June 8, 1912; 2⅔ pp., illus.) 20c.

9,910—TUNNEL—Lining Part of the nticou Grade Tunnel on the Catskill ueduct. John H. C. Gregg. (Eng ., June 22, 1912; 2¾ pp., illus.) 20c.

9,911 — TUNNEL — Methods of Con- ucting the Rondout Pressure Tunnel of Catskill Aqueduct. (Eng. and Con- cting, May 22, 1912; 4½ pp., illus.) 20c.

9,912—TUNNELING—Rapid Mine Tun- ing in Arizona. Norman Carmichael. g. and Min. Journ., Aug. 17, 1912; 3¼ , illus.) 20c.

9,913—TUNNELS—Method and Cost of nstructing Six Small Tunnels in Earth Rock, Chicago Water Works. Myron Reynolds. (Engineering and Con- cting, July 3, 1912; ¾ p., illus.) 20c.

9,914—VALUATION of Base-Metal nes. W. H. Goodchild. (Min. Mag , y, 1912; 2¼ pp.) 60c.

9,915—VENTILATION—Versuche uber Zweckmassigkeit blasender oder sau- der Luttenbewetterung bei Rettung- beiten. (Preus. Zeit. f. B., H. u. S , , Part 2; 3½ pp., illus.) Experiments the usefulness of ventilation either by wing fresh air or exhausting foul air ough pipes in rescue work

,916—WAGES—Bonus System on Los geles Aqueduct. (Mines and Minerals, e, 1912; 2½ pp., illus.) Rules of opera- and method of computing bonus foot- and earnings. 20c.

,917—WOOD PRESERVATION Die esten Fortschritte auf dem Gebiete Holzkonservierung. (Bergbau, June 1912; ½ p.) The latest progress in the servation of wood. 20c.

,918—WORKMEN'S ACCIDENT COM- NSATION. A. Dinsmoor. (Coal Age. e 29, 1912; 1½ pp.) 20c.

ORE DRESSING—GENERAL

.919 — CONCENTRATOR — The Peck trifugal Concentrator. (Eng. and Journ., Aug. 3, 1912; 1 p., illus.) 20c.

,920 — CRUSHING — Amerikanische lmaschinen. Nagel. (Chem.-Ztg., e 18, 1912; 2 pp., illus.) American ding machines. 20c.

,921—JIG—Harz Jig Improvements. g. and Min. Journ., Aug. 24, 1912; 1½ illus.) 20c.

,922—ORE DRYING—Abrasion and t Losses in Ore Drying. Carl F. tz and Dyke V. Keedy. (Bull. A. I. M. July, 1912; 22 pp., illus.)

19,923—SLIMES CONCENTRATION—Multiple-Deck Concentration of Slimes. Charles J. Downey. (Min. Sci., July 25, 1912; 3 pp., illus.) Describes new invention of A. R. Wilfley. 20c.

METALLURGY—GENERAL

19,924—ALLOYS—Ueber Blei-Zinn-Antimon-Legierungen. William Campbell. (Metallurgie, July 8, 1912; 3½ pp., illus.) On lead-tin-antimony alloys. .40c.

19,925—FLOW OF GAS FORMULAE with Reference to Illuminating Gas. J. M. Spitzglass. (Progressive Age, June 1, 1912; 8¾ pp., illus.) 40c.

19,926 — GAS — Gasfeuerungen und Kraftgasanlagen mit chemischer Regenerierung von Vergrennungsgasen Gwosdz. (Gluckauf, June 1, 1912; 4½ pp., illus.) Gas firing and power gas plants with regeneration of combustion gases. 40c.

19,927—MELTING BY GAS—Industrial Uses for Gas. Edward F. Davis. (Progressive Age, June 15, 1912; 1½ pp.) Brief notes on the uses of gas for melting, annealing, hardening and tempering metals. 20c.

19,928—PROPERTIES OF METALS—Ueber die Aenderung der Eigenschaften bei der bearbeitung von Metallen. Tanemann. (Zeit. f. Electrochem., July 15, 1912; 14½ pp., illus.) On the change of properties in working metals. Also discussion. 40c.

19,929—ROASTING—Thermische Daten zu den Rostprozessen. K. Freidrich. (Metallurgie, July 8, 1912; 9 pp., illus.) 40c.

19,930 — SMELTER FUME — Electrical Fume Precipitation. F. G. Cottrell. (Bull. A. I. M. E., July, 1912; 14 pp., illus.) 40c.

MINING AND METALLURGICAL

19,931—AERIAL ROPEWAY at the Blaydon Burn Pits of the Priestman Collieries. Limited. (Iron and Coal Tr. Rev., June 28, 1912; 1 p., illus.) 40c.

19,932—CAGE—A Drop Bottom Cage Used at the Mines of the St. Louis Smelting & Refining Co. (Eng. and Min. Journ., Aug. 3, 1912; 1 p., illus,) 20c.

19,933 — DIESEL MOTOR — Teer und Teerol als Treibmittel fur den Diselmotor. Rath. (Gluckauf, June 22, 1912; 9 pp.) Tar and tar oil as motive power for the Diesel motor. 40c.

19,934—DIESEL MOTOR—Untersuchung eines mit Teerol betriebenen 480 P S-Dieselmotors. Butow and Dobbelstein. (Gluckauf, June 22, 1912; 7½ pp., illus.) Testing of a 480-hp. Diesel motor actuated by tar oil. 40c.

19,935—ELECTRIC FURNACE for the Treatment of Tin Dross, Concentrates from Cyanide Mills and Other Metallurgical Work. R. S. Wile. (Met. and Chem. Eng., Aug., 1912; 2½ pp., illus.) 40c.

19,936—ELECTRIC FURNACE—Thirty Years' Progress in the Electric Furnace F A J Fitzgerald (Proc. A I E. E , June, 1912; 9 pp.)

19,937—ELECTRIC MINING APPLICATIONS. E. A. Lof. (School of Mines Quart., July, 1912; 23 pp., illus.) 60c

19,938 — ELECTRICAL INSTALLATIONS of the Lena Gold Mining Co. (Min. Journ., June·29, 1912; 1¾ pp., illus.) 40c.

19,939—ELECTRICAL PLANT of the "El Guindo" Mining Company, La Carolina. Spain. (AEG Journ., June and July, 1912; 6½ pp., illus.) 60c.

19,940—ELECTRICITY — Electric Mine Operations—Rotary Converters. Stuart Rice. (Min. and Eng. Wld., June 29, 1912; 1½ pp.) 20c.

19,941—ELECTRICITY in the El Guindo Lead Mine in Spain. (Elec. Rev., London, July 26, 1912; 2¾ pp., illus.) 40c.

19,942—ELECTRICITY—The Factor of Safety in Mine Electrical Installations. H. H. Clark. (U. S. Bureau of Mines, Tech. Paper 19, 1912; 14 pp.)

19,943—FLOW OF WATER—Calculating the Flow of Water in Pipes. T. W. Holloway. (Power, June 4, 1912; 3½ pp., illus.) 20c

19,944 — FURNACES — Industrial Furnaces. J. B. M. Knutsen. (Aust. Min Stand May 30 and June 13, 1912, 2½ pp., illus.) Deals with gas, oil-fuel and electric furnaces 80c

19,945—GAS ENGINE—The Design and Construction of a New Gas Engine Built by the C & G Cooper Co (Iron Tr Rev., July 11 1912, 3 pp , illus) 20c

19,946 GAS ENGINES — The Direct Driving of Mining Plant by Internal-Combustion Engines, with Special Reference to the Operation of Colliery Fans. A. Vennell Coster. (Cassier's Mag., July, 1912; 11 pp., illus.) 40c.

19,947—GAS PRODUCER—Status of the Gas Producer and of the Internal-Combustion Engine in the Utilization of Fuels. Robert Heywood Fernald. (Bureau of Mines, Tech. Paper 9, 1912; 42 pp., illus.)

19,948 — GAS PRODUCER — Verdampfungsversuch an einem mit Wefer-Gasfeuerungen ausgerusteten Zweiflammrohrkessel. Butow u. Dobbelstein. (Gluckauf, May 18, 1912; 3½ pp., illus.) Experiment of generating steam in a two-tube boiler equipped with Wefer gas producer. 40c.

19,949—GASOLINE INDUSTRIAL LOCOMOTIVES. Frank C. Perkins. (Mines and Minerals July, 1912, 1¼ pp., illus.) Difficult conditions to which the internal combustion motor has been adapted. 20c

19,950—HOISTING—Sicherheitsvorrichtung Grunewald mit Regel-, Stau- und abgestufter Bremswirkung. Forster (B. u. H. Rundschau, June 5, 1912; 2 pp., illus.) The Grunewald safety brake and regulator on hoisting engines. 40c

19,951—HOISTING Tests on an Electric Winding Plant with Flywheel Storage, and Comparison of Balancing with that Obtained by Buffer Batteries. L Crouch (Eng Rev , June 15, 1912, 2¼ pp , illus.) 40c

19,952—HYDRO-ELECTRIC PLANT—A New Large Hydro-Electric Plant for the State of Oaxaca (Mex. Min Journ , June, 1912, 1 p) 20c

19,953—LAMP—A New Electric Miners' Lamp. D. B. Rushmore. (Bull. A. I. M. E., July, 1912; 8 pp., illus.) 40c.

19,954—LAMPS—Die Dirchblasesicherheit von Doppelkorblampen Beyling and Hatzfeld (Gluckauf, June 1, 1912, 8¾ pp., illus.) The security of double basket lamps against blowing through. 40c.

19,955—MINE TELEPHONE of Today. E. L. Cole. (Coal Age, July 27, 1912; 3½ pp., illus.) 20c.

19,956 — MOTOR TRANSPORTATION for the Contractor. Rollin W. Hutchinson. (Concrete-Cement Age, July, 1912; 3½ pp,. illus.) 20c.

19,957 — ORE BUCKETS — Joplin Ore Buckets. (Eng. and Min. Journ., Aug. 10, 1912; 1½ pp., illus.) 20c.

19,958—PUMP—The Hydraulic Ram—Its Possibilities of Development and Use. Stirling B. Hill. (Can. Engr., May 23, 1912; 5 pp., illus.) 20c.

19,959 — SHOPS — Oliver Iron Mining Co.'s Shops at Hibbing, Minn. (Iron Tr Rev., July 11, 1912; 6½ pp., illus.) 20c.

19,960—STEAM TURBINE—Untersuchung einer Abdampfturbine auf Zeche ver Helene u. Amalie. (Gluckauf, July 6, 1912; 1½ pp.) Testing an exhaust steam turbine at United Helene & Amalie colliery. 40c.

19,961—TURBO BLOWERS—Construction and Operation of Turbo-Blowers and Compressors. Franz zur Nedden. (Eng. Mag., July and Aug., 1912; 17½ pp., illus.) 80c.

19,962—VENTILATION—Untersuchung eines doppelt saugenden Grubenventilators, Bauart Hohenzollern, auf der Zeche Graf Bismarck. (Gluckauf, July 20, 1912; 1½ pp., illus.) Testing a double suction mine ventilator of the Hohenzollern type at Graf Bismarck colliery, Westphalia. 40c.

INDUSTRIAL CHEMISTRY

19,963 — GAS MANUFACTURE—By-Products in Gas Manufacture. Charles E. Munroe. (Journ. Franklin Inst., July, 1912; 34 pp., illus.) 60c.

19,964—LITHOPONE—La Fabrication du Lithopone. E. Lemaire. (Genie Civil, June 1, 1912; 1½ pp., illus.) 40c.

19,965—PRODUCER GAS—Zur Teerbestimmung im Gereratorgase. Gwiggner. (Chem. Ztg., Apr. 25, 1912; 1½ pp., illus.) Concerning the determination of tar in producer gas. 40c.

19,966 SULPHURIC ACID Its Manufacture and Its Development up to the Present Time. Wm. Wilke. (Am. Fertilizer, July 13, 1912; 2 pp.) 20c.

19,967 WATER PURIFICATION—Speisewasserreinigung und Permutitverfahren. Basch. (Chem.-Ztg., July 6, 1912; 2 pp.) Purifying feed water and the permutite method.

19,968—WATER PURIFICATION—Ueber Wasserreinigung und Kesselsteinbekampfung. Braungard. (Chem. Ztg. May 9, 1912; 2 pp.) 40c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

J. R. Finlay has returned to New York.

Prof. J. F. Kemp has returned from Panama.

F. F. Sharpless is in Joplin, Mo., on business.

James A. Kelly, has opened offices at 740 Henry Building, Seattle, Wash.

B. B. Thayer has returned to New York from his summer sojourn in Montana.

F. K. Simonds, of Simonds & Burns, New York, is in Cuba on professional business.

John Seward, of New York, is at Cobalt, Ont., making an examination of the Kerr Lake mine.

Dyke V. Keedy, of Dietz & Keedy, Boston, is now in Kentucky on professional business.

Leon Pepperburg, of San Francisco, visited Mina, Nev., recently on professional business.

J. M. Callow, consulting engineer for the Inspiration Copper Co., is now in Salt Lake City, Utah.

R. J. Grant, of Denver, Colo., recently inspected mining properties in Ophir and Telluride Colorado.

John P. Cosgro, resident manager at Mexico City, of the Mine & Smelter Supply Co., is in Paris.

W. C. Brace, mining engineer of Denver, Colo., recently inspected mines in the Telluride district, Colorado.

D. E. Young, general manager Blue Lead mine, near Bangor, Butte Co. Calif., has returned to the mine from Boston.

Frank A. Leach, of California, has been nominated by the President for the position of superintendent of the San Francisco mint.

Forest Rutherford has been appointed superintendent of reduction works for the Copper Queen Consolidated Mining Co., at Douglas, Arizona.

Alfred Still has recently been appointed chief electrical engineer to the mining department of the Algoma Steel Co. His headquarters will be at Magpie Mine, Ontario.

J. M. Rodd, of Kent, England, late metallurgist for Elliott Brothers, an electrical engineering firm of London, is now studying zinc and lead mining in southwestern Missouri.

W. Frank Roberts, who has been assistant superintendent of the Bethlehem Steel Co., South Bethlehem, Penn., has been made superintendent of the Lehigh works of that company.

Edward Soppit, recently with the Jamison Coal & Coke Co., has been appointed general superintendent of the Latrobe Connellsville Coal & Coke Co., and has taken charge of operations.

William Brown, Hibbing, Minn., was elected president of the Iron Mountain Co., Duluth, Minn., at the annual meeting recently. The company is developing property on the Cuyuna range.

Samuel Hale has resigned as vice-president and general manager of the Wisconsin Steel Co., Chicago, to become general manager of the Algoma Steel Corporation, Sault Ste. Marie, Canada.

A. P. Cameron, superintendent of the Penn Gas Coal Co., has been made superintendent of the Westmoreland Coal Co., succeeding E. G. Smith, who becomes consulting engineer of both companies.

Paul Klopstock, general manager for the Gold Note Mining and Milling Co., Kennedy, Nev., has gone to Syracuse, Sicily. Mr. Klopstock is consulting engineer of the Ragusa asphalt mines at that place.

Charles Vickers, editor of the non-ferrous casting department of the *Foundry*, has resigned to take charge of the introduction of copper-titanium for the Titanium Alloy Manufacturing Co., Niagara Falls.

Captain Thomas Nichols, who has been employed for 12 years by Pickands, Mather & Co., Cleveland, on the Mesabi range, will have general supervision of a new property which will be developed by the Cascade Mining Co., on the Marquette range.

Herbert C. Hoover left New York last week for California, where he will remain for about a month enjoying a vacation, after which he will return to New York. His translation of "Agricola" is now in press, and probably will be issued in about three months.

T. Poole Maynard, formerly assistant state geologist of Georgia, announces that he has opened an office as mining and consulting geologist at Chattanooga, Tenn. Examination and reports will be made on both undeveloped and developed mineral properties, including ore deposits.

James A. MacKillican, who has been city engineer of Escanaba, Mich., for two years, has accepted the position of assistant superintendent of the Merden Iron Co., Hibbing, Minn., and will assume his duties on Sept. 1. He is a graduate of the Michigan School of Mines, at Houghton.

I. S. Roe, formerly superintendent at the Barrows mine of the Virginia Mining Co., on the Cuyuna range, has been transferred to Crystal Falls, Mich., where he will take charge of the Carpenter, Monongahela and Ravenna mines. The properties are all controlled by M. A. Hanna & Co., Cleveland.

Viscount T. Inouye, professor of mining in the Imperial University at Tokio and Yoichi Katsura, director in the Fujit company, which owns the Kosaka mine in Japan, are visiting in the Unite States to observe mining and metallurgical practice. Professor Inouye expect to return to New York in about a mont and Mr. Katsura in about three months

Among the visitors to the Internationa Congress of Applied Chemistry, are Professor Hoffman of the Clausthal Schoo of Mines; Professor Stavenhagen of th Berlin School of Mines; Professor Simmersbach of the Technische Hochschul at Breslau; R. Franke, manager of th works of the Mansfelder Kupfer Schieferbauende Gesellschaft; and Dr. F. Heberlein of the Metallurgische Gesellschaf Frankfurt am Main, Germany.

OBITUARY

Thomas Means died about Aug. 1 a Bakersfield, Calif. He was 69 years ol Mr. Means came to California in earl days, and was the first explorer of oil bearing land in Kern County. Althoug he had opportunities to gain great wealt his estate is found to be valued at onl about $50,000. Not only was he the firs explorer of the field, but it was throug his insistance that the Kern River fiel was so early developed.

D. M. Forker died at Cincinnati, Ohi Aug. 29, aged 52 years. He was born i Meadville, Penn., but went to Alabam when a young man and engaged in th iron business. He aided in starting th Gate City rolling mill, near Birmingha and became one of the larger owner When the Gate City mill was sold to th Republic Iron & Steel Co., he joined th working force of that company, and ha since remained with it.

Societies and Technical Schoo

American Chemical Society—This society was to give a general reception the members of the Eighth Internation Congress of Applied Chemistry on Satu day evening, Sept. 7, at the Metropol tan Museum of Art, New York.

American Iron & Steel Institute— The general committee of the Amer can Iron and Steel Institute has selecte Friday and Saturday, Oct. 25 and 2 as the dates for the fall meeting the institute, which will be held Pittsburgh. The committee is composed of President James A. Farrel of the Steel Corporation, President A. S. Clarke, of the Lackawanna Ste Co., President C. M. Schwab, of th Bethlehem Steel Co., President John Topping, of the Republic Iron & Ste Co. and Frank S. Witherbee, of Withe bee, Sherman & Co. The program now in course of preparation and will b announced soon.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Aug. 27—The state mining bureau *Bull.*
o. 63, "Petroleum Development of
uthern California," by Paul W. Prutz-
an, has been completed in the manu-
ript and a portion of it is in type; the
mainder is being edited by the state
ineralogist, W. H. Storms. It will be
ady for distribution within a few weeks,
d will contain a large number of an-
yses of the oils found south of
hachapi. This bulletin will be sold
a price that will cover only the cost
printing and binding. The bulletin
as begun during the regime of Mr.
orms' predecessor, but was not com-
eted because of lack of funds. The last
lletin on petroleum issued by the bu-
au was published in 1904. Great prog-
ss has been made in the industry in
at period, and there have been urgent
mands for further publications on the
bject. The mining bureau is also about
issue *Bull.* No. 64, containing statistical
ta of the production of all minerals in
lifornia in 1911. The date of the issue
ll be about three months earlier than
rmer statistical bulletins, and the data
ll be accurate and properly compiled.
will contain also a brief history of the
reau, and the statutory laws governing
ning in the state. The chapter on laws
s been carefully revised from former
nilar bulletins. There are frequent in-
iries for concise and direct publications
the mining laws, and this bulletin will
eet the demand. It will be distributed
atuitously.

There are 31 survey parties at work
der the direction of the California state
ghway commission; 18 are on the coast
ute of the proposed new highway be-
een San Diego in the extreme south-
stern part of the state and Willets, in
north. Willets is at the end of the
rthwest Pacific R.R., which is being ex-
nded to Eureka, the most northerly
rt of call in the state and the entrepot
a large timber industry and for an
developed mining district that contains
h copper and gold ores. The 13 other
rvey parties are working in the coun-
s along the western side of the state,
the region embracing the principal
ning districts. The western route of
proposed new highway will not enter
ectly all the mining counties, but most
them may be directly connected by
erals. Since the completion of the au-
nobile tour, inaugurated by the Inyo
unty good roads association and con-
cted by W. G. Scott, of Bishop, a mining engineer, the mining counties not directly on the route of the highway are taking greater interest in the project. Inyo County is practically isolated as regards transportation, but it has been one of the most active in support of the highway. So far, all the counties through which the highway is routed have agreed to furnish rights-of-way and to build all necessary bridges that exceed 20-ft. span. The people of Sierra County are circulating a petition for a $100,000 bond issue, to be expended exclusively in road building, having concluded to depend upon themselves instead of the state for the construction of roads, particularly in the northern part of the county. While the state commission may not aid Sierra County in its plans, the construction of the roads will give the outlets that are essential to the full development of the mining districts that are now reached either by trail or poor roads. It is not possible that the routing of the highways will please all the pople and include direct roads through all the 58 counties of the state, but it is possible that every mining county will be either directly or indirectly benefited if they will assist the undertaking, although the prime purpose of the $18,000,000 appropriation was not so much intended for the development of mining districts as to provide easy going for automobiles.

Denver

Aug. 29—Colorado is gradually recovering from the effects of the conservation fever. President Taft has just restored to entry as agricultural land 751,691 acres included in coal withdrawals in this state, and this makes a total return to the public domain of upwards of 2,000,000 acres. On the report four years ago that the whole of North Park was underlaid with coal 563,099 acres was withdrawn. Now the Geological Survey has discovered that the coal in the center of the park is 2000 ft. deep and therefore unworkable. This acreage has been restored to entry. Along the east and west sides of the park, however, there is an outcrop of lignite ranging from 40 to 60 ft. in thickness and this is still reserved. The 188,592 acres withdrawn in Montezuma County have not been found to be coal bearing and have also been restored to entry as agricultural land.

It is now stated on good authority that the Burlington and Santa Fé railroads have asked for bids from the Pueblo plant of the Colorado Fuel & Iron Co. on 75,000 tons of steel rails and fastenings, to be used in Colorado, Wyoming and adjacent territory. These two orders will approximate $2,500,000. Bids for 75,000 tons more have been asked for by the Harriman and other lines.

The government attorneys claim a great victory because Federal Judge R. E. Lewis has forced the Colorado Fuel & Iron Co. to go to trial to answer charges of having acquired 5000 acres of coal land by agricultural filings, nothing being said in the applications of the "dummy" entrymen about the coal-bearing qualities of the land. In doing this, Judge Lewis has gone over two decisions of the U. S. Land Office, at Pueblo, which held that the land was agricultural. Some of the land adjoins the Primero mine, the best producer of the Colorado Fuel & Iron Company.

For the first six months of 1912, the output of the new Yampa coal field, in Routt County, on the Denver, Northwestern & Pacific Ry., was 246,375 tons, as compared with 103,496 tons for the same period in 1911. The total coal output of Colorado for the first six months of the year was 5,277,238 tons.

Butte

Aug. 28—A party of Eastern men and others connected with the United Missouri River Power Co., arrived at Helena, Aug. 23, on a trip of inspection to the various properties. The party consisted of Max Hebgen, manager of the Montana Irrigation & Reservoir Co.; C. F. Kelley, vice-president of the Anaconda Copper Mining Co.; George F. Canfield, secretary of the Butte Electric & Power Co.; C. W. Whitmore, president of the North American Co.; Frederick Strauss, manager for J. & W. Seligman & Co.; and J. C. Carson, of New York. They proceeded to the Hauser Lake dam and viewed the reclamation project in the valley below, leaving afterward for Great Falls to make an inspection of the power plants there. The itinerary of their trip also includes stops at Lewiston, Livingston, Billings and the Montana Reservoir & Irrigation Co.'s power plant, on the Madison River. As a result of the visit of these men, who have been instrumental in harnessing a portion of Montana's water power, it is believed that one more link will be added in the resumption of work on the Holter dam, near Wolf Creek, which has been about one-third completed.

As a result of the efforts made by Representative Pray, in the interests of the

Butte chamber of commerce, to secure an appropriation from the government with which to investigate underground water conditions, looking to the reclamation of the arid flat south of Butte, the assurance has been forwarded that steps are about to be taken in that direction. Professor Mizner, of the Geological Survey, who has charge of underground water investigations for the government, will arrive in Butte, Oct. 1, and will spend several weeks in determining whether or not the flat is underlain with artesian or other sources of water. There are about 10,000 acres of land in the valley which could be reclaimed from its present practically useless condition, by the discovery of water in sufficient quantity.

Salt Lake City

Aug. 31—The mineral output of Utah and Nevada during 1911 is given in detail by Victor C. Heikes, of the U. S. Geological Survey. He shows that the total output of Utah in gold, silver, copper, lead and zinc amounted to $36,837,457. The production is given by counties, Salt Lake County coming first with a total of $22,561,615, followed by Juab, Summit, Tooele and Utah Counties in the order named. The gold produced was valued at $4,696,998, of which $5634 was produced from placers. The silver output amounted to 12,473,787 oz., copper to 146,960,827 lb., lead 136,496,750 lb., and zinc to 17,840,261 pounds.

A bill permitting agricultural entry on oil land in Utah has passed the House. The object of the measure is to permit the agricultural development of large tracts of land in southern Utah classified as valuable for oil, and withdrawn from entry.

Mining-machinery houses report good sales and much heavy machinery has been shipped from Salt Lake during the summer. Seven compressors were sent out by two firms in a single week.

Tintic shipments have lately been increasing. The output for the week ended Aug. 30 amounted to 231 cars. This is one of the largest week's shipments for the camp, the previous record having been made in March with a total of 205 cars. For the second week in August the output was about equal to that of the record week of March. The shipments include zinc ores from several properties. It was understood that the new rates on zinc ores had gone into immediate effect without the 30 days advertising usually required. Word has just been received, however, that the new rate has been held up again. The new rate was to have gone into effect Aug. 20, being $7.30 per ton to the Kansas smelters, as compared to $9.20 per ton formerly. Zinc ores so far shipped have been sampled at the Silver City plant of the Utah Ore Sampling Co., and settlements are made here before the ore reaches the Kansas smelting belt.

Kingman, Ariz.

Aug. 27—There is evidence of renewed interest in Mohave County in the use of auto trucks for freighting. This is probably primarily due to the continued rise in the price of hay and grain and the resultant increase in the cost of freighting with teams, although it is also evident that the manufacturers of auto trucks are commencing to give more attention to the design and construction of trucks intended for service under conditions similar to those existing here. In the last few years several different makes of trucks have been tried out in the county, the results in the majority of cases not being satisfactory and indicating that, until a closer study of the actual working conditions is made by the designers and builders of these trucks and their plans are altered to meet the requirements of a service different from that of the paved streets of a city, their products will not come into general use in such districts. Several years ago, two 10-ton trucks of special design were built in Chicago and shipped to Kingman at a probable cost of about $10,000 each. They are each fitted with a 90-hp. gasoline engine, the power from which is converted into electrical energy by a generator and then applied to the propulsion of the machines by two motors on each truck. The gage proved to be too wide for the single-track roads of the county. Their cumbersomeness and complexity of construction were so prejudicial to their chances of successful operation that they were never even given a thorough working test and still stand in Kingman as a monument to the lack of foresight upon the part of their designer.

Among the different trucks which have been in use in the county are the White, the Knox, the Grabowsky, the Buick, the Avery and lately the Saurer. A White 1500-lb. truck has been in service between Kingman and the Big Sandy for about one year, making two round trips of 120 miles each week. With the exception of the Saurer, this truck has probably given more satisfactory service than any of those mentioned. In the recent month's trial of the Saurer truck by the Arizona Southwestern Copper Co. the cost was about $4.50 per ton for a haul of 22 miles, a portion of the road being through heavy sand and the greater part of it up-grade, the total rise in elevation being probably over 2000 ft. It is understood that the Gold Road Mines Co. has ordered two auto trucks for operation between Kingman and Gold Road, and it is also understood that the Lovin & Withers Co. is considering the purchase of one or two for use between the same places. As the latter company does most of the freighting by teams in the county, its interest in auto-truck transportation is significant.

Negaunee, Mich.

Aug. 29—A new mining company h started operations in the territory betwe the Gogebic Rand and the Iron River di trict. The corporation is known as t Presque Isle Iron Co. and includ Messrs. Whitesides, W. H. Cole, a associates, of Duluth. Some drilling h been done, and shaft sinking will started soon. This area between Gog bic Range and the Iron River district receiving attention from several large i terests, including Frederick Carpenter, Chicago, a landowner in the district, a the E. J. Longyear Co., of Minneapoli which is examining the country ge logically.

Since the news of the big find at t Mastodon property in the Crystal Fal district has circulated around, other i terests have begun taking options in t vicinity, and it is likely that considerab drilling will be done in tracing the o formation in the region south and we of the Dunn mine.

The Oliver Iron Mining Co. is drilli between the Dunn and Mastodon mine on two "forties" of the Michigan Iron Land Co. over the extensive holdings which the Oliver company has a blank option. The orebodies in the Cryst Falls district are extremely difficult trace, owing to the thick overburden a the irregularity of the occurrence of t lenses of ore in the slates. For thes reasons exploration work in the distri is costly, but it is in such districts th most of the recent finds were made, the costly and difficult explorations wer overlooked until late years.

Jena, Germany

Aug. 20—During the last week most the technical journals have devoted muc space to the history of the Krupp fir and descriptions of the festivities cele brated in commemoration of the 100t anniversary of its foundation. *Stahl un Eisen* published a special pictorial jubi lee number. The festivities lasted fro Aug. 3 to 8, when they were suddenly in terrupted by the fatal explosion at th Lothringen colliery, in which 111 me were killed and about 20 men were injured. The Krupps had no interest i this colliery, but out of respect to th Emperor, who hastened to the scene o disaster, all further amusements wer called off.

The German daily papers are hootin at Herr von Havenstein, president of th Reichsbank, for his notes of warning t the financiers of industrial enterprises and are decrying Herr von Gwinner president of the Deutsche Bank, as a false prophet for predicting an impendin collapse of the present industrial boom The boom still continues, but undoubtedly there is a feeling of nervousness i financial circles.

The Mining News

The Current History of Mining

Alaska

W. B. Close of the White Pass & Yukon R.R. has announced plans for building a smeltery at Skagway or White Horse, and an extension of the White Pass road from White Horse 120 miles down the Yukon River to the Tantalus coal mine.

Gold Bullion—The initial cleanup of this property amounted to about $26,000. William Barthoff, of Knik, is superintendent.

Tacoma—This claim on Slate Creek has been purchased by John Miller, of Seattle, who will install a hydraulic plant.

Alaska-Treadwell—During July the mill was in operation 31 days, crushing 81,116 tons of ore, from which 1650 tons of concentrate was produced. The estimate of free gold recovered from this ore was $118,216; gold in concentrate $102,186, a total of $220,402. The realizable value was $218,198, the operating expense $78,349; construction expense $13,967, leaving an estimated net profit of $125,882. The yield per ton of ore milled was $2.71.

Arizona

MOHAVE COUNTY

C. P. Lupher recently made a promising strike in a tunnel near the head of McGeary Wash in the Hualapai mountains. The ore contains gold, silver and lead.

Wallapai Precious Metals Co.—It is reported that this company will commence development work on its group of five claims in the Wallapai district at Stockton Hill. George W. Gibson, of Denver, manager.

De la Fontaine—Forty tons of zinc ore has been sorted by M. A. Burke and associates and is ready for shipment to the smelter. An equal tonnage of lead ore is about ready for shipment.

Ruth—Sinking has been temporarily discontinued at a depth of about 425 ft. Crosscutting has been started at the 400-ft. level. Last year a mill was built upon the property by the Young Construction Co., but owing to litigation between the construction company and the operators of the property, it is not in operation.

Kingman Copper Mining & Milling Co.—This company, capitalized at $100,000, has been organized by H. E. Bierce, of Denver, and associates, and under the active direction of Thomas McNeely, is developing the McNeely copper properties at Mineral Park.

Nevada-Arizona Gold Mines Co.—The Lovin & Withers Co. has hauled three carloads of machinery from Antares to the property of this company in the Music mountains. It is reported that the framework is erected and that the mill will soon be ready for operation.

George Washington—A carload of ore is ready for shipment to the smelter from this mine at Mineral Park.

SANTA CRUZ COUNTY

Bradford—Messrs. Lindsey, McFarland and Gardner have shipped five cars of ore from this mine to the Copper Queen smeltery. The ore contains copper and a little silver. The mine belongs to the Ferry estate.

Glove—The Sheehey brothers, owners of this promising zinc and lead mine, are negotiating with John Hoy and J. E. Higgins, who are field men for Senator Clark, for the sale of this and some other prospects.

Silver Crown—This group has been optioned by Josiah and M. A. Bond to St. Louis lead men. There are several veins in the group carrying a mixed copper-lead-silver ore, silver predominating.

Tia Juana—Six claims, belonging to W. E. Balcom, James Kane and the estate of the late Professor Blake, have been examined for Senator Clark.

California

AMADOR COUNTY

Plymouth Consolidated—The Pacific shaft has been unwatered to the 1800-ft. level. The skip cable broke recently 300 ft. from the skip, dropping the skip to the bottom of the shaft. No one was injured. Details of the accident are not available.

South Jackson Mining Co.—The new vertical shaft is down 200 ft. The ground is favorable for fast sinking.

BUTTE COUNTY

Installations of machinery for treating black sand, in order to recover fine gold and platinum are being considered for the Nimshew, Mineral Slide and Bader mines near Magalia.

Forbestown Consolidated Gold Mines—M. J. Cooney, of Oroville, president of the company, has inaugurated the leasing system for the operation of the Gold Bank and Golden Queen mines in the Forbestown district. There are 20 men now employed in development and construction work. A 20-stamp mill will be built from the machinery of the old Gold Bank and the Miller mill. The Miller mill is still in good repair, and has 20 stamps, but the distance to the mine prevents its economical use in the position in which it stands. The new structure will occupy the site formerly occupied by the Gold Bank. Frank Naughton, of Forbestown, superintendent.

ELDORADO COUNTY

Zentgraf—A new stamp mill has been installed at this mine, near the Big Buzzard. The property will hereafter be known as the Home. It is being developed by Sacramento men.

Standard Unit—It is reported that the mill, idle for two years, will resume crushing. S. Beer, inventor of the Beer roller mill, owner and superintendent.

Big Jeff—A 5-stamp mill and concentrator is being installed at this mine, at China Hill, near El Dorado.

INYO COUNTY

Santa Rosa—A 6-drill compressor has been purchased, to be driven by gasoline until electric power is available. The company has built and is improving 12 miles of new road between the mine and Keeler, a distance of 25 miles. The railroad could be built, shortening the distance to 10 miles, and a five-mile aërial tram would answer the purpose of carrying the ore to a point five miles below Keeler. A 5-ton Pierce-Arrow motor truck has been ordered for freighting and ore carrying. It is the purpose of the company to equip the mine for development to a depth of 500 to 800 ft. Mr Meisell, superintendent.

NEVADA COUNTY

William J. Barrett, while panning for gold in the South Yuba River, near Jones bar, found a small diamond which weighed a little less than ¾ carat, and valued at about $15. There is no positive evidence that it is a product of the formation; it may have been dropped there.

Cheyenne—This property in the Willow Valley district has been leased by Peter Tautphaus, of San Francisco, to Kistle Brothers, of Nevada City.

Arctic—Work has been resumed at this mine, north of Washington. A large auto truck is being operated between Emmigrant Gap and the mine, hauling machinery. Air drills are a part of the equipment to be installed. J. V. Kline, superintendent.

Placer County

Zeibright—The 10-stamp mill is running steadily. The tunnel, which is now 1100 ft. long, is being advanced along the vein and some stoping is being done. J. H. Patrick, of Emmigrant Gap, lessee and superintendent.

Sierra County

Kirkpatrick—A new compressor, to be driven by a 20-hp. Fairbanks-Morse gasoline engine, is being installed. This will facilitate the work of driving the tunnel which is now in 300 ft. The company is prospecting for gravel. J. H. Ragon, of Goodgrass Bar, superintendent.

Alaska—The work of rebuilding the mill and headframe, which were destroyed by fire last November, is nearly completed and the new 40-stamp mill will soon be in commission. Eight Wilfley concentrators have been installed. George St. John, of Pike City, superintendent.

Trinity County

Trinity Dredging Co.—The new dredge to work ground six miles up Trinity River from Lewistown is expected to be in operation early in September.

Gold Trail Mining Co.—This is a new corporation organized in Glenn County to operate an old mine in Trinity County, which was a former producer. H. B. Turman, of Willows, and Lewis Osburn, of Reno, Nev., are interested.

Tulare County

About 30 claims were recently registered in one day in the Powell district, about 14 miles east of the terminus of the Porterville-Northwestern R.R., at Springville. Gold, silver and lead are reported to have been found.

Tuolumne County

About 500 ft. of the wall for a dam across Tuolumne River, two miles below Jacksonville, has been completed. The dam is to divert the stream so that the bed of the river may be mined for gold; 16 men are employed in two shifts; another shift will be added.

Atlas—Electric power has been installed and two shafts are being sunk on this mine at Tuttletown. J. L. Witney, superintendent.

Street—A contract has been let for unwatering this mine at Tuttletown.

Newbaumer—The 5-stamp mill is running steadily on good ore from this mine at Tuttletown.

Rose Springs Mining Co.—New machinery has been ordered for the Iron Spring mines, near Tuolumne. S. O. T[illegible]

Colorado

Clear Creek County

Clara—This mine, in the Alice district, is being operated with a small force of men. A good vein of milling ore is being developed. Small streaks of ore in the vein assay as high as 40 oz. gold, and it is estimated that a small tonnage of smelting ore may be sorted out to advantage. A campaign of systematic development is planned. Doctor Woodring, president and manager.

Argo Reduction & Ore Purchasing Co.—This company is building a mill near the portal of the Argo tunnel. The company will sample and purchase ores from properties operating through the tunnel. The sampler and mill building are to be of steel, the contract for which has been let to the Minneapolis Steel & Machinery Co. The sampler will have a capacity of 350 tons per 10 hr. The first section of the mill will have a capacity of 100 tons per day. More units will be added later. The process of treatment follows closely that used in the Hudson mill, and will consist of amalgamation, concentration, and cyanidation, using stamps, Card tables, and continuous agitation and decantation in the cyanide department.

Lake County—Leadville

The ore shipments from Leadville for July were smaller than for the preceding month, being retarded by heavy rains and surface water. The total was 57,500 tons.

La Plata—Zinc-carbonate ore has been discovered in several of the old stopes of this mine on Rock Hill, and as the old shaft has been retimbered and the drifts cleaned out, the lessees are enabled to break ore and expect to hoist about 30 tons daily.

Dome—About 1000 tons per month of zinc-carbonate ore are being shipped by the lessees of this mine on Rock Hill.

Highland Chief—A 27-hp. hoist is being installed on the Eliza shaft of this mine on Breece Hill, which is under lease to W. E. Hollister. Drifts will be run from the bottom level to open the ore developed in the Black Prince and St. Louis.

Onyx—In this claim which is above timber line on French mountain, the owner, John Rahrer, is sacking rich gold ore. The first shipment will be made in a few days.

San Juan District

Great interest is being taken, in this district, in the treatment of zinc-bearing ores. The zinc plant at the Sunnyside mill is in constant operation and four Huff electrostatic machines are running.

Frisco Tunnel Co.—This company, operating the Bagley tunnel, near Animas Forks, is completing the construction of a mill. The installation of machinery will include Blake, and Sampson crushers, two Akron chilean mills, Callow cones, spitzkasten and Wilfley tables. The mill was framed at Silverton during the early months of this year, and construction was commenced just as soon as the Silverton Northern R.R. was open to Animas Forks. The construction work is being done by Paul Hansen and M. E. Porter; they feel confident that the work will be completed in October.

Gold King—High-grade, free-milling gold ore, associated with pyrite-bearing quartz, is being produced from this mine. A strike of such ore was recently made by Charles Airy, a lessee.

Southern Exploration & Mining Co.—A strike of copper ore was recently made in the Congress mine. The mineral is enargite, and is found in a shoot that in all probability extends up to the old Walsh workings, because the discovery was made 90 ft. below the place where Thomas Walsh took out a rich pocket of this ore. F. B. Goudy is manager for the company.

Intersection Development Co.—In Maggie Gulch, this company has increased the capacity of the mill and unwatered the mine.

Esmeralda—Lessees on this mine in Maggie Gulch are mining rich argentite ore from veins of fairly stable character.

Emma—Negotiations with Boston men have been closed and it is now expected that operations will be started. These will include driving a lower tunnel on the lode and possibly some sinking.

Teller County—Cripple Creek

Gold Dollar—Most of the lessees on this Beacon Hill mine operate from the main shaft. The Husted shaft is operated by the Union Leasing Co. The August production was large.

Mary McKinney—The profits made from ore opened below the old water-level are said to be large. The output for August was 40 carloads of higher grade than usual.

Cresson—A rich strike of sylvanite is said to have been made at the 1200 level. Richard Roelofs, manager.

Six Points—For the last month the output from Chilson & Polly's lease, which is being operated through the Los Angeles shaft, was four carloads of mill ore from the 475-ft. level.

Vindicator—It is officially stated that the development at the 1500 level has proved the oreshoots as big and as rich as in the levels above. In a crosscut to the south a new vein has been opened showing ore which has not been found in the upper workings.

Isabella—Another strike has been made in the Fackerell lease on the north 900-ft. level of the Lee shaft.

Idaho

BOISE COUNTY

It is reported that Moore's creek beow Idaho City is to be worked again. 'he placers are known to be rich, but n account of large boulders have hereofore proved to be unprofitable. A sysem of cables operated by electric power vill be used.

Boston & Idaho—The two dredges of his company continue to operate at a rofit. The larger, 15-cu.ft. boat, has ompleted its work on Elk creek and is tarting down Moore's creek on its first ut, to make connection with the smaller redge, which is working up that creek.

Banner—About 14 men are at work n this property opening the main tunel and prospecting.

National Mining & Development Co. -A 5-stamp mill has been built recently n the Mountain Chief mine, near uartzburg. A. C. Gallupe, manager.

Golden Age—The mill at this property as been closed pending further developent work.

Gold Hill—The 20-stamp mill connues in steady operation. Considerable rospecting and development work is beg done on the 500-ft. level.

IDAHO COUNTY

Hydraulic-mining operations are beg conducted on the property formerly wned by S. A. Moon, near the falls of eadow creek, a little below the old wn of Florence.

Gilt Edge—Work is to be resumed on ese quartz claims owned by Daniel unn. Much mining equipment is being auled to the property.

Mineral Zone—The hoist has been it in place on this mine and sinking is been resumed. The road has been aded from the mine to the mill and e bins of 300 tons capacity have been ected. For a time, but five stamps will put into commission, but later, as on as enough ore can be hauled in, e mill will be operated at full caicity.

Michigan

COPPER

Franklin—Shaft No. 3 is down to the level. At No. 1 shaft the drift from e 23 level is being extended to the e of No. 1 shaft. When this point is ached a raise will be started. Upon e completion of this work there will two shafts available for hoisting and e production will be materially ineased. Conditions underground in e lower level of No. 1 shaft are high- satisfactory.

Isle Royale—This company is shipping out 2250 tons of ore per day to the ll from shafts Nos. 2, 4, 5 and 6. aft No. 5 is maintaining the best results. Production is to be gradually increased as fast as the necessary labor can be secured.

Keweenaw Copper Co.—At a recent directors' meeting a consolidation plan was worked out which will be submitted to the stockholders. The company has acquired about 6000 acres of additional land and the proposed merger takes in the Arnold, Ashbed and Meadow properties, so that the company will have about 13½ miles on the Ashbed lode. W. J. Uren, formerly general superintendent of the Tamarack-Osceola properties, was the engineer employed to report on the properties and it is probable that he will be placed in charge of the development work.

IRON

Hilltop—The Oliver Iron Mining Co. has surrendered its lease on this property on the Menominee Range after proving some ore by exploration; the reason given is because so much attention must be given to the Hill lands on the Mesabi. C. T. Roberts is one of the fee owners and the tract will now revert to the Roberts Ore Company.

Lucky Star—At this Breitung mine in Negaunee the shaft is now in solid rock, the 85 ft. of surface having been successfully gone through. The rock at this place is diorite, which is generally looked upon as favorable ground for a permanent shaft. Small one-man plugger drills are being used in sinking, and one of a new type, which rotates its own steel, is giving satisfaction; it is understood that this type has been used for several years in Europe.

Wickwire Mining Co.—Power for the Cortland mine of this company, situated west of the Hiawatha, is now obtained entirely from electricity. The air compressor is operated by electricity and forces compressed air into a receiver from which it is taken for hoisting. It is planned to equip the Wickwire mine in the same manner and close down the present steam plant.

Jones Furnace Co.—At the Kloman mine at Republic, where the Jones furnace has been used in experimenting in the metallization of low-grade iron ores, unsatisfactory results are reported and the work on iron ores will be discontinued, at least temporarily. It is proposed to try out some copper ores in the furnace and a consignment of Mexican ore is soon to be put through.

Empire—This Cascade Range mine of Oglebay, Norton & Co. is being operated only in a small way, contrary to expectations early in the season.

Salisbury—This mine is closed for two weeks while an electric hoist, compressor and centrifugal pump are being installed. Power will be furnished from the company's water-power plant at Marquette. The electric hoist will be run by alternating current direct from the power house at 2300 volts. The centrifugal pump will replace the big Cornish pump. It is understood that the centrifugal pump was purchased some time ago, as the later installations of the company, notably at the Negaunee mine, have been electric plunger pumps.

Minnesota

MESABI RANGE

Because of the possibility of an advance being made in the ore rate, shippers have been anxious to get as much ore out of the local port as possible before the first of the month. Within the last two weeks a record was made of 230,000 tons of ore shipped in 36 hours.

Oliver Iron Mining Co.—It is reported from Duluth that this company has called for bids for stripping a new property near Mesaba station on the Duluth & Iron Range R.R. The bids are to be opened Sept. 1. This is one of the properties that is to be developed at once in what is known as the new Mesabi district. Compared with properties like the Fayal and St. Louis, the operation, it is understood, is not a large one.

Pillsbury, Bennett & Longyear—Five drills are in operation on this property, east of Keewatin, to ascertain at what depth the ore lies and to determine whether it will be operated by stripping or milling. This property has been drilled, and the work now being done is a final drilling preparatory to making the mine a shipper.

Bray—At this mine grading for 10 company-houses has been started. A shaft will be sunk this autumn and work will be continued all winter. Nels Johnson, superintendent.

Montana

BUTTE DISTRICT

North Butte—Since the discoveries of rich ore, principally zinc, in the northern portion of the district, this company has been exploring the northern part of its territory with gratifying results. The company recently acquired interest in the Carlisle and Protection claims, east of the Elm Orlu mine, and it is understood that the north crosscut driven some time ago from the Speculator shaft on the 1800-ft. level, will be continued on into the newly obtained ground with the expectation of finding zinc ore. Some of the richest ore produced is now being shipped from the Snowball vein. The Berlin vein, north of the Snowball, was explored by a shaft sunk to the 1000-ft. level several years ago, but only recently has any systematic exploration work been done at greater depth than that, and the results are very promising.

Ophir—Machinery for the new mill is being erected. It is believed that the mill will be completed and in operation this autumn.

Butte-Minnesota—This company has been incorporated for $750,000 in shares of $1 par value. Directors and incorporators are: William Vuoti, John E. Porthan, Emil Bjorkman, John Kukko, Jacob Lampi and Emanuel Antio, of Ely, Minn.; Peter Johnson, of Chisholm, Minn., and Emil Jung and Isaac Peterson, of Butte.

Cascade County

The old mining camp of Neihart, one time a silver producer, may be resuscitated. The camp was practically deserted in the early '90's. With uptodate processes of treating zinc ores, the Neihart ore, rich in zinc, may be treated profitably in the future.

Fergus County

Barnes-King—This company, which has been seeking new mining property, has acquired the claims of the North Moccasin Mining Co., at Kendall. The property comprises four claims, the Santiago, the Santiago Fraction, Sceptor and Possible. The Barnes-King company discovered ore in the adjoining Santiago just at the end line of its own property. It worked out the small part of this ore within its own ground. The North Moccasin company mined the ore to some extent, and was making large profits when a cave-in closed the mine, which, from lack of funds, has not since been opened.

Spotted Horse—Development work is being carried on steadily at this mine, near Maiden, and lately some good ore has been opened. St. Paul men, owners of the property, have been recently making an inspection of the mine to decide upon the advisability of erecting a mill. The mine has been a steady producer of rich ore for many years.

Gallatin County

West Gallatin—Preparations have been nearly completed for the beginning of placer mining on a large scale, and within a week it is expected that 1000 cu.yd. of gravel will be sluiced daily. The company owns placer ground in the West Gallatin cañon, near the Michener camp, and recently completed a 4½-mile ditch to the property, which conveys a large volume of water under a strong head, to be used in sluicing. Thomas Michener, chief owner of the property, is managing operations.

Jefferson County

Mount Washington—George W. Wilson, of Butte, and John D. Pope, manager of the North Butte Mining Co., have obtained a two-year option on a group of seven claims in the Colorado district, and are preparing to install a hoist and surface buildings preparatory to active operations there. The property, which is owned by Frederick Kauf, lies between the Alta on the east, and the Bluebird and Pen Yan on the west. The Mount Washington company, capital 100,000 shares, par $5, has been incorporated by Wilson and Pope to defray the expenses of development work.

Lewis & Clark County

Penobscot—M. W. Anderson is developing a portion of this mine, which lies north of the Bald Butte mine, by running a tunnel east on the vein. This mine was formerly a producer of rich ore and was sold by its former owner, Nate Vestal, at a high price.

Nevada

Comstock Lode

Mexican—According to the bullion-tax statement just rendered to the Storey County tax collector, the company, for the quarter ending June 30, 1912, shipped to the mill 6486 tons of ore, the gross yield from which was $131,844. The expenses for operating during that period were $61,000; milling expenses and sale of bullion, $26,007; transportation and freight, $1568. The bullion tax paid for the three months was $1834, being figured on the net yield. The company shipped 12 bars of bullion up to and including Aug. 28. The last week of the month the mill was shut down for three weeks, when the filter was rewound, the first time it has been necessary since the mill started, six months ago.

Ophir—The production for the three months ended June 30, 1912, was 1842 tons of ore, which was milled at the Kinkead mill, giving a gross yield of $46,334.

Consolidated Virginia—Ore milled during the June quarter, secured from the exploration work on the 2400-ft. level, gave gross returns of $7044.

Comstock-Phoenix—During the quarter ended June 30, 587 tons of ore was sold, which gave a net yield of $18,331, from this mine in the Silver Star district.

Crown Point—For the quarter ended June 30, 6995 tons of ore was shipped to the Yellow Jacket mill, which yielded $35,462. This ore was low grade, stoped from the 1200-ft. level.

Lincoln County—Pioche District

Shipments of ore gathered in small quantities by the Pioche Assay Office (Snyder & Empey) are being made at the rate of about one carload per week. The Highland-Mary, in the Highland district, is shipping about one carload per month. A carload of zinc-lead ore, sorted from the old Raymond & Ely dump by lessees, has just been shipped to Kansas. Lessees of the Condor mill tailings dump will soon finish the shipment of about 15,000 tons.

Mendha-Nevada—Shipments are being made from the dump at the rate of 40 tons daily, *via* the Prince Branch R.R. One and one-quarter miles of pipe and a pump will be installed to provide adequate water service, whereupon operations in the mine will be resumed.

Day-Bristol—Operations at the Day mine have been suspended and the force transferred to the Bristol properties. Copper ores from the May Day and Gypsy shafts are being shipped at the rate of about one car daily, by wagon to the Pioche-Pacific R.R. A survey has been made for a telpherage system to eliminate the long wagon haul, the tunnel project having been abandoned.

Prince Consolidated—This company is still shipping tailings from the old Bullionville dump at the rate of about 300 tons daily. A preliminary survey has already been made for a spur to the Dry Valley tailings dump where work will be commenced shortly. The Prince mine is shipping about 200 tons daily of manganese ore. The diamond drill being operated from the 500, which is the water level, recently struck high-grade lead-silver ore at a depth of 340 ft.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Aug. 22, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,450	113,819
Tonopah Belmont	3,685	75,851
Montana-Tonopah	1,041	34,933
Tonopah Extension	1,055	33,568
West End	805	24,619
Midway	40	420
MacNamara	455	11,852
North Star	......	130
Mizpah Extension		40
Jim Butler	300	400
Totals	10,881	295,632
Estimated value	$270,775	......

Mizpah Extension—The first shipment, of 40 tons of ore from the 1000-ft. level, was made Aug. 10.

Tonopah Merger—Drifting on the vein on the 980-ft. level of the oreshoot is still in progress.

Tonopah Extension—This company has declared a dividend of 2½c. per share payable Oct. 1, this, with a dividend of the same amount, paid July 1, makes the total amount of dividends distributed by the company $350,000. The clean-up of the mill for the first half of the month of August resulted in the shipment of 2690 lb. of bullion worth $30,500. The main ore shoot on the 500-ft. level is now over 300 ft. long. The new vein on this level is being drifted on at the 660-ft. level 700 ft. west of the place where first encountered.

MacNamara—The 10-stamp mill is now treating 67 tons of ore daily.

Tonopah-Belmont—The report for July, 1912, states that a total of 10,415 tons of ore was milled for a net profit of $114,081, this being the smallest profit for many months.

North Star—A new oreshoot has been cut on the 800-ft. level.

Montana-Tonopah—A new shoot of good milling-grade ore has been cut on the 390-ft. level, another on the 565-ft. level and a third has been opened on the 765-ft. level.

Midway—A winze from the 535-ft. level has cut a new ore shoot.

Manhattan-Big Four Co.—Contracts for the erection of a 150-ton mill at this property have been signed. The plans stipulate that the mill be completed and in operation before Jan. 1, 1913. L. K. Koontz is president of the company.

Tonopah Mining Co.—As a result of an inspection by J. E. Spurr, consulting engineer for the company, the directors have decided to prospect its most western claim, the Sand Grass, on which a shaft has been sunk to a depth of 585 ft., but no lateral work has been done.

In addition to the six regular producing mines in the camp there are now 16 other properties being developed on the east and west ore zones.

New Mexico

GRANT COUNTY

Silver Hill—H. L. Dotson and G. C. Eastman have a lease on this group of mines. The claims were located in 1875 and much work has been done upon them, but the complex ore, which carries zinc, lead, copper, gold and silver, was so difficult to treat that profitable production could not be maintained. The present lessees expect to be able to ship galena to El Paso, Tex., and blende to Bartlesville, Okla., within a few weeks.

Oregon

Green River Copper—Patrick Nestor, of Portland, Ore., and Wick O'Connell, of Duluth, Minn., have made a contract with the stockholders of this mine, in Douglas County, to install new machinery within 60 days, and to commence development work.

Utah

JUAB COUNTY

An ore buyer from the Kansas Zinc Co. has been in Tintic making contracts for zinc ore.

Lower Mammoth—Prospecting for zinc ore is being done and some has been opened on the 1500- and 1800-ft. levels. Silver-lead ore was discovered recently in the western part of the property. There is also a stringer of silver-lead ore on the 1000-ft. level. These are being followed.

Yankee—Two weeks more work will be necessary to clean up the low-grade dump ore, which is being marketed at the rate of about a car per day.

Swansea Consolidated—Some delay has been caused by an accident to one of the boilers, but ore is again being hoisted at the usual rate.

Chief Consolidated—An increase in shipments has been made during the last few weeks, the output ranging from 25 to 30 cars. For the week ended Aug. 16, 29 cars were shipped. Efforts are being made to have the Denver & Rio Grande R.R. construct a switch, which will make loading possible directly into the cars, eliminating the present wagon haul.

Colorado—Drifting from the 500-ft. level of the Crown Point has been discontinued. This level corresponds approximately to the 1000-ft. level of the Colorado.

Dragon Consolidated—Diamond drilling has been in progress for the last six weeks on the south end of this company's ground. Several hundred feet was drilled. There has been some trouble with the power arrangements, due to the long distance from the compressor. Work has been discontinued for the present.

Daly-Judge—A contract has been given to J. A. McIlwee & Sons, of Denver, tunnel contractors, for driving various drifts and crosscuts in this property. Work on this contract will begin Sept. 1. Other contracts for similar work have been made with the Daly West.

Barry-Coxe—This company shipped 27 tons of ore during the week ended Aug. 17. The roads from Scott Hill have been poor, but are improving. The main tunnel is in 240 ft., and two orebodies have been opened.

SALT LAKE COUNTY

Bingham-New Haven—It is reported that by the new ore contract with the International Smelting Co., $1.50 a ton will be saved. The ore will be shipped over the Utah Consolidated tramway.

Ohio Copper—The payment of the first half of the $1 per share assessment was extended to Aug. 28.

Michigan-Utah—The tram from Alta down Little Cottonwood is being overhauled, and should be ready to handle ores within the next two weeks.

Columbus Consolidated—Shipments are being made, and the company is having some difficulty in securing ore teams for its output.

SUMMIT COUNTY

Park City shipments for the week ended Aug. 24 amounted to 2,926,880 pounds.

Little Bell—Shipments are again being made from this property.

Thompson-Quincy—Between 15 and 20 tons of ore is reported to have been mined from the raise, which recently cut ore in fissures near the limestone-quartzite contact. Drifting on this ore has been started.

Washington

Bear Mountain—Operations at this silver mine near Colville, Stevens County, will be resumed by Thomas Newton in the near future.

FERRY COUNTY

Last Chance—This mine is being unwatered by Phillip Creaser, for examination by a syndicate which has an option on it. If conditions are satisfactory, operations will be resumed at once.

McKinley—Operations at this property near Orient are at a standstill, awaiting the arrival of new machinery which has been ordered.

Boston & Maine—Active operations will be started on these claims by A. E. Stewart, of Republic, and extensive developments are planned.

North Washington Power & Reduction—The result of a recent 10-day run of ore at this plant was a gold and silver ingot weighing 196 lb., and of a total value of $10,600. The capacity of this plant will be doubled as soon as the new rolls are installed.

OKANOGAN COUNTY

Molson—New machinery is being installed in this gold mine near Chesaw, and after a general overhauling, steady operations will be started.

Apex—The shaft of this mine is being drained, and after a 1½-year shutdown, this property will again be opened.

Wisconsin

Vinegar Hill Zinc Co.—This company has installed an Overstrom sludge table to save the fine sulphide slime at the Wilkinson mine near Benton. In addition to its zinc output this mine produces 300 to 400 tons of iron pyrite per month.

Reich—Litigation has been settled and mining operations will be commenced by F. W. Meeks, of Galena, Ill., who has purchased the mill equipment.

Beloit-Merger—This company, operating the Beloit-Elmo mine, has completed the installation of a Fairbanks-Morse oil engine and has resumed underground work.

Wyoming

ALBANY COUNTY

Commercial Gold Mining Co.—A crosscut tunnel is being driven on this property to intersect the vein.

Klondyke—A strike of high-grade gold ore was made recently at this property, near the Snowy Range, in Carbon County, about 10 miles from Centennial.

Mary Ellen Mining Co.—At this mine, at Atlantic City, in Fremont County, preparations are being made for underground operations. It is stated that four carloads of mining machinery have recently been received from Denver.

Canada

British Columbia

Richmond Group—The company operating this property in the South Belt, Rossland district, has recently purchased the Lily May and Black Horse mineral claims, those claims being adjacent to the former holdings of the company. On the Lily May there is a shaft 200 ft. deep with some lateral workings on the 100- and 200-ft. levels. On the Black Horse claim there are two shallow prospecting shafts. It is the intention of the company to erect a hoist at the Lily May shaft and start development work from that place.

Granby Consolidated—Negotiations have been concluded for the purchase by this company of the mineral rights to about one acre of the Snowshoe mine, the property of the Snowshoe Gold & Copper Mining Co. The ore will be removed from the mine through the tunnel of the Gold Drop property of the Granby company, which passes through property adjoining that recently required.

Standard Silver-Lead Mining Co.—This company, operating the Standard mine, near Silverton, has declared a dividend of $50,000, making the total dividend paid within the last year $225,000.

Red Cliff—The first shipment from this mine, in the Portland Canal district, consisted of 511 tons of ore, which was shipped to the smeltery at Tacoma. A second shipment of 750 tons was ready to be shipped the last week in August. A. Erskine-Smith, president.

Judge Scott—Filling operations have been started in the new 10-stamp mill on this property, in the Chilliwack district.

Moody—This group of six copper claims, at Tasso Harbor, Moresby Island, in the Queen Charlotte group, has been leased by F. W. Rossburg, of Butte, Mont., and shipments will be made in the near future to the smeltery at Tacoma. The property is owned by Arthur Gowing, of Vancouver, and associates.

British Columbia—Atlin District

Malhuin Syndicate—At this mine on Otter Creek, the season so far has been occupied in installing a large plant to operate the ground prospected last year by a Keystone drill. The work is almost completed, and piping will be commenced shortly. H. Malhuin, manager.

Engineer—This mine on the Taku area has lately been working a large crew of men. It appears to be the intention of the owners of this property to push systematic development and ascertain the extent of ore. Several good shoots of ore have recently been discovered, and progress will be watched with great interest.

Ontario

Moose Head—This copper property, in Cobden Township, seven miles northwest of Blind River, has been taken on option by J. A. Hacker, of Chicago, and associates. Two new shafts will be sunk and if results are satisfactory, a $50,000 plant will be installed.

Ontario—Cobalt

Nipissing—The monitor at work on this property has uncovered a new vein supposed to be an extension of vein No. 128.

King Edward—An endeavor is being made to arrange matters with the shareholders so that this mine may be reopened.

Foster—This property will be reopened on a leasing basis. C. B. Flynn, who is one of the principal owners of the McIntyre, is promoting the leasing company.

Apex—Work is to be resumed on this property, which has been closed for some time.

Standard—The creditors of this company have refused to accept the offer made by the directors. It has been decided that the company should go into voluntary liquidation, and the assets be sold at public auction.

Ontario—Porcupine

McEnaney—Construction work on the new mill has been started.

Rea—Negotiations are under way for the reopening of this property.

North Dome—The main shaft will be sunk to a depth of 200 feet.

Dome—An electric hoist will be installed at the head of the incline to handle the ore from the 45- and 100-ft. levels to the crushers.

Mexico

Jalisco

Mololoa and El Favor—These Makeever mines in the Hostotipaquillo district are under the management of Walter Neal. During July, 298 tons of high-grade ore was shipped to the Aguascalientes smeltery, and 417 tons of manganiferous ore was milled. A 36-ton lot of high-grade ore was shipped from the Mololoa to the Aguascalientes smeltery, in July, and it is expected that shipments can be continued. The necessity of providing air connections has retarded shipments lately. During July, 523 tons of Mololoa ore was treated in the El Favor mill.

Cinco Minas—All arrangements have been made for the erection of a 250-ton reduction plant at this mine in the Hostotipaquillo district. The mill will be built of steel and concrete. The equipment will include 30 stamps, each weighing 1650 lb., and five tube mills for re-grinding. An all-slime cyaniding process will be used. The ore will be delivered from the mines to the mill over an electric surface tramway ½ mile long. Power will be supplied by the Chapala Hydro-Electric & Irrigation Co. J. W. Crowdus is in charge of construction work; Harry E. Crawford is general manager.

Sonora

Greene-Cananea—The concentrates from the Miami mill, in Arizona, are fed direct to the converters, and it is because of this that the company has been enlarging its converter plant so as to be able to produce 6,000,000 lb. of its own copper per month this autumn. Within the last two weeks two of the new converter stands have been put into commission.

La Esquina—A drainage tunnel 700 ft. long is being driven on this property to unwater the vein. As soon as drained the mine will be put upon a producing basis. It is expected that Morton Lindley will examine the property in the near future.

Nacozari Consolidated Copper Co.—At this mine work is being done on the 4000-ft. tunnel to tap the main orebody of the district at greater depth. Unexpected veins are being encountered in driving this tunnel, some of which carry profitable ore. John Alexander, manager.

San Nicolas—This mine, under lease to Frank Borgeson, is producing a fair quantity of ore, some of which is high grade.

Moctezuma Copper Co.—The shaft at the Pilares mine is being sunk to the 2000-ft. level. Labor seems to be plentiful, many men coming in looking for work who have never been in the district before.

Metates—James Nolan and J. Baumann, have been leasing this property near Oputo. They recently denounced some claims of their own in that district and expect to begin work on them in the near future.

Lucky Tiger—During July the mills crushed 6046 tons of ore; the cyanide plant treated 5810 tons of tailings from the two mills and 1829 tons from old dumps in 28 days operations. The bullion, concentrates, and shipping ore produced were estimated to be worth $158,000, the costs at $71,413.

South America

Braden—To facilitate the new milling operations, the management has determined to experiment on finer grinding, and one Hardinge mill and one 22-ft. tube mill have been shipped to the property. When these experiments on grinding have been completed, provided the results by the new method continue satisfactory, it is the intention to equip the entire mill with the Minerals Separation process.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Sept. 4—The seaboard bituminous trade is still improving. Demand is good and prices are generally firmer. The coastwise trade is showing more activity than at any time this year.

In the West trade is also in good position, with a large demand for steam coal. Consumers are also inclined to put in stocks ahead rather freely.

The anthracite market is behind in deliveries. The anthracite companies have not yet made up the April-June shortage, while consumers and dealers are pressing for supplies. There is some fear of a shortage of cars, as the collieries are now using all the equipment they can get. Storage yards are generally empty and coal is shipped as fast as it can be mined.

Coastwise shipments of coal from leading Atlantic ports half-year ended June 30, long tons:

	Anthracite	Bituminous	Total
New York..........	6,875,678	5,883,281	12,758,959
Philadelphia	834,983	2,333,510	3,168,493
Baltimore	88,087	1,845,189	1,933,276
Newport News.. ...	...	1,430,104	1,430,104
Norfolk......... ..	. . .	2,570,077	2,570,077
Total	7,798,748	14,062,161	21,860,909
Total, 1911........	9,108,945	13,012,245	22,121,190

Total decrease this year, 260,281 tons, or 1.2%. New York covers all the harbor shipping points, including barge shipments to city and neighboring wharves.

Belgian Coal Trade—Imports and exports of fuel in Belgium, half-year ended June 30, metric tons:

	Imports	Exports	Excess	
Coal.............	3,884,851	2,452,953	Imp.	1,431,898
Coke............	454,372	463,406	Exp.	9,034
Briquettes.....	201,295	338,828	Exp.	137,533
Total..........	4,540,518	3,255,187	Imp.	1,285,331
Total, 1911....	4,215,283	3,349,053	Imp.	866,230

Imports are from Germany, France and Great Britain.

IRON TRADE REVIEW

New York, Sept. 4—The iron and steel markets continue strong and active, with little falling off from the standard of the past two months. The only decline in demand seems to be in structural steel, and this is prospective rather than actual. It is due to two causes, the difficulty of arranging deliveries, and the higher rates of interest increasing the cost of financing large new building projects.

New records were made in August tonnage of shipments of steel products. The American Sheet & Tin Plate Co. made such a record, shipping a larger aggregate of its products, tinplates, black and galvanized sheets, blue annealed sheets and light plates, than in any previous month in its history. Many mills shipped larger tonnages than in any preceding August, this being particularly true in the pipe trade. August specifications were, on the whole, probably materially in excess of shipments, particularly in bars, plates, shapes and wire products, in which lines the surplus probably amounted to about 25 per cent.

The finished-steel trade seems to be done with spectacular advances; at any rate the United States Steel Corporation is understood to be strongly opposed to further advances of moment, and many at least of the leading independents hold the same view. The principle is that as relatively low-priced contracts extend through the year, any further advances would mark too great a disparity between expiring contracts and the new ones which would have to be made. In special cases, however, advances are likely to occur. It is practically certain that sheets will advance in the near future, probably by $2 a ton on black and $3 a ton on galvanized, while the tin mills will certainly advance prices before they begin to sell for next season. These advances would be predicted upon advances in the raw materials for sheet and tinplate making, sheet bars, spelter and pig tin, all three of which have been advancing sharply.

Activity in pig iron is increasing. Foundry iron is being taken freely, in a way that indicates heavy demand. Basic iron is also called for, and some large contracts are reported. Prices are firm and advancing. Stocks at furnaces are decreasing, and no rapid increase in active capacity can be expected, owing to the difficulty of obtaining coke and the scarcity of labor.

Birmingham

Sept. 2—**Following the announcement that some sales of large proportion had been made during the month just past, it is given out that inquiries are in hand which indicate there is still a need for large tonnage of pig iron. The inquiries are for iron to be delivered during the first half of next year and $13 per ton, No. 2 foundry, is the lowest quotation that is stated. The sales in the main made during August will be delivered during the balance of the year and most likely through the first quarter of the** coming year. Cast-iron pipe concerns in the Southern territory have prepared for a continued activity into next year and other consumers are said to be assured of activity. The sales made during the month of August by Southern pig-iron manufacturers call for a larger production of iron and preparations are well in hand for that condition.

Iron prices for the first quarter of the coming year will be on a basis of $13 per ton, No. 2 foundry, with a possible increase of 50c. per ton for delivery during the first half of the year. The greater portion of the sales made so far for delivery this year are on a basis of $12.50 per ton, No. 2 foundry.

The steel situation in Southern territory is almost everything that could be desired. There is activity at the big plant of the Tennessee Coal, Iron & R.R. Co. while the Southern Iron & Steel Co. is doing well at its plant at Gadsden, wire goods being in strong demand.

Cast-iron pipe makers are busy with orders in hand and in sight that will run far into next year. Pipe prices are improving right along. Foundries report improving conditions, in fact all branches of the trade are doing well with the future prospects bright.

Baltimore

Sept. 2—Exports for the week included 1,046,865 lb. steel plates to Rotterdam; 781,000 lb. old car wheels to Leith, Scotland; 2,184,220 lb. steel rails and 401,310 lb. track fastenings to St. Johns; 9,527,575 lb. miscellaneous iron and steel to Panama. Imports included 886 tons ferromanganese from Liverpool; 5050 tons manganese ore from Poti, Russia; 4700 tons pyrites from Huelva, Spain; 27,900 tons iron ore from Cuba.

Chicago

Sept. 2—A strong tone continues in the iron market, with pig iron in somewhat better demand and prices stiffening. On last-quarter business $12.50 Birmingham ($16.85 Chicago) for No. 2 foundry is generally quoted; on first-quarter deliveries 50c. more is obtained. A little iron is said to be obtainable in odd lots at less than $12.50. Northern No. 2 foundry brings $15.50@16 at the furnace, which represents about $16@16.50 delivered. For both Northern and Southern the demand is increasing, more melters showing a desire to contract for first-half requirements. Selling agents in general are holding out for the higher quotations on all business running into next year, but there is much tonnage yet to be placed for the last quarter. Steady buying in small- to medium-sized lots is the policy of many melters and their aggregate purchases from week to week constitute a satisfactory record of sales from the furnace agent's point of view. Charcoal iron continues in good demand, at $16.50@17, Chicago.

The market for finished products continues strong despite higher prices in some lines. Local mills are crowded to their limit of production for this year; contracts for 1913 deliveries are not yet being generally made though the pressure for them is increasing. Bar iron holds to 1.40c. minimum with a large demand and steel bars are active at 1.48c. Railroad supplies are in increasing demand with the tendency of the roads to buy liberally for reconstruction and improvements. Structural material continues actively sought and difficult to obtain because of the pressure on the mills. Plates and sheets show a similar demand and scarcity of material for early delivery. The whole situation indicates a continuation of large demand for practically every line of finished products.

Cleveland

Sept. 2—Ore shipments are so heavy that some wild boats are finding employment. A few sales are still being made to furnaces which underestimated their requirements.

Pig Iron—The market is strong and sales are good. Quotations, Cleveland delivery, are $15.30 for bessemer, $14.25 for No. 2 foundry, $13.50@13.75 for gray forge and $18 for Jackson County silvery.

Finished Material—There is a good general demand. Iron bars are in special request, and 1.45c., Cleveland, is now quoted. Jobbers report good sales.

Philadelphia

Sept. 4—The hardening of pig-iron prices is stimulating inquiry and demand. It is the general opinion among consumers that a higher level of prices is very probable. Much business that is presented is for a later delivery than furnace interests care to take on at present quotations. There is a rumor current that some Southern furnaces are either negotiating or have recently answered inquiries looking to deliveries during the first half of next year but whether at current prices or at a little advance the rumor does not mention. Quite a number of furnaces which are well sold up are asking as much as 50c. advance, but this is not looked upon as a serious quotation. Yet it may turn out to be. Steel-making pig iron is leading other kinds and additional large sales have just been made with more inquiries in sight at prices that a month ago would have been regarded as improbable. Stocks are steadily declining and output is slowly increasing. The most active inquirers are the larger interests throughout all the territory supplied from this market. No. 2 X foundry is quoted strong at $16.50; Virginia, $17; Pennsylvania forge, $16; basic, $16.50, and low phosphorus, $21.50. Surprises in purchases for distant delivery are liable any day.

Steel Billets—The pressure for steel billets is now mainly from the smaller concerns who are glad to escape the consequences of their carelessness by paying whatever prices that are quoted. Forging billets have been advanced to $30, but even higher prices have been paid for special accommodation.

Bars—Bars have advanced slightly in actual selling prices and orders are trooping in. Steel bars are hard to obtain except on delivery conditions named by the mills. Bars have been advanced $1 per ton.

Sheets—Sheet mills are willing to book business for first or second quarter next year, but their quotations are high and simply mean "take it or let it alone."

Pipes and Tubes—Quotations in tubes remain fixed and business is reported large, the heavier consumers ordering for future necessities. Merchant pipe is more active than for some weeks. Cast-pipe quotations have been advanced under stronger crude-iron quotations.

Plates—Plates have been advanced at least $1 a ton, but the bulk of the past week's business has been done on premium quotations. Sheared plates are quoted at 1.60c., with 1.65c. for universal shapes.

Structural Material—Much more business is being offered to the mills than is being accepted and there are no signs that this situation will be changed this month.

Scrap—The scrap dealers are having a harvest and their yards are practically empty except for certain ordinary lines and tentative orders are now in the hands of the dealers who are scouring the country for supplies.

Pittsburgh

Sept. 3—The close of the regular summer or vacation period has made no appreciable difference in the condition of the iron and steel trade. The July-August business was on the whole a record breaker in point of specifications, and the mills are now wondering whether September and October will show a larger total, as they do in normal times, when July and August have been dull. There are suspicions that many buyers desired to get ahead of the general run in specifying, and made a special point to specify heavily in August. If this was the case, their specifications may be lighter this month, and even in October also. A point of importance is that the mills have been able to render much better service than at any former time when they were under great pressure. They have not fallen behind in shipments nearly as much as they did in 1906 or 1909. In 1906, for instance, there was a long period in which the best delivery many of the mills could promise was six months. At this time the mills are making much better promises though a much larger tonnage has been specified. On a general average, specifications for steel products can be filled in from six to eight weeks.

Pig Iron—The August pig iron averages, compiled by a leading interest in the trade from actual sales reported, are announced at $14.534 for bessemer and $14 for basic, at Valley furnaces, against $14.25 for bessemer and $13.48 for basic in July. The Bessemer market is now higher, however, several small lots having sold lately at $14.75, while in the past few days at least one small lot has sold at $15 and several small lots are pending which are expected to go at $15. There are no large negotiations for bessemer. Basic iron has brought $14, Valley, and most furnaces are asking $14.25 or higher. There is very little foundry to be had at $14.25, Valley, for this year, and none at all for next year. We quote: Bessemer, $14.75@15; basic, $14@14.25; No. 2 foundry, $14.25@14.50; malleable, $14@14.50; forge, $13.75@14, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—There is a moderate amount of selling at the $2.50 advance noted in last report, for forward delivery, while prompt material is scarce and sometimes brings a premium. The general market is $53.50, Baltimore.

Steel—The market has been advancing sharply, owing to an insistent demand with very little steel offered. Most of the large mills are now out of the market, being practically sold up for this year and being unwilling to quote for next year. Finishing mills are paying higher prices than are justified by the rates at which their finished product is sold, merely to give service to their customers and keep their order books clearer for later deliveries, when they expect to realize better prices for their finished product. Some purchases lately made are almost spectacular in the advances paid over what could have been done a week or two earlier, and the market is advancing at a pace rarely seen. A round tonnage of openhearth steel, running well into the thousands of tons, has been taken at a price higher than a basis of $24, maker's mill, Pittsburgh, for openhearth billets, and openhearth sheet bars have been quoted at $25, maker's mill, with the prospect that the steel will eventually be taken at this figure. The market is not closely quotable, as it changes overnight, and sellers rarely make a quotation except for acceptance the same day. We quote as approximately representing the market: Bessemer billets, \$23@23.50; bessemer sheet bars, \$23.50@24; openhearth billets, \$24@24.50; openhearth sheet bars, \$24.50@25; rods, \$25.50@26, f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—The market is very strong, with shipments extremely heavy and specifications equally heavy. Several of the independents have lately been selling into next year at present prices, but the leading interest is not doing so, except that it has made contracts with special consumers which run into next year. It is probable that sheets will advance within a fortnight, by \$2 a ton on black and \$3 a ton on galvanized, which would increase the spread between black and galvanized from 1.10c. to 1.15c. The increased spread is more than justified by the high price of spelter, whereas a 1.15c. spread has sometimes obtained in the past when spelter was lower. We quote the market at present at 1.50c. for blue annealed, 10 gage, 2.05c. for black, 28 gage, 3.15c. for galvanized, 28 gage, 2.20@2.25c. for painted corrugated, 28 gage, and 3.20c. for galvanized corrugated, 28 gage.

Connellsville Coke—The market for prompt furnace is 5@10c. higher this week, sales being made of 10,000 tons or more for prompt and September at \$2.30 and \$2.35, and \$2.40 in one instance, for a specially desirable brand. No fresh contracts for the remainder of the year are reported. It is questionable whether \$2.25 can be done any longer on contract.

Sept. 4 (By Telegraph)—Independent tinplate makers advanced their price 10c., or \$2 per ton, making it \$3.60 base for 100-lb. cokes. They will not sell for 1913 delivery before October. The American Sheet & Tin Plate Co. has made no official advance, but is sold up for this year and is not selling for 1913. The independent advance makes the market for tinplates, which is now quotable at \$3.60 base per box.

Foreign Iron Trade

German Iron Production—Pig-iron production in Germany in July was 1,468,011 metric tons, being 49,566 tons more than in June. For the seven months ended July 31 the make was as follows:

	1911	1912	Changes	
Foundry iron	1,776,561	1,843,283	I.	66,722
Forge iron....	324,279	309,997	D.	14,282
Steel pig	1,005,797	1,224,841	I.	219,044
Bessemer pig..	204,169	227,668	I.	23,499
Thomas(basic)pig	5,661,939	6,286,854	I.	624,915
Total..	8,972,745	9,892,643	I.	919,898

The total increase this year was 10.3%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

METAL MARKETS

New York, Sept. 4—The metal markets have been generally strong and inclined to be active. Tin has had another sharp advance.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess	
Gold				
July 1912..	\$ 7,263,624	\$ 3,747,869	Exp.	\$3,515,755
" 1911..	2,178,088	2,594,653	Imp.	416,565
Year 1912..	40,660,460	29,012,211	Exp.	11,648,249
" 1911..	15,429,650	36,367,679	Imp.	20,938,029
Silver				
July 1912..	6,591,054	3,449,716	Exp.	3,141,338
" 1911..	5,275,008	3,920,794	Exp.	1,354,214
Year 1912..	40,260,276	28,713,965	Exp.	11,546,311
" 1911..	39,718,211	25,881,395	Exp.	13,836,816

Exports from the port of New York, week ended Aug. 31: Gold, \$600; silver, \$1,851,971, chiefly to London and Paris. Imports: Gold, \$606,096; silver, \$223,004, principally from Mexico and South America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. Exports reported last week included £183,000 to India and £700,000 to South America, besides a considerable amount to Germany.

Iridium—This metal is quoted at \$63@64 per oz., New York.

Platinum—There is still talk of lower prices, but foreign holders seem to be able to keep prices up, notwithstanding their reported holdings of large stocks. Dealers here still ask \$45.50 per oz. for refined platinum and \$48 per oz. for hard metal.

Silver—The market advanced this week on buying by the Indian Bazaars, touching 29$\frac{1}{16}$d. in London on Aug. 31. Since then price has reacted on lack of orders on account of holidays in India and closes dull at 28⅞d. with buyers satisfied.

SILVER AND STERLING EXCHANGE

Aug.-Sept.	29	30	31	2	3	4
New York....	62⅜	62⅝	63⅛	....	62¾	62¼
London.....	28$\frac{11}{16}$	28$\frac{13}{16}$	29$\frac{1}{16}$	28$\frac{13}{16}$	28⅞	28$\frac{13}{16}$
Sterling Ex..	4.8740	4.8715	4.8695	....	4.8675	4.8655

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Aug. 22, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes	
India...	£5,100,600	£5,087,700	D.	£ 12,900
China	890,400	933,500	I.	43,100
Total .	£5,991,000	£6,021,200	I.	£ 30,200

India Council bills in London averaged 16.03d. per rupee for the week.

Imports of gold into Great Britain, seven months ended July 31, were £29,712,028; exports, £21,423,795; excess of imports, £8,288,231, against £9,945,522 last year.

Copper, Tin, Lead and Zinc

NEW YORK

Aug.-Sept.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
29	17⅝ @17¾	17.57½ @17.60	46¾	4.65	4.55 @4.60	7.15 @7.20	7.00 @7.05
30	17⅝ @17¾	17.55 @17.60	47¾	4.85	4.75 @4.77½	7.20 @7.25	7.05 @7.10
31	17⅝ @17¾	17.55 @17.60	47¼	4.85	4.75 @4.77½	7.25 @7.27½	7.10 @7.12½
2	......	......	....	....	......	......	......
3	17⅝ @17¾	17.52½ 17.57½	47¼	4.85	4.75 @4.77½	7.27½ @7.30	7.12½ @7.15
4	17⅝ @17¾	17.52½ 17.57½	47¼	4.85	4.75 @4.77½	7.27½ @7.32½	7.12½ @7.17½

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Aug.-Sept.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
29	78$\frac{1}{16}$	79$\frac{1}{16}$	84¼	213	212	20½	26¼
30	79$\frac{1}{16}$	79¼	84¼	218¾	217½	20⅝	26⅝
31							
2	79$\frac{1}{16}$	79¼	84½	216¼	214¼	20½	26¼
3	78$\frac{13}{16}$	79⅛	84¼	216¾	214¼	20¼	26¾
4	78$\frac{13}{16}$	79¼	84¼	216¼	214	21¼	26¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ±£25 = 5.44c.; £70 = 15.22c. Variations, £1 = ±21¾c.

Copper—Even before the holiday the market was beginning to look tired, the demand both for Europe and America having dwindled, Europe being undoubtedly affected by the relapse in the standard market. There has again been reports that European buyers are being supplied with relatively cheap copper out of stock on their side. In our own market there has been a disposition to attract business by concessions, both for export to Europe and for delivery in Connecticut and elsewhere in this country. Since Monday sales of electrolytic have been made at 17.55c., cash, New York. Lake has sold at 17⅝@17¾c. Some producers of Lake report a good business while others report none at all. On the whole the tone of the market has been easy. However, there seems to be no doubt as to the maintenance of a high rate of consumption, both here and abroad. In this country the operations of manufacturers seem to be limited only by their inability to obtain the necessary labor to run their plants. At the close Lake copper is quoted 17⅝@17¾c.; electrolytic, in cakes, wirebars or ingots 17.52½ to 17.57½c.; while casting copper is quoted nominally at 17⅜@17½c. as an average for the week.

The London standard market has been quiet and has fluctuated within narrow limits, spot standard moving from £78 16s. 3d. to £79 6s. 3d. and back again to £78 16s. 3d. at the close for spot and £79 5s. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6725 long tons. Our special correspondent gives the exports from Baltimore at 2491 tons for the week.

Visible stocks of copper in Europe Aug. 31 are reported as follows: Great Britain, 29,450; France, 7890; Rotterdam, 550; Hamburg, 4610; afloat from Chile, 2600; afloat from Australia, 5600; total, 50,700 long tons, or 113,568,000 lb. This is a decrease of 530 tons from the Aug. 15 report.

Tin—The market has developed great strength, due primarily to the very strong statistical position. The visible supply of tin is now 11,285 tons, the smallest quantity on hand since 1906. The deliveries into consumption during August were very large, amounting to 4300 tons. The demand from consumers has been very good, and besides, there has been a strong bull movement in London, in consequence of which prices have considerably advanced; in fact, spot tin has been ruling at the highest price on record since June, 1911, and three months' tin is actually selling at a record figure.

In New York, the market advanced to 47¾ on Aug. 30, and closes on Sept. 4 at 47¼ cents.

In London, spot closed on Aug. 29 at £213 and three months at £212. Ou Aug. 30 it advanced over £5. A slight reaction took place on Aug. 3 to £216 15s. for spot and £214 5s. for three months. The market closes on Aug. 4 at £216 5s. for spot and £214 for three months.

Visible stocks of tin on Aug. 31 are reported as follows: London, 5981; Holland 975; United States, excluding Pacific ports, 4329; total, 11,285 long tons, a decrease of 2061 tons during August.

Lead—The market is strong and advancing; consumption is excellent and stocks appear to be small. On Friday, Aug. 30, the principal producer advanced its price to 4.85c., New York, at which figure there has been a good business. St. Louis is quoted at 4.75@4.77½ cents.

The London market for lead continues to advance and metal for early delivery is very scarce. At the close, Spanish lead is quoted £21 5s.; English lead, 2s. 6d. higher.

Spelter—The market has advanced smartly, the movement being attributed especially to the covering of some speculative contracts. Some business has been done with consumers, but the demand from them has not been large. A fundamental cause for the movement is probably the conviction that production is experiencing a falling off. Anyway, the situation in the Kansas-Oklahoma gas-fields is reported to be becoming acute and the works at Altoona, Bartlesville, Caney, Dearing. Neodesha and Cherryvale are reported to be operating at reduced capacity. This offers some relief to the previous shortage of ore and the smelting margin is again satisfactory. Calamine is again being imported from Mexico, partly because of the shortage of other ore supply and partly because this kind of ore requires less gas for smelting than in the case of blende. The spelter produced from imported ore is now being entered for domestic consumption, which, of course, has an influence both upon our own market and upon the European. At the close St. Louis is quoted at 7.12½@7.17½c.; New York 7.27½@7.32½ cents.

The London market for spelter is firm, good ordinaries being quoted £26 15s.; specials 5s. higher.

The smelting works of the American Zinc, Lead & Smelting Co. at Hillsboro, Ill., have been put in operation.

Base price of zinc sheets is $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—Business is steady, and metal is still rather scarce for early delivery. The current quotation is 24¼@24½c. per lb. for No. 1 ingots, New York.

Antimony—The market is firm and fairlyy active. Sales at lower prices from second hands are gradually being eliminated. Cookson's is quoted 8.45c. per lb.; Hallett's and U. S., 7.95@8.05c., while 7.45@7.70c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—The market is firmer, but prices here are unchanged so far. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price has been advanced 10s. and is now £8 5s. per flask, with £8 quoted from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 31—The base price paid this week for 60% zinc ore was $54@55. The base price of 80% lead ore was $58@59 per ton.

SHIPMENTS, WEEK ENDED AUG. 31

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,030,100	....	596,000
Highland	774,900	....	....
Mineral Point	652,120	....	....
Galena	473,600	....	....
Shullsburg	454,000	....	....
Hazel Green	360,000	....	....
Platteville	323,000	....	90,400
Harker	254,720	....	....
Cuba City	162,880	....	458,660
Dodgeville	52,250	....	....
Total	4,537,570	....	1,145,060
Year to date	138,356,950	5,887,420	23,471,430

Shipped during week to separating plants, 2,089,140 lb. zinc ore.

Joplin, Mo., Aug. 31—The high price of zinc-sulphide ore this week was $59, the price per ton of 60% zinc $53@56. Zinc silicate sold at $29@31 per ton of 40% zinc. The average, all grades of

SHIPMENTS, WEEK ENDED AUG. 31

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,385,590	......	861,360	$138,910
Joplin	2,572,240	......	305,100	80,865
Duenweg	683,060	......	58,730	20,770
Galena	627,620	......	54,610	18,780
Miami	431,310	......	276,970	18,535
Alba-Neck	490,160	......	25,500	14,930
Granby	53,190	452,900	16,860	9,150
Carl Junction	286,110	......	.....	6,865
Oronogo	336,600	......	......	6,795
Spurgeon	71,350	143,350	4,000	4,170
Lawton	91,480	......	......	2,560
Cave Springs	59,810	......	......	1,615
Aurora	......	87,850	......	1,490
Totals	10,039,220	684,100	1,603,130	$325,425
8 mos	361,981,470	22,481,070	61,635,360	$11,493,460

Blende val the week, $269,005; 8 mos., $9,438,294
Calamine, the week, 11,280; 8 mos., 342,192
Lead value, the week, 45,140; 8 mos., 1,713,474

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	......	41.29	.....	59.33	......
October	42.38	.....	40.89	......	54.72	......
November	45.40	......	43.25	......	57.19	.....
December	44.13	.....	40.76	......	62.03	.....
Year	$41.45	.....	$39.90	......	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

zinc, $52.70. Lead sold as high as $60 per ton, 80% grades receiving $55@56. All grades averaged $56.30 per ton. There is a move on foot to buy lead, as zinc, on the actual dry weight.

The shipment this week was considerably short of the past two weeks, but a large tonnage purchased this week at advanced prices for next week's delivery insures a heavier tonnage again next week.

It is reported here that the Mineral Point Zinc Co. has secured contracts on the larger portion of the Wisconsin output, which is forcing some of the smelting companies to secure a larger tonnage in this district.

Chemicals

New York, Sept. 4—The Universal Chemical Co. has been organized with an authorized capital of $30,000,000. It is not known who is behind the new company.

Copper Sulphate—Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Arsenic—Supplies are still scarce and quotations are $4.50@5 per 100 lb. for white arsenic.

Nitrate of Soda—Demand is good and prices firm at 2.52½c. per lb. for spot nitrate and 2.55@2.57½c. for futures.

CURRENT WHOLESALE PRICES

Ammonium sulphate	cwt.	3 25@3 28
Arsenic, white	lb.	0.04½@0.05
Barytes, ground	sh. ton	12 50@14 00
" floated	sh. ton	16.00@17.00
Calcium acetate, gray	cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls	sh. ton	70.00
Carbons, good drill quality	carat	85 00
Cement, Port., Am.	400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburg	M.	175.00
ore, 50%, ex-ship, N. Y.,	lg. ton	14.00@16.00
Copperas, bulk	cwt.	0.55
bbl.	cwt.	0.65@0.85
Copper sulphate	cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg	ton	8.00@9.00
Magnesite, crude, 95%	lg ton	10 00@11 00
calcined, powdered		30 00@35 00
brick, dom., f.o.b. Pittsburg	M.	160@180
Paints, litharge, Am. powd	lb.	0.07@0.07½
red lead, American	lb.	0 07@0 07½
white lead, Am., dry	lb.	0 05¾@0 06¼
zinc white, Am., dry	lb.	0.05⅜@0.06¼
Phosphates, acid:		
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4 75@5 00
68@72%		4 25@4 50
‡So. Car. land rock 60%		3.50@3.75
otassium cyanide, 98@99%	lb.	0.19
yrite:		
Domestic, non-arsenical, furnace size, f.o.b. R R per unit		0 12@0 12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit		0 13½
Imported, arsenical, furnace size, size, ex-ship, per unit		0.12¾@0.13
Imported, fines, arsenical, ex-ship		0.11@0.12
Imported, fines non-arsenical, ex-ship, per unit		0.12½

Pyrite prices are per unit of sulphur. A deduc-on of 25c per ton is made when ore is delivered large lumps.

odium cyanide, 120 to 130% KCN (per 100%)	lb.	0 18
nitrate 95% spot	cwt	2 52½
95% future	cwt.	2.55
ulphur, Louisiana prime, N. Y,	lg. ton	22.00@22.50
roll	cwt.	1 85@2 15
flour	cwt.	2 00@2 40
flowers, sublimed	cwt	2 20@2 60
pow. com., bags	cwt.	1.50
Sicilian, crude brimstone	lg. ton	22 50
inc chloride, granular	lb.	0.04¼@0 04½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S.C.

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

California oil production in July is reported at 7,580,748 bbl.; deliveries, 6,982,646 bbl.; stocks at close of the month, 48,022,469 bbl. There were 64 wells completed in July, and 408 under the drill.

MINING STOCKS

New York, Sept. 4—On Aug. 29 the Exchange was quiet, with light business and no important changes. On the Curb copper stocks were in some demand, but prices show little change. Other mining stocks were dull.

Aug. 30 the Exchange was dull. On the Curb copper stocks were weaker. Cobalts sold rather freely at slight declines. Other mining stocks were quiet.

The Exchange adjourned from Friday, Aug. 30, over to Tuesday, Sept. 3, on account of the Labor Day holiday.

Sept. 3 and 4, after the recess, the Exchange continued dull and unsettled, with small recessions in price. The Curb was also dull with rather limited trading. Copper stocks were fairly steady, with few price changes. Other mining stocks were inclined to be weak, and were not in active demand.

In Baltimore, Aug. 30, a sale of 1700 shares common stock Alabama Consolidated Coal & Iron Co., pledged as collateral, brought $8.08 per share for 100 shares, and $5.50 per share for the remaining 1600 shares.

Boston, Sept. 2—After making new high records for the year in many cases, stock prices have settled somewhat. The market for copper shares can be said to be healthy in tone with future promise, judging from the continued demand for the metal. The Hayden, Stone & Co. floatation of the Alaska Gold Mines Co. has been watched with keen interest and allotments were but 25% of original subscriptions in most cases. The firm's customers and particular friends were about the only beneficiaries, although good-sized blocks went abroad. With $5 paid in the price rose to $9.12½ on the Curb, although it reacted from this to $7.25 on knowledge of the allotments and desire to get quick profits.

Calumet & Arizona, Granby, North Butte and Old Dominion were the particularly strong features during the week. The last company is expected to increase the dividend beyond the present $3 rate at its next period. Fairly active trading in Keweenaw caused the price to advance

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments	4,134,569	2,224,441	....
Anaconda	22,750,000	23,000,000	25,250,000
Arizona, Ltd	3,300,000	3,200,000	....
Copper Queen	7,622,730	7,708,147	....
Calumet & Ariz	4,160 000	4,748,000	....
Chino	1,474,979	2,945,000	3,437,309
Detroit	1,959,634	2,194,090	....
East Butte	....	....	....
Mammoth	....	....	....
Mason Valley	1,438,580	1,500,000	....
Nevada Con	5,913,832	6,084,274	....
Ohio	665,000	617,500	....
Old Dominion	2,130,000	....	....
Ray	3,004,195	2,985,965	....
Shannon	1,270,000	1,446,000	1,400,000
South Utah	162,335	142,555	....
United Verde*	2,500,000	....	....
Utah Copper Co	8,772,742	10,602,000	....
Lake Superior*	15,600,000	19,500,000	....
Non-rep. mines*	8 300,000	8,970,000	....
Total production	....	....	....
Imports, bars, etc.	24,262,292	....	....
Total blister	....	....	....
Imp. in ore & matte	8,434,936	....	....
Total American	....	....	....
Miami†	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	996,000	1,026,000	....
Granby	1,888,400	....	....
Mexican Cos.:			
Boleo†	1,851 920	2,386,480	....
Cananea	4,310,000	4,000,000	....
Moctezuma	3,176,819	3,094,016	....
Other Foreign:			
Cape Cop., S. Africa	....	....	....
Kyshtim, Russia	....	....	....
Spassky, Russia	757,120	795,200	....
Famatina, Argen	....	....	....
Tilt Cove, Newf'd	....	....	....
Exports from:			
Chile	9,856,000	8,960,000	....
Australia	8,176,000	8,288,000	....
Arrivals in Europe‡	12,667,200	14,114,240	....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VIII, 1911	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	...		......

VISIBLE STOCKS

	United States	Europe	Total
IX, 1911	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	......	113,568,000	......

to $2.50. This is due to plans to consolidate this company with Ashbed, Humboldt, Meadow and others of more or less promise. Outside of Alaska Gold, trading on the Curb was quiet, although a firm tone was maintained in the better class of issues.

Assessments

Company	Delinq.	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0 10
Belmont, Ida	July 22	Aug. 22	0.002
Black Pine M. & M., Utah	Aug. 29	Sept. 19	0.00½
Cedar Talisman, Utah	Sept. 14	Oct. 3	0.00½
Con. Virginia, Nev	Aug. 11	Sept. 5	0 20
Dalmatia, Ida	Aug. 24	Sept. 21	0.002
Dennemora, Ida	July 20	Aug. 20	0.002
Eagle Mt., Ida	July 31	Aug. 22	0.001
Empire, Ida	Sept. 23	Oct. 23	0.002
Hilarity, Ida	Sept. 5	Oct. 5	0.002
Horseshoe Ida	Aug. 8	Aug. 30	0.002
JohnnyGold M. & M. Co., Utah	Aug. 30	Sept. 20	0.00½
Laclede, Ida	Aug. 1	Aug. 24	0.003
Little Butte, Ida	Sept. 21	Oct. 21	0.001
Lone Star, Nev	July 20	....	0.02
Manhattan Red Top, Nev	July 12	....	0.01½
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
New Hope, Ida	Sept. 3	Oct. 3	0.002
New Reliance, S. Dak.	....	....	0.01
Ohio Copper, Utah	Aug. 28	....	0.50
Reindeer, Ida	Sept. 7	Oct. 5	0.003
Sandstorm-Kendall, Nev	July 8	....	0.01
Seven Troughs Mon'h, Utah	Aug. 10	Aug. 30	0.0½
Smuggler, Utah	Aug. 20	Sept. 20	0.00½
Springfield, Ida	July 30	Aug. 31	0.002
Tonopah North Star, Nev.	July 15	....	0.02
Twin Star, Ida	Aug. 31	Sept. 28	0.02
Wasatch, Utah	Sept. 27	Oct. 16	0.01

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	.....	24.567	24.209	....
October	55.490	53.340	.....	25.596	24.594	...
November	55.635	55.719	..	25.680	25.649	..
December	54.428	54.905	..	25.160	25.349	...
Year	53.486	53.304		24.670	24.592	..

New York quotations, cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic 1911	New York Electrolytic 1912	New York Lake 1911	New York Lake 1912	London, Standard 1911	London, Standard 1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	.....	12.508	.	55.253	....
October	12.189	.....	12.370	...	55.170	..
November	12.616	..	12.769		57.253	..
December	13.552		13.768		62.068	.
Year	12.376		12.634		55.973	...

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	
April	42.185	43.923	October	41.185	.
May	43.115	46.053	November	43.125	
June	[illegible]	45.815	December	44.655	
			Av. Year	42.281	...

Prices in cents per pound.

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	.....	4.356	......	14.744	....
October	4.265	.....	4.139	.....	15.332	....
November	4.298	......	4.181	....	15.821	....
December	4.450	.....	4.332	...	15.648	....
Year	4.420	..	4.286	..	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869		5.719		27.750	...
October	6.102	.	5.951	..	27.256	....
November	6.380		6.223	...	26.795	...
December	6.301	.	6.151	..	26.849	.....
Year	5.758	..	5.608	..	25.281	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

Month	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No. 2 Foundry 1911	No. 2 Foundry 1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90		13.57		14.40	..
October	15.43	......	13.44	.	14.34	
November	14.92	..	13.30	....	14.25	.
December	15.15		13.10	...	13.90	.
Year	$15.72		$13.94	....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 3

Name of Comp.	Bid
Acacia	.04½
Cripple Cr'k Con.	.02
C. K. & N.	.16⅛
Doctor Jack Pot	.6⅜
Elkton Con.	.65½
El Paso	1.14
Findlay	.07½
Gold Dollar	.18
Gold Sovereign	.02
Isabella	.20¼
Jack Pot	.05
Jennie Sample	‡ .06¼
Lexington	.009
Moon Anchor	‡ .09
Old Gold	.03⅞
Mary McKinney	.71¼
Pharmacist	.01¼
Portland	.97
Vindicator	.85
Work	.01½

SALT LAKE Sept. 3

Name of Comp.	Bid
Beck Tunnel	.09
Black Jack	.13
Cedar Talisman	.00¼
Colorado Mining	.18
Columbus Con.	.18
Crown Point	‡ .02¼
Daly-Judge	‡5.75
Grand Central	.57
Iron Blossom	1.27½
Little Bell	.30
Lower Mammoth	.05
Mason Valley	12.00
May Day	.14
Nevada Hills	1.92½
New York	‡ .03
Prince Con.	1.75
Silver King Coal'n	2.95
Sioux Con.	.04½
Uncle Sam	.15
Yankee	‡ .11

TORONTO Sept. 3

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.50	Hollinger	12.00
Hudson Bay	65.00	Imperial	.02
Temiskaming	.38	Pearl Lake	.16
Wettlaufer-Lor.	.41	Porcu. Gold	.21
Apex	.02	Porcu. Tisdale	.02
Central	‡5.56	Preston E. D.	.03
Crown Chartered	.06	Rea	.25
Doble	.25	Standard	‡ .00½
Dome Exten.	.10	Swastika	.08
Foley O'Brien	.14	West Dome	.05

SAN FRANCISCO Aug. 29

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.09	Belmont	9.70
Belcher	.40	Jim Butler	.66
Best & Belcher	.08	MacNamara	.24
Caledonia	1.50	Midway	.59
Challenge Con.	.09	Mont.-Tonopah	2.25
Chollar	.10	North Star	.21
Confidence	.75	West End Con.	1.70
Con. Virginia	.54	Atlanta	.26
Crown Point	.40	Booth	.07
Gould & Curry	.03	C.O.D. Con.	.11
Hale & Norcross	.11	Comb. Frac.	.15
Mexican	2.92	Jumbo Extension	.43
Occidental	.50	Pitts.-Silver Peak	.91
Ophir	.91	Silver Pick	.11
Overman	.90	St. Ives	.30
Potosi	.03	Tramp Con.	.04
Savage	.07	Argonaut	2.50
Sierra Nevada	.16	Bunker Hill	‡4.50
Union Con.	.73	Central Eureka	.38
Yellow Jacket	.41	So. Eureka	‡2.90

N. Y. EXCH. Sept. 3

Name of Comp.	Clg.
Amalgamated	86
Am. Agri. Chem.	59¼
Am. Sm. & Ref., com.	84⅜
Am. Sm. & Ref., pf.	108¾
Am. Sm. Sec., pf. B	87¼
Anaconda	44¼
Batopilas Min.	1½
Bethlehem Steel pf.	72¼
Chino	40
Comstock Tunnel	‡ 10½
Federal M. & S., pf.	43
Goldfield Con.	3¾
Great Nor., ore, ctf.	45½
Guggen. Exp.	57¾
Homestake	96
Inspiration Con.	18¾
Miami Copper	29½
Nat'nal Lead, com.	59⅝
National Lead, pf.	107
Nev. Consol.	22½
Pittsburg Coal, pf.	96½
Ray Con.	21⅞
Republic I&S, com.	27¼
Republic I & S, pf.	88½
Sloss Sheffi'd, com.	54
Sloss Sheffield, pf.	100
Tennessee Copper	41⅝
Utah Copper	65
U. S. Steel, com.	72
U. S. Steel, pf.	113
Va. Car. Chem.	45½

N. Y. CURB Sept. 3

Name of Comp.	Clg.
Barnes King	88
Beaver Con.	.46
Braden Copper	7
B. C. Copper	5
Buffalo Mines	1.25
Caledonia	‡ 40
Con. Ariz. Sm.	⅝
Davis-Daly	2 7/16
Diam'field-Daisy	7
Ely Con.	9/32
Florence	95
Giroux	5⅜
Gold Hill Con.	5/16
Greene Cananea	9⅞
Greenwater	.05
Internat. S. & R.	‡124
Kerr Lake	2¾
Keystone	2⅜
La Rose	2 15/16
McKinley-Dar-Sa.	2
Min. Co. of A. new	3
Motherlode Gold	15/16
Nev. Utah M. & S.	‡ 01
Nipissing Mines	8⅜
Ohio Copper	13/16
Pacific Sm. & M.	7/32
South Live Oak	1¾
South Utah M. & S.	⅝
Standard Oil (Old)	1110
Stand'd Oil of N.J.	412
Stand'd Oil Subs.	‡525
Stewart	1 7/16
Tonopah	7¼
Tonopah Ex.	2⅞
Tri-Bullion	⅛
Tularosa	1
Union Mines	‡ 9/16
United Cop., pfd.	10
Yukon Gold	3⅝

LONDON Sept. 4

Name of Com.	Clg.
Camp Bird	£1 8s 6d
Dolores	1 10 0
El Oro	0 13 6
Esperanza	1 15 9
Mexico Mines	7 12 6
Oroville	0 5 3
Stratton's Ind.	0 3 1½
Tomboy	1 6 0

BOSTON EXCH. Sept. 3

Name of Comp.	Clg.
Adventure	8½
Ahmeek	350
Algomah	5¼
Allouez	47
Am. Zinc	30¾
Ariz. Com., ctfs.	5⅛
Bonanza	‡ 40
Boston & Corbin	‡7⅞
Butte & Balak	‡3 1/16
Calumet & Ariz.	81½
Calumet & Hecla	545
Centennial	‡22⅞
Con. Mercur	‡ 03
Copper Range	58¼
Daly West	4¾
East Butte	13¾
Franklin	‡11½
Granby	56¼
Hancock	‡28½
Hedley Gold	‡19⅔
Helvetia	1
Indiana	18
Island Cr'k, com.	‡55
Island Cr'k, pfd.	‡91
Isle Royale	35½
Keweenaw	2⅜
Lake	35⅝
La Salle	‡6½
Mass	7¼
Michigan	‡2½
Mohawk	69½
New Arcadian	‡4½
New Idria Quick.	‡6⅞
North Butte	33¼
North Lake	5¾
Ojibway	4⅝
Old Dominion	60¼
Osceola	116
Quincy	‡92½
Shannon	16⅝
Shattuck-Ariz.	21½
Superior	47
Superior & Bost.	‡1⅞
Tamarack	43
Trinity	6
Tuolumne	‡2 15/16
U. S. Smelting	45¼
U. S. Smelt'g, pf.	50
Utah Apex	‡2¼
Utah Con.	11⅛
Victoria	‡3
Winona	5¼
Wolverine	102
Wyandot	‡2

BOSTON CURB Sept. 3

Name of Comp.	Last
Bingham Mines	3
Boston Ely	1
Boswyocolo	02
Butte Central	7
Cactus	10
Calaveras	3
Chief Cons.	1¼
Corbin	95
Cortez	99
Crown Reserve	3
First Nat. Cop.	2
Majestic	48
Mazatan	‡
Moneta Porc.	‡ 05
Nevada-Douglas	2
New Baltic	2
Oneco	1
Raven Copper	30
Rhode Island Coal	13
San Antonio	‡
S. W. Miami	5
South Lake	9
Trethewey	40
United Verde Ext.	37
Vulture	‡

‡Last quotation.

The Engineering and Mining Journal

Vol. 94. SEPTEMBER 14, 1912 No. 11

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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*Illustrated.

The Iron and Steel Institute's Statistics for 1912

The American Iron & Steel Institute has already begun on the statistical work which it has taken over from the American Iron & Steel Association, and has prepared a statement of the production of steel and finished material for the first half of 1912, the figures from which are given on another page. In this work the institute has followed the lines laid down by James M. Swank, so long manager of the old association. This, of course, is natural and commendable, as it continues the statistics in their familiar and accustomed form, and that form is one which proved to be convenient and acceptable to the trade.

The statistician of the institute, however, seems to be desirous of extending the work by comments on the result, where Mr. Swank was content simply to present the facts, leaving others to draw inferences. This is evidently to be a feature of the new reports. for the preliminary statement issued promises further comment and analysis at an early date. It may be questioned whether this will be an improvement, and whether the clear presentation of the facts is not properly the whole object of a statistical work like this. Comment and analysis must be, after all, the expression of individual or group opinion, and may often fail of general acceptance. It should at least be carefully separated from the presentation of the facts.

In this statement of the institute the steel and finished material productions are for the first time given for a half-year. Heretofore they have been published by yearly periods only. This prevents any effective comparisons with the first half of 1911. Some attempt at such comparison is made by taking one-half the production of 1911 as a basis; but that this is not by any means a close comparison is evident when we consider the conditions of the trade.

The steel production of the half-year was the largest on record. Briefly summing up the detailed figures given elsewhere, we made in the first half of 1912 a total of 14,373,701 tons of steel; 33.9% of this total being acid bessemer or converter steel; 3.6% acid openhearth; 62.1% basic openhearth and 0.4% miscellaneous, which includes crucible steel, electric steel and a small quantity made by various special processes. The special point is the continued growth of the openhearth process. Up to 1907 more than half our steel was made in the bessemer converter. From that year on the openhearth furnace has had the lead, until this year bessemer steel is only about one-third of the total. Another point in the statement is that the half-year's make of steel exceeded that of pig iron by a little over 300,000 tons. This was due partly to the drawing on stocks of pig iron brought over from 1911, and largely to the use of steel scrap in the openhearth furnaces.

The make of finished rolled products for the half-year was also large, the total being 11,201,819 tons, of which 10,722,338 tons were steel and 779,481 tons wrought or puddled iron. These totals include only finished and merchantable forms, and not steel sold by makers in half-finished shape, such as blooms, billets, sheet bars and similar forms sold to be further worked into shape. The leading products in the order of their quantity, were plates and sheets, bars, rails, structural shapes and wire in various forms. In quite a number of cases record productions were made, so far as comparisons can be instituted. Rails, however, showed but little gain. The most noteworthy feature about the make of rails was the increase in the proportion of openhearth steel used, which was this year 63.2%, while as recently as 1908 it was only 29.4% of the total.

The publication of these figures half-yearly will undoubtedly be of advantage to the trade; and they appear with a promptness which is commendable, considering the labor required to collect and prepare the figures.

American Institute of Mining Engineers

As we reported a few weeks ago, Dr. James Douglas sent to the members of the American Institute of Mining Engineers a circular letter pointing out that the necessity for any increase of dues would be obviated by voluntary subscriptions to settle the debt due on the Institute's share of the cost of the land on which the United Engineering Building stands. Doctor Douglas has informed us that he sent out about 4100 letters. Up to date replies have been received from 247 members, of whom 189 promised subscriptions. Some of these have been for large amounts, but most of the subscriptions have been confined to the $25 per member as suggested by Doctor Douglas in his circular. Regrets of inability to subscribe were received from 58 members. It is significant that a large number of these expressed their financial inability to contribute and several stated their fear of compulsory resignation in case the dues were raised.

Answers continue to come in daily, but as yet only about 3½% of the members have subscribed. Their response has been liberal and gives good ground for the hope that if the members who are still undecided as to their response would imitate the example of those who have replied, the financial status of the Institute would be immediately placed upon a satisfactory basis.

As we have previously pointed out, the membership of the Institute owes this money. The sum originally owed was much greater, but has been reduced by the generosity of some members and their friends. It will be too bad if the membership will not settle the remainder of its obligation, which was incurred by its own vote. Let every member at least do his duty. Let those be generous who can afford to be. And especially, let prompt attention be given to this matter in order that an announcement may be made at the meeting on Oct. 7 that the indebtedness of the Institute has been settled and that the organization is thereby enabled to march onward without a retarding load.

The Copper Statistics for August

The copper statistics for August are as surprising because of the large production of refined copper reported, as were the monthly statistics previous to July surprising for the smallness. The production of crude copper by the miners and smelters has not yet attained 145,600,000 lb. in any month, wherefore the only inference is that the refiners began in August to draw upon the accumulation of crude material.

In carrying an accumulation of copper, provided that a sufficient quantity of refined be kept on hand to enable commercial requirements to be freely met, it is, of course, most economical to carry the remainder in a crude form if the cost of transportation and refining exceed the value of the precious metals locked up, which is the case in respect to the crude copper from several important districts.

The production reports of the refiners in July and August have fully confirmed previous inferences as to the excess of mine production, which ought normally to have become apparent in the refinery statistics as early as last April. We think that this has been singularly unfortunate, because if the refinery production figures can be rendered so misleading, the suspicion will arise that the delivery figures will also fail sometimes to represent what they ought to.

Thin Lined Blast Furnaces

Recently in the metallurgy of iron there has been a good deal of attention given to thin-lined blast furnaces, which are considered to offer advantages, in the opinion of some metallurgists. Thin-lined water-cooled stacks have been advocated for over a decade by certain German designers, but there was no construction of this sort in America until 1908. The Eastern Steel Co., at Pottstown, Penn., has erected a furnace of this type cooled by water flowing down a spiral trough around the furnace shell. The Illinois Steel Co., has a thin-walled furnace cooled by water sprays from a series of circular pipes, thus increasing the thickness of the water curtain as the bosh is approached. Some other furnaces of this type are in use in this country, and recently the Detroit Steel & Iron Co. followed much the same lines in remodeling its "A" stack.

We are inclined to think that these may be only sporadic experiments rather than the forerunners of a new type that will come into general use. Anyway, some of the leading iron metallurgists are distinctly skeptical. Some are of the opinion that the thick lining of the furnaces of present use has advantages that outweigh the good points of the thin-lined furnaces, and that on the whole the construction of the latter is inferior. The trend of good opinion seems to be to stick to the thick-lined furnaces rather than to follow the pioneers who are experimenting with the thin-lined furnaces.

It is said to be an ill wind that blows nobody some good, but often there are winds that blow good to many people, although, perhaps, in different degrees. Thus, the recent rise in the value of lead, which seems to be based upon economically sound conditions, has been of benefit to all miners and smelters, but likely to none so much as to the International Smelting & Refining Co. This company went into the lead-smelting business about a year ago, and in the first place had to accumulate a large stock of ore pending the completion of its smelting furnaces, and then had to pile up many tons of base bullion while its refinery was in process of erection. The refinery will presently be put into operation and will convert the accumulation of the company into its final marketable form. In the meanwhile, the company has experienced a fine appreciation of value while the stock has been on its hands.

The Chinese Republic is to be added to the list of gold-standard countries, if the currency plan submitted by the Board of Finance is approved. This plan provides that the standard unit is to be a gold dollar having the same value as the Japanese yen, which is equal to $0.498 United States currency. There is no provision, however, for gold coinage, and it does not appear that there will be any immediate demand for gold currency. The silver dollar, which will doubtless be the chief circulating coin for some time to come, is to have the same value, 49.8c. United States currency; by weight the ratio of gold to silver fixed is 29.3. The dollar is to be divided into 1000 cash; one-cash pieces will have a value of 0.05 cent of our money.

By the Way

British patent No. 18,614, the London *Mining Journal* reports, is for "riders" for steadying "bowks" or "kibbles" in pit shafts. We presume these will be used for hoisting ore that was indicated by "shines" and produced "chats" when being milled.

The finest collection of minerals in the United States is believed to be that in the American Museum of Natural History n New York, the basis of which was the famous Bement collection. There are several important private collections. Among those, that of Col. W. A. Roebling, Trenon, N. J., is considered to be the best; anyway, the largest. Next in rank are probably the collections of A. F. Holden, Cleveland, Ohio, and Fred A. Canfield, Dover, N. J. Mr. Canfield's collection is especially strong in specimens of the minerals of New Jersey.

Several years ago the priest of the parsh of Telluride, Colo., was attempting o raise funds for the purchase of a bell for the church. He was asking each miner in the camp, among whom were a number of Cornishmen, to donate a day's pay, writes an engineer. Upon accosting "Elic," the following conversation enued: "Elic, all the boys in the camp re giving me an amount equal to a day's pay, and I would like you to give me the same." Elic replied, "'Ell what i given ee dys wages fer?" "Well," said the riest, "we will use the money to buy a ell for the church." "'Ow much bluddy ell costen," Elic asked. "About $300," he padre replied; upon this information Elic whistled and replied, "Damme, why n 'ell don't 'ee buy a bluddy 'ooter?" Whistle).

The United States is the greatest coal miner, this country producing about twofths of the world's output. According o the U. S. Geological Survey, the United States has held first place in the coal-producing countries of the world ince 1899, when this country supplanted Great Britain. In 1911 the total world's coal production amounted to approximately 1,302,500,000 short tons, of which more than 80% was produced by hree countries, the United States, Great Britain and Germany. The United States roduction in 1911 was approximately 00,000,000 tons, that of Great Britain lightly over 300,000,000 tons, and that f Germany about 258,000,000 tons. Since 899, Great Britain has increased its outut about 50%, and Germany over 175%; he United States increased its production ver 250% during this period.

A London syndicate, with a capital of 2000, having been formed to acquire opons in Nigeria, dispatched an engineer o inspect a property it had obtained the ght to purchase. Within a few weeks f his arrival, says the *Canadian Mining ournal,* the following cable was received: "Property absolutely valueless. Coming home." As may be imagined, this caused considerable disgust, but the chagrin soon changed to joy when a further cable was received, announcing that the engineer had been eaten by cannibals. He was insured for £3000, and out of this sum the shareholders were paid their first and final dividend of 150%. It is to be hoped that the publication of this story will not have the effect of causing a great run on mining engineers, with the object of sending them, heavily insured, to inspect and report on properties in countries where they are likely to be regarded as additions to the visible food supply. At the same time there are some that might be spared and even the most worthless of us may have his uses.

Discussing the heavy blast-furnace construction at Great Falls, Mont., R. L. Lloyd said that the low repair record of these furnaces was proof positive that it was worth while, though he thought at first it was too heavy and said so to W. J. Evans, at that time superintendent of construction for the Amalgamated Copper Co., and for many years associated with Mr. Klepetko in roasting- and smelting-furnace design and construction. This remark to Mr. Evans brought out a rather curious answer, which was as follows: "Young man, if you will take my advice, when you build anything, build it strong enough; if you get it too strong, nobody will ever find it out; if you do not get it strong enough, everybody will know all about it." Mr. Lloyd replied: "Mr. Evans, that is not good engineering," which elicited the further retort: "It may not be good engineering, but it's damn good sense," followed by a hearty laugh and then his serious explanation, which was that when one is dealing with furnace construction one is dealing with what he was pleased to call "red-hot mechanics," and that the usual factors of safety, as used in regular engineering practice, are not at all adequate for such work.

In the announcements of the incorporation of the $30,000,000 Universal Chemical Co., which will utilize the Newberry-Fishburne process for the manufacture of fertilizer from phosphate rock without the use of acid, several papers unauthoritatively announced that Dr. Harvey W. Wiley would be one of the directors. This has called forth an official denial from Doctor Wiley, who is quoted by the *Oil, Paint and Drug Reporter* as follows: "Some gentlemen from Chattanooga called on me about a month ago and told me of their plans. They said that they would like to have me associated with them. I got all the papers and other information regarding their patent, obtained the analytical work of their expert and hired an expert of my own to investigate the proposition. The reports were uniform; the fertilizer they proposed to sell was satisfactory. I then told them that I would go in providing three conditions were fulfilled: That the company have sound financial backing; that all of the stock and bonds be subscribed before I entered, as I did not proposed to have my name used as a part of a stock-selling plan, and that I should have entire charge of the chemical work, and that any statements made regarding the product have my approval before being used. I did not care to have anything to do with the business end of it, and if I had gone into the company my financial interests would have been small. When my attention was called to the fact that my name appeared in connection with the company, I said that I knew nothing about it. . . . I have written the company's backers that if that is the way they do business I wish to have nothing to do with the matter. I was interested because the soluble-phosphate fertilizer which they were to make and sell promised to help the farmer. I am a farmer myself, and if I can do anything to help farmers I want to do it." Doctor Wiley said that a $30,000,000 corporation was a little out of his class. "I am not a millionaire. My connection with this institution puts me in the position of the darky who was asked to change a $10 bill. 'Ah can't change it, suh, but Ah'm pow'ful 'bliged fo' de compliment.' I cannot see that a monopoly can be obtained, as practically the same process is patented in a dozen different countries."

Last year, we published a brief description of the Reid electric smelter and expressed some doubts as to whether it had been developed to the point of commercial practicability. In a Denver paper, there appears an interview with a certain Colorado mine operator who saw some things we did not—at any rate, he reports them differently. He is credited as saying, in part: "The ore, crushed to ¼ in. or smaller, feeds downward through a pipe and the instant it comes in contact with the part that is charged with electricity the ore begins to smelt. A heat of from 3000° to 6000° F. or more is created. It melts all the minerals, and the rock or silica is practically burned to ashes. Below the smelter is a tank filled with water to which water is added continuously. As the molten matter drops into the water it creates an explosion which separates the ashes from the mineral. . . . . There is no doubt that the smelter will melt, but as to the cost and percentage saved I must take the inventor's figures. He claims a saving of practically 100%." (All new processes expect to make "practically 100% saving"). It may not be amiss, the interviewer adds, to state in this connection that there always seems to be some hitch with the Reid smelter that prevents anything more than a casual run, therefore no person with whom he has talked has been able "to see very much."

W J McGee

W J McGee died at Washington, Sept. 4, aged 59 years. He was widely known as a scientist and author of extraordinary versatility, having made a reputation in several fields. He was born on a farm in Dubuque County, Iowa, and attended country schools in Iowa for a short time, but his education was chiefly acquired by private study, which he commenced while engaged in farm work. While continuing his country life, he studied Latin, higher mathematics, astronomy, law and surveying, appeared as attorney in courts, and worked at land surveying in 1874-76. He invented and patented a number of agricultural instruments, working at forge and bench from 1877 to 1881. He made a study of geology and archæology, and from 1877 to 1881 he made a geological and topographical survey of Northeastern Iowa, the most extensive ever executed in America up to that time without national or state aid, covering 17,000 square miles.

After examining and reporting upon the building stones of Iowa for the tenth census, Doctor McGee, in 1883, become geologist in the United States Geological Survey, and was engaged seven years in surveying and mapping in the southeastern section of the United States; he also compiled geological maps of New York. In 1893 he was appointed ethnologist in charge of the Bureau of American Ethnology, during which he explored Tiburon Islands, Gulf of California, where he made a study of a savage tribe never before recorded. He also investigated the Charleston earthquake. In 1903 he resigned from the bureau to become chief of the Department of Anthropology in the Louisiana Purchase Exposition, at St. Louis.

When the Inland Waterways Commission was created in 1907, Doctor McGee was appointed a member by President Roosevelt, and at the same time he was appointed soil expert in the Department of Agriculture. He was later made secretary of the commission and held that position to the time of his death. He was one of the most effective advocates and promoters of organized effort among scientific men. He was president of the American Anthropological Association, vice-president of the National Geographic Society, vice-president of the Archæological Institute of America, one of the editors of the *National Geographic Magazine*, and member of many other societies, and one of the founders of the Geological Society of America and the Columbia Historical Society. He was the author of many important works.

Doctor McGee never had a given name other than the initials "W J " by which he signed his name, and also insisted that he be addressed by those initials without periods after them. He was married in 1888 to Anita Newcomb, a noted physicist, daughter of the late Prof. Simon Newcomb. Doctor McGee left a will bequeathing his body and brain for anatomical and scientific study to Dr. Edward Anthony Spitzka, the famous Philadelphia anatomist and neurologist. He also bequeathed to Doctor Spitzka the brain of Maj. J. W. Powell, former director of the Geological Survey, which had been in his possession since Major Powell's death several years ago.

International Association for Testing Materials

The congress of the International Association for Testing Materials was held in New York last week. This is the first congress of the International Association to be held in America. In effect it represents the first occasion on which the American membership, the largest contingent upon the association's roll, received a recognition commensurate with its numerical importance. In committee representation and other activities of the association, America has played a very minor part indeed.

The work of the sixth congress may be concisely summarized by the statement that in number of papers, 153, it contained roughly twice as much as the preceding congress and in results of work of technical committees it was at least equal to any of the previous congresses.

The first official act of the congress was to make Acting President Howe the president of the association, an act which was beyond the constitutional power of the governing council, after the death of the regularly elected president, Dr. C. B. Dudley, and had therefore to be deferred until the congress convened. The congress accepted the invitation of the Tsar of Russia to hold the next congress, in 1915, at St. Petersburg, and elected Dr. N. Belelubsky, of St. Petersburg, president of the association for the next three years. Prof. H. M. Howe was made a life member of the council and Robert W. Hunt, the member of the council for the United States. The secretary of the association is Ernst Reitler, of Vienna, Austria.

The membership of the association, now numbering nearly 3000, is insufficient to pay the expenditures of the triennial congress period, with the present annual dues of $2; the dues were accordingly raised to $4 per year.

The technical proceedings of the congress were concentrated in the first week of September. Following the real work of the congress a railway excursion, the "Official Tour," was begun on Sunday, Sept. 8, to continue throughout the week. From a technical viewpoint the visit to the Bureau of Standards laboratory in Washington, inspection of the laboratories of the Bureau of Mines and the Bureau of Standards in Pittsburgh and a demonstration by the Bureau of Mines at Pittsburgh are the chief events of the excursion week.

T. Lane Carter

Thomas Lane Carter died Sept. 2, 1912, at Polaris, Beaverhead County, Mont., from the result of injuries sustained in an accident in a mine of which he had recently assumed the management. The details of the accident have not yet been received. Mr. Carter was married to Miss Helen Hyde, of Chicago, about four months ago, and immediately thereafter went to Polaris.

His boyhood was spent at Amite City, La. He graduated from Tulane University about 16 years ago and went to South Africa where he entered the mining-engineering profession under the influence of Hamilton Smith, a relative, who had achieved great success on the Rand gold field. Mr. Carter was for six years in the employ of the Crown Deep and Robinson Central Deep mines, when compelled to leave the Boer republic at the outbreak of the war with Great Britain. After a trip to the United States, he returned to South Africa as a captain of volunteers and served during the closing months of the war. Mr. Carter assisted in an investigation of the mineral resources of Central Africa and later was appointed manager for the French Rand Mines which he made a profitable undertaking. He returned to the United States in 1907 and spent the following year in exploration work in Nicaragua. He then went to Chicago and in partnership with S. T. Osgood established the engineering firm of Osgood, Carter & Co.

Mr. Carter, who was in his 36th year, was one-time vice-president of the Chemical, Metallurgical, and Mining Society of South Africa, a member of the American Institute of Mining Engineers, and the Institution of Mining & Metallurgy. He contributed to the transactions of these societies, was South African correspondent for the ENGINEERING AND MINING JOURNAL, and the author of several books on travel in the many countries he had visited. Mr. Carter was a grandson of the late Chief Justice Hennen, and a cousin of Gen. J. B. Hood, of the Confederate Army. He is survived by his mother, widow, three brothers and four sisters.

New Cinder Nodulizing Plant

The Pyrites Co., Ltd., of London, has begun the construction of a plant at Roanoke, Va., for nodulizing pyrites, says the *American Fertilizer*, Sept. 7, 1912. The copper contents will be leached, and the daily output will be about 200 tons of nodulized pyrites. The company will collect cinder from various Southern plants. George W. Gray is manager.

Eighth Congress of Applied Chemistry

A noteworthy gathering of hundreds of chemists from all parts of the world now being held in New York. Short notes on the proceedings of the Congress, and abstracts of some of the principal metallurgical and chemical papers.

The first business sessions of the ighth International Congress of Applied Chemistry were held in the various uildings of Columbia University, on ept 6. The gymnasium was used as egistration office, and for the conveni-nce of the hundreds of foreign scien-sts, information booths were installed here French, German and Italian in-uiries were answered.

The congress met on Friday in 24 sec-ons: Analytical chemistry; inorganic hemistry; metallurgy and mining; ex-losives; silicate industries; organic hemistry; coal-tar colors and dyestuffs; ndustry and chemistry of sugar; india ubber and other plastics; fuels and sphalts; fats, fatty oils, and soaps; aints, drying oils and varnishes; starch, ellulose and paper; fermentation; agri-ultural chemistry; hygiene; pharma-eutical chemistry and pharmacology; hotochemistry; electrochemistry; phy-ical chemistry; law and legislation af-ecting chemical industry; political econ-my and conservation of natural re-ources.

FIRST DAY TROUBLES

The programs for the congress were ot issued until Friday morning, Sept. , which left a great deal of uncertainty the minds of the speakers before the ections as to when their papers came. his coupled with the usual unavoidable bsences caused many papers to be read title only, for instance, in the section f mining and metallurgy, out of 28 pa-ers scheduled for the first day, 21 were ead by title only. Another first-day ifficulty was the evident unprepared-ess of the University Commons for the rowd that wanted lunch, and it is be-eved many foreign savants had to con-nt themselves with a glass of water.

DICTAGRAPHS TAKE DOWN DISCUSSION

Arrangements were made by the com-ittee to take down all the discussion, d as the number of stenographers com-etent to take dictation in the four offi-al languages of the Congress (English, rench, German and Italian) was limited, dictagraph had been installed over each strum, and connected with two phono-aphs which were used alternately. iscussion was, of course, conducted om the rostrum, and not from the oor.

In addition to the formal presentation papers before the section of metal-rgy and mining, which held joint ses-on with the American Institute of Min-g Engineers, Dr. J. W. Richards, who esided, welcomed the delegates in ench and English, and at the close of ercises, Doctor Heberlein, of Hunting-n-Heberlein fame, presented the regards of the Gesellschaft deutscher Hutten-und Bergleute, of Berlin to their engineering brethren of the world, and George C. Stone of the American Institute of Mining Engineers welcomed the delegates in behalf of that association.

Short drafts of the papers of Dwight and Hofman appear elsewhere in our columns. The complete program of the first day was:

R. Adan, Micrographie des fontes speciales de fer

William Campbell, Some Metallographic Notes.

*Henry M. Howe, The Carbon Iron Diagram

J. A. Matthews, Some Physical Characteristics of High Speed Tool Steel;

Bradley Stoughton, The Influence of Titanium on the Strength of Iron Castings.

Albert Sauveur and G. A. Reinhardt, The Case-Hardening of Special Steels

*R. H. Sweetser, Blowing-In of Blast Furnaces.

*E. B. Cook, Further Experience with the Gayley Dry Blast;

*R. B. Carnahan, Open Hearth Practice.

N. S. MacCollum, A Novelty in Open Hearth Furnace Practice.

*A. Raman, Improvements on Kilns for Briquetting Iron Ores.

*A. Weiskopf, (1) Ueber den gegenwaertigen Stand der Eisenerzbrikettirung, (2) Einflus von Eisenerz-Briketts auf den wirthschaftlichen Betrieb des Hochofens.

*F. E. Lucas, W. H. Blauvelt, C. W. Andrews and J. De Forrest, The Manufacture of Coke.

*A. Lidoff, Iron Coke.

*E. P. Matthewson, Development of the Reverberatory Furnace for Smelting Copper Ores.

*F. Laist, Chemistry of the Reduction Processes in Use at Anaconda, Montana.

*Utley Wedge, Roasting Copper Ores and Concentrates Preliminary to Leaching to Secure Copper Values.

A. S. Dwight, The Dwight and Lloyd Process of Roasting and Sintering.

H. O. Hofman and Mr. Wanjukoff, The Decomposition of Metallic Sulphates at Elevated Temperatures in a Current of Dry Air

*W. M. Corse, Modern Manganese Bronze Tests.

*R. C. Canby, Development of the American Water Jacket Lead Blast Furnace.

*F. Cazin, The Evolution of the Modern Lead Blast Furnace.

*F. Guiterman, Silver Lead Smelting;

*E. F. Eurich, Zinc Desilverization.

*W. A. Barrows, Jr., and Carl Zapffe, Cuyuna Iron-Ore Range.

*A. S. Skinzopoulos, Un Nuovo Processo di Purificazione di Sterri e Sabbie di Zolfo a Ganga Priva di Calce ed Argille.

A. Eilers, Notes on Bag Filtration Plants.

THE SECOND DAY

The places of meeting and expected papers were fully understood on this day, and a much greater proportion of papers was presented at length than on the first day. The squirrels on the University campus had grown used to being addressed in four or more languages, and the University Commons came in a triumphant first over visiting appetites, although in this it was assisted by an exodus of visitors at noon, as there was one session only. There was a joint meeting of the American Institute of Mining Engineers, the American Electrochemical Society, and the sections of Electrochemistry, Mining and Metallurgy, and Political Economy, of the Congress. The papers presented were:

F. A. J. Fitz Gerald, Heat Losses in Furnaces.

C. H. von Bauer, Electric Induction and Resistance Furnaces.

P. Heroult, Recent Developments in the Metallurgy of Iron and Steel.

A. E. Greene, Electric Heating and the Removal of Phosphorus from Iron.

R. Amberg, The Function of Slag in Electric Steel Refining.

F. T. Snyder, Electric Smelting of Zinc Ore.

L. Addicks Cathode Impurities in Copper Refining.

Nothing was said of A. E. Greene's "Electric Furnaces in the Metallurgy of Steel," announced in the program, while J. O. Handy stated that his paper, "Extraction of Copper from Sulphide Ores by Roasting, Leaching and Deposition," had been formally withdrawn, and that it was given in the program in error. He gave a few details of it, however, which are presented on p. 487 of this issue of the JOURNAL.

In the afternoon a reception was tendered the International Association for Testing Materials and the Congress of Applied Chemistry at the American Museum of Natural History, and at night the American Chemical Society entertained the Congress at the Metropolitan Museum of Art, many of the Testing Materials delegates being also present. Both were brilliant affairs, and greatly enjoyed by all attending.

THE THIRD DAY

By Monday morning the supply of badges, transactions, etc., had apparently permanently caught up with the frenzied applicants. The section of Mining and Metallurgy held a joint meeting with the sections of Inorganic Chemistry, Electrochemistry, Physical Chemistry, and the American Electrochemical Society, and as seen by the program, Mining and Metallurgy was swamped.

Binet du Jassoneix, Etude de Proprietes Magnetiques des alliages du Fer, du Cobalt, du Nickel, et du Manganese avec le Bore.

Matthew A. Hunter, Reduction of the Chlorides of Titanium, Carbon, Silicon, Beryllium and Neodymium by Metallic Sodium.

F. M. Jaeger, On Natural and Artificial Sulfo-antimonites and Sulfo-arsenites.

Marcel Oswald, Equilibres des systemes eau-azotites de soude

E. Weintraub, Experimental Lecture on the Element Boron; Its Compounds and Uses.

Richard Zsigmondy, Bemerkungen zur Systematik der Kolloide.

B. Kuriloff, Elektrochemie und physikalische Chemie des Uebergangs von kolloidalen zur krystallinischen Korpern.

Albert Reychler, Contribution a l'Etude des Savons.

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*Read by title only.

H. Bechhold, Licht von Standpunkt der Kolloidforschung.

D. A. MacInnes, The Rate of Absorption in Catalysis by Colloidal Platinum Solutions.

Nicola Pappada, Sulla Elettrizazione de Grani Colloi (On the Electrization of Colloidal Grains).

S. Miyasawa, On the Coagulation of Colloidal Aluminum Hydroxide.

Owing to lack of time, the last seven papers were carried over until Tuesday.

Over in the section of Analytical Chemistry the zinc experts had their innings, as follows:

G. Chesneau, Analyse de l'acide vanadique commercial

Victor Lenher and C. C. Meloche, The Influence of Lead on the Ferrocyanide Titration of Zinc.

Frank G. Breyer, A Proposed Standard Method of Analysis for Zinc.

Frank G. Breyer, A Rapid Estimation of the Amount of Cadmium Present in Zinc Ores and Products.

Eric John Ericson, A New Method of Spelter Analysis.

Ellwood B. Spear, The Electrolytic Determination of Zinc.

TUESDAY'S SESSION

On the fourth day the morning session of the section of Mining and Metallurgy was chiefly remarkable for its lack of papers. Of the nine papers called for, there was but one read in abstract, that of Richard Zsigmondy, "Bemerkungen zur Sytematik der Kolloide," which was presented by Jerome Alexander for Doctor Zsigmondy, and discussed at some length by G. Brūni, of the University of Padua, Italy, and Mr. Alexander.

The interesting fact was emphasized that Zsigmondy, who classifies all colloidal diffusions according to the size of the particles, and to the original states of the substance diffused and the medium, does not try to define the state in which the diffused substance is. That is, red glass is a colloidal diffusion of small gold particles in glass, i.e., a diffusion of small particles of a solid in a solid, but it would not of necessity follow that the diffused substance itself was solid. Again, colloidal mercury (an original liquid) acts like other colloidal metals (original solids) when in water. While the paper itself did not seem particularly interesting to the metallurgists, there is an ultimate hope of light being thrown on such problems as metal losses in slag, fume in flue gas, etc.

In the section of Inorganic Chemistry there was some amusement caused over Jerome Alexander's introduction of a resolution commending the Diamond Match Co. for its public-spirited action in giving to the public its rights to the phosphorus-sesquisulphide process. This was objected to by one member, who stated he had heard, but did not know, that the Diamond Match Co. was able to do this, because it still controlled the patent on all the machinery that would make sesquisulphide matches. Mr. Alexander stated that he did not know, but that other people could turn out matches as shown by the lively competitors of the Diamond Match Co. He said that he believed that the Diamond company did control some fine match-making machinery, but simply because they were willing to give the public the use of the sesquisulphide patents, and instruction in how to use them, was no reason for making a general distribution of stock and machinery, and advising the public as to the combination of the safe. Mr. Alexander's motion was enthusiastically carried, the chairman meanwhile facetiously explaining neither he nor Mr. Alexander were Diamond Match employees.

A lively tilt was also carried on between Messrs. Wilke, Bowen and von Rucker over the use of the contact and chamber-acid processes in tandem, which we report fully elsewhere. The dictagraphs had succumbed to an overdose of technical vocabulary, and were no longer to be seen today.

A resolution was presented for action on Thursday, to the effect that the report of the International Committee on Atomic Weights should be published only every fifth year in January. In the discussion it was urged that even though the table was not authoritatively altered except every fifth year, the publication of the changes ought to be in September, to enable the teachers of chemistry to use the same table the entire scholastic year. It was also urged that there should be some discretionary power vested in the committee, so that if a new element were discovered, or a radical error found in an old one, the change could be adopted officially immediately.

Other interesting resolutions introduced were: That the financial statements of the International Commission on the Publication of Annual Tables of Constants should be approved, its work approved, and its powers continued, and that the congress recommend financial aid be extended to the commission by governments, academies, learned societies and technical establishments. It was urged that this is a work which interests everyone who needs reliable and complete tables of constants. Resolutions were also introduced, favoring an International Commission on the Nomenclature of Iron and Steel, and moving that the official languages of future congresses be French, German and English.

The congress will close on Thursday but various social functions will fill in the time Friday and Saturday. A Pittsburgh meeting has been announced for Sept. 17 and 18. On Sept. 17, the Clairton works of the Carnegie Steel Co. will be open to the delegates and in the afternoon there will be an excursion on the Monongahela River when the various establishments on its banks may be viewed. Wednesday morning, Sept. 18, the congress will visit the laboratories of the U. S. Bureau of Mines and Bureau of Standards, as well as the Pittsburgh municipal filtration plant. A choice of two excursions will be offered Wednesday afternoon: (1) Harwick mine, of the Allegheny Coal Co. (2) A. Guckenheimer & Bros. whiskey distillery and U. S. Bonded Warehouses, and the plant of the Allegheny Plate Glass Co. Other important industrial establishments will be thrown open to small parties of visitors.

Recent Dwight - Lloyd Installations

The general features of the Dwight-Lloyd machine are well-known to the JOURNAL readers, so that no repetition is necessary. However, certain points given by A. S. Dwight before the International Congress of Applied Chemistry are new. Mr. Dwight, in speaking of the Huntington-Heberlein pots, said that these had been about five times as effective roasters as any furnace previously known. But apart from the massiveness of the cake produced and the labor for breaking it, their disadvantage was the powdery residue on top of the roasted charge. This seemed to be due to the ebullition of the top particles under the influence of the blast.

It seemed possible to avoid this fine residue by putting a screen over the surface. The next step was to make this screen support the material as well, by turning pot and blast upside down, and the result was a process about five times as efficient as the Huntington-Heberlein pots had been.

Some of the photographs shown of the new installations were highly interesting. At the Murray, Utah, plant, was shown a double row of storage bins for ores for the Dwight-Lloyd roasters; the storage bins were old up-ended Brückner roaster cylinders, superseded by the Dwight-Lloyds. In this plant the bins feed to short-belt conveyors, which in turn feed to a big belt conveyor that feeds the roaster. If the roaster is speeded up, the belt conveyors are automatically hurried to suit, reducing hand labor to a minimum.

In the Tooele plant, the blast-furnace charge is collected in a larry which weighs the ingredients as they are added, put over Dwight-Lloyd machines, and then smelted.

At a lead plant in Missouri, four Dwight-Lloyd roasters have replaced 29 Huntington-Heberlein pots, and 27 men do the work 187 formerly did. At this plant, only coke, a little limestone, and occasionally some ferruginous flux is added.

Doctor Heberlein himself was in the audience and at the close of Mr. Dwight's lecture, remarked that he could only confirm Mr. Dwight's estimate of his machines' efficiency, and that he himself had recommended their installation a several plants.

While he said it was possible to push the efficiency of the Huntington-Heberlein roasters far beyond the early practice, so that one pot would treat 40 tons per day; and while the massiveness o the cake was partly offset by putting the pots well up in the air, so that by dropping the cakes a partial disintegration resulted, the breaking still necessary was unhealthful work with lead ores, and owing to the saving in health alone, the Dwight-Lloyd roaster justified its adoption. In copper practice, Doctor Heberlein said the use of a water spray on the cakes, following by dropping them, as above mentioned, completely disintegrated them, while in lead roasting there were strings of metallic lead through the mass, which effectively bound it together.

He also made some interesting comments on the high SO_2 content obtained in some Huntington-Heberlein installations. For instance, at Friedrichshütte, 60 to 70% of the evolved gases were used for sulphuric-acid making in the lead-chamber process, while at the Rhine Nassau Works in Stolberg, the Dwight-Lloyd process is used, and gases with about 4.5% of SO_2 transformed into monohydrate acid by the Grillo contact process.

A Combination Contact and Tower Acid Process

Under the title "Combination of the Contact Process with the Ordinary Lead Chamber or Tower Systems," William Wilke stated before the Congress of Applied Chemistry that he had had for consideration at one time whether some clients of his who were operating under the patents of the Verein Chemischer Fabriken in Mannheim for the production of strong acids, could profitably reduce the highly concentrated acids to lower strengths.

They had decided they could not, and in order to fill the demand for chamber acids, had combined the chamber and contact processes. In order to be independent of the variations of the pyrites market both coarse and fines burners had been installed, the final daily capacity being 24,000 lb. of fines and 36,000 lb. of lump ore.

The flue from the fines burners was provided with baffles and the gases, after passing this, united with the lump-burner gases, and were conducted through an iron-oxide contact shaft. An exhaust fan was placed on the fines flue, to regulate the draft on the fines burners, and a second fan was placed between the contact shaft and the Glover tower. About 30% of the SO_2 underwent conversion in the contact shaft.

As a result of the combination of the two distinct processes: (1) The capacity of the chamber plant was increased 30%; (2) about 30% of the SO_2 was converted in the contact tower; (3) the acid in the Glover tower was water white; (4) 95% of the arsenic in the gases was eliminated in the contact tower; (5) the entire chamber production of acid can be concentrated to 60° Bé. or higher. Further, the iron-oxide shaft is the best known means of keeping dust out of a chamber system, it is an accumulator and equalizer of heat and saves 30% of the niter usually required. These satisfactory results were all attributable to the introduction of the contact shaft between the burners and the Glover.

Mr. Bowen Objects

Mr. Bowen, of the Contact Process Co., endeavored to find out whether this paper did or did not refer to its Buffalo plant, but Mr. Wilke would only say that he had designed its plant first and had since designed six or seven others. Mr. Bowen said that he concluded that Mr. Wilke's description referred to the Buffalo plant. In that case he wished to say that eight or nine years ago a plant had been built at Buffalo to work on the Mannheim system (iron-oxide contact). That later a plant was built in which the iron-oxide plant is followed by the chamber process. That it could not be described as satisfactory, it never had been, and was torn out, and rebuilt after Doctor von Rucker's designs. Even now, although it worked fairly well, it was not nearly so good as the straight contact plant.

The average conversion was not 30%, it was sometimes *nil*, sometimes as high as 50%, but would not average 30%. The plant did not eliminate 95% of the arsenic, their figure was 80 to 85%. He also questioned Mr. Wilke's statement as to the type of fines burners originally installed (Mr. Wilke stated they were Herreshoff's) as the burners were the O'Brien type. A question was asked at this point, whether warm or cold weather made any difference in the conversion. Mr. Wilke said none whatever. Doctor von Rucker, of the Contact company, interrupted and stated that the conversion was much greater in winter.

After another paper had been read Mr. Wilke requested permission again to take the floor, and stated that the plant he illustrated was not the Contact Process Co.'s Buffalo plant, and that he had not gone particularly into the burner question as the burner type was immaterial. Mr. Bowen stated that he had vainly attempted to get Mr. Wilke at the outset to say whether or not he was describing the Buffalo plant. Although he could see that the illustration was not the Buffalo plant, one would reasonably infer from the statement "since constructing the above described plant, the contact shaft has been introduced into other chamber plants with good results," that the above described plant was the first, the Buffalo plant. At this point the Chairman stated that as the discussion was verging on the personal, and had nothing to do with the scientific side of the case, he was forced to close it.

Extraction of Copper by Roasting and Leaching

In an informal talk before the International Congress of Applied Chemistry, J. O. Handy told of some results attained by him in the extraction of copper by roasting and leaching. The ore consisted of chalcocite, copper pyrite, and a little iron pyrites, with an aplite and porphyry gangue. The ore was crushed to from 20 to 40 mesh, and roasted at 500° to 550° C., which completely converted the copper to sulphate. It was found unnecessary to grind below 40 mesh.

The copper was then leached out with water, and was to be precipitated by electrolysis. Carbon anodes were found to disintegrate rapidly in the copper-sulphate solutions, and lead anodes were used. These were found to peroxidize less rapidly when covered with some sort of fabric. Apart from the corrosion of the lead, the peroxide is disadvantageous as it raises the voltage. A way to get rid of it temporarily was to shoot up the current rapidly and crack off the peroxide.

He found that the figures given in the text books for deposition seemed rather too high, and that he obtained 23 lb. per horsepower-day. The original idea was to use the spent electrolyte for leaching, in order to get out any oxides of copper with the sulphate, but he found an obstacle in the sulphatization of the alumina and potash in the ores, which leached out with the copper, and when the solution cooled during deposition, deposited as crystals of alum on the electrodes and in the tanks. It might have been possible to separate the alum as a commercial product, but the alumina was in excess of the potash, and addition of potassium salts would have been necessary.

Carl Hering, in the discussion, said he had obtained some interesting results in depositing zinc from sulphate solutions, using a porous lead anode. The zinc was deposited on the cathode, the SO_4 formed $PbSO_4$ in the porous anode and deposition went on practically down to clear water.

[It is our experience that agitation of the anodes, preventing polarization to a great extent, inhibits the disintegration of carbon anodes, while the trouble with aluminum and potassium salts foreshadows what seems to be the great trouble with all leaching processes when operating on a commercial basis, that is, contamination of and consequent necessity for regeneration of the electrolyte. It is to be hoped that the results of the experiments of the Braden Copper Co. and of the various Arizona companies on leaching will some day be made public, as they will probably greatly clarify this problem.—Editor.]

Electrolytic Determination of Zinc

In a paper before the International Congress of Applied Chemistry, Ellwood B. Spear discussed the inaccuracies of the electrolytic zinc determination and how they may be avoided. The zinc must be present as sulphate; and strong hydroxide solution should be added (10 to 20% solution).

The analysis is made with a rotating cathode and the cathode must be lower than the anode, otherwise the oxygen rising from the anode oxidizes the deposited zinc. The amount of the zinc in solution should be roughly known, so that the time of deposition may be calculated. Electrolysis is started in boiling hot solution, and about four to six minutes before the end of deposition the solution is cooled with ice water. The best results are obtained when the top edge of the gauze cathode is bent over to form a three-quarter hollow sphere.

When the cathode is removed, it should immediately be washed in water, alcohol, then ether, and dried by artificial heat. This last is important. If the ether be allowed to evaporate spontaneously, it cools the cathode and deposit until a film of water forms which hydrolyzes the deposit, and the results will be high.

As a matter of fact, a little of the zinc dissolves when the cathode is taken out, and a little is oxidized in washing and the two errors just balance. One should not attempt to displace the electrolyte with water, or to siphon down the electrolyte, otherwise the errors will not balance.

A High Critical Point in Steel

In the course of a paper before the International Congress of Applied Chemistry, C. H. von Bauer spoke of finding a high critical temperature for steel. As is well known, when steel is heated by a uniform source of heat, at 760° C. the temperature ceases to go up as rapidly as before, and continues to advance slowly until 810°, after which it again goes up at the former uniform rate.

A second such point was found at about 2350° to 2550° C. Below 2350° the steel was very liquid, but grew pasty on being heated more, in which condition it continued until it reached about 2550° C. after which it became fluid again. On cooling, the reverse changes took place. At 2550° C. the steel became pasty and could not be poured. A bar of cold steel was then put in the ladle which cooled it down so that it again became fluid and could be poured. The steel used was blown basic bessemer, not recarburized, and carried about 0.08% C. The temperatures were taken with a radiation pyrometer.

In this connection Mr. von Bauer spoke of the temperature range in the induction-furnace work, which is practically limited only by the fusion point of the lining. For instance, he had attained temperatures in an eight-ton steel furnace, using the current usually required for a 15-ton furnace, which had fused a magnesia lining.

The Genesis of the Steel Eating Worm

The ancient Munchausen tale concerning "the worm that eats steel rails," which has for a quarter of a century been revived at intervals, is again abroad in the land. To learn where this particular story originated, *Engineering News* requested E. G. Spilsbury, past-president of the American Institute of Mining Engineers, who was not only present at the birth of the story, but appears to have been a sort of associate midwife, to reveal to the world the true record concerning this marvellous tale. Mr. Spilsbury wrote as follows:

Sir—Your request for an account of the discovery of the "Steel Worm" takes me back to the little manufacturing village of Haspe in Westphalia, in the year 1866. Just about that time the introduction of bessemer steel rails had begun on a commercial scale, and the press—both lay and technical—was full of discussions for and against the new product.

The professional employees of the different iron, steel and chemical works of the surrounding country used to meet every Thursday evening in the "Weinstube" of the local hotel and discuss all questions that were then of general interest. Any visitors were also made welcome.

Under the stimulus of good fellowship, and possibly good wine, all sorts of theories scientific and otherwise—were evolved, and the outcome of these meetings was the founding of the Society of "Ulk," which soon became known all over Germany as the source for practical jokes. The title "Ulk," an old and nearly obsolete German word, means "fun," and for our motto we used the three letters U L K as the initials for the words, Unsinn, folly; Leichtsinn, frivolity; Kneipsinn, conviviality; and we never belied either one of them.

It was then at one of these Thursday evening meetings that the "steel worm" was born. An inquisitive editor from one of the nieghboring towns was the subject of the joke, which was propounded in confidence to him as a scientific discovery of great value. It was supposed to be kept a secret until further investigation should prove the correctness of the theory.

By the following Thursday, the animal itself was produced, being a gruesome-looking thing, nearly all head, made out of gutta percha burette tubing. It was exhibited in a bottle half filled with roll scale, and the worm itself, having been filled with dilute hydrochloric acid, would, when properly stirred with a glass rod, emit a drop, which at once attacked the flakes of the roll scale and proved the theory that corrosion of the rails was due to an acid secretion and that the resulting oxides were the food of the worm.

The newspaper man swallowed the whole story and proceeded to publish it, quoting the names of quite a number of well-known iron and steel men as sponsors. The press all over Germany took the matter up and very funny discussions resulted among their different correspondents. Some of the most amusing were the denials of the authorities quoted in the first published account that they had ever noted or studied this question of rapidity of corrosion of bessemer steel rails, over those made from iron. Of course, the matter was too ridiculous to be kept up as a serious discussion for very long, but the story has never died, and every year or so crops up as a new and wonderful discovery.

While the carrying out of the details of the story was the result of the combined efforts of our society or club, the first conception of it was evolved from the brains of a young man whose name I forget, but who was, I think, a chemist at the Hoerde Iron Works in Bochum.

Quite a number of other discoveries and inventions emanated from that little coterie of bright intellects, but none of them has equaled the vitality or longevity of the "steel worm."

E. Gybbon Spilsbury.
New York, N. Y.

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*Reprinted from "The Engineering News, Aug. 29, 1912

A Memorial to Lord Kelvin

Members of all the British technical and engineering societies are engaged in raising by subscription a fund to place a memorial window in Westminister Abbey in honor of the late Lord Kelvin—perhaps better known as Sir William Thomson—the distinguished electrician and inventor. A general committee has been formed, with Dr. William Cawthorne Unwin as chairman, to take charge of the work of securing the funds and erecting the memorial. This committee includes representatives of the American Institute of Mining Engineers and the other prominent engineering societies of the United States.

Influence of Lead on Ferrocyanide Titration

Victor Lenher and C. C. Meloche stated before the International Congress of Applied Chemistry that they had investigated the literature of the ferrocyanide titration of zinc to see what was said concerning the influence of lead, and had found practically nothing written. They had investigated the matter, adding lead chloride to the point where 200 cc. of solution refused to dissolve any more, and had found it without effect.

Krupp Centenary

In connection with the Krupp Centenary, (cf. ENG. AND MIN. JOURN., Aug. 31, 1912, p. 394), we reproduce some illustrations from the August number of *Stahl und Eisen*, showing the steel foundry in 1835, the hammer of 1835, and the steam hammer of 1852. The engine shown in the back-ground of the 1835 hammer is the first steam engine

THE KRUPP FOUNDRY IN 1835

THE TRIP HAMMER IN 1835

THE STEAM HAMMER OF 1852

used by the Krupps; the hammer head weighs 800 kg. The gentlemanly puddlers and smiths seem to be attired in the formal afternoon clothes of the period. The steam hammer of 1852, it will be noted, is driven directly by a piston and cylinder.

Approaching the Limit of Increasing Gold Production

From the present outlook in the gold-mining industry of the world, gold production will have reached its maximum within the next 12 months, and it is possible that 1912 will show a positive decrease, says H. C. Hoover, in a recent article in the New York *Sun*.[1] Continuing with a review of the various countries in respect to their future gold production, Mr. Hoover said:

The placer gold of Europe was practically exhausted in Roman times. Lode mining there is a small industry and every foot of ground is known. In Asia the Chinaman has washed the gravels from Siam to Tibet and Mongolia centuries ago. In lode mining I can say from three years of exploration there that he has long since exhausted the mines down to water level and if mines do exist it will be a very slow business finding them.

No Great Expectations from Central Asia

I do not myself believe there exists in China or Central Asia a district of such importance as to materially affect the question, for no greater illusion exists than that the Chinaman has any prejudice against mining for gold—when he can make a profit. And he can make lode mines profitable by hand labor on which we could not earn a cent with the finest machinery ever built.

In India mining has been going on for thousands of years. The placer deposits are exhausted and in the only lode-mining district of importance we discovered the mines are now 3500 ft. deep and are becoming very difficult to operate. India has been decreasing its output for the last six years, and it will inevitably continue to do so.

In Asia Minor the alluvial gold has been exhausted since Crœsus' time. There may be some lode mining, but it is a striking fact that none of the districts that were worked by the ancients—and they worked everything they could find—give any evidence of large volume.

In Egypt hundreds of ancient workings have been opened up during the last few years to the grief of the operator. In fact all mines in these old civilizations, Egyptian, Chinese, Central Asia and India, were worked by slaves or convicts who were fed with impressed food so that all of the metal was profit, and thus hundreds of deposits were worked which prove of no use to the modern operator with all his appliances. And it is scarcely probable that the ancients deliberately chose the worst deposits.

In Australasia, the placer industry is in its dotage. The lode districts within the periphery of say 300 miles from the coast line, are in their decadence, the great interior desert is partially unknown but has in recent years been much traversed. The districts in the interior so far discovered, such as Coolgardie, Kalgoorlie, etc., are all decadent. The maximum output from Australasia was reached about five or six years ago, and it has been steadily decreasing ever since.

U. S. Dredge Production Has Passed Its Zenith

Placer mining in the United States made a recovery from apparent extinction a few years ago by the rise of the dredging industry; this has passed its zenith and the output will soon begin to decrease if it has not already done so. Lode mining has had no accessions since the Nevada discoveries of ten years ago. Altogether the outlook is decidedly toward diminution of the output, for lack of sufficient new recruits to fill the places of those producers now imminent of death.

Canada poured a vast quantity of gold out of the Klondike hand-worked placers, but that stream has become but a trickle from the giant dredges now being built to work over the leavings of the early pioneers. Elsewhere, even with Porcupine thrown in, that country cannot, from anything in sight, maintain its average of ten years ago, although the unknown territory in that country is nascently more pregnant of new mines than the now well prospected countries further south.

Siberia has been vaunted as the future gold source of the world, and gold is wonderfully distributed over that country. But so are dismantled mills and abandoned dredges—a confirmation of the opinion of all engineers of experience in that region, that but little of the area promises profitable mining. Some hope does, however, exist for successful new dredging areas in the extreme Northeast.

South and Central American placer gold was practically all seized by the Spaniards. The lode mining has had English capital poured into it for generations. One company is over a century old. And on balance only a loss has resulted.

The Rand Will Not Increase Its Output

On the Rand, which produces over one-third of the world's gold, the mines are already becoming fairly deep (there are considerable workings at more than 3500 ft.), the ores are becoming poorer with depth, the profit to be won from the shallower areas was vastly overestimated, labor and physical conditions are steadily becoming more difficult, working costs are rising and grade of ore falling. This district will certainly not materially increase its output, and I should not be surprised to see an appreciable decrease within 12 months. It will go on producing gold for fifty years, but in steadily diminishing quantity and even 10 years will see a great decrease.

Outside of the Transvaal, there are two large areas known in Africa, that is Rhodesia and West Africa. The gold deposits of Rhodesia are mostly the erratic quartz type, and *en bloc* cannot be expected to return the money invested. The British public has invested this money under the glamour of the Rand, and will not repeat very often the game of spending $20 of labor and material to get $10 in gold.

West Africa has been vastly overestimated, and the tombstones of English companies who have been operating there are now being set up by the score. There are some unexplored places on that continent but they are much less than is currently believed by those unfamiliar with the vast amount of prospecting that has been in progress during the last 15 years. Large areas of the Congo Free State, Uganda, Nyassaland, Nigeria, Sudan, Sahara, etc., have been demonstrated to be geologically unfavorable, and the probability of any gold industry is of the remotest kind in these territories.

Opportunities for Improved Methods Not Important

It is not my point that no new mines will be discovered; it is that great districts are unlikely and that the annual supply of new isolated mines will not replace the frail and dying members. The great opportunities for the application of newly discovered methods have all been taken advantage of; no industry has had such a generous supply of capital for every warrantable enterprise. Further the opportunities for improvement on modern methods, and thus the renewed play of lower-grade or refractory mines, are no longer of importance. The increase in percentage recovery from 60% to over 90% offered many opportunities and realized much increase in production, but the region for expansion between 92% and ultimate 95% is small.

The cost of working has been reduced to near bedrock by mechanical equipment, until the room for further improvement amounts to cents per ton and not dollars as it was formerly. And in this last connection the cost of wages and supplies in this industry is increasing like all others and will more than offset any reduction due to improved methods. The working costs on the Rand, in Australia, in Russia and elsewhere show a considerable rise during the last two years. This in itself will tend to diminish the output.

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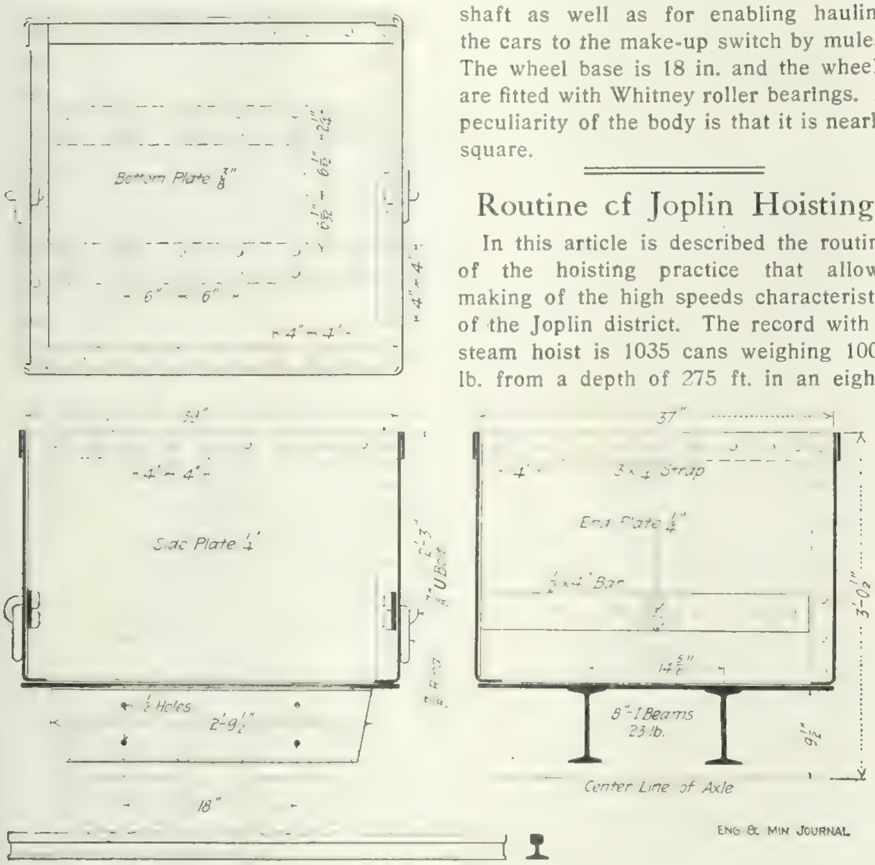
[1] "Are We Near the Gold Output Limit?" by H. C. Hoover, "The Sun," Sept. 8, 1912.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Doe Run Mine Car

The car used in the mines of the Doe Run Lead Co., in southeastern Missouri is of the type in which the dumping must be done by a tipple. Where most of the ore is mined on one level and there is little need of dumping waste from development work into stopes in order to fill them as is so often the case in mining the weaker-walled deposits of the West, this is not much of a drawback, for whenever the ore does have to be dumped to a lower level for tramming it to the shaft a tipple can cheaply be put in to do the dumping. Such cars in which the body and wheels are tied tightly together are much cheaper to keep in repair than are those pivoted to a wheel truck so as to allow dumping at any place. Moreover, they are cheaper in first cost.



CAR USED IN THE DOE RUN MINES

In order to permit placing the wheels under the body they are fastened by their axles to two 8-in., 23-lb. T-beams that are riveted tightly to the bottom of the body which is a ⅜-in. plate. The sides which are ¼-in. plate are riveted to this bottom plate without any reinforcement at the lap. The top of the car is reinforced by a 3x¼-in. strap, while a 4x½-in. piece is put on the inside of the car to reinforce it and to distribute the strains that come from the draw-rings over a larger area of the end plates. There is a draw-ring at each end of the car for fastening them in trains when they are hauled by locomotive to the shaft as well as for enabling hauling the cars to the make-up switch by mules. The wheel base is 18 in. and the wheels are fitted with Whitney roller bearings. A peculiarity of the body is that it is nearly square.

Routine of Joplin Hoisting

In this article is described the routine of the hoisting practice that allows making of the high speeds characteristic of the Joplin district. The record with a steam hoist is 1035 cans weighing 1000 lb. from a depth of 275 ft. in an eight-hour shift. This is an average of a round trip in 28 sec., hour in and hour out. It was made with a first-motion steam hoist. At the Diplomat mine at Galena, Kan., where nine-hour shift is worked the record for one of the electric hoists is 1031 buckets from a depth of 200 ft. in one shift, while in one week of 6 days 5847, 30x30-in. buckets have been hoisted.

Where hoisting is done at high speeds there is always employed what is called a "pig-tail" whose duty is to run the buckets up to the hooker who stands at the bottom of the shaft and to take off the bucket and put another on. Generally a center pull is used. In this system the bucket is run in on the truck directly under the sheave so that the bucket does not have to be steadied before the trip begins as is the case when a side pull is used. As the bucket comes down, the tub hooker swings it aside and lands it on a small side plat on which he is standing and which is about 15 in. above the ground so that after the loaded bucket is off the bucket car the hooker can easily shove the empty bucket on the car. Upon lowering the bucket in the center-pull system the hoistman lets out just enough slack so that the hook when removed from the empty will easily but tightly hook into the bail of the loaded bucket. Then the bucket is ready for hoisting as soon as the signal is given without any necessity of steadying the bucket to stop side swinging, but generally the bucket is slacked up an instant when about the height of a man's head and the bucket hooker steadies it in case there is any side swing due to the bucket car being placed a little out from its correct position. This steadying of the bucket is necessary because in Joplin hoisting no crosshead is used.

In the system of hoisting with a side pull, which is also used in the Joplin mines, the empty bucket is landed on a platform under the center of the shaft while the loaded bucket is on the car butting up against this plat, but out of plumb with respect to the sheave of the hoisting rope. In this system of hoisting the hoistman, when he lowers the bucket lets enough slack out so that the hook may be just swung over and fastened to the bail of the loaded bucket. Then the hooker gives the signal, the hoistman raises the bucket about a foot higher than the empty bucket, the hooker steadies it so that there is no side swing, then the hoistman takes the bucket away. Owing to the fact that the bucket has to be steadied by the hooker with the empty bucket directly underneath there is danger with this system of the hooker getting his hand mashed between the two buckets through slipping of the brake. The system is slower than the other and more dangerous. In the side-pull system the empty bucket just as in the other case has to be worked over on to the bucket car. In both systems where the buckets are being run to the shaft from two directions the empty bucket is landed on an extra truck and the lifting of the bucket is avoided. Still this lifting does not take much exertion as the hookers develop a marvelous dexterity just as cagers do in the handling of cars both on the turnsheets and in dropping them on to the cage when the hoistman has lowered the deck a little too far.

The hoistman not only has to tend to the hoist operating at a speed of 100 ft. per sec., but also has to throw a door over the shaft well, hook the tail rope into the ring in the bottom of the bucket, dump the bucket, swing the door out of the way of the bucket, hoist back the bucket from its dumping position, unhook the tail rope and lower the bucket again. Fortunately there is a regular routine to the work which has been worked out with a surprising simplicity.

In the first place the geared or direct-connected steam, or electric hoist is placed so that the hoistman stands at the side of the well in the floor of the derrick through which the bucket passes. Around this well is a boxing with a slope to the top sides of about 45°, upon which rests the door for covering the well, while the bucket is being dumped. This door rests back against stops when not in position over the well, and from the top there generally extends an iron pin for a handle on which the hook of the tail rope for dumping the bucket hangs so that the hoistman can grab it with three fingers while with the other two he swings the door across the shaft. This he does with his left hand. To enable him to grasp the hook easily, the hook is made with a handle.

The steam hoists are made with vertical cylinders so that there is no side shaking of the derrick. The drum is loosely mounted on the shaft and is connected to the engine by a friction clutch, which in the case of the electric and first-motion hoists is a friction band while in the case of the geared hoists connection is made through a friction cone that is thrown in and out by a screw feed. There are three levers to control the hoist. One is the throttle that the hoistman operates with his left hand and which is always in front of him. After a certain point has been reached the hoistman closes the throttle enough so that there is just sufficient steam going to the cylinders to raise the empty bucket back from the dump position at the end of the hoist. The momentum brings the bucket through the upper part of the shaft. This frees his left hand early enough so that he can have his hook and door ready by the time that the bucket is out of the well. The friction lever is grasped with the right hand while the brake band which is fitted with a hand lever and a foot lever is generally operated by the foot. A stud on the bed plate of the hoist keeps the friction lever from flying back too far to be grasped easily with the hand, but generally when the bucket reaches the top, the hoistman hangs his right knee over the friction lever and controls the friction that way while he has his right hand free to operate the throttle if he has to give a little more steam to the cylinders to get the bucket back from the dump. As soon as the door is across the well and the hook is in position, the hoistman slacks off on the friction and lets the bucket settle back and dump its load over the grizzly bars where the screen men sort out the boulders of flint.

The hoistman then throws in the friction; raises the bucket back over the well, unhooks the tail rope, swings back the door hanging the hook on the handle as he does this, lowers the bucket, having thrown out the friction clutch and put on the band brake to control the speed of lowering. About the time that the bucket reaches the bottom of the shaft the hoistman throws on full steam and is ready to pick up the load with the engines at full speed when he throws in the friction clutch on getting the signal.

By opening the ports of the engine to the air and varying rate of the escape of the air from the cylinders so as to cushion the steam piston and cause it to act as an auxiliary brake to help out the friction brake which might get out of control for some reason or other, men can be slowly lowered. Where fast hoisting is done, the engines of the hoister are never stopped. A three-way auxiliary valve is provided on the first motion hoist that in one position cuts off all the steam from the cylinder; in another position full head of steam is on, while of course between these two there are intermediate pressures. In the third main position of the valve steam is cut off from the main passage through the valve and a small quantity, sufficient to run the engine and lift the bucket out of the dump position, is admitted through a by-pass to the cylinders. The engineer sets this valve with respect to this last position so that just enough steam is admitted for that purpose. With this type of valve there is only one stroke of the throttle valve either from full steam or to the by-pass position in ordinary hoisting which results in a higher hoisting speed being attained. It is this last type of hoist, called the Freeman first-motion which is being extensively used in the newer installations. Indeed, it was the introduction of this hoist that resulted in the speeding up of the hoisting operations as when the first-motion men began to speed up their movements, the geared-hoist men also did so with a considerable increase in the speed of their hoisting.

At the Leonard mine in the Chisholm district in Minnesota recently a steam shovel loaded 8100 tons of iron ore on 180 cars in one shift of 10 hours. This, it is claimed, is a record performance on the Mesabi range. The mine is leased by the Steel Corporation from the Hill trustees.

Raising a Stack while in Operation

By Thomas J. Jones*

It recently became necessary to increase the height of the main stack at the Karabash smeltery without in any way interfering with current operations. The stack was built of sheet steel ⅝ in. thick, for the bottom rings, and diminishing in thickness to ¼ in. at the top. It was 8 ft. outside diameter and lined with 9 in. of brick. The height was 125 ft. from the top of the foundation, which is 50 ft. above the feed floor. An additional height of 75 ft. has been gained in the following manner:

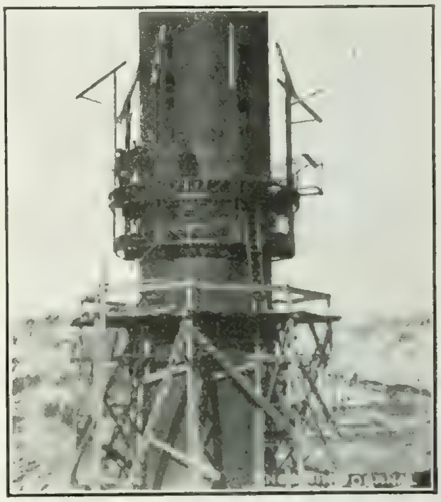


Fig. 1. Climbing and Working Platform

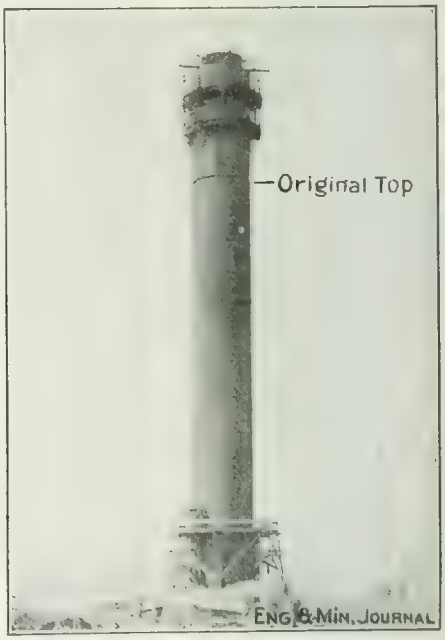


Fig. 2. Stack with 45 ft. Added Height

A mechanical device for climbing and working around the stack was built on a staging 20 ft. above the base. A close view of this is shown in Fig. 1, and the drawings, Fig. 3, illustrate the details of its construction. It consists of two rings provided with wooden friction blocks and wedges, which enables them to grip the stack from all sides. The lower ring was provided with stanchions to the top of which small chain blocks were attached; thus it may be seen that the two rings were alternately hoisted and wedged firmly at intervals of approximately 12 ft. until the top of the stack is reached. Platform galleries inclosed with wire netting were attached to each ring as a working place for the men. The men and material were hoisted and lowered by means of a counterpoised boatswain's chair and a hand winch. When the top of the stack had been reached, it became necessary to put in place a false length of stack, which would protect the riveters from the smoke and heat. This was put on in sections by means of swinging gantrys attached to the stanchions as shown. The gantry arms remained attached so that as the work advanced, this false section maintained the same relative position to the advancing rings.

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*Manager copper department, Kyshtim Corporation, Perm, Russia.

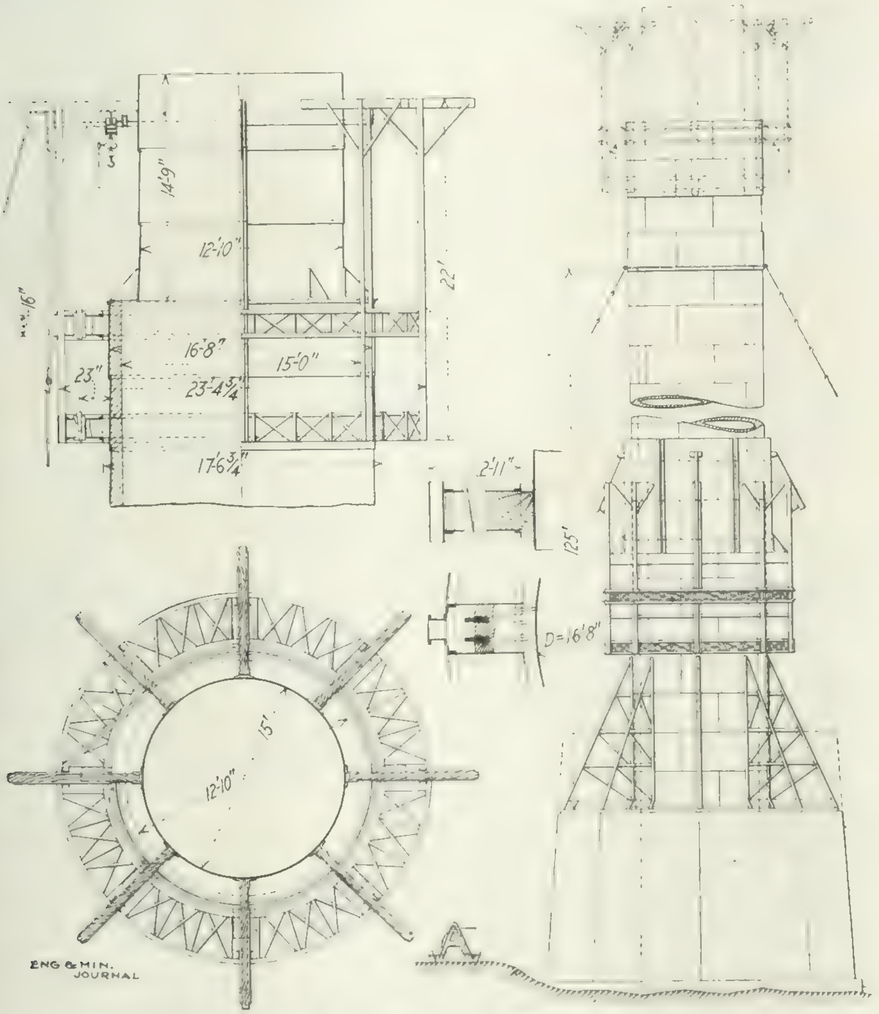


Fig. 3. Details of Climbing and Working Platform

The only difficulty encountered was with the heat, which charred the friction blocks and made it difficult for the men who had to stand between the false section and the new rings holding the rivets. The former was overcome by interposing some thicknesses of asbestos and the latter by using some sheets of camel's hair felt. Credit is due to Messrs. Koliasnikoff and Richter, smeltery manager and master mechanic, who worked out the various details of this successful and economical method.

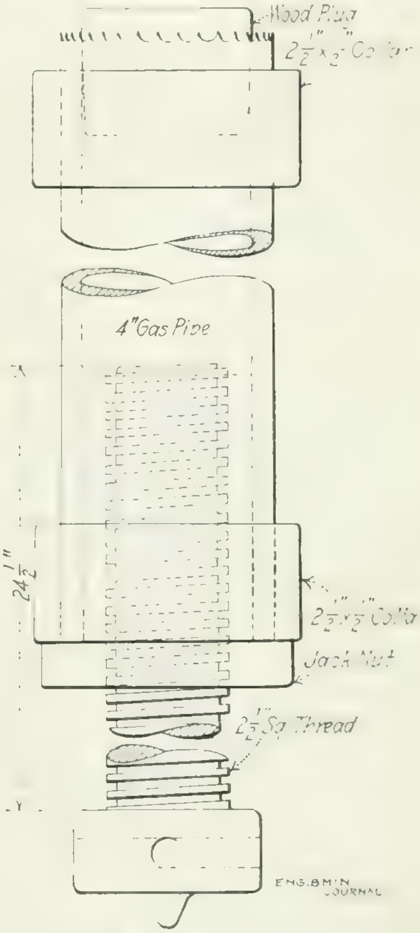
Greasing Mine Car Wheels

The efficiency of grease over oil is so marked in mine-car wheels, particularly in the roller-bearing types, that there is a marked loss of economy where oil is used, says Benedict Shubert in *Coal Age*, Aug. 31, 1912. The difficulty of thoroughly greasing the wheels, however, has prevented the introduction of grease to as large an extent as is really warranted.

A simple greasing device consists of a drum containing about half a barrel of grease, the drum being fitted with a piston which is actuated by either air or steam pressure on one side. This drum is set permanently and two connections are taken from the drum, one to each side of the car track. The cars are run into position and the grease is quickly and thoroughly forced into the bearings, the delay being no greater than if oil were used.

Simple Machine Bar

In the accompanying drawing is shown the design of machine bar used in the mines of the lead district of southeastern Missouri. It is a one-screw post without any header casting at either end. The teeth for gripping the top blocking are made by cutting the pipe used for the column in two by drilling it full of holes. The pipe is then plugged with a piece of oak to keep grit from getting down into the thread of the jacking screw. A collar of 2½x½-in. iron is shrunk on the upper end to reinforce it after the plug has been hammered in. A similar collar is also shrunk on the bottom after the jack screw has been put in. The details of the jack-screw casting are shown in the accompanying sketch. There is no shoe on the bottom end of the jacking screw. It simply ends in a blunt point. Formerly this was stuck in the axle hole of a car wheel in making a set-up, but the ends often penetrated too far into the wheel and as the side strain was strong on the jacking



Machine Bar Used in Southeastern Missouri screw the result was that several screws would be broken in the course of a month. On that account simple plates about 6 or 8 in. wide and 1 in. thick, with a depression in the center for taking the end of the jack screw are now provided. These do not let the jack screw enter far enough to put any side strain on the screw so that there is no more breaking of the jacking screw.

With this shoe plate it is possible to set up without any trouble on a steeply slanting bottom. If there was a shoe to the jack screw, a considerable side strain would be thrown on the screw unless a block was put under it to level up with such a sloping bottom so that the column could be stood perpendicular to the foot blocking. In other words, more care has to be taken in making a set-up when a foot shoe is used than when one is not, and so as the work of setting up with this type of shoeless column is easier and quicker, the machine men like it better than the bar of the regulation type. As the column is always set up on solid rock in this district, the fact that the end of the jack screw is not of large area is not important.

Emergency Repairs on Dredges

In discussing broken shafts, etc., on certain Government dredges, S. E. Lawrence calls attention (*Eng. News.*, Aug. 8, 1912) to the field for thermit repairs on these vessels. Such a repair on the pipe-line suction dredge "Captain C. W. Howell" is described.

The crankshaft of its 12x22x14-in. compound engine, directly connected to a 12-in. dredging pump, was 5½ in. in diameter. A crack was discovered in the low-pressure crankpin, and investigation showed that the crack ran into the web and back again around the pin. This precluded all the ordinary schemes of replacing the broken pin by shrinking in a new one, as the web did not have sufficient remaining metal to make such a repair safe.

The dredge was operated until arrangements could be made for a thermit weld, and on the repair day the shaft was removed to a shop. It was found to be entirely broken off. Part of the pin was machined off, leaving about an inch of space between the web and pin when the parts were aligned and fastened to a bedplate.

The mold was prepared in the usual way, and the ends to be united heated to as high a temperature as was safe. There was no hitch in the pouring of the crucible and, after cooling over night, the mold was removed in sections to prevent uneven contraction.

When the gates were removed and the complete shaft placed in a lathe the nice allowance for shrinkage, etc., was evidenced by the fact that scarcely any refinishing was necessary on the thrust collars of the shaft. The pin was turned up and the surplus metal removed and web reshaped to original dimensions without changing the balance of the shaft.

A total of four days was lost by the plant because of this repair, most of the delay being due to the distance of the dredge from the shop. This shaft continued in constant use without any evidence of the repair until the dredge was lost a year after on the Texas coast.

An idea of the saving effected in this instance may be obtained from the fact that a new shaft ordered rushed at once from the factory at a cost of $465 was not ready for shipment 90 days after receipt of order, as compared with a charge of $150 and a delay of four days for the thermit weld.

The necessity of skilled handling and placing of parts to be welded can not be too forcibly emphasized, as the chances for ruining a part are greater from mishandling than from failure of the weld, and much unnecessary finishing work is prevented by careful attention to the mold conforming exactly to the desired shape of the part to be repaired.

The hard-driven machinery of dredging plants, with their interdependent individual machines, offers an excellent field for economic employment of this method, and it will very likely play an important part in cutting down long delays brought about by extraordinary accidents.

Wear on the Trolley Wheels

One of the parts of an electric locomotive which wears the most is the trolley wheel. (*Electrical Review*, Aug. 16, 1912.) In one case it was noticed that a new trolley wheel fitted to a trolley head was worn out very rapidly and upon examination it was discovered that this was due to the fact that there was too much tension on the trolley. Some time previously the trolley standard had been overhauled and the tension on the springs set by guess work. Trolley tension for center running should not exceed 20 lb., while 25 lb. is sufficient for side running. The tension should be set with a spring balance tied to the trolley rope, care being taken to keep the trolley head at the normal height of the overhead wire. It will then be found to follow the usual inequalities of the line with pressure sufficient for good operation.

Steel Mine Ties

The steel track-tie shown in Fig. 1, and recently described by F. D. Buffum in *Coal Age*, is ½ in. thick and the bolts used are the same as those in the rail-splice bars. No sledges, gages, spikes or spike pullers are needed for either laying or taking up ties; the only tool required is the wrench that is used for rail-splice bolts. As the ties rest directly upon the ground they may be spaced at intervals as great as six feet.

The bolt hole in the tie is made oblong to suit the diamond-shaped head of a track bolt so that the nut cannot turn while the nut is being tightened or loosened, particularly the latter because after the tie has been in use for a long time the nut rusts the tie the same as does the nut in the rail splice.

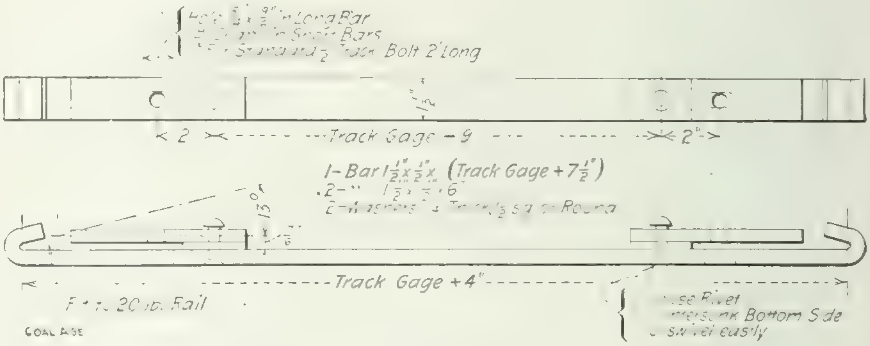


Fig. 1. Mine Haulage, Steel Track Tie for Mine Cars

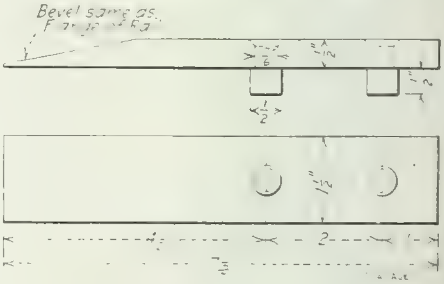


Fig. 2. Steel Mandrel for Shaping the Bent Ends of Steel Track Ties

In making the ties the holes are first punched or drilled to gage, then the bar to be bent is heated and a mandrel like that shown in Fig. 2 is placed on it for a form, over which the bent end is quickly shaped by a few blows of the hammer. All parts are thus made to the same gage. The bottom head of the rivet is countersunk as shown in Fig. 1, because it is easier to beat down such a head than it is to use a rivet set.

Details of Metallurgical Practice

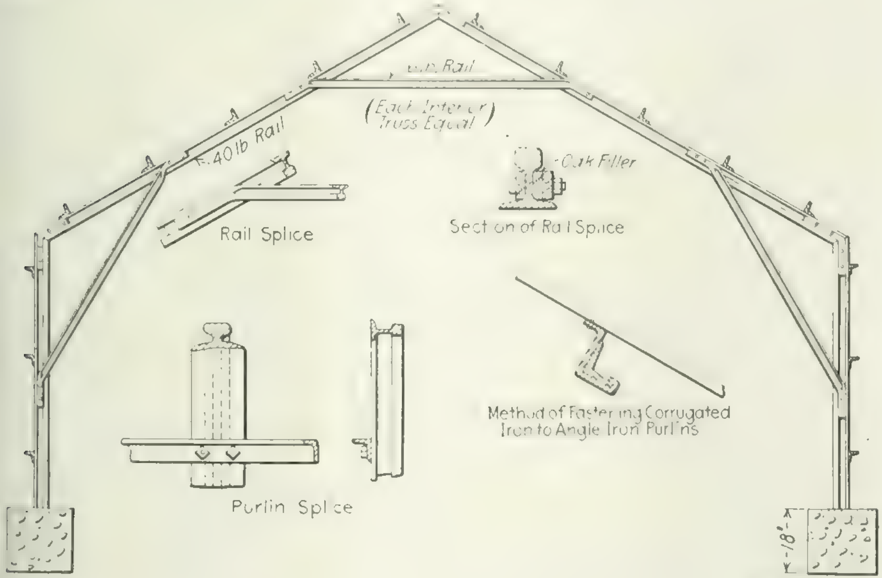
Records of Experience in Ore Dressing, Cyaniding and Smelting

Cheap Steel Trusses

By Claude T. Rice

Steel trusses can be made cheaply at any mine where old rails are available. The span of the trusses is limited only by the size and length of the old rails at hand. Such trusses were used in building the change house at No. 3 shaft of the Desloge Consolidated Lead Co., in the southeastern Missouri lead district. Of course, there would be no economy if it were not possible to use up scrap material in this way.

The rails are built up into the truss with the flanges outward, as this allows the internal braces to be secured more readily to the main members. The rails are sawed off so as to meet at a fairly tight although rough joint and they are spliced together fish-plate fashion by splice plates that fit in snugly against the webs of the rails. Bolts are used to fasten the splice plates to the truss and two rivets are used, in most instances, at each end of the splice plates. The internal braces of the truss are also old rails of smaller section. For this internal bracing 16-lb. rails that are no longer serviceable or even 12-lb. rails can be used. These are heated and hammered down in the shop into a bar section and bent to the proper angle so as to be parallel at the ends. These are bolted to the rails forming the main members of the truss with a piece of oak as filling, so as to give a surface even with the side of the head of the rail for the auxiliary bracing, as shown in the accompanying sketch.



ROOF TRUSSES MADE OF OLD RAILS

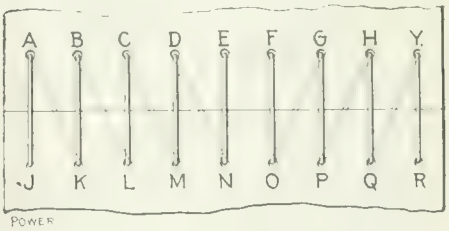
In the truss for the Desloge changeroom shown in the accompanying sketch, the unsupported portion of the main span is less than the length of the legs of each minor truss. The trusses are bolted together by the longitudinal bracing that ties the trusses together, and the longitudinal bracing that ties the trusses together is also bolted to them through holes drilled in the flange of the rails forming the main members of the trusses. These longitudinal braces that tie the different trusses are angle irons. In bracing the sides there is one brace about 18 in. from the top, another about 12 or 18 in. from the bottom and a third in the middle between these two, the side walls of the building being about 9 ft. high. The purlins of the roof are also angle irons, but are placed closer. The manner of attaching the corrugated irons to the purlins is shown in the sketch. A strap hook is used that comes up from around the bottom edge of the angle iron. This has a rivet of soft iron in the end of it by which the corrugated sheet is riveted to the clips. In this way the corrugated iron is tightly fastened to the purlins.

The trusses for the change house were raised and then held in place by the purlins. The first truss, after being raised with poles, had to be braced in position. The side purlin angle-irons were attached by one bolt in each to the vertical legs of the truss. Then the next truss was raised and the side purlins bolted to the second truss. Then the second bolt was put in at each purlin joint, and the two trusses tightly bolted together. After that, no more bracing was required as each truss was bolted to the purlins as fast as it was raised. This made a rigid structure so that there was no movement of the legs after the concrete for the pedestals for the trusses was poured around the vertical post. The rails forming the vertical legs of the trusses extend down into concrete about 18 inches.

A strong and cheap truss is thus obtained. It is simple to build. Other than boring the holes in the flanges, there is nothing that cannot be done in any blacksmith shop, and no skilled workmen are required. All the bolting of the main trusses is done before they are erected, and in all instances ⅝-in. bolts are used. A truss of this kind is an excellent way of using up old rails that are no longer serviceable.

Wire Lacing for Belts

When a tendency is exhibited by wire lacing to pull the ends of the belt out of line, Clifford Smith, in *Power* recommends the joint shown in the accompanying illustration. All the holes are made first, using a punch about ⅛ in. in diameter and punching the holes ½ in. apart. In drawing the lacing tight with pliers, the end of the lace only should be gripped as the pliers would otherwise nick the wire and cause it to break. The end nicked by the pliers will be cut off so there is no harm done in this way.



STYLE OF WIRE LACING FOR BELTS

To lace this joint, double the wire in the middle and put the ends through adjoining holes, as at *E* and *F*. From the back side pull both ends through until the loop is up tight on the belt, then take one end across on the face to the opposite hole as from *F* to *O*, then back to *F* and across to *O* again and then from *O* to *G* across the back, and so on to *R*. From *R* run to *Y* across the back, then through *Y*, and pull the wire tight in the direction of *R*. Finally cut off the ends fairly close and hammer them down with the rest of the lacing. Treat the other end the same way.

This style of lacing equalizes the lateral strain and prevents disalignment of the belt. It has also been used successfully when using an annealed-iron wire when the regular wire lacing could not be obtained.

Water Supply for Laboratory Purposes

By W. J. Hulings*

The following is a description of a locally evolved automatic water still and heater in successful use in the laboratory of the Tennessee Copper Co. Essentially the apparatus consists of a still fed from a steam line, an overhead reservoir taking the distilled water, and two 40-liter carboys for the overflow from the reservoir.

Hot water from the reservoir flows through an overhead glass-tube main of 3/8-in. bore, and is tapped off at the various work benches by means of glass tees inserted in the main, and rubber tubing, 3/16-in. bore, dropped from the stems of the tees.

In Fig. 1, the still, *A*, is a lead tank, 24 in. high by 12 in. diameter, with a block-tin coil inside carrying the steam to be condensed, from a 1-in. steam pipe. Cold water for condensing purposes is obtained from a 3/4-in. water pipe, *F*, emptying into a long-stemmed lead funnel, *G*, carrying the water to the bottom of the still. The waste water is carried off by the pipe *H*.

The distilled water is forced through a block-tin pipe into a covered block-tin reservoir *B*, 18 in. high by 12 in. in diameter, at a point *J*, midway between the top and bottom. The water in *B*, therefore, cannot fall below this point in case the main steam supply is cut off. The reservoir is set high enough to give a suitable water pressure. The water in the reservoir is maintained sufficiently hot for laboratory purposes by means of a steam coil in *B*. The steam pipe to the still is spliced at *L*, Fig. 2, and a tee inserted with a 1/2-in. globe valve just above. A tin pipe connects the valve and is continued into the reservoir at *M*. Inside, the tin pipe is coiled twice and continued out and down to where it is again spliced into the steam pipe at *N*.

The overflow and distributing system is best shown in Fig. 2. A block-tin pipe is burned into the reservoir at *O* and is connected with another tin pipe, *P*, open at the top to prevent siphoning the water from the reservoir. The lower end of this pipe is connected with the main line of the water supply for the laboratory. At a point, *Q*, on the upper end of the tube, opposite the level at which the overflow from the reservoir is desired, a short piece of tin pipe is spliced into the pipe *P* and is connected by means of glass and rubber tubing with a carboy *C*.

The two carboys, *C* and *D*, Fig. 1, take care of the overflow from the reservoir and supply the cold water for the laboratory. As the overflow water from the reservoir empties into *C*, part of it is siphoned over into *D*, thus keeping the water in the carboys at the same level. The water in *D* cools to room temperature and is siphoned off when needed through a long inverted U-tube, *R*. As it is desirable not to interrupt distillation, overflow from the carboys is provided for through a siphon tube. Water enters at *S* and is delivered to a drainage pipe at *T*. It is to be noted that the openings *S* and *T* are at the same level, thus preventing air getting into the tube at either end. This makes the siphon automatic.

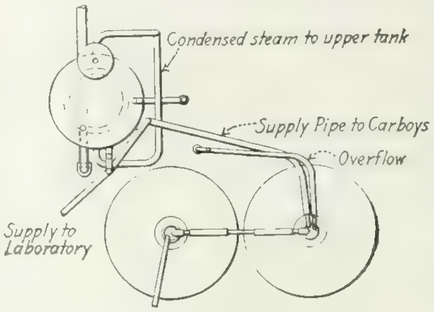


FIG. 3

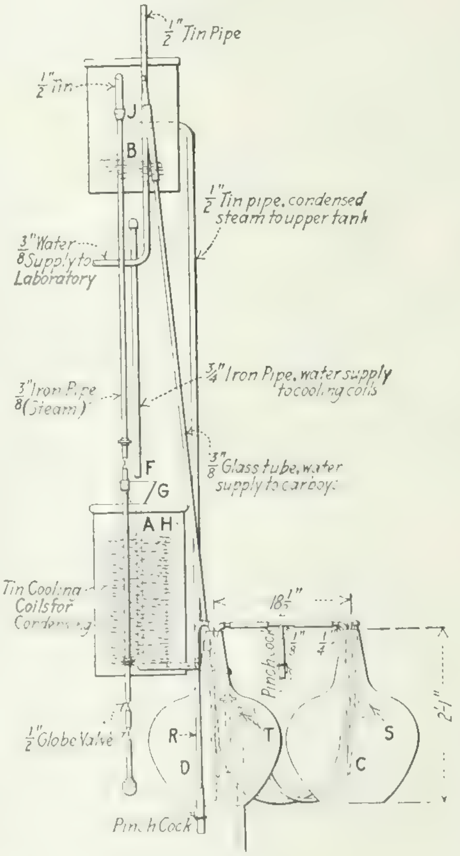

1/2" Tin Pipe
1/2" Tin
J
B
1/2" Tin pipe, condensed steam to upper tank
3/8" Water Supply to Laboratory
3/4" Iron Pipe, water supply to cooling coils
3/8" Iron Pipe (Steam)
3/8" Glass tube, water supply to carboys
F
G
A
H
Tin Cooling Coils for Condensing
18 1/2"
Pinchcock
1/8"
1/4"
2'-1"
1/2" Globe Valve
R
D
T
S
C
Pinch Cock

FIG. 1

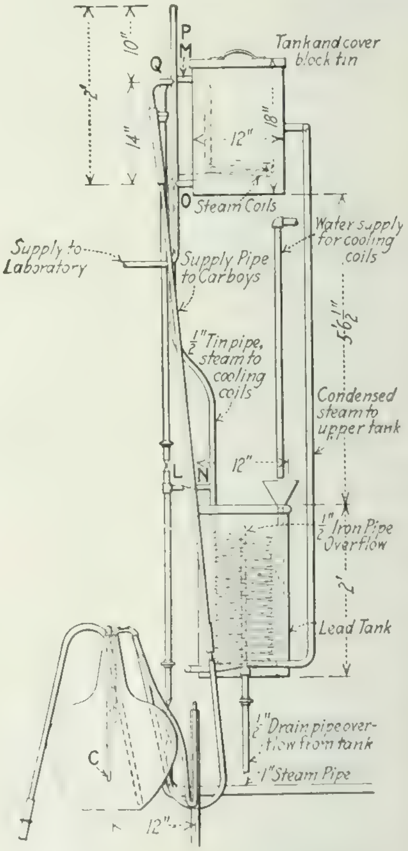


FIG. 2

Continuous Laboratory Water Still

The principal advantages of this system are: the use of a steam-heating coil instead of an induction coil; glass tubing throughout the laboratory, instead of iron piping; and continuous distillation, which eliminates the introduction of dirty greasy water from a cold steam line.

Lifting Pig Iron by Magnets

Heretofore the practice of handling furnace pig iron with electromagnets has been limited by the quantity that could be lifted under the ordinary plan of picking the iron from the ground or floor, says *Electrical World*, Aug. 10, 1912. With the pigs lying flat, only a relatively small number adhere to the magnet. At the Zenith furnace in Minnesota experiments have recently been made with stacking the pigs vertically, standing each pig erect on end. This arrangement allows a greater number of pieces to make direct contact with the magnet pole pieces, and the lifting capacity of the magnet is correspondingly increased. In fact, with a given magnet which was able to pick up only 1000 lb. of pigs lying flat, 2000 lb. can be lifted if the pigs are stacked vertically on the floor.

Where concentrates are dried for shipment as they are produced, it requires about one cord of wood for a hearth drier to dry 20 tons of concentrates, to about 3% moisture.

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*Chief chemist, Tennessee Copper Co., Copperhill, Tenn.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Operations at the Butterfly Mine, Colo.

By D. J. Sayer[*]

The operations for the year ended March 31, 1912, at the mines of the Butterfly-Terrible G. M. Co., may be of interest as showing what is possible when working under fairly favorable condiions.

The mill is equipped with 30 stamps of 050 lb. and 9 Frue vanners. Water power is available for 7 months of the year and drives the compressor as well or the same period. An auxiliary steam plant is used for the other 5 months to ssist the hydraulic power, as well as or heating purposes.

MILLING STATEMENT

Total dry tons milled	16,620.9
Value of heads	$2.992
Value of tails	0.578
Recovered by amalgamation	1.880
Recovered by concentration	0.534
Total recovery	2.414
Per cent. recovery	80.7
Troy oz. quicksilver lost per ton milled	0.074

TOTAL OPERATING COST

	per ton milled
uperintendence	$0.258
General expense	0.035
Labor Milling	0.327
upplies for Milling	0.052
Heating	0.033
Renewals for Mill	...0.052
Power & Flume upkeep	0.032
ssaying	0.008
Freight Concentrates	0.062
Smelting Concentrates	0.078
Mint Charges Bullion	0.006
Labor Mining & Development...	0.810
Tramming Expense	0.110
upplies Mining	0.126
Timber	0.039
Blacksmithing	0.022
Royalty...	0.230
Total Costs	$2.500
ess other earnings	0.242
et Operating cost	$2.258

The gold occurs in fine particles which ecessitates fine crushing to release it. The screen used is a No. 159 Ton-Cap with a slot opening of 0.012 in. This educes the stamp capacity to about 2½ ons per day, or about 2000 tons per month when operating at the full capacity of the mill. A good deal of trouble was encountered, when using the horizontal slot screens, on account of plitting, but when the vertical slot screen was used this trouble was overcome and he life of the screen more than doubled. No difference in capacity was noted.

For the first three months the ore milled was only 3248 tons, about half capacity, so that the cost for the first quarter was considerably higher than for the last part when, the mill running at full capacity, the milling cost fell to $1.88 per ton.

All stoping is done with hammer drills of the Waugh type and the ore trammed through a tunnel direct to the ore bins. The tunnel was run on a grade of 3 in. to 100 ft., so that a horse can pull from 10 to 12 cars at a trip. By this means all the tramming can be done on one shift.

Little timber is used in mining as 20 ft. of backs are left when starting a stope. The mill holes are carried up 20 ft. before stoping begins. All mill holes are rock built and will last for stopes carried from 250 to 300 ft. between levels. All ore extracted during the last year or more was from a depth of about 1600 ft. and it is found that the percentage saved is not so high as when ore from the upper levels was being milled.

The ratio of concentration was 36.3:1, the concentrate carrying on the average an excess of 30% iron over silica.

In cost accounting the drill repairs and tools are charged to mine supplies and shoes, dies, screens, quicksilver, oil and waste are charged to mill supplies. The mining cost includes development.

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[*] Manager and lessee, Butterfly-Terri-le Gold Mining Co., Ames, Colo.

Unit Costs, Pittsburgh-Silver Peak

The following data, furnished by W. A. Bradley, general manager of the Pittsburgh-Silver Peak Gold Mining Co., Blair, Nev., represents approximately the average standard of work at that mine. A month's record shows that 16,200 tons of ore were produced, 15,000 tons coming from stopes and 1200 tons from development work. In addition to this tonnage 400 tons of waste were mined in the stopes and 3000 tons taken from development work, making a total of 19,600 tons mined, of which 15,400 tons were credited to stoping and 4200 tons to development, which consisted of 609 ft. of drifts and crosscuts and 931 ft. of raises.

The rock mined consists of quartz alaskite, limestone, diorite and schist. Pillars are left standing for supports and practically no timber is used, only about 700 linear ft. of stulls being used per month in stopes and 900 ft. of stulls and 1100 bd.ft. of 3x12-in. lumber in development. Electric lights are used in main drifts and stations and candles in other parts of the mine; the consumption of candles is at the rate of four per man in eight hours. Laborers are Americans, Italians, Slavonians and Finlanders. About 87 are regularly employed at the mine, distributed as follows: Stoping, 38; development, 25; miscellaneous underground, 7, and surface, including shops, 17 men. Of the men employed in stoping, 12 were engaged in breaking ore, 18 shoveling ore to chutes, 6 in tramming to skip pockets and 2 in timbering. In development 15 were engaged in advancing and 10 in mucking and tramming.

From these facts it may be deduced that approximately an average of 7.5 tons of rock is broken per day, or 6.22 tons of ore is secured per man employed at the mines. In the stopes, 13.5 tons of rock were secured per day per man, which included waste at the ratio of one ton for every 37.5 tons of ore. Based upon the men employed in various occupations in the stopes, 42.8 tons of rock were broken per day per man engaged in breaking ore, 28.5 tons per day were handled through chutes per man engaged in moving ore to chutes, and 85.6 tons were trammed per day per man tramming from stopes. The average advance per day per man employed in running drifts, crosscuts and raises was 4.92 ft., reduced to man-hours for one foot of advance it required 1.63 man-hours, consisting of 0.98 man-hours for drilling and blasting and 0.65 man-hours for mucking and tramming. The ratio of waste to ore produced from both stoping and development was 1 to 4.77 tons and of development work to ore produced from stopes, 1 ft. for every 10.5 tons of ore mined, while development work produced 1 ton for every 1.28 ft. advanced. The miscellaneous men employed underground were equal to one man for every 76.5 tons of ore per day and surface men, including shops, were equal to one for every 31.5 tons per day.

The total dynamite consumption was 22,200 lb., 10,400 being used in stopes and 11,800 in development, indicating that it requires about 0.676 lb. in the stopes to break one ton of rock and 7.67 lb. in development to make one foot of advance. A total of 339 machine-drill shifts were run in the stopes, breaking approximately 45.5 tons per shift and 442 shifts in development advancing on an average of 3.5 ft. per shift. Water Leyner and Ingersoll-Rand piston drills are used in development. It requires about one hour to make a setup in drifts, and working an 8-hr. shift the drilling average is about 35 ft. of holes. In stopes, air-hammer drills are used and the average drilling rate is 45 ft. per shift. The oil consumption per shift on piston drills is one-half pint and on stopers one-quarter pint. It requires 8 man-hours to sharpen an average of 225 machine-drill bits per day, using a drill sharpener and oil forge supplied with air blast from compressor line. The consumption of crude oil is 7 gal. per day, or about 1 gal. for every 34 bits.

Fourteen mine cars are used in the mine, the average distance trammed is about 700 ft. and the average life of each car is two years. The average consumption of lubricating oil is approximately 2½ gal. per month per car. One man shoveling from a rock bottom into car and tramming 700 ft., averages eleven 1$\frac{1}{10}$-ton cars in 8 hours, which is equivalent to 1.52 tons per man per hour. One man shoveling from a plat into car and tramming 1000 ft., averages six 2$\frac{1}{10}$-ton cars in 8 hours, which is equal to 1.575 tons per man per hour. A trammer loading from a chute and tramming 700 ft. averages forty-five 1$\frac{1}{10}$-ton cars in 8 hours, or 6.19 tons per hour.

In running 5x6-ft. drifts through fairly hard ground, the average advance is about 4 ft. per shift of 8 hours with one drill runner and one mucker, or 16 man-hours. The approximate time required for drilling is 5½ hours, or 68.8% of the total time. Air pressure ranges from 90 to 100 lb. According to these figures, an average of 7.5 cu.ft. of rock is removed per man-hour. In running a 5x4.5-ft. raise through fairly hard ground, it requires one man on an average of 8 hours to advance 3 ft., drilling 4 hours per shift and timbering 1½ hours. The average dynamite consumption is 27 lb. per shift, 9 lb. per ft. of raise or 1 lb. per cu.ft. of rock broken. The advance is equal to 0.375 ft. of raise, or 8.45 cu.ft. of rock per man-hour, of which 50% is required for drilling and 18.8% for timbering.

Machine Drilling at the Robinson Deep

The following will show the increased drill efficiency obtained at the Robinson Deep Gold Mining Co., Transvaal, S. Africa. This is due partly to the increased efficiency of labor but chiefly to a more careful study of drilling operations, improvement in design of 2¾-in. stope drills, higher air pressure and better drill steel.

During year ending March 31, 1911, hammer boys worked 144,755 shifts and broke 0.076 fathom per shift. Small machines, 2¾x2½ in., were operated 23,439 shifts and broke 0.55 fathom per shift and large machines, 3⅓ in., drilled 18,718 shifts breaking on an average of 0.63 fathom per shift. During year ending March 31, 1912, hammer boys worked 90,872 shifts and broke 0.072 fathom per shift, small machines drilled 32,320 shifts at the rath of 0.701 fathom and large machines drilled 11,969 shifts breaking an average of 0.76 fathom. On this basis the ratio of small machines to hammer boy was 7.24 in 1911 and 9.7 during 1912, and large machines 8.34 and 10.6 respectively.

Construction and Operation of the Tigre Mill

Mill construction and operating costs at the Lucky Tiger mine, El Tigre, Sonora, Mex., are given by D. L. H. Forbes in *Bull.* A. I. M. E., August, 1912. The building of the cyanide plant, the No. 2 mill, and the remodeling of No. 1 mill, were done under somewhat adverse conditions, owing to the revolution in Mexico at the time, and consequent unsatisfactory labor conditions, but the work was completed in 14 months from the time that the preliminary plans and estimates were approved by the directors of the company.

The following unit-cost figures, expressed in United States currency, on the construction work may be of interest, as an example for a property situated in northern Mexico off the railroad: Excavation, medium-hard ground with boulders, 16,103 cu.yd. done at an average cost of $0.64 per cu.yd. Cement masonry, with stone partly dressed, 1850 cu.yd. done at an average cost of $7.40 per cu.yd. Cement concrete, 10% of which was reinforced, 972 cu.yd. done at an average cost of $12.28 per cu.yd. Carpentry work, buildings, launders and miscellaneous, 320.3 M. board feet of lumber, put in at an average cost (including cost of the lumber) of $84.24 per M. Steel tanks, assembling, riveting and calking, 247 tons of steel were put up at an average cost of $26.38 per ton. The total cost of the cyanide plant was $221,208, of which $11,203 was spent on testing and preliminary investigations.

The total cost of the No. 2 mill was $50,104, made up as follows: Excavation, $2518; foundations, $9813; carpentry, $14,723; local handling, $761; machine work, $2710; testing, $59; supervision, $1479; electrical work, $573; painting, $231; miscellaneous, $246; first cost, freight and duty, $16,991.

UNIT COSTS OF CYANIDE-PLANT SUPPLIES AT EL TIGRE

Mine quartz for tube mills, per lb	$0.00379[1]
French flint pebbles, size A, per lb	0.02138
Danish flint pebbles, sizes C and D, per lb	0.02397
Zinc dust, 92%, metallic zinc, per lb	0.075
Sodium cyanide, 130%, KCN, per lb	0.2247
Burned lime, 38 to 40% CaO, per lb	0.0155
Borax glass, per lb	0.1375
Sodium bicarbonate, per lb	0.07
Fluorspar, per lb.	0.0745
Sodium nitrate, per lb	0.085
Graphite crucibles, No. 125, each	9.54
Gas oil for melting furnace, per gal	0.375
Gasoline, per gal	0.1385
Hydrochloric acid, commercial, per lb	0.119
Lead acetate, per lb	0.12

[1] United States currency

The average consumption of supplies in the cyanide plant is as follows: Sodium cyanide, 5.08 lb. per ton of tailings treated; lime, 52% CaO, 23.0 lb. per ton of tailings treated; zinc dust, 1.3 lb. per ton of tailings treated; ratio Zn to Au plus Ag as 1.52: 1; gas oil for melting, 0.025 gal. per oz. of bullion produced; flint pebbles, 8.7 lb. per ton of tailings treated.

MILLING COSTS PER TON OF ORE MILLED AT EL TIGRE

	November, 1911		October, 1911	
	No. 1 Mill	No. 2 Mill	No. 1 Mill	No. 2 Mill
Crushing	$0.496	$0.413	$0.566	$0.405
Grinding	0.269	0.021	0.291	0.029
Concentrati'g	0.961	0.239	1.225	0.521
Construction	0.169		0.189	
	$1.895	$0.673	$2.271	$0.955

The cost of cyanide treatment at E Tigre is very high, owing chiefly to the large consumption of cyanide. The following are representative average cost for the various steps in the process Conveying and screening tailings, $0.11 tube milling, $0.65; classification, elevation and dewatering, $0.22; treatment $1.50; filtration, $0.30; precipitation $0.14; melting, $0.19; total, $3.11 pe ton.

From 62% to 64% of the gold and silver in the mine ore is recovered in th form of concentrates and sorted grade The recovery by cyanide treatment o the concentrator tailings is about 82% and of the dump tailings about 85%. Th total recovery by sorting, milling, an cyaniding is from 93% to 95%.

Trucking Costs

The following figures show the comparative costs of running three double truck teams and a four-ton motor truc which replaced them. It will be note says the *Iron Trade Review*, Aug.

THREE DOUBLE TRUCKING TEAMS

Cost of six horses at $300	$1,8
Cost of three wagons at $450	1,3
Cost of six harnesses at $35	2
Cost of keeping horses, $25 a month	1,8
Repairing harnesses, wagons, etc	1
Interest on investment	3
Drivers' salaries, $12 a week	1,8
Total, horses.	$7,4

"KISSEL-KAR" FOUR-TON TRUCK

Cost of 4-ton truck	$3,8
Gasoline, 2,400 gals. a year at 10c	2
Oil, 156 gals. a year at 23c	
Driver's salary at $18 a week	9
Amortization, 10 per cent on $3,800	3
Interest on investment	3
General overhaul, once a year	1
Total, truck	$5,9
Balance in favor of motor vehicle	$1,5

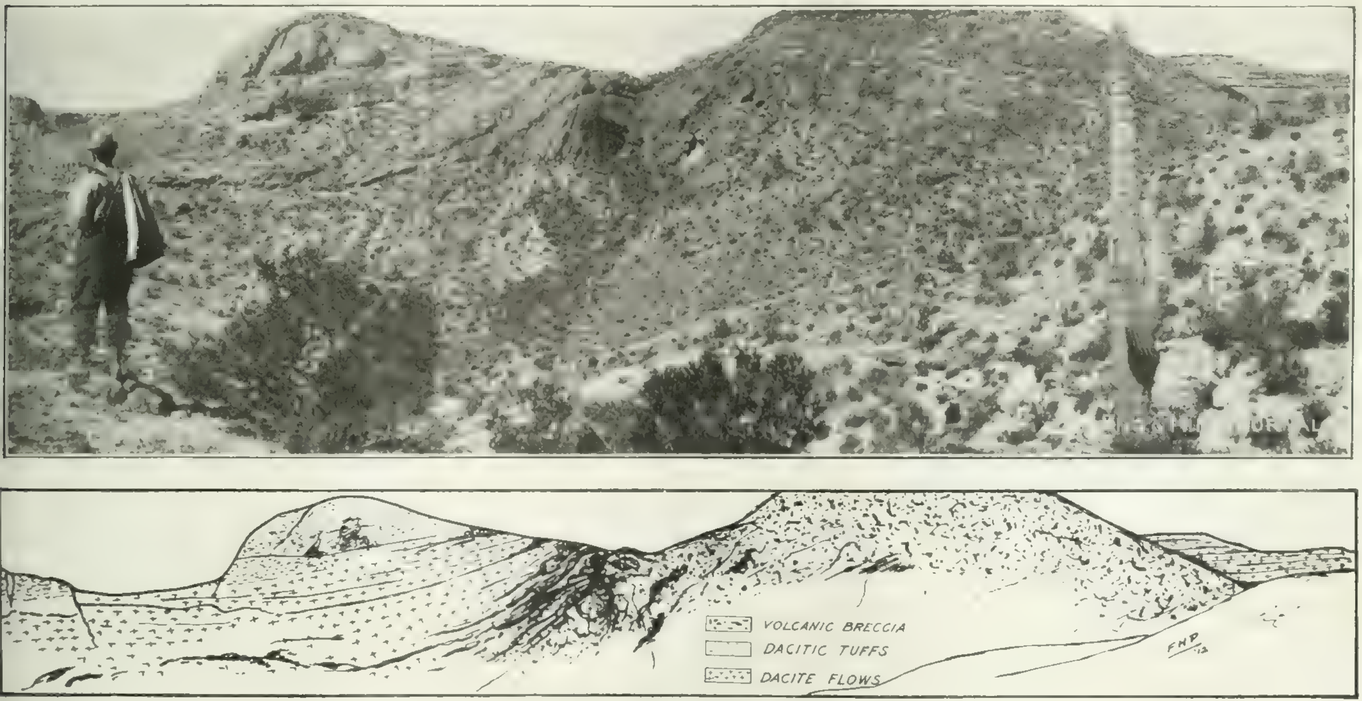
1912, that no depreciation is figured the horse trucks. The motor truck at fi ran 484 miles per month, consuming 7 gal. of gasoline, and two gallons of per day.

Copper Butte, Ariz., A Volcanic Throat

By Frank H. Probert*

A plugged volcanic throat, which evidences explosive volcanism, near Ray and a short distance east of Florence, Ariz. The expelled breccia is cemented with a material which carries copper. Black, manganiferous copper silicate exists as at Miami and Ray.

The present topography of the Mineral Creek district, in which the Ray orebodies are found, was determined largely by great crustal movements in late Tertiary—post-dacitic times. The series of northwest southeast faults, roughly paralleling the line of Mineral Creek are later than the dacite, and therefore post-mineral. The downthrown fault blocks to the east offer, in restricted areas, possibilities of workable orebodies, as proven by a number of drill holes put down by the Arizona Hercules Copper Co. In the Miami district, similar post-dacitic fractures evidence rock adjustment following a period of great dynamic disturbance.



PANORAMIC VIEW AND GEOLOGIC SECTION OF COPPER BUTTE

At Copper Butte, an old volcanic throat bears testimony to explosive volcanism at the close of the Tertiary age, an age which gave to the mining world a vast petrographic province, rich in mineral resources, extending from northern Nevada to southern Mexico.

SCHISTS AND PORPHYRY EXPOSED NEAR THE BUTTE

Copper Butte rises nearly 2000 ft. about the Gila River in a range of grotesquely carved dacitic hills, about 18 miles east of Florence, and four miles southwest of Ray. On account of surface indications of copper, a group of claims was located, the examination of which enables me to give the following description of the property. The group lies well within the mountainous tract east of the Florence valley composed of rhyolitic and later dacitic lavas, resting upon an eroded and hilly surface of schist, sedimentaries and granite. In the valley of the Gila and its tributaries, the volcanic mantle was relatively thin, and has been stripped by erosion, exposing the older rocks, but leaving remnants of the lava flows as rough cragged mountain tops. Near the Butte, the gray schists and later granitic porphyry are exposed over large areas; the limestones and quartzites are conspicuous by their absence.

A careful study and correct interpretation of the geologic structure was necessary to determine the commercial value of the claims examined. The coarse biotite granitic porphyry is fresh though crumbling from surface disintegration, and shows but little evidence of mineralization, except near the contact with diabasic dikes. Local development of aplitic dikes in the granite are common. The exposed schist areas are copper stained in places, and are generally of a reddish color from surface oxidation of contained pyrite. Dacite flows and well bedded soft friable dacitic tuffs once covered the whole section studied and the dissection of the region by erosive forces has revealed the presence of volcanic necks, through which all the rocks were alike expelled by explosive action.

THROAT FILLED WITH CONSOLIDATED BRECCIA

The copper-bearing area of Copper Butte is part of one of these throats, broken through the schist, granite, sedimentaries and dacite flows, and filled by its own products, part of the ejected fragments falling back into the throat, forming a plug of consolidated breccia against which the dacite flows have been steeply upturned. In surface exposure the throat would seem to be about half a mile wide by three quarters long, roughly elliptical in shape. The walls are noticeable in a number of places showing sharp contracts of dissimilar rocks. However, a large part of the rim is obscured by the breccia mantle. The breccia is singularly sharp and angular with but a small amount of cementing material. The fragments are only slightly altered; schist predominates, a dark sericitic variety of the Pinal schist, while quartzite blocks two and three feet across are not uncommon. Limestone fragments partially altered are seen at the bottom of the Wallace shaft.

A study of the dacitic flows and tuffs suggest intermittent explosions, with periods during which lavas flowed over the walls of the throat, catching up some of the breccia. Angular fragments of schist are seen included in the consolidated flows. Large masses of black dacitic glass, obsidian, the result of rapid cooling or chilling of the outpoured lava, were noted within a few miles of Copper Butte.

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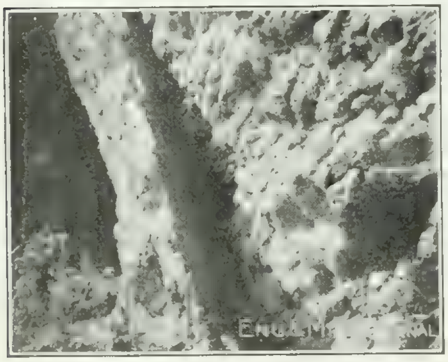
*Geological and Mining Engineer, Los Angeles, Calif.

Copper Occurs in Spaces Between Rock Fragments

The breccia filling the throat and covering the hill slopes to the east is more or less commercially mineralized with copper carbonates and silicates. Sulphides are rare, showing occasionally as minute pyritic grains in the fresh schist. The copper occurs as a staining of a dull earthy brown matrix filling the space between practically unaltered rock fragments. Streaks and patches of chrysocolla are found in the mass while part of the breccia is cemented by the oxides of iron. The oxidized breccia is, however, only a small part of the total brecciated mass which extends northward to Walnut Cañon. Generally speaking, the evidence of solfataric action is slight, although locally and always where ore is developed, limestone fragments are less common. It is probable that the last phase of activity was expressed by feebly active vapors rising through vents and lines of weakness developed in the throat. Limestone fragments were dissolved, granitic particles show impregnation with pyrite and stains of copper silicate.



Dacite-breccia Contact, West Side of Throat

The original nature of the cementing material can only be surmised. North of the Butte, it appears to be merely finer dust-like particles of the same rocks as the included fragments, but to the east of the orebody the breccia shows a cement of dacitic dust with fragments of sanidine, fresh black biotite and occasional quartz particles.

The red ochreous gossan outcrops may be the result of oxidation and leaching of pyritic grains in the schist and granite fragments, although had they been generally pyritized, the sulphuric waters produced by meteoric oxidation would probably have caused more marked alteration of the brecciated rock fragments than is apparent.

Segregation of Copper Pitch Is Noticeable

Two shafts have been sunk in the throat walls, but the work done is insufficient to prove the real value of the ground. Rock fragments cemented by iron oxides were found to a depth of 105 ft., with erratic masses of silicate ore, but below this for 260 ft., unaltered non-mineralized breccia was encountered.

A noticeable feature of the ore-bearing section of this volcanic throat is the segregation of black manganiferous copper silicate—copper pitch. This mineral is common in the dacite fractures of Miami and Ray; it is not a direct oxidation product of sulphides in place, but is of exotic origin. Colloidal silicates of the same composition, however, are frequently found in the upper levels of the Ray Central mine, which on being dehydrated give identically the same analysis. This colloidal chrysocolla at Ray Central, is unquestionably a product of the oxidizing cupriferous sulphides. The source of this mineral at Copper Butte is still obscure but it is found as a coal-black and vivid-green, soft, resinous substance cementing rock breccia and again as nodules in the fragmental mass. It also occurs in thin crusts and films in fault slips throughout the matrix. It may be said that the ore carries a higher percentage of copper than its appearance would indicate.

The Evolution of Ore Flotation

The evolution of flotation methods and their importance in modern mining is treated by Dr. Leo Herwegen, in *Glückauf*, July 27, Aug. 3, 1912 (abstr., *Min. Journ.*, Aug. 10, 1912). Taking all the processes devised, collectively, the author divides them on the basis of their peculiar theoretical points into two main categories: (I) Processes based opon the rising power of solid matter in liquids; and (II) processes based upon the surface tension of liquids and the resistance connected with it. The first category is sub-divided into four groups: (a) Those based upon the power naturally inherent in certain minerals of rising in liquids of higher specific gravity; (b) those based upon the artificially increased tendency to rise conferred upon certain minerals by their capacity of adhesion to certain gases; (c) those based upon the artificially increased tendency to rise conferred upon certain minerals by their capacity of adhesion to oils as well as to gases; (d) those based upon the artificially increased tendency to rise conferred upon certain minerals by their capacity of adhesion to oils, assisted by a vacuum. The second category is subdivided into: (a) Processes based solely upon the resistance of the smooth surface of a liquid; (b) processes based upon the increased resistance inherent in emulsion foams.

The only method which can properly be said to belong to the I(a) group is that connected with an ingenious apparatus patented and introduced by the German Humboldt Engineering Co. It is simple in its principle as well as in its application, and efficient in working. Group I(b) includes several processes worth mentioning; i.e., those of Potter and Delprat, first practically adopted 10 years ago by the Broken Hill Proprietary Co., but since then superseded in favor of more perfect and suitable methods, and the De Bavay and Sutton processes. The third group includes a very large number of practically proved methods; among others, the Leuschner process, adopted at the Friedrichssegen works in Germany (Eng. and Mining Journ., May 11, 1912) the Siegge process, which reduces oil consumption to a minimum; the Hoover and Cattermole methods, and the improved process and apparatus lately introduced by Messrs. Sulman and Picard. A good representative of the fourth group is the Elmore process, which embodies both vacuum and flotation technics. As types of the first group of the second category, Doctor Herwegen describes the Macquisten, Brackelsberg, and Jeffrey methods, while as representatives of the II (b) group he cites the emulsion processes acquired by the Minerals Separation, Limited. All the above-mentioned methods, as well as the different plants for working them, are minutely described by the author, and, regarding the Elmore and the Minerals Separation processes, detailed calculations of installation and working costs are added. In conclusion, the author states that the inventors engaged in the elaboration and evolution of the flotation method have achieved great results within a comparatively short space of time. They have successfully pointed out to the mining industry the ways leading to the cheap and suitable concentration of poor ores, and they have evolved several processes which have become of the greatest importance in judging the payability of numerous ore deposits. An advantage common to all flotation processes, he concludes, is that they make it possible to separate without any difficulty minerals of approximately equal specific weight, as, for instance, zinc-blende from spathic iron, a problem which causes the greatest trouble in all mechanical processes.

The occurrence of alunite in the San Cristobal quadrangle, Colorado, is reported by the U. S. Geological Survey. The mineral is of interest as a possible source of potash.

Churn Drilling in New Mexico

By I. J. Stauber*

In drilling 114 churn-drill holes of a total aggregate depth of 62,208 ft., in the Burro Mountain district of New Mexico, the average cost was $2.18 per foot. Mother Hubbard bits, and rigs 36 ft. high were used. Cast-iron plugs were inserted in crooked holes to guide the bit in straightening the hole.

Attempts have been made at various times to prospect by drilling methods the mineralized area of the Burro Mountain mining district. Owing to the shattered condition of the rock and the many nearly vertical, hard, slip planes, considerable trouble was experienced. The country rock is an altered monzonite porphyry, and, except for slips, dikes, etc., is not very hard. The copper occurs as disseminated chalcocite. Caving, and crooked holes seem to be the most serious difficulty, although the previous unsatisfactory results were mostly due to inexperienced drillers.

Late in January, 1910, two Star 23-T machines were installed to prospect and develop the extensive holdings of the Savanna Copper Co. These two machines were operated almost continuously until Oct. 19, 1911. Each machine was operated two 12-hr. shifts per day; for the first 10 months they were operated seven days per week, and after that no drilling was attempted on Sundays and holidays, except in case of hole trouble, caving or fishing for tools. I might state that this system of "days off" kept the men in much better condition, resulting in a more steady crew and an increased footage per month.

HIGH MASTS DESIRABLE IN CROOKED-HOLE COUNTRY

All-steel Mother Hubbard bits were used, of special design, being especially long and thick. The height of mast, 36 ft. above ground, prevented using anything longer than a 35-ft. string of tools. In a crooked-hole country I am satisfied that a 50- or 60-ft. string of tools would be much better than one only 35 ft. long. In Fig. 1, both the Mother Hubbard and the regular form of bit, are illustrated.

Most of the holes were started with a 10-in. bit, but 11- and 12-in. bits were tried several times. The larger bits seemed to undercut on a small short stem, resulting in a rough hole. Eight-inch casing was used to follow the 10-in. bit, but seldom could be made to follow to sufficient depth to be of much service. No casing was driven. If it did not go down of its own accord, the next smaller size was used. As a result little or no casing was ever lost. The following-bit sizes used were 8-, 6-, and 4½-in., with 6¼- and 4¾-in. steel casing.

It was absolutely necessary to continue each bit size as deep as possible, regardless of any caving. This caused more or less trouble, and sometimes necessitated taking long chances, but was the only means of gaining depth with our limited strings of casing. Of course any time the sludge showed copper, the hole was immediately cased. The thickness of the surface-leached material varied considerably, being from a few to 700 or 800 ft., probably an average of 500 to 600 feet.

Crooked holes and many other troubles can be prevented to a large extent by proper dressing of the bits. With the thermometer around 100° F., in the shade, it is no easy task to dress these bits; hence nearly all drillers are inclined to run a bit too long. A properly dressed bit causes little trouble in the hole. Avoid all moon faces, irregular shapes, etc., and keep water courses open for speed. In many instances fresh bits were put on every five-foot screw, and bits were never run for more than 15 or 20 ft. The bit is an all-important factor in drilling, and cannot receive too much attention.

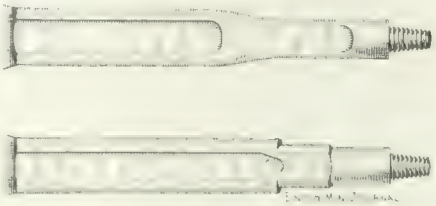


FIG. 1. REGULAR AND MOTHER HUBBARD PATTERN OF CHURN-DRILL BITS

METHODS OF STRAIGHTENING CROOKED HOLES

Of course, crooked holes will occur, and these were straightened by dropping cast-iron or rope into the hole. Either of these materials would hold the tools up and permit a shoulder to be cut. Cast iron seems to be the better, as it is more easily removed when the hole has been straightened. Reamers and straighteners were not of much use, probably on account of the extreme difference in hardness of the two sides of the hole. In particularly difficult cases, blasting was resorted to, but as this always caused a cave, it was avoided if possible. When blasting, great care should be exercised to place the shot properly, or more damage than good will result. Various sizes of tin tubes were used, holding from 50 to 100 lb. of 60% dynamite. One of these tubes was carefully placed at the top of the crook, and then exploded by dropping in a small tin tube, 1½-in. diameter by 18 in. long, containing two sticks of dynamite and two strings of fuse and caps. When blasting under water, the hole should be cleared of casing, otherwise the casing is liable to be split its entire length.

After encountering ore, the upper portion of the hole was cased, and the ore then drilled in sections of 20 ft. each, by drilling ahead for sample, casing, drilling for sample, reaming, etc. Owing to caving, it was not always possible to follow this scheme, but it was the system used when conditions permitted. The hole was sampled every five feet, and all sludge was put through the mechanical splitter shown in Fig. 2. This splitter was designed by me, and, if carefully made, will actually cut to 1/16 and give a reliable sample, as was demonstrated by numerous tests on prepared sludges. Any carpenter can easily make one of these splitters in a day or two. We found cypress to be easily worked and satisfactory for this purpose.

After each foot of drilling, the hole was bailed as clean as possible. When drilling under water, the bailer was run 15 times. This seemed more than was necessary, but insured good results. After going through the splitter, the sludge from this five-foot sample amounted to from one-third to one tub full, depending on conditions. This tub sample was then further reduced by pouring it back through the splitter at its various sections. If the sludge appeared to show ore, it was cut to about four gallons; if not, it was reduced to one gallon. This last sludge was then poured into one-gallon milk cans with tight covers, and hauled to the assay office, usually a mile or more distant. This mud sample was there dried on a large sheet-iron oven, in 10x12-in. drip pans. This final drying, quartering, etc., was done by an assistant directly under the supervision of the assayer. About five cords of wood per month were required for this drying.

COPPER DETERMINED BY CYANIDE AND IODIDE METHODS

All sludges were assayed by the cyanide method, and all assays showing more than 2% copper were checked by the iodide method. Two pulps of every sample were kept, each weighing about 1/3 lb., one being from the assayer's pulp and the other from the dried sludge not bucked down. Five-pound samples were also frequently kept for panning tests. All of these samples were filed in order in a warehouse.

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*Superintendent Savanna Copper Co., Silver City, N. M.

Driller Relieved of Sampling

Two samplers, working 12 hr. each, were kept at the rigs, one working the day and one the night shift. When the drills were not in ore, the drillers took care of the sampling, and the sampler was employed in bringing maps and other data up to date. Sampling is simple work, and can easily be taken care of by the drillers, but their work is apt to be unreliable. Each driller's footage was recorded, and he knew it; he therefore took care of his monthly footage. The sampler's duties were to prevent errors in depth, cleaning splitter, tubs, cans, etc. The driller bases his measurements on the length of rope, which gives a slightly inaccurate result due to stretching of the rope. The sampler checks these measurements with a steel tape. This division of responsibility between the driller and sampler permits the driller to give his entire time and attention to drilling, with no chance for excuses.

TABLE I—COST OF DRILLING AT PROPERTY OF SAVANNA COPPER CO.

	Jan 31,1910 to July 31, 1910		Aug 1, 1910 to Oct. 10, 1911		Jan. 31, 1910 to Oct. 19, 1911	
	Feet drilled 12,032		Feet drilled 19,072		Feet drilled 31,104	
	Number of holes 29		Number of holes 28		Number of holes 57	
	Average depth 415 ft.		Average depth 681 ft.		Average depth 545 ft.	
Labor	Amount	Per ft.	Amount	Per ft.	Amount	Per ft.
Runners	$3,964.25	$0.329	$9,097.22	$0.477	$13,061.47	$0.420
Helpers	2,691.37	0.224	5,865.00	0.307	8,556.37	0.275
Assaying and sampling	1,816.33	0.151	4,551.87	0.239	6,368.20	0.204
Teaming	532.87	0.044	1,425.56	0.075	1,958.43	0.063
Foremen	1,018.75	0.085	1,773.85	0.093	2,792.60	0.090
Clerks	225.00	0.019	551.08	0.029	776.08	0.025
Roads	1,377.46	0.114	1,095.10	0.057	2,472.56	0.080
Total Labor	$11,626.03	$0.966	$24,359.68	$1.277	$35,958.71	$1.157
Supplies						
Fuel and coke	$2,760.62	$0.229	6,496.30	$0.341	$9,256.92	$0.298
Oils and grease	64.73	0.005	507.79	0.027	572.52	0.018
Road supplies	76.28	0.006	36.17	0.002	112.45	0.004
Cables and sand lines	528.31	0.044	2,697.37	0.141	3,225.68	0.104
Drill tools and repairs	650.72	0.054	2,536.12	0.133	3,186.84	0.102
Surface tools and repairs	48.14	0.004	361.20	0.019	409.34	0.013
Repairs to machine and boilers	188.18	0.016	795.57	0.041	983.75	0.032
Lighting	116.94	0.010	146.56	0.007	263.50	0.008
Barn supplies	273.50	0.023	793.09	0.042	1,066.59	0.034
Building material	186.87	0.016	282.78	0.015	469.65	0.015
Chemicals and engineering supplies	179.21	0.015	740.44	0.038	909.65	0.029
Stationery and printing	28.40	0.002	45.35	0.002	73.75	0.002
Telagrams	47.11	0.004	47.82	0.003	94.93	0.003
Transportation	345.35	0.028	410.95	0.022	756.30	0.025
General supplies	71.21	0.006	607.59	0.032	678.80	0.022
Depreciation	1,200.00	0.100	3,275.00	0.172	4,475.00	0.144
Casing	61.65	0.005	749.95	0.039	811.60	0.026
Total	$6,827.22	$0.567	$20,520.05	$1.076	$27,347.27	$0.879
Pumping Plant						
Labor	$870.75	$0.072	$1,226.35	$0.064	$2,097.10	$0.068
Fuel	815.17	0.068	812.41	0.043	1,627.58	0.052
Oils and grease	21.76	0.002	91.59	0.005	113.35	0.004
Repair to pump	31.56	0.003	65.74	0.003	97.30	0.003
Repairs to pipe line	77.20	0.006	368.73	0.019	445.93	0.014
Total	1,816.44	$0.151	$2,565.82	$0.134	$4,381.26	$0.141
GRAND TOTAL.	$20,269.69	$1.684	$47,444.55	$2.487	$67,714.24	$2.177

Everything consistent with good management was done to make the work agreeable. The drillers were protected by a rough, iron housing. This shed and platform, while costing but little, furnished satisfactory protection from the weather, and could be used over and over again. The bunk and boarding houses were kept to a high standard—so high in fact that they were operated at a loss, but the loss was more than offset by the steady crews and the final cost sheet. We considered a driller to be of little or no value until he had completed at least two holes, and had learned the peculiarities of the formation. Both drills were kept close together whenever possible, for convenience in sampling, repairs, water, teaming, casing, use of the fishing tools, and general economy.

All sludges were panned at drill by the sample man, and all details noted in book form. The report sheets of the holes were forwarded to the eastern office upon completion of the holes. Daily cards were also forwarded, showing the latest information on each hole.

Analysis of Cost Sheet

The costs of 20 months' drilling are shown in Table I. Table II is a schedule of time consumed for the different operations and Table III is the scale of wages paid. During the first 16 months of drilling, the foreman looked after the rigs and repairing; for the remaining 4½ months this foreman was also a drill runner. With more than two rigs, we consider it advisable to have a man to act as foreman only.

Regular drilling-machine boilers were used for the first 14 months; for the remaining time we used 20-hp. auxiliary boilers, mounted on wheels. After the installation of these latter boilers, the regular boilers were used for moving only. This arrangement effected a coal saving as follows:

Coal per machine, per 24 hr., regular boilers.	1.37 tons@$8.30 = $11.37
Coal per machine, per 24 hr., auxiliary boilers..	1.07 tons@$8.30 = $ 8.88
Saving	0.30 tons or $2.49

The above data were calculated for full period of drilling, 20½ months, using steaming hours only.

For the first 13 months depreciation was calculated at $100; for the remaining 7½ months at $150 per machine per month.

The cost of the machines, fully equipped with tools, rope, fishing tools, boilers, etc., all on the ground, erected and ready to drill with, was $7499.73. This cost, however, does not include any casing. Both machines, after more than 20 months' use, are today in fair condition. I therefore consider $125 per machine per month a proper depreciation charge, provided one contemplates considerable drilling. After the machines were thus fully equipped as above, all tools, repairs, supplies, etc.,—in fact everything sent to either rig, was charged out directly against it. Casing was charged out monthly as lost or destroyed.

TABLE II—TIME TABLE OF 20 MONTHS DRILLING

Time of drilling	20 mo.
Total feet drilled	31,290 ft.
Possible hours drilling [1]	27,024 hr.
Progress per hour of possible time	1.15 ft.
Actual hours drilling	13,342 hr.
Progress per hour of time drilled	2.09 ft.

Lost Time

	Hours	%
No water	782	2.9
Repairs (machine or tools)	1531	5.7
No help	1041	3.8
Fishing	1314	4.9
Casing and pulling casing	1472	5.4
Moving and erecting	2904	10.7
Reaming and bad hole	2482	9.2
Miscellaneous (rain, sickness, etc.)	231	0.9
Total time lost	11,757	43.5

[1] Possible machine hours for two machines per total time of drilling deducting only Sundays, holidays and a short period when drilling was discontinued.

TABLE III—SCALE OF WAGES

Drillers	$6 per day of 12 hr.
Helpers	4 per day of 12 hr.
Samplers	$110 per month
Mexican labor (roads etc.)	$1.75 per day of 9 hr.
All supplies hauled by wagon 14 miles	$3.50 per ton.

Detail costs were kept of each hole. The cost per foot appears to increase directly with depth, but, on plotting our cost per foot with depth, too much irregularity was found to determine any positive relation. Our last three months of drilling, a total of 6258 ft., was in unusually favorable ground. The average depth of hole for this period was 782 ft., at a total cost per foot of $1.98. The item of pumping is rather high, as the water is not exceedingly abundant in the district. Our water supply was at times inadequate and required steady pumping. The water was pumped from two to four miles, and this long line of pipe, uncovered and over rough country, caused serious trouble and delays, especially in freezing weather. The water requirements amounted to from 1000 to 3000 gal. per machine per 24 hr., depending on size of hole and whether drilling above or below water-level.

There is as yet little activity in the Burro Mountain mining district. Up to the present, nearly all operations have been confined to development. The Burro Mountain Copper Co. has a 300-ton mill, but this has not been in operation since 1908. The Burro Mountain Copper Co., Chemung Copper Co. and Savanna Copper Co., the three leading companies in the district, each have a large tonnage of commercial ore developed. With the present condition of the copper market, it is probable that the district will soon see greater activity.

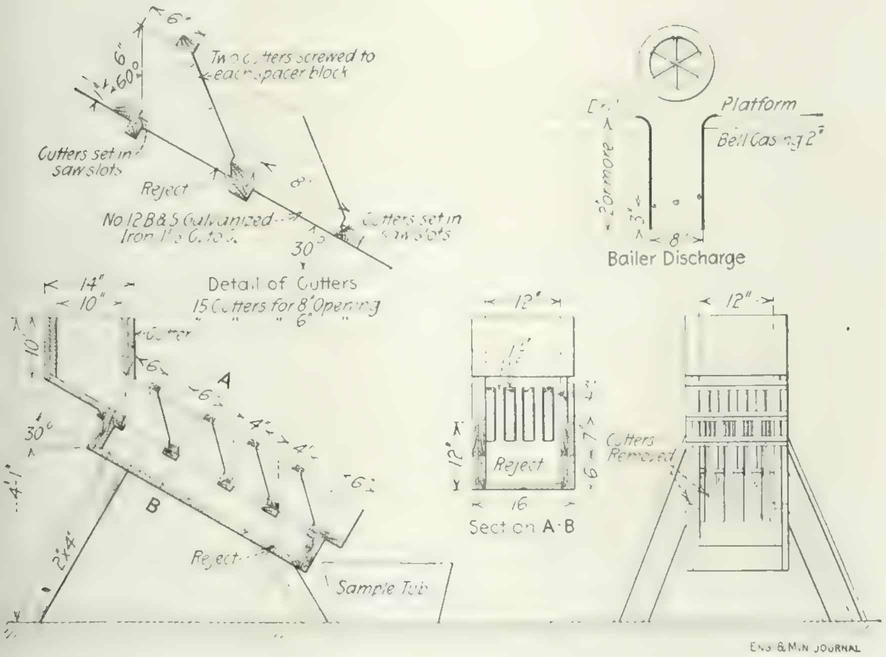


FIG. 2. DETAILS OF SAMPLE CUTTER FOR CHURN-DRILL SLUDGE

Longitudinal Railway of Chile

The completion of the Longitudinal Railway from Santiago to Iquique promises much for the mining interests in the north of Chile. The work is progressing rapidly and should be completed by 1914, when a large section of rich mineral lands will be provided with good transportation facilities. The following quotation, taken from the *South Pacific Mail*, of Valparaiso, gives the views of Arthur MacDonald, the Canadian engineer connected with the Northern Longitudinal Railway. In his opinion the copper mines which abound in the Province of Antofagasta will necessitate the construction of at least one smelting establishment in Antofagasta, as the service of the Longitudinal Railway will insure the carrying of ore to the coast. All the mine owners are anxious that smelting works be established, to enable them to sell their ore at prices equal to what they would receive in European markets. He further asserts that there are now sufficient nitrate grounds to warrant the working of 10 more large *oficinas*. American interests are now examining mining properties in that section of the country.

Preservation of Mine Timbers

The Forest Service of the U. S. Department of Agriculture, in Bulletin 107, by E. W. Peters, gives some interesting data on the preservation of mine timbers. A few extracts are given herewith. The wood-preserving plant of the Anaconda Copper Mining Co., erected at Rocker, Mont., with a capacity of about 570 cu.ft. of timber per run, has the following equipment: One treating cylinder 43 ft. long by 6 ft. in diameter; workng pressure, 100 lb. per sq.in.; one receiving tank, 47 ft. long by 5 ft. in diameter; two measuring tanks, 12-ft. diam. by 17 ft. high; one general service pump, 360 gal. per min., at 125 lb. per sq.in.; one pressure pump, 60 gal. per min., at 125 lb. per sq.in.; one vacuum pump, 7x10x6 in., and jet condenser; 18 cylinder cars and one hoist engine. The total cost of this plant erected was approximately $15.000.

In the accompanying table is given the detail of the cost of untreated and creosoted 8-in. Douglas fir shaft sets placed in the mines of the Anaconda company. These sets contain 1127 b. ft. of squared Douglas fir timbers from the Pacific coast, and 393 b. ft. of lagging. The average absorption secured in the treatment of these timbers amounted to 4.5 lb. of creosote per cubic foot.

COMPARATIVE COST OF UNTREATED AND TREATED TIMBER SETS

Cost of untreated sets	
1127 ft. b.m. squared timbers, at $20.50 per M b.m.	$25.36
Framing timbers	13.50
Lagging, at $15 per M	5.90
Switching and unloading charges	0.85
Cost of placing set	18.00
Cost of untreated set in place	$63.61
Cost of treatment:	
Treating, including interest, depreciation, fuel and labor charges	3.34
Creosote, at 15.6c. per gal	8.03
Loading and unloading charges	1.23
Total cost of treatment	$12.60
Total cost of treated set in place	$76.21

From this example it is seen that the cost of treating timbers, while a considerable item, does not, when taken in conjunction with the cost of the timber and its preparation and placement, form an unduly high proportion of the whole cost. The actual cost for other mines will, of course, differ more or less from these figures, but they serve to illustrate the relation between the cost of treated and untreated timbers.

LIFE OF TREATED AND UNTREATED TIMBERS

From various experiments carried on in coal mines the following conclusions are given:

(1) All of the untreated material failed within from one to three years, while brush-treated timber remained serviceable from three to four years.

(2) The life of untreated peeled loblolly and short-leaf pine was from 10 to 15% greater than similar unpeeled material.

(3) In dry, well-ventilated workings the average life of untreated seasoned loblolly pine was approximately 25% greater than that of similar green material. In wet places seasoned timber did not appear to outlast unseasoned material.

(4) Loblolly and short-leaf pine, brush-treated with coal-tar creosote and Avenarius carbolineum, proved to be from 50 to 100% more durable than untreated material. Moreover, brush-treated loblolly and short-leafed pine proved more serviceable than untreated long-leaf pine, pitch pine and red oak and black oak. Brush treatment with Avenarius carbolineum was somewhat more effective than similar treatment with coal-tar creosote.

(5) The condition of timber treated by the open-tank process with sodium and magnesium chloride, although not comparing favorably with that of timber similarly treated with other preservatives, was better than that of brush-treated timbers.

(6) Open-tank treatment of green timber with zinc chloride proved fairly effective, but tests indicate that better results will be secured with seasoned tim-

ber. A chart shows that 13% of the green timber treated with zinc chloride by the open-tank process showed marked signs of decay after four years, while no decay was found after the same period of service in seasoned material similarly treated.

(7) With the exceptions noted, none of the impregnated timbers showed signs of decay after from three to four years' service, although some of them had failed from crushing and squeezing.

(8) In some cases impregnated timber, re-framed after treatment, showed signs of decay. This was probably due to the cutting away of treated material and the consequent exposure of untreated portions of the timber.

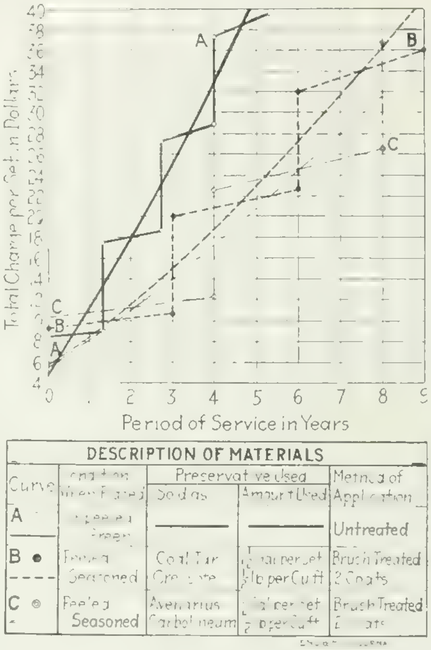
COMPARATIVE COST

The chart reproduced herewith shows graphically the comparative cost of untreated and brush-treated loblolly pine gangway sets after various periods of service. The charge includes the cost of installation and maintenance, plus simple interest at 5% on the investment, and was derived from cost data as published in table 3 of the bulletin and the figures for average life secured from the experimental sets placed in the mines of the Philadelphia & Reading Coal & Iron Co. The broken lines show the actual expenditures for a gangway set of average life. Thus the original cost of a green unpeeled and untreated loblolly pine gangway set, including removal of old timber and placement of new ones, amounts to about $8.50. The average life of such a set is about one year and four months. At the end of this period the simple interest charge on the expenditure amounts to 57c., making a total of $9.07 up to that time, as indicated on line A. To this must be added a replacement charge of $8.50, which is indicated by the vertical rise in the line; the total charge for the two installations and the maintenance and simple interest on the first installation up to this time amounting to $17.57.

After a period of two years and eight months the interest charges on the cost of the first installation amount to $1.14 and on the first replacement to 57c., making the total cost up to that time, $18.71. A second replacement is then necessary, the cost of which is again shown by the second vertical rise in the line. Thus the increased interest charges are represented by the increase in the slope of the lines connecting the vertical rises in the broken line, while the vertical rises represent the successive replacement charges. Lines B and C, showing the cost of brush-treated sets, are derived in a similar manner. If a number of sets are considered it is unlikely that all of them will fail at the same time, and for this reason the average expenditures are better represented by the smooth curves shown in the diagram.

SUMMARY

The results of the investigations discussed in the bulletin are summarized as follows: Decay is, in general, the agency most destructive to timber used in mines. Although decay may often be retarded by peeling and seasoning, treatment with a suitable preservative is more effective. The average life of green, unpeeled, and untreated loblolly-pine gangway sets, under the conditions of the experiments discussed, was less than one and one-half years; brush treatments with creosote and carbolineum increased this to three or four years, while impregnation treatments with zinc chloride and creosote left from 70 to 90% of the timbers sound at the end of four years.



COMPARATIVE COST OF BRUSH-TREATED AND UNTREATED LOBBOLLY PINE SETS

The use of treated timbers results in a saving in the cost of maintenance of workings and a reduction in the amount of timber required and makes possible the utilization of inferior species of wood.

Brush treatments are economical when the amount of timber to be treated will not warrant the erection of a small open-tank or pressure plant, or when only a short increase in service is required. The open-tank process is adapted to the treatment of small quantities of easily impregnated timber; when a large amount of timber is to be treated, a pressure plant should be used. Mine timbers impregnated with zinc chloride and creosote oils have shown the best results, up to the present no difference in their durability being noted. An efficient system of inspection and supervision in the use of timber will reduce waste and result in considerable economy.

Electric Smelting of Arsenical Copper Ore[*]

The following experiments were performed on an ore carrying SiO_2, 20.3%; Cu, 10.1; Fe, 27.10; Al_2O_3, 9.45; As, 9.25; Mn, 0.48; S, 15.0; Co, 0.116%; and small quantities of Bi, Ag and Au, to see what advantages electric smelting promised over the ordinary methods. The first experiments attempted to produce coarse copper by reaction smelting, for which a portion of the ore was roasted until the product showed SiO_2, 22.5%; Cu, 10.5; Fe, 34.6; Al_2O_3, 11.5; As, tr; Mn, 0.5; S, 1.5 per cent.

The first trial attempted to produce only metallic copper, using a shaft furnace, the upper electrodes being of carbon, the lower of copper. The charge melted easily, evolving large quantities of sulphurous and arsenious acid, and some metallic sulphur, and the slag was liquid. The copper electrode was too greatly corroded, however, and in the next trials the quantity of roasted ore was increased. Under these conditions the copper produced was mixed with speiss, much matte was formed, and the slag was high in copper, so the idea was given up in favor of matte smelting.

The experiments on matte smelting were carried out in a black-lead crucible. A hole was bored in the bottom through which one electrode entered, the joint being made with gas tar. The other electrode entered through the cover, and at the start a pencil of carbon was inserted between the electrodes. A pipe inserted in the side of the crucible toward the top led to a dust chamber, in which it was hoped to collect arsenious sulphide.

In this smelting no speiss was obtained. The matte carried: Cu, 21.37% Fe, 50.27, S, 28.39%. The slag was glassy and assayed 0.15% Cu. The ore smelted was 3.62 kg.; the power consumed, 9.6 kilowatts-hours; so that, as the ore carried 0.35 kg. copper, this is equivalent to 27,500 kilowatt-hours per ton of ore smelted. The matte recovered amounted to 1.6 kg., containing 0.342 kg. copper. There was 0.85 kg. of slag carrying 0.001 kg. copper, leaving the unexplained loss of copper 0.007 kg. The sublimate amounted to 0.35 kg. carrying 60% As, a saving of 65.6 per cent. Experiments were then made to find the best tenor of matte to produce, the following points being considered: cost of roasting; cost of smelting; loss of copper in slag; cost of matte and speiss treatment. The results obtained pointed to a mixture of about 60 to 70% of roasted ore, and that it was advisable to clean the slag by addition of a little raw ore after the smelting was over.

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[*] Abstract of a paper in Metallurgie, Vol. 8, Part 19. Translation by O. H. Hahn.

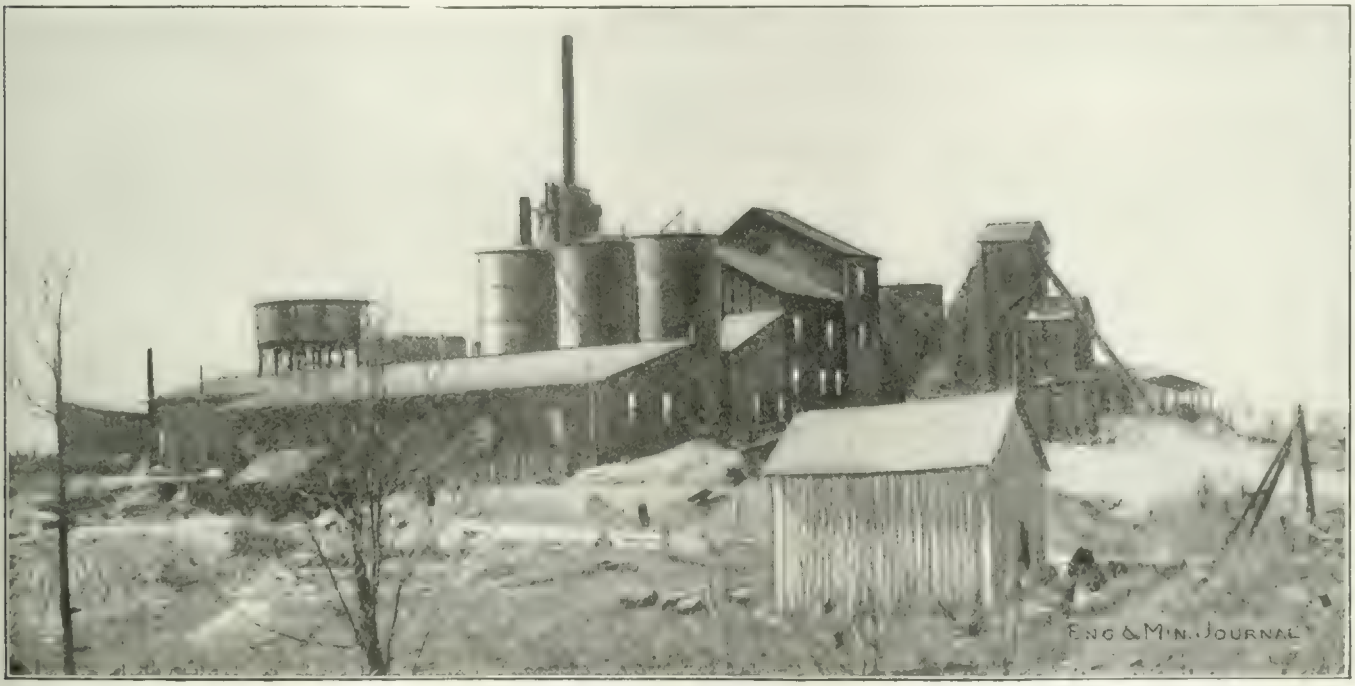
Iola Cyanide Mill, Candor, N. C.

By Percy E. Barbour*

In a distinctly agricultural district in the South is found a modern, all-slime cyanide mill. It is equipped with 1750-lb. stamps, Parral agitation tanks, pressure filter and every modern accessory. The labor, however, is particularly inefficient for mining purposes.

It is a far cry to the time when North Carolina was the first gold-producing state of the Union, yet that is a cherished boast of some North Carolinans. When, three years ago, a well known New York mining capitalist started the financing of a gold mine in this state, his friends said it sounded about as attractive as a banana plantation in Butte. The result, however, is a mine which ships between 40 and 50 lb. of gold bullion semi-monthly to the mint from a new mill, which is not only modern in every detail, including the latest types of machinery in every department, but which has the distinction of having the heaviest stamps in the United States.

Through the courtesy of William F. Mack, the manager, and Arthur B. Parsons, the superintendent, I am glad to be able to furnish some interesting details of this mill and to state the remarkably low milling costs, which would be a credit to a modern mill in a district where the labor is much more efficient than it is here in the cotton country.



Iola Cyanide Mill, Candor, Montgomery County, N. C.

Early History

The Iola mine and mill, operated as the Candor Mines Co., are situated about three miles from Candor, Montgomery County, in the south-central part of North Carolina. The surrounding country is an agricultural one; where corn and cotton thrive and on some plantations are raised scientifically on an extensive scale; where large peach orchards ship carloads daily; where negro and white labor work together harmoniously, and almost equally inefficiently, when they are not working on the crops; and where the scarcity of labor in general is appalling.

The early history of the Iola was much like the early history of a Western mine in every way, as the variety of shafts, old stone chile mills, and other mill and mining machinery on the company's scrap heap all testify. The mine was named in honor of the lady who furnished funds for the early efforts of the project, and who bore the euphonious name of Iola Oyster. The last touch of Western realism is added to this mining district in the cotton belt by noting the small Macedonian graveyard, near the mine, said to contain nineteen killed in fair fight or murdered, which makes even Pioche look to its laurels.

Ore Washed and Sorted

The present mill has been in operation continuously since its completion, in August, 1911. Sixty-two tons of ore per day are hoisted and dumped from an inclined skip over a 1¾-in. grizzly at the top of the headframe. The undersize drops to a bin in the lower portion of the headframe structure. The oversize is washed on a picking floor at the foot of the grizzly by negroes who learn to do it so dextrously, with buckets of water as the ore falls from the skip, that no delay is occasioned and the rock is cleaned so that about six tons of waste can be picked out by hand. The ore is then crushed to 1¾ in. in a 15x9-in. Blake crusher. The crushed ore drops into the bin with the undersize through the grizzly, from which bin it feeds to an 18-in. belt conveyor. This conveyor belt, 80 ft. long on centers, and inclined 22°, is also the picking belt. At the lower end, a fine water spray cleans the ore again and enables the pickers, seated along the belt, to pick out about six tons more of the slate. The elevator discharges into a 100-ton flat bottomed bin. Thus to get 50 tons of ore into the mill bin, 62 tons are hoisted from the mine. As a matter of fact, if there were sufficient reliable labor, five tons more waste could be picked from the 50 tons which are now fed to the stamps through suspended Challenge feeders.

Underground sorting is unsatisfactory for several reasons. The vein is narrow, averaging about 24 in. and is frozen to both walls, which are greenish-gray slate. The mine is very wet and the ore is so muddy that it is impossible to sort it satisfactorily underground, and owing to the pieces of slate being frozen to the quartz, crushing has to be done before the final sorting, which latter has to be under the eye of the mill boss or the waste becomes low-grade ore.

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*Manager, Uwarra Mining Co., Candor, N. C.

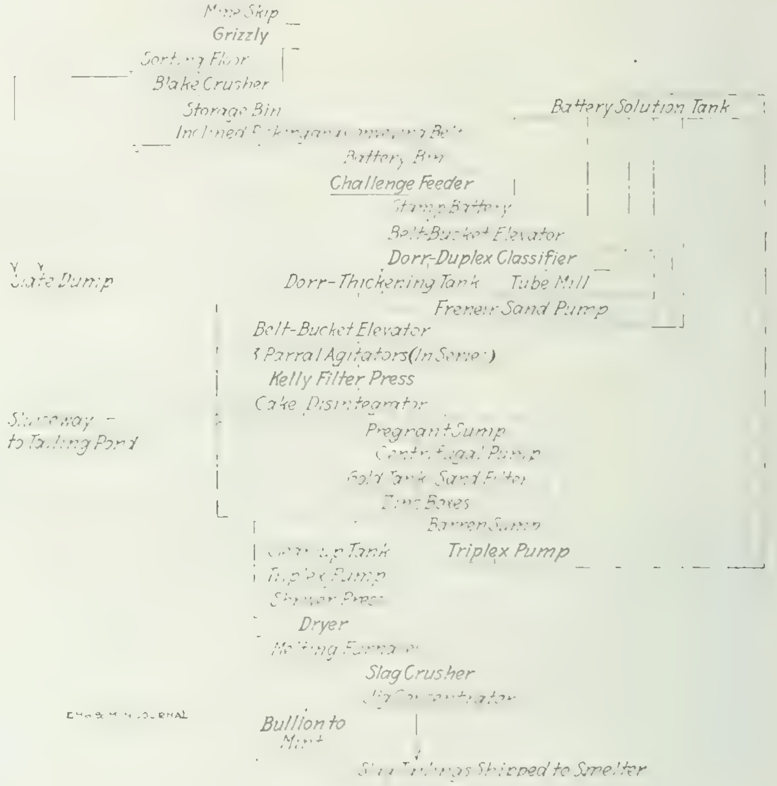
There are two kinds of ore treated, which require radically different treatment of themselves, but cannot be mined and treated separately under local conditions and therefore have to be mixed just as they come from the stopes. The ore from the upper levels is oxidized and the accompanying waste is a soft clayey brown slate. In the lower levels the ore is a very tough hard clay quartz with a pearly luster, and the country rock to which the vein is frozen is a tough gray slate. The unavoidable mixing of this ore as it happens to come out of the mine complicates the treatment problem, and more, also, the purely mechanical manipulation of the machinery adjustments.

The 1750-lb. Stamps Crush from 10 to 12 Tons per Day

The battery has five 1750-lb. Allis-Chalmers stamps which have a 7 to 7½-in. drop and make 107 drops per minute. The weight of the stamps is distributed as follows: Stem, 4 in. x 15 ft., 635 lb.; tappet, 215 lb., boss head, 650 lb.; shoes, 9¼x14 in., 250 lb. The cam shaft is 7 in. in diameter. The mortar box is of the narrow El Oro type and weighs 10,500 lb. The boss heads extend above the mortar, which has no housing above the screen frame.

The original set of chrome-steel shoes and dies crushed 4000 tons of ore. A new set of chrome-steel shoes was put on, and dies, cast at a local foundry from a mixture of old chrome-steel dies and common pig iron, were used. These dies were hard enough but were brittle and did not wear out the new set of shoes and were replaced with all cast-iron dies, also cast locally. The second set of shoes now being worn out is being replaced, and the cast-iron dies, while not worn out, are being replaced with a set of chrome steel, as at first used. The cost per pound of locally made dies was considerably less, but the cost per ton of ore crushed was approximately the same as when the chrome steel was used.

The battery screen originally used was 4-mesh. This screen was found to be entirely too coarse for the capacity of the 4x20-ft. tube mill, and a Tyler "ton-cap" equivalent to 8-mesh went to the other extreme and failed to load the mill to capacity. At present a double-crimped Tyler screen, with openings one-sixth of an inch, wire 0.120-in. diameter, is being used. The ratio of solution to ore is approximately 6:1. Under these conditions the capacity of the stamps per 24 hr. when crushing hard ore alone averages 10.5 tons, which is rather low for such heavy stamps. The extremely tough character of the ore is the only explanation. During the month of June, just passed, when 15% of the ore came from the upper workings of the mine, the duty increased to 11.9 tons. While the mine does not produce in excess of the capacity of the mill, 50 tons, and there is accordingly no necessity for increased capacity at the present time, there is no doubt that a 5x22-ft. tube mill, allowing a 4-mesh battery screen, a larger solution ratio, and closer feeding, would make possible a stamp duty of 15 to 16 tons, and would result in more economical operation.



Flow Sheet of Iola Mill, Candor, N. C.

Battery Construction

The mortar block is a concrete monolith reinforced with steel rods. It has a tunnel through it into which all holding-down bolts extend; the latter can, therefore, be replaced if necessary without moving the mortar box. There are eight 2-in. bolts for the mortar box and eight of the same size for the shoes for the battery posts. The cross-section of the mortar block is unusual and would seem to be weak structurally at the foot of the batter across the short dimension to the bolt tunnel, but the block has stood a year's pounding of the heavy stamps, which seems to allay criticism. The concrete mixture for the block was 1-2-4. A rubber pad, ¼ in. thick, is used between the block and the base of the mortar box.

At the end of 11 months' operation not a single stem nor tappet nor boss head had been broken. The only breakage about the battery was a 7-in. camshaft, which gave out after eight months' use, due chiefly to a flaw in the material. One cam was broken in removing it from the shaft, but other than this no cams have been broken. A scheme is being tried to damp the vibration of the free end of the camshaft by means of a lever of oak bearing upon the shaft with the free end held down by means of an old spiral crusher-spring. This does away with most of the vibration, and is expected to increase the life of the shaft. as well as the bearings and the battery. posts.

Regrinding the Battery Pulp

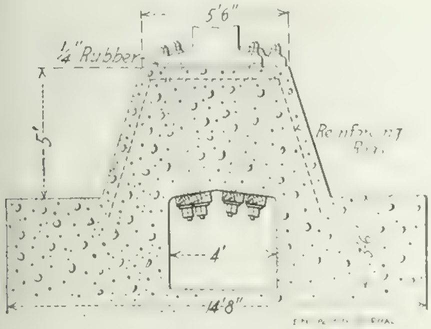
The strength of the mill solution averages 1.3 lb. KCN per ton and the protective alkalinity is 0.6 lb. per ton, in terms of CaO. The battery pulp is elevated by a 12-in. bucket elevator, with special extra-heavy grit-proof bearings, designed by Bernard MacDonald, to a standard double-rake Dorr classifier. Owing to the hard and tough character of this ore, the slime is always granular, even when it passes 200 mesh (it is never colloidal), and it settles quickly and compactly. Therefore it has been found necessary, in order to obtain a comparatively clean sand for the tube-mill feed, to supplement the spray pipes in the bottom of the classifier with an additional pipe put in above the rakes. The Dorr-classifier overflow goes to a Dorr thickener and the classifier discharge drops directly into the feed hopper of a spirally fed 4x20-ft. Allis-Chalmers tube mill.

The tube-mill lining is of the Montana Tonopah cast-iron ribbed type. The first set of liners at the head end wore entirely through in eight months, which gives an idea of the abrasive character of the ore. This mill makes 31 r.p.m. The best Danish pebbles are used which cost between $18 and $19 per ton at the mill. The pebble consumption for the first four months of this year averaged 3.45 lb. per ton of ore crushed. The sand from the Dorr classifier contains 29% solution and 10 to 11% more is added to give the tube-mill pulp 39 to 40% moisture.

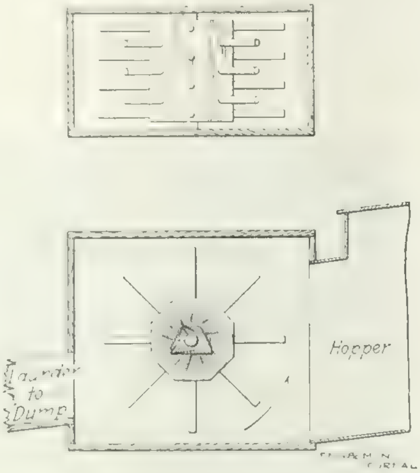
The tube-mill product is returned to the Dorr classifier by a 6x48-in. Frenier sand pump operating against a vertical head of 12 ft. The pump to date has run without any trouble and without any repairs other than the renewal of a pinion and a packing joint.

Treatment of the Pulp

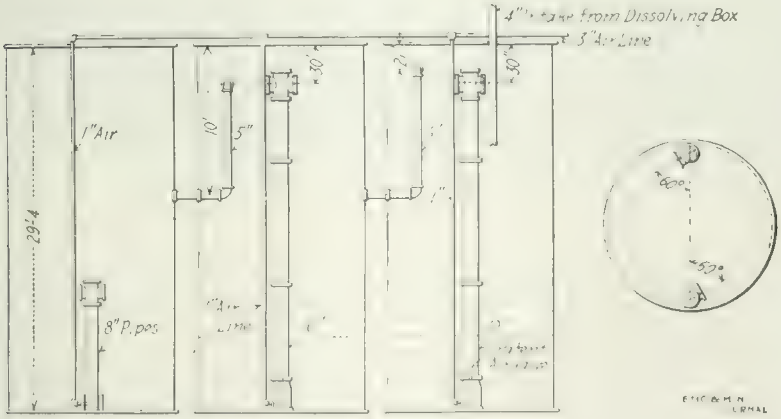
The overflow from the classifier goes to a steel tank, 18 ft. diameter by 8 ft. deep, equipped with a Dorr continuous thickener. This thickener is not allowed to discharge continuously but is drawn off at intervals of 30 min. Then only the thick pulp is withdrawn, fresh circulating solution being added to bring the specific gravity down to about 1.38, the most satisfactory consistence of pulp for agitation here. The pulp discharges through a 12-mesh screen-bottomed tray into a boot of a second bucket elevator. This screen catches nearly a bushel basket full of fragments of wood, which get into the ore in spite of the ore pickers, who should remove such material. This second elevator, similar to the first, carries the pulp to the top of the No. 1 Parral tank. At the boot of the elevator additional lime is added in the form of an emulsion at the rate of 0.5 to 2 lb. per ton, depending upon whether the ore comes from the bottom of the mine or the softer oxidized workings nearer the top. This pulp is discharged into the first Parral tank through a cone, made from an old cone classifier, which has a pipe extending 5 ft. below the surface of the contents of the tank. This is done to make the fresh pulp go into the cycle and to prevent any chance of short-circuiting. Fresh cyanide is introduced into the system at this point, being placed on a screen in the bottom of the cone where it is dissolved by the pulp splashing over it. The cyanide is added every four hours at the rate of about 0.5 lb. per ton of dry slime.



Concrete Mortar Block



Filter-cake Disintegrator



Arrangement of Parral Tanks at Iola Mill

There are three steel Parral tanks, each 13 ft. diameter by 29 ft. high, with a capacity of 55 tons of dry slime in pulp of the average consistence. The first two tanks are arranged for continuous agitation and the pulp therefore gets an agitation treatment of more than 48 hr. before it goes into the third tank, which was originally a Parral but which has since been changed. The air-lift pipe in this third tank has been cut off one-third the way up from the bottom because this tank acts as a storage tank for the slime filter, which runs only during the day shift, being full in the morning and below the top of the air-lift pipe at night. The pulp, therefore, gets further agitation in this tank, making the total time of agitation equivalent to about 52 hr. However, 90% of the total extraction takes place in the first tank. These Parral tanks are the usual type with the two air lifts near the circumference of the tank with their discharges pointed away from the diameter; the accompanying engraving shows the details of the various connections together with sundry dimensions. These tanks each have a false bottom, shaped like a peaked roof, made of wood. They are arranged so that either can be cut out and the contents filtered.

A third Parral tank, which serves the dual purpose of an agitation and a storage tank went through an interesting change from its original form. Inasmuch as the filter is operated only during the day shift, this storage tank is during the night accumulating the slimes crushed during that shift and is slowly filling; the reverse takes place during the day when the tank is being slowly emptied. Originally the tank was equipped with two air-lift pipes, similar to those in the other two tanks, except that the top tee was only about one-third the way up the tank. The discharge pipe to the filter was in the center of the bottom of the tank, so that no false bottom could be put in. The result was that the sand packed around this discharge and caused much trouble in keeping the pipe line to the filter open. To obviate this, one of the lift pipes was put over the center of the tank and the other lift pipe disconnected, with results which justified making this arrangement permanent. The slime has naturally packed high along the circumference of the tank, and, sloping downward toward the center, has built up a nearly perfect inverted conical bottom, so that to all intents and purposes it is now operating as a Pachuca tank. One would hardly look in the field of agitation tanks for an exposition of a Darwinian theory, but this seems to be clearly an example of "reversion to type."

Kelly Filter Used

The separation of the slime and pregnant solution is effected in a Kelly pressure filter, size No. 1 B, which easily handles the total tonnage in less than 12 hr. The cycle of operation is: Filling press, 2 min.; forming cake, 3 to 6 min., depending upon condition of leaves; returning excess pulp, 2 min.; filling with wash pulp, 2 min.; filling with wash water, 2 min.; Washing, 1½ to 3 min.; returning wash and drying, 3 min.; discharging, 12 min.; total length of cycle, 25 to 30 minutes.

The filter treats 2.2 tons per charge. The dissolved gold in the tailing varies from 2 to 15c. and averages about 7c.

per ton. A solution wash was tried, but the additional time and labor required did not justify the slight additional saving of dissolved gold, so that water is the only wash used at present. The tailing discharged from the filter leaves contains about 20% moisture.

Disintegration of Filter Cake

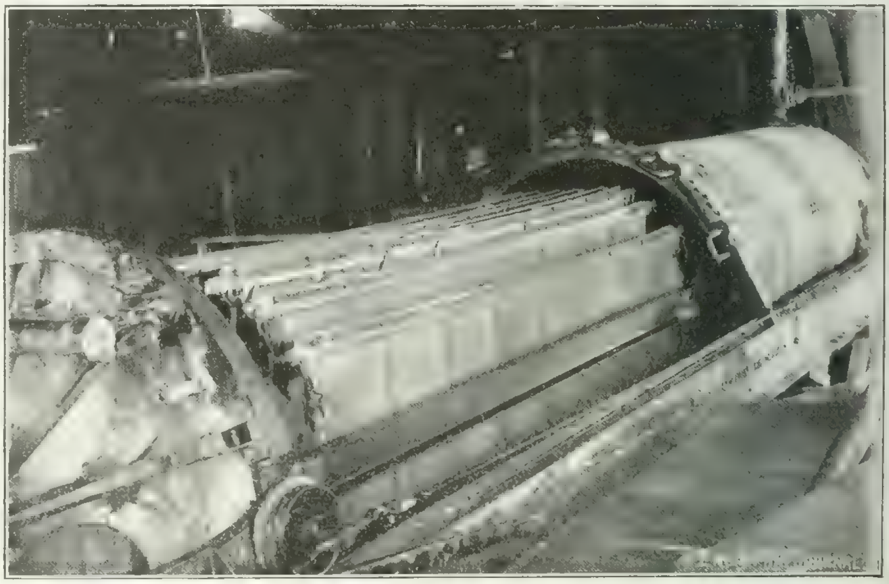
Built, as found necessary with this plant, on almost level ground, the problem of disposing of the tailing gave some trouble. There is a fair supply of water available, but not enough to carry the tailing through the long wooden launders with only a slight grade until the tough cake is completely broken up. At first this breaking up was accomplished by a real "down South hoeing nigger," who worked in the hopper with a hoe, but this was an unsatisfactory combination. A cake disintegrator was devised, consisting of an oak log stuck full of wooden pegs arranged at right angles to the flow of the tailing and revolved 70 times per min. by belt and pulley. This disintegrator is at the very mouth of the discharge hopper and revolves so that the pegs tend to lift the cake up and carry it over the top of the log. The disintegrator is housed in to prevent splashing. It is an extremely simple, almost crude device, but it works perfectly and saves the labor of one man per day with an inconsiderable expenditure of power. Since the installation of this device the work of sluicing has fallen to the solution man, who is able with a fire hose and a good head of water to discharge the cake from the filter leaves in three to four minutes, the disintegrator doing the rest. The total water used in flushing away this tailing is about two tons per ton of dry slime.

Every 20 to 25 days the filter leaves are washed in a 0.5% HCl solution. They are not treated in the filter drum as the Kelly company recommends, but are put in a vat and the solution is forced through them in the same direction as the water, which forces the cake off the leaves. This treatment continues 24 hr. Another reason the leaves are treated outside the filter drum is because a good scrubbing has been found to put the leaves in much better condition for being returned to service. Duplicate sets are kept on hand and it takes less than an hour to change a set.

The pulp and the wash water are handled wholly by montejus, no pumps with moving parts being employed in connection with the filter. The mill which antedated this one, which was burned, had a revolving-drum continuous vacuum filter, but the results were unsatisfactory, due to the fact that the ore makes no colloidal slimes. As before stated, when ground to 200 mesh, the product is all distinctly granular, and this product not only did not make a good cake despite all efforts, but owing to the rapid settling of the granular slimes the tank in which the drum revolved would build up with this settled slime, so that every week it was necessary to shut down and sluice out this tank and lose the entire contents. Several air jets for agitating the pulp in the tank were tried without overcoming the difficulty. The management point to this as a striking example of the superiority of the pressure filter over the vacuum filter for this particular ore.

Precipitation by Zinc Shavings

The pregnant solution from the filtered slime goes to a gold tank, from which it is pumped to a clarifying tank, which has a filter bottom made of wooden slats supporting cocoa matting, the space between the slats being filled with gravel containing pebbles not over ½-in. diameter. On the cocoa matting is 3 in. of fine sand. The top of this sand layer has to be cleaned off every two weeks and the entire layer renewed every two months. The solution is handled to this tank by a 4-in. Morris centrifugal pump.



Kelly Filter in Discharging Position—Iola Mill, Candor, N. C.

From the gold-filter tank the solution flows by gravity to three 6-compartment zinc boxes, 24x36x20 in. Only four compartments of the six are packed. The zinc shavings, cut at the mill in an ordinary zinc lathe, grade 250 per in., and are made up into skeins 2 ft. long and as large around as a man's arm. These skeins are laid in the boxes with alternating layers crossing each other cobwork fashion.

Semimonthly Cleanup

Cleanups are made twice per month, during which the small quantity of short zinc is treated with sulphuric acid, this procedure resulting in a cleaner bullion by excluding a portion of the zinc. The precipitate which passes a 30-mesh screen goes to a clean-up tank and is pumped by a Deane 2x3-in. triplex pump to an 18x18-in. Shriver filter press. The acid-treated material is put through the press separately. The entire precipitate is then mixed, dried and melted down in an iron-muffle furnace, using coke for fuel. The flux used consists of 25 parts borax, 15 soda, 15 sand and 7 each of niter and slag. The slag from the melting is crushed, hand-jigged and shipped to the smelter. The bullion assays 718 fine in gold and 225 in silver, and is shipped either to the U. S. Assay Office, at Charlotte, or to the mint at Philadelphia.

Cost of Operation

The labor in this section is a source of great annoyance, due to the irregularity of attendance of employees, which also makes for inefficiency. The labor required to operate this mill consists of one millman at $2.50, one solution man at $1.85, one mill helper at $1.65, on each of the two 12-hour shifts, and one filter man at $2 on the day shift only. These men operate and keep up all mill repairs, making the total labor cost $14 per day.

The treatment cost per ton of ore is $1.64, divided as shown in the table.

TREATMENT COSTS AT IOLA MILL

	Per ton ore milled
Milling	
Power	$0.577
Crushing and conveying	0.129
Stamping	0.061
Elevating	0.038
Classifying and thickening	0.048
Tube milling	0.011
Mill engine	0.015
General charges	0.126
Total milling	$1.005
Cyaniding	
Power	$0.115
Cyaniding	0.190
Precipitating and refining	0.081
Filtering	0.085
Assaying	0.095
General charges	0.069
Total cyaniding	$0.635
Total milling and cyaniding	$1.64

The mill heads averaged for a three months' period $12.921 per ton, and the tailing $0.552 per ton, showing an extraction of 95.7%. The consumption of chemicals and pebbles for four months of this year is shown in the table.

CONSUMPTION OF MATERIAL

	Lb. per ton ore milled
Cyanide	$0.5487
Zinc	0.1600
Lime	3.7425
Pebbles	3.4500

A flow sheet of the mill operation and a general view of the installation are shown in the accompanying illustrations.

New Colorado Smelting Schedules

Special Correspondence

The new smelting schedules, covering Clear Creek, Gilpin and Boulder counties, appear to be more favorable to the shipper than the older, particularly on lead ores and concentrates. The working charge has been reduced $1 per ton on ores and concentrates up to 30% lead, the deduction from the copper quotation has been reduced one cent, and the sampling charge has been eliminated on lots of over 7 tons. The following schedule is f.o.b. cars, Denver, on carload lots.

Lead Ore Schedule

Payments will be made for gold over 0.05 oz. per ton at $19.50 per oz.; silver on 95% of assay at New York price; lead prices are based on $4 lead, as explained below; copper, deduct 1.5 units from wet assay, and pay at Western Union quotation for casting copper less 6c. Zinc over 10% is penalized at 50c. per unit. On the so-called neutral basis, the payments for lead and the working charges are given below, the working charge being 10c. up or down from the neutral basis. The "flat" schedule is also given, and either the neutral or flat schedule is used, as is best for the shipper.

PAYMENTS ON FLAT SCHEDULE

Lead %	Pay Per Unit	Working Charge
5 to 10	40c.	$10.00
10 to 15	43c.	8.50
15 to 20	45c.	7.00
20 to 25	47c.	5.50
25 to 30	49c.	4.50
30 to 35	51c.	3.50
35 to 40	52c.	2.00
40 to 45	52c.	1.00
45 to 50	53c.	1.00
50 to 55	54c.	1.00
Over 55	55c.	1.00

Lead Concentrate Schedule

Gold is paid for at $19 per oz. when from 0.05 to 2.0 oz. per ton, and at $19.50 when over 2.0 oz. per ton. Silver and copper are paid for as in lead ores: Lead prices are based on $4 lead. Silica is penalized at 10c. per unit over 10%. Zinc is penalized at 50c. per unit over 10%. On lead from 5 to 10%, pay at 40c. per unit, $3.75 working charge; from 10 to 15%, 43c. per unit, $3 working charge; 15 to 20%, 45c. per unit, $2.50 working charge; 20 to 25%, 47c. per unit, $2.25 working charge; 25 to 30%, 49c. per unit, $2.25 working charge. Upon concentrates assaying over 30% lead, apply either the neutral or flat schedule, whichever figures better for the shipper, except pay for gold as provided under lead concentrates.

The prices paid per unit of lead in all ores and concentrates are based upon a quotation of $4 per cwt., for lead, and vary one cent up or down for a change of 5c. in the quotation used as a base of settlement. This quotation is figured as follows from the New York sales price on the date of settlement. When the sales price does not exceed $4 per cwt., take 90% of the sales price. When it does exceed $4, add to $3.60 per cwt. one-half of the excess of the New York price over $4.

PAYMENTS ON NEUTRAL BASIS

Lead %	Pay Per Unit	Working Charge
5 to 10	40c.	$6.00
10 to 15	43c	5.00
15 to 20	45c.	4.00
20 to 25	47c	3.00
25 to 30	49c	3.00
30 to 35	51c.	2.00
35 to 40	52c.	1.50
40 to 45	53c.	1.00
45 to 50	53c	1.00
50 to 55	54c.	1.00
Over 55	55c.	1.00

General Ore Schedule

On carload lots, f.o.b. Denver, the general schedule is as follows: Gold, $19 per oz. from 0.05 to 2.0 oz. per ton; $19.50 if over 2.0 oz. per ton. Dry copper (wet assay less 1.5%) up to 5% dry assay, is paid for at Western Union quotation for casting copper less 6c. For copper from 5 to 10% dry assay, deduct 5c.; over 10% dry, deduct 4c. Zinc over 10% is penalized at 50c. per unit. On ore of $14 gross value or under, the treatment charge is $5; $14 to $20 gross, $6 treatment; $20 to $25, $6.50; $25 to $30, $7; $30 to $35, $7.50; $35 to $40, $8; $40 to $45, $8.50; $45 to $50, $9; over $50, $10. Lead, 5% or over, is paid at 25c. per unit, but either the flat or neutral lead-ore schedule is applied to lead ore if better for the shipper. On dry ores, if better for the shipper than the above flat schedule, apply $7 treatment charge, neutral basis, 10c. up or down.

On dry concentrates: Gold, silver, and copper are paid for above. Silica over 10% is penalized at 10c. per unit; zinc over 5% at 30c. On concentrates of $35 gross value or under, there is $3.50 treatment charge; from $35 to $80, $4 treatment; over $80, $4.50 treatment. The maximum treatment charge upon concentrates, including the silica but not the zinc penalty, shall not exceed the maximum charge upon crude ores of the same grade.

July Operations at Goldfield Consolidated

During July, 1912, the total production of the Goldfield Consolidated Mines Co., according to the official reports, was 31,907 tons, containing gold worth $474,956, or an average of $14.89 per ton, of which 29,000 tons was milled with an average extraction of 91.05% and 2907 tons was shipped of an average value of $16.42 per ton, the net recovery from all ore being $13.69 per ton. The total net realization to the company was $238,279, or $7.47 per ton. The total cost of mining, development, transportation, milling, office and general expense was $6.41 per ton, distributed as shown in the accompanying table.

During July, 2923 ft. of development work was done. In regard to the month's work, J. F. Thorn, general superintendent for the company, remarks as follows:

At the Combination, the 402-G stope, 300 ft. north of the shaft between the fifth and sixth levels, produced 399 tons of $30 ore, this being the deepest point in the mine at which ore has been found. A new stope on the second level, 80 ft. east of the 136 stope, produced 275 tons of average $17 ore.

GOLDFIELD CONSOLIDATED OPERATING COSTS FOR JULY, 1912

Mining, including stoping and developing	$3.18
Transportation	0.08
Milling	1.97
Marketing	0.05
General expenses..	0.40
Bullion tax	0.05
Marketing ore shipped..	0.66
Construction.	0.07
Total cost of operation	$6.46
Miscellaneous earnings..	0.05
Net cost per ton..	$6.41

At the Mohawk, the 3-J sill, north of the 3-E stope in the old Sheets-Ish workings, produced 279 tons of $28 ore. The 170-J stope, on the 250-ft. level, or the downward extension of the old Sheets-Ish stope, produced 69 tons of $58 ore. The 202 stope, which is being carried through the old Frances-Mohawk workings, produced 68 tons of $40 ore. A new raise at the south end of the 348 stope, between the 450- and 350-ft. levels, has encountered ore assaying $40 per ton. An important development was made on the intermediate level, between the 450- and 600-ft. levels, about 700 ft. north of the shaft. The 426 crosscut penetrated ore, and the 490-I sill, which is being cut in the ore, produced 755 tons of $40 ore.

At the Clermont, the 571 drift on the downward extension of the 510 orebody, between the 750- and 900-ft. levels, produced 55 tons of $40 ore. In the Grizzly Bear, 250 tons of ore, averaging $30 per ton, was shipped from development work on the 1300-ft. level. Work on this level has been done rather slowly, on account of being carried on in conjunction with sinking the shaft. When the 1400-ft. level of the shaft is reached, lateral work from both levels can be carried on more rapidly.

Petroleum Industry in the United States

Since the beginning of the oil industry in the United States over two and a half billion barrels have been produced, according to the U. S. Geological Survey, and the total value of the oil, reckoned in the crudest condition at the mouth of the well, is over two billion dollars. More than half of this oil has come from New York, Pennsylvania, West Virginia and Ohio, and all has been produced in two years over half a century. In the first half of this period nearly the entire product came from the eastern fields, but lately the declining production of the eastern states has been more than compensated by the enormous output in the West, so that of the total product of the United States 972,429,805 bbl. have been produced west of Mississippi River, and at this time the Midcontinent and California fields are the controlling influences in the oil production of this country. If a line is drawn across Ohio separating its eastern oil areas from the Lima area and the Lima oils are included in the western production then the West already exceeds the East in the total produced.

The annual report of the U. S. Geological Survey on the production of petroleum, compiled by David T. Day, shows that for 1911 California not only led in quantity of product (over 80,000,000 bbl.), but produced almost half as much again as Oklahoma, the state second in rank. The Mid-Continent field omitted, California produced as much oil as the rest of the United States put together; the United States being omitted, California produced more oil than any entire nation; and if Russia and the United States are omitted, California far surpassed the combined production of all the rest of the world, including Mexico, India, Roumania, Galicia, Japan and South America.

In point of production by states, California, Oklahoma and Illinois form a class by themselves, the lowest (Illinois) producing over 30,000,000 bbl. and the three furnishing three-fourths of the entire output.

The second group includes Louisiana, West Virginia, Texas, Ohio, and Pennsylvania, in which Louisiana furnished a surprise by yielding the greatest product on record for that state (over 10,000,000 bbl.) and passing to the head of this group, while the slight gain from two pools in Texas put that state in advance of Ohio again.

In the third group, which comprises Indiana, Kansas, New York, Kentucky, Colorado, Wyoming, Missouri, Utah and Michigan, the largest state production is less than a fourth of the lowest in the second group, and combined these states produced less than 2.2% of the total.

Drill-Rigging Contest at Calumet, Mich.

CALUMET CORRESPONDENCE

A drill contest was held at Calumet, Mich., on Aug. 24, 1912, which was a novelty in its conception. It was a rigging-up contest divided into two classes, viz: Two men setting up a Rand 3-B machine; the other one man with a C-113 Butterfly. The object was to show the relative efficiency in handling the two types of machines. Each machine was run for a period of two minutes, but the depth of the hole was not taken into consideration, as this was done only for the purpose of demonstrating that the machine was rigidly and properly set up.

There were three prizes for each class of $100, $50 and $25, donated by the Ingersoll-Rand company. The Calumet & Hecla Mining Co. built the framework, there being two constructions. These frames were built to accommodate two drills each, this being done to facilitate the handling of the 38 entries.

ARRANGEMENT FOR DRILL-RIGGING CONTEST AT CALUMET, MICH.

Two teams of the same class contested simultaneously at different frames and during this time the other two drills that had been used on the opposite side of the sets were being dismantled and arranged for the next team of the other class. Compressed air for the operation of the drills was furnished from the Calumet & Hecla main compressor plant through a small booster and delivered to the drills at about 85-lb. pressure.

The following rules governed the contest: Only one entry was accepted for each contest from each mine; complete outfits were placed 10 ft. from the place of rigging; nuts on clamp and arm were even with the bolt at the start; the use of one standard wrench was allowed; a 50-ft. length of hose was coiled with one end connected to the air supply; both chuck bolts were tightened; jack screws were flush with the bottom of jack at the start, and the collar stationary on the post; each contestant was required to rig up, turn on full air, and run his drill for two minutes, change steel at the finish and tighten both chuck bolts; machines, drill steel, hose and complete equipment were furnished; the drilling was on flat dry holes.

RESULTS OF DRILL CONTEST AT CALUMET, MICH.

Time				Representing Mine
Rigging	Drilling	Changing steel	Total	
min. sec.	min.	sec.	min. sec.	
Two-man teams				
1 - 32	2	10	3 - 42	Ahmeek
1 - 33⅗	2	10⅕	3 43⅘	Calumet & Hecla-Amygdaloid
1 - 32	2	15	3 - 47	Wolverine.
One-man teams				
2 - 21	2	12⅗	4 - 33⅗	Calumet & Hecla-Amygdaloid
2 - 26	2	16⅘	4 - 42⅘	Allouez
2 - 28	2	17	4 - 45	Wolverine

Another interesting feature in connection with the above contest was a contest between the hammer and drill team that won the match held in conjunction with the Calumet & Hecla miners' picnic two weeks previous, and an operator with a Rand-Ingersoll B-C-23 hand hammer tool.

The conditions governing the match were that each should have 15 min. actual drilling in a "Cape Ann" granite block. The hammer and drill team succeeded in making a hole 49 in. deep, using a 1¼-in. bit to start and finishing with a ¾-in. bit. The operator with the hand-hammer tool went through the block, a depth of 60 in. in 14 min. and used five different bits, starting with a 2-in. bit and finishing with a 1⅛-in. bit.

The property of the Western Steel Corporation at Irondale, Wash., has been acquired by the recently incorporated Occidental Steel Co. of Maine. The plant contains three 22-ton basic open-hearth steel furnaces, the first operated on the Pacific Coast. These were started in 1910, but have been idle for some time.

Caving System in Chisholm District—II

By L. D. Davenport*

Two methods of stoping are followed in the mines of the Minnesota iron ranges, slicing and square-set work. Slicing consists of driving a number of parallel and adjacent timbered drifts across the pillar to be mined. The details of the method are described in this article.

There are two systems of stoping used in the Chisholm district of Minnesota; drift slicing and square-set work. Slicing is the driving of a number of parallel and adjacent timbered drifts across the pillar to be mined, leaving only the posts between, and making them of sufficient height to take all of the ore. A slice set consists of a 7-ft. cap and two posts the length of which ranges from 2 to 18 ft., according to the height of the ore to be mined. The most convenient and economical height for a slice is 11 ft., that is, using 10-ft. posts.

TEST RAISES PUT UP BEFORE SLICING

When as described in the first instalment[1] of this article the slice drifts had been driven from the raises at the tramming level to the property line of the Nels mine, or to the shore line, stoping was started.

Let us consider the drift north from No. 3 raise, which struck the shore at about 1025 ft. north. Before slicing was started, test raises (3x3 ft.) were put up at 50-ft. intervals, starting at No. 3 raise. These raises, Fig. 1, were put up to the surface to determine the height of the ore above this sub-level. Having found the ore to be less than 11 ft. for the last 100 ft. of drift, slicing was started.

Dropping back from the breast of the drift to the point Z where the ore was about seven feet high, a crosscut was driven 40 ft. east and 10 ft. west from the center of the slice drift taking the full height of the ore, and the south side was boarded up with No. 5 boards as shown in Fig. 2. This crosscut is sometimes timbered with open sets, that is, the caps are placed parallel to the crosscut, instead of regular drift sets, as shown in the sketch. It is better to use open sets since slices can be started from the crosscut, without changing any of the timber in the crosscut, as is necessary when the regular drift sets are used.

Then, starting at the end of the 40 ft. crosscut, the first slice was run north over the rock until the ore was so thin that it was not practical to advance farther.

In some cases, posts less than 2 ft. in height have been used in the last set. The track is put in the crosscut, and sometimes if the rock does not rise too rapidly, the track is extended into the first slice.

Frequently, when the rock rises several feet on the north side of the crosscut, the miners use a wheelbarrow to fill the car. This is not possible, however, unless the back rises as fast as the bottom rock, so as to give the men headroom.

EASIER TO SLICE PERPENDICULAR TO SLOPE OF ROCK

The reason for driving the crosscut first, and then slicing from it, instead of starting to slice directly from the drift is, that it is easier and quicker to slice perpendicular to the slope of the rock. The posts in each set will be nearly of the same length, and it is easier to handle the ore down a direct slope. Again, sometimes, the first slice at the end of the 40-ft. crosscut extends 30 or 40 ft. farther north than the breast of the slice drift, and it would be difficult to hold a room open long enough to take out this ore had slicing been started from the slice drift. Using the method described, should the first two or three slices get heavy, the crosscut can be breasted up and the first slices boarded up, and then blasted down.

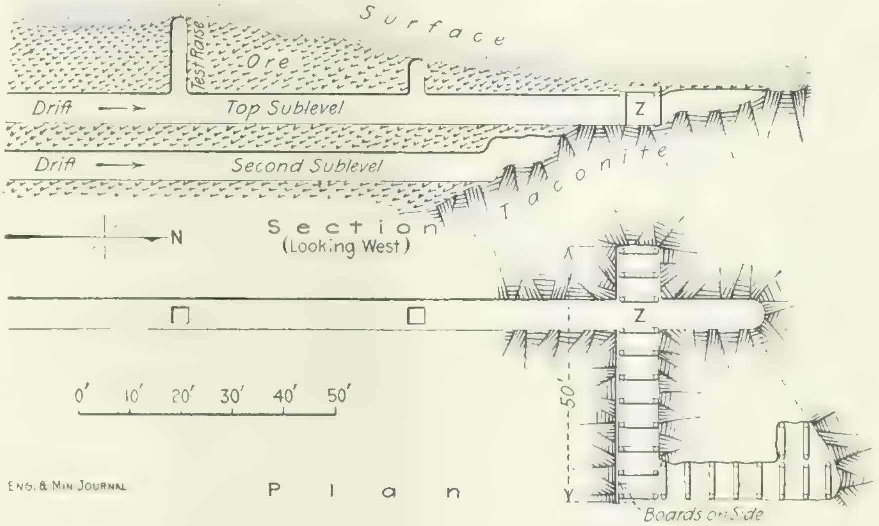


FIG. 1. DETAILS OF SUBLEVELS DRIVEN IN THE SLICING SYSTEM

In starting the first room against caved ground, an open set is put in the drift against the caves with the caps parallel to the drift. Both the caps and the posts are spragged as shown at *A* in Fig. 3. Fig 4 shows the general method of blasting a set. After the first two holes are blasted, the upper half of the breast is squared up, and hitches are cut for the posts before the bottom is blasted. This saves building a staging for the men to stand on. A hitch is then cut in the top of the breast, and the end of a pole put into it with the other end resting on the cap of the last set. Short boards are placed on top of the pole, which is then wedged up tight against the boards. This pole, sometimes two or three are used, and the short boards secure the back, while the bottom half of the breast is taken up as shown in Fig. 3B.

The slice is continued along the caved ground across the pillar, usually about 40 ft. If the next pillar has been mined out, that is, if the slice is to strike end caves at 40 ft., it is the usual practice to leave a small pillar of one or two feet to hold back the sand as shown at *X*, Fig. 3. The track is turned into the first slice.

METHOD OF STARTING SECOND SLICE

Dropping back to the second or third set, as for instance set *B*, Fig. 3, from the end of the slice a second slice is started and continued to the end caves, the bottom of the last set is covered with boards and a small pillar *X* is taken out, since, if a little sand runs into the end of the room at this time, it will do no harm. This second slice is then worked back toward the drift, leaving only the ground at *C* between the end of the second slice and the drift as shown in Fig. 3. This pillar *C* serves as a protection to the men while they are working on the other side of the drift. The solid side of the second slice is then boarded.

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*Assistant chief engineer, Oliver Iron Mining Co., Chisholm division, Chisholm, Minn.

[1] Eng. and Min. Journ., Sept. 7, 1912.

Next, a second open set is put in the drift against *A* set and the four sets, *a-a-a-a* on the farther side of the drift are taken out and boarded up. A set is then put in at *C*, the room is cleaned out and if there is ore on the bottom, it is covered with a single layer of No. 5 boards. The drift is then breasted up, and the room blasted down.

Ordinarily, in blasting a room, the center posts except the open sets are blasted. Sometimes, it is necessary to blast the side of the old caves to make the room fill. In some places, two open sets are put in the drift and the two slices carried along together. This method works well in some places where there is a solid back. The danger is that the room may come down before the last two or three sets are out, and then it is necessary to drive in a new slice and take out the remaining sets from behind.

The reason for taking out the pillar with a long and a short side, 40 ft. on one side and 10 ft. on the other, is that but one curved track is required, the four sets *a-a-a-a* are shoveled directly into the car in the drift.

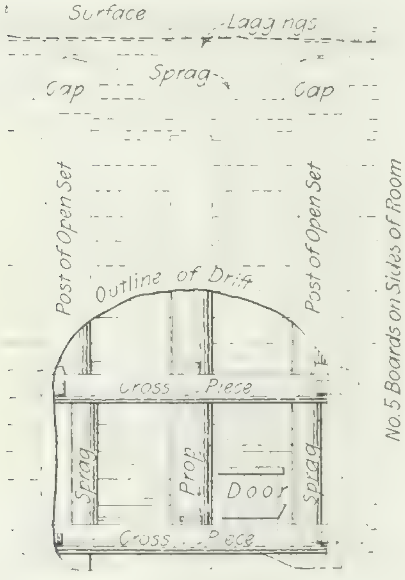

FIG. 2

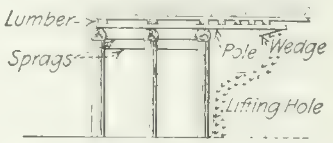

FIG. 3

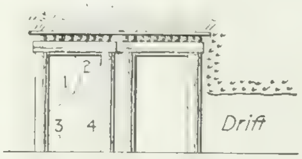

FIG. 4 End Section

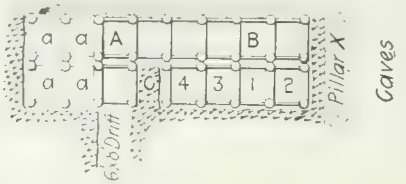

FIG. 5 Plan

METHODS OF TIMBERING SLICING DRIFTS

(*To be concluded.*)

Bavarian Mineral Production

The production of minerals in Bavaria in 1911 was as follows: Lignite, excluding the mines own consumption, 1,311,723 metric tons; bituminous coal, net production, 709,227 metric tons; iron ore, 375,409; pyrites and other sulphur-bearing ores, 81,652; rock salt, 782; and graphite, 11,298 tons. There is no production reported for zinc, lead, copper, gold, silver, tin, quicksilver, arsenic, or manganese, although there are 20 workers reported in the zinc, lead, copper and antimony mines. The Bavarian production of selenium is given at 712 kilograms. There are large productions of sandstone, fireclay, chalk, granite, etc.

Katanga Copper Deposits

JOHANNESBURG CORRESPONDENCE

The deluge of copper from the Katanga deposits has not yet arrived to overwhelm the markets and to bankrupt American producers. This was foreseen by most copper experts in America when two years ago the chairman of the English company was making optimistic forecasts. During the last year local reports of frequent stoppages of smelting tended to show that something was wrong and it was at length admitted that with copper in the neighborhood of £60 per ton it was impossible to smelt the highly silicious, oxidized copper ore at a profit, using imported coke costing £12 per ton at the mines.

A water-jacket furnace has been erected and during this year, a two months' test run was made which produced 1002 tons of 97% copper. Coke from the Wankie colliery in South Rhodesia, near Victoria Falls, proved satisfactory. It cost £6 per ton and reduced the cost of copper production to £30 per ton landed in London. A five-year contract has been made with the Wankie company and within a year coke will be made at the Star of the Congo mine in Katanga from Wankie coal, the gas being used for steaming purposes. This coke is estimated to cost £4 10s. per ton. Meanwhile, beehive ovens are nearing completion at the Wankie mine and will provide 1200 tons of coke per month at a cost of £5 8s. per ton. Smelting is to be resumed for permanent running at the end of September. A second furnace has been ordered and is expected to be in operation early in 1913. A rough-washing plant is being erected which will eliminate much silica and alumina from the furnaces and reduce the consumption of coke about one ton per every ton of copper produced.

The reduction process by which the copper in the low-grade ore was to be reduced with coal in a reverberatory furnace and the resulting copper concentrated, has been tried on a small scale without success so far. In Ugine (Savoie), France, about 50 tons of ore have been smelted in a makeshift steel furnace by electricity and future experiments with a properly designed furnace are to be carried out. If successful a subsidiary company will supply power from the falls near the mine for this process.

In the Star of the Congo mine there are said to be developed 350,000 tons of 15% ore and 1,500,000 tons of low-grade ore. The railway will be completed to the Kambove mine by the end of the year. In this mine two to three million tons are developed. The question as to whether these oxidized orebodies are due to concentration by descending waters and are merely superficial or whether they are the capping of sulphide deposits strangely enough does not appear to have yet been solved, or if solved the information has been kept secret. There has been ample time to test this matter with a drill.

The Benguela Ry. from the West coast has been advanced 208 out of 750 miles and is carrying about £1,000,000 worth of goods per year. When the rubber district, 100 miles further on, is reached, trade will greatly increase.

The Katanga district is now connected with the east coast by railway via northwestern Rhodesia, Victoria Falls, Bulawayo, Salisbury and Beira. Capetown can also be reached by railway from Bulawayo via Kimberley.

Fuller's Earth in Arkansas

The deposits of fuller's earth near Benton, Ark., are the residual clay of igneous dikes, according to Hugh D. Miser, of the U. S. Geological Survey. The color of the clay near the surface is yellowish to reddish-brown, the deeper product is light gray to light olive green. All of the Arkansas earth is decidedly plastic, but its plasticity decreases with increasing depth. The Arkansas earth is used for bleaching cottonseed oil, hog leaf lard, beef tallow and stearine. Lack of experience in the industry has caused poor products to be put on the market and has retarded, to some extent, the introduction of Arkansas earth to displace the English earth, which is used mainly by American packers and cottonseed-oil companies.

The Arkansas earth is not used in refining petroleum, tests with it having proved unsatisfactory. In 1911, Arkansas was the third largest producer of fuller's earth in the United States, Florida being first and Georgia second.

Steel Production in 1912

The American Iron & Steel Institute has completed its first half-yearly report, covering the production of steel and of finished products for the six months ended June 30. Heretofore statistics of finished materials have been published annually by the American Iron & Steel Association. The report, which was prepared by Howard H. Cook, assistant secretary and statistician, says:

"On July 1, 1912, statistical schedules were sent to all steel works and rolling mills in the United States, asking for a return of the production of steel ingots and castings, rails and all iron and steel rolled products for the first six months of 1912. The results have been tabulated and are set forth in the following summary statement in order to secure immediate publication. A more elaborate analysis of the results, together with a study of the statistics of finished rolled products, is in course of preparation and will be published in the near future.

"The total production of all kinds of steel ingots and castings for the first six months of 1912, was 14,373,701 gross tons, of which 9,441,706 gross tons consisted of openhearth steel, 4,868,306 gross tons of bessemer steel and 63,689 gross tons of all other kinds of ingots and castings.

"The total pig-iron production did not vary greatly in the first half and in the last half of the year 1911, being 11,666,996 gross tons for the first six months as compared with 11,982,551 gross tons for the remainder of the year. It would seem fair, therefore, to make comparisons between the ingot production for the first half of 1912, and one-half of the ingot production of 1911. It should be borne in mind, however, that such comparisons are only approximately correct. On this basis the total production of ingots and castings for the first six months of 1912, shows an increase over the estimate for the similar period of 1911, of 2,535,648 gross tons, comprising an increase of 1,642,381 gross tons of openhearth steel and 894,379 gross tons of bessemer steel, and a decrease of 1112 gross tons of all other steel."

STEEL PRODUCTION

The total steel production, in ingots and direct castings, for the half year, in long tons, is given in Table I:

I—TOTAL STEEL PRODUCTION

	Ingots	Castings	Total
Openhearth	8,992,860	448,846	9,441,706
Bessemer	4,838,765	29,541	4,868,306
All other	51,858	11,831	63,689
Total	13,883,483	490,218	14,373,701

Openhearth steel was 65.7% of the total; bessemer, 33.9% and all other 0.4%. The production of all other steel is divided into 53,476 tons crucible steel, 6882 tons electric steel and 3331 tons miscellaneous steel, including cemented bars. The division by acid and basic processes is given in Table II:

II—ACID AND BASIC STEEL

	Acid		Basic	
	Tons	Perct	Tons	Perct
Openhearth	514,127	3.6	8,927,579	62.1
Bessemer	4,868,306	33.9		
Other	63,689	0.4		
Total	5,446,122	37.9	8,927,579	62.1

The total production of steel for the half year exceeded that of pig iron by 301,479 tons. There was a similar excess in 1911, and this result in 1912 may be ascribed to the same causes as last year; the use of pig iron drawn from stocks and the larger use of steel scrap in the openhearth furnaces.

FINISHED IRON AND STEEL

The accompanying Table III gives the production of finished rolled iron and steel for the first six months of 1912, showing separately the production of rolled iron and rolled steel, as well as the total tonnage for 15 classes of product. The classification used by the American Iron & Steel Association has been followed in compiling the results so that they are comparable with figures for previous years. Semi-finished rolled products intended for further rolling, such as blooms, billets, slabs, sheet and tin bars, have not been included. Plates include production rolled to No. 12 gage or thicker, and sheets, production rolled to No. 13 gage or thinner. The production of black plate for tinning and of tie plates included in the body of the table under sheets and plates are separately stated at the foot of the table.

III—FINISHED ROLLED PRODUCTS

	Iron	Steel	Total
Plates	30,917	1,567,310	1,598,227
Sheets	26,397	1,300,137	1,326,534
Total	57,314	2,867,447	2,924,761
Rails	......	1,466,565	1,466,565
Nail plate	6,930	18,045	24,975
Structural shapes		1,223,886	1,223,886
Wire rods		1,220,004	1,220,004
Merchant bars	426,191	1,424,212	1,850,403
Bars for rein. concrete	2,169	118,813	120,982
Skelp	141,355	989,063	1,130,418
Splice bars	14,761	92,020	106,781
Hoops	.	130,345	130,345
Bands and cotton ties	12	204,322	204,334
Rolled forging billets	1,066	187,771	188,837
Other rolled products	129,683	479,845	609,528
Total rolled products	779,481	10,422,338	11,201,819
Black plates for tinning	1,057	498,294	499,351
Tie plates	24,446	70,690	95,136

Comparisons with the previous year cannot be made, as heretofore these statistics have been collected only by yearly periods.

RAILS

The production of rails for the half year, classified by weight and kind of steel used is given in Table IV. No iron rails were made.

The openhearth rails were 63.2% of the total made; bessemer, 33.9%, and others 2.9%. The remarkable point in this statement is the increase in proportion of openhearth rails, which, in 1911, was 59.4%, and in 1908 only 29.4% of the total.

IV—RAILS MADE

	45-lb. and under	45-85 lb.	85-lb. and over	Total
Bessemer	52,142	272,029	172,756	496,927
Open-hearth	29,559	238,388	658,557	926,504
Electric	10	87	45	142
Rerolled	41,973	1,019	....	42,992
Total	123,684	511,523	831,358	1,466,565
Per cent	8.4	34.9	56.7	100.0

California Oil in July

The net production of petroleum in California fields in July was 7,013,858 bbl., an increase of 117,993 bbl. over June. There was a decline in daily average from the 30 days in June to the 31 days in July of 2645 bbl., chiefly in southern fields, particularly in Salt Lake-Sherman, which amounted in that field to 1755 bbl., due largely to curtailment of Amalgamated production. Fullerton-Puente declined about 500 bbl. per day. Midway increased about 3000 bbl. per day, making an advance in total production from 1,989,072 in June to 2,081,271 bbl. in July.

CALIFORNIA PRODUCTION BY FIELDS

District	Bbl.
Fresno County	
Coalinga	1,575,025
Kern County	
Midway	2,081,271
Kern River	917,267
McKittrick	548,481
Sunset-Maricopa	419,129
Lost Hills	106,233
Total Kern County	4,072,381
Santa Barbara County	
Santa Maria, Lompoc, Cat Canon	448,843
Summerland	4,350
Total Santa Barbara County	453,193
Southern Fields—	
Fullerton-Puente	470,669
Salt Lake-Sherman	198,595
Coyote-La Habra	89,707
Ventura County	59,216
Whittier	52,920
Los Angeles City	31,842
Newhall	10,310
Total Southern Fields	913,259
Total in all fields	7,013,858

Shipments in July were 6,314,579 bbl., a decrease from June of 105,826. In addition there were seepage and evaporation losses of 128,366 bbl. The total stocks on July 31 amounted to 45,490,175 bbl., an increase from June of 570,913.

The record of field development in July shows 44 new rigs, 65 completed wells, 6021 active producing wells, 681 idle producing wells, 408 active drilling wells, 307 idle drilling wells, 28 wells abandoned.

The metallurgical plant of the Primos Chemical Co., at Primos, Penn., was partially destroyed by fire on Aug. 20; that portion of the plant has been rebuilt, and was to be placed in commission again during the current week.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

John W. Mercer sailed from New York Sept. 7 on his way to Ecuador.

D. A. Herron, manager of the Tomboy Gold Mines Co., Ltd., is in Denver.

John T. Glidden has been appointed general foreman of the Cerro de Pasco mills, in Peru.

Philip L. Foster, of the Exploration Co., has returned to Denver from a visit to Telluride, Colorado.

H. A. Linke, of Palisade, Nev., is in Chicago on professional business, and expects to go to Nevada soon.

R. C. Benner, Department of Industrial Research, of the University of Pittsburgh, spent the month of August in Ontario.

Franklin Wheaton Smith was married to Miss Ernestine Craig, Aug. 24, at Fairholm Island, Muskoka Lake, Ontario.

Alexander P. Rogers, of New York, is in Panama on professional work. He expects to return to New York early in October.

Allen H. Rogers is engaged in professional work in Utah. He expects to return to New York about the middle of September.

Frederick J. Apgar, mining geologist, of Jamaica, N. Y., is engaged in an examination of iron-ore deposits in northern New Jersey.

Howland Bancroft, of Denver, is occupied in making examinations in western Colorado, returning to Denver about the middle of September.

Cecil Pocock, for the last three years with the Cerro de Pasco Mining Co., is now in charge of the Santa Clara group of mines, at Morococha, Peru.

Herman L. Schneider has been appointed superintendent of the New State Smelting Co., of Socorro, N. M., and took charge early in August.

Norval J. Welsh is at Orogrande, N. M., planning the development and operation of the By Chance group of copper-gold claims for the Jarilla Copper Syndicate.

Norman B. Roper, formerly of the Cerro de Pasco Mining Co., Peru, now with Backus & Johnson Co., of Casapalca, Peru, is visiting the United States.

Henry H. Armstead has finished his inspection of the properties of the Colmena Mining Co., at Guanajuato, Mexico, and has left for New York. He will return to Mexico in November.

W. H. Aldridge is changing his headquarters from Los Angeles to the Bankers Trust Bldg., 14 Wall St., New York. He will continue to take charge of William B. Thompson's mining interests.

George E. Farish who has been in his New York office since leaving Porcupine, Ont., several weeks ago, is on his way to Arizona, where he will examine a copper property. He expects to return to New York the latter part of September.

S. S. Arentz, general superintendent of the Nevada-Douglas Copper Co., and the Nevada Copper Belt R.R., will have his office at Salt Lake City, Utah, after Oct. 1. He will have charge of the construction of the Interurban R.R., between Salt Lake City and Payson, Utah.

James Bowron, president of the Southern Iron & Steel Co., who was appointed receiver when litigation was started, has been chosen trustee in bankruptcy. The Federal court has named William S. Lovell, A. H. Carpenter and John H. Adams to appraise the property of the company.

Dr. A. E. Barlow, president of the Canadian Mining Institute, left Montreal for British Columbia, Aug. 18. His intention is to visit a number of the mining centers in West Kootenay and elsewhere before proceeding to the Coast. He will preside at the Western meeting of the institute in Victoria, on Sept. 18 and 19, and also at a meeting to be held, Sept. 30, at Frank, Alberta.

R. B. Hutchinson, of Chihuahua, Mexico, is on a motoring jaunt from Los Angeles to San Francisco and through the Yosemite Valley, in California. After an an active connection of 14 years, during which time he developed and managed the Concheño mines, in Chihuahua, and, subsequently, the mine and smelting plant of the Rio Tinto Copper Co., of Chihuahua, Mr. Hutchinson has resigned the position of general manager of the Corrigan, McKinney & Co., of Cleveland, Ohio., interests in Mexico, and, on his return from California, will establish an office as consulting and examining engineer in El Paso, Tex. Norval J. Welsh will be associated with him.

OBITUARY

J. W. Horne, secretary and treasurer of the Utah Apex Mining Co., died in Falmouth, Mass., Aug. 25 last.

J. Newton Cole, treasurer of the Calaveras Copper Co., and secretary of the F. L. Ames estate, died suddenly, Sept. 3, in his office at Boston.

James Terry Gardner, of New York, died at Northeast Harbor, Maine, Sept. 10, aged 69 years. He was born at Troy, N. Y., and educated as a civil engineer in Rensselaer Polytechnic Institute and the Yale-Sheffield Scientific School. During the civil war he was employed by the United States Government as inspector of the harbor defenses of San Francisco, and later served on the U. S. Geological Survey. From 1876 to 1886 he was director of the New York State Survey, and during the same period served on the State Board of Health. In the latter part of his life Mr. Gardiner entered the coal business, becoming vice-president of the coal companies of the Erie R.R.; president of the Mexican Coal & Coke Co., Randolph-Macon Coal Co., and West Kentucky Coal Company.

Societies and Technical Schools

Wisconsin State Mining Trade School—The school at Platteville opened for the fall term Sept. 4. A full two-year course in mining engineering is now given at this institution. The school, has during the past few months, installed much new equipment. The chemical laboratory has been enlarged and equipped to accommodate the increasing number of students. A new Fairbanks-Morse oil engine has been added, and a small concentrating mill is being installed for experimental work.

California State Miners' Association—The California Miners' Association plans to aid the Panama-Pacific Exposition directors in securing for the 1915 world's fair a complete mineral exhibit from all the states west of the Missouri. The executive committee of the association met recently and a committee of three was appointed to confer with the exposition directors. This committee consists of President William C. Ralston, Charles G. Yale, statistician of the U. S. Geological Survey and C. B. Branden, vice-president of the Selby Smelting Co. The committee will confer with the exposition directors as to the form of call to be issued for a convention to be held in San Francisco of the California Miners' Association in November.

American Peat Society—The sixth annual meeting was held in New York, Sept. 5-7. Sept. 5 there was a business meeting and a session for reading and discussion of papers; also two sessions on Sept. 7. Sept. 6 was taken up by an excursion to the Alphano peat plant, on the Great Meadows, near Hackettstown, N. J. The meeting closed with the annual dinner. The presidential address was by Dr. J. A. Holmes, director of the Bureau of Mines. Among other papers presented were: "Drainage Work in North Carolina," Dr. Joseph Hyde Pratt, State Geologist North Carolina, Chapel Hill, N. C.; "Peat Fuel and Methods of its Preparation," Dr. J. Arthur Mighill, Boston; "Investigation into the Methods of Drying Peat by Pressure," G. Herbert Condict, Plainfield, N. J.; "The Peat Fuel Work of the Canadian Department of Mines," B. F. Haanel, B. S., Ottawa; "A Successful Peat Fuel Plant," Ernest V. Moore, Alfred, Ont.; "Drying of Peat," Robert Ranson, St. Augustine, Fla.; "Peat Coking," Edward A. Beals, Hartford, Conn.; "Progress of Peat Utilization in 1911." Prof. Charles A. Davis, Washington.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Sept. 5—It is not improbable that gas roduced from the wells drilled for oil vill ultimately displace crude oil as fuel or pumping and drilling in those fields vhere the gas is produced in considerable olume. Electricity has, in many places, een adopted in the place of crude oil, and he experimenting with gas has reached point where it is coming to be recogized as a strong competitor of electricty. The Pacific Light & Power Co., vhich operates oil wells in the Salt Lake ield, near Los Angeles, is using gas for ower to generate electricity. One of its lectric power plants is driven by steam, ising natural gas for fuel. The company s installing two 250-hp., 16x21 Buckeye, ingle-tandem engines. The plant is conected with the company's power line hat extends into Los Angeles. Gas enines have been employed for several ears on the oil-land lease that the comany operates, for drilling and pumping. The Rancho La Brea, in the same field, s reported to be employing 1000 hp. for umping and drilling with gas fuel, and inds it unnecessary to use oil for power uel. This company is said to have the reatest amount of gas of any operator n the field, and if the Pacific Light & Power Co. succeeds with its experiments, t is expected that it will endeavor to btain by purchase or lease the valuable ands of the Rancho La Brea. Formerly he gas in the fields has in many, if not n most instances, been allowed to go to vaste. The field consumption of oil for uel has usually averaged about 350,000 o 500,000 bbl. per month, which means pproximately $150,000 to $200,000 per nonth for fuel in all fields.

Unexpected rain fell in various parts f the state, Sept. 1, and in some places as continued intermittently. In Siskiou and Trinity counties, the weather has een unusually cold for so early in the eason. In Nevada and Shasta counties ain is much earlier than usual. In other nining counties there is rain or indicaion of early rains. Last spring predicions were made that the mines would uffer from lack of water before the end f the summer season; but the facts do ot bear out the prediction. Only one listrict has actually complained of lack f water, and that was for use in placer nining, at Magalia. The only dredging peration reported to have lacked water s the Siskiyou Dredging Co. dredge, on McAdams Creek, in Siskiyou County, but the fear of continued dry weather seems now to have passed.

The Mammoth Copper Mining Co. has complained to the state railroad commission that the rates charged by the Southern Pacific for transportation of blister copper from Kennett to San Francisco is excessive, and asks that it be reduced. The rate is $3.50 per ton and the distance is only 273 miles, while the rate from Chicago to New York, a distance of 900 miles, is only $2.70 per ton. The present railroad commission has been liberal to the shippers in all branches of industry in the matter of requiring the railroads to reduce rates, and it is expected that the reduction of 50c. per ton asked by the Mammoth company will be granted on proper showing. The present railroad commission is the first in California for 20 years that has given much heed to the demands of shippers.

Denver

Sept. 6—Figures from valley reduction plants and the various local mills of the Cripple Creek district are as follows: Valley plants and smelteries, 44,850 tons, value, $1,070,250; local plants 28,456 tons, value $82,100; so that the production of the camp is maintaining the high mark set early in the year. The Colburn-Clancy process mill is expected to be running again this month. The water-level recession during August has been about 15 ft., and a still lower drainage tunnel is being contemplated.

In the case of the government against Stratton's Independence, Federal Judge W. H. Pope, of New Mexico, has handed down the decision that to remove ore from mines does not cause such depreciation of the property as to give the mine owners the right to refuse to pay the federal corporation income tax assessed on the net earnings by the commissioner of internal revenue. The ruling means that the mines of Colorado will be forced to pay thousands of dollars taxes each year, which they hoped to avoid by bringing up the question that when gold, silver or other metal is taken from them, it causes a loss that cannot be replaced and therefore must be counted as depreciation, and not to be taxed under the law passed in 1908. The government sought to force the Stratton's Independence company to pay approximately $1500 for taxes for the years 1909 and 1910. Other mines were assessed in proportion to their net earnings, and all of them, following the lead of Stratton's, paid the taxes under protest and made the same claims. Stratton's Independence was selected to make a test case and filed suit through its attorney, William V. Hodges, for a recovery of the money paid to the government for the tax of 1% on income over $5000. The other big mining companies of the state supported the Independence in the suit. The case will be appealed, and meantime the mining companies will continue to pay the excess tax on their net earnings over $5000 under protest.

It is reported that Henri Chagneux, representing French interests, is investigating vanadium ore deposits in the Coal Creek district, near Meeker, in Rio Blanco County. Steady shipments of carnotite ore continue to be made from Paradox Valley to Europe.

Butte

Sept. 4—E. B. Milburn, of Butte, has sold to the Congdon-Cole interests, of Duluth, the Michigander, Third Sphinx, Morel, Carn Brea, Wanda, Valley Queen, and an interest in the Sarah lode claims, adjoining the Butte & Superior property, north of Butte. The price paid was about $500,000, and deeds recorded show that cash is being paid for the claims. It is not known when work will be started.

The activity in acquiring mining ground in the district north of Butte, which began several months ago, continues unabated, and in addition to Duluth capital, which was the first to enter the field, Spokane men have come prominently to the fore and have obtained valuable holdings. A group of 10 claims in Dixie Gulch, about ¾ mile north of the horse-shoe bend of the Great Northern R.R., has been acquired by Spokane men, who have organized the Butte Northern Mining Co. North of these lies the Dewey claim, in which at slight depth, silver and copper have been discovered, and the property of the Butte & Great Falls Co. The Butte Consolidated company's property adjoins it on the west, and south of the claims are the holdings of the Butte & Bacorn Mining Co. Several veins have been developed slightly by shallow shafts and surface cuts with good indications. On the east side of the gulch a crosscut tunnel has been started to intersect one of the veins which outcrops strongly on the surface. It has now attained a depth of 50 ft. and it is expected that the vein will be cut in the near future. G. W. Lansing, secretary of the company, is in Butte directing operations.

Salt Lake City

Sept. 5—Owing to the rise in the price of metals, an increase in wages of 25c. per day has been granted by Bingham operators. The new scale went into effect Sept. 1.

The delegates to the national convention of the American Institute of Banking, meeting in Salt Lake City, made an excursion to Bingham, Aug. 24, to see the camp, and steam-shovel operations of the Utah Copper Co., stopping at Garfield to visit the mills and smeltery.

At a meeting of the Utah Conservation Commission, held recently, the following new officers were elected, and new committees appointed: On Conservation of Forests, O. J. Salisbury and L. A. Merrill; Agricultural Conservation, John A. Widtsoe and Professor Merrill; Conservation of Power Sites and Water, George Austin and T. L. Allen; Conservation of Mineral Resources, J. E. Pettit and H. T. Haines. Governor William Spry is chairman, who, together with the above mentioned committees, constitutes the executive board. Reports of the work of the commission are now in press, and will be ready shortly for distribution.

The question as to whether workers in underground coal or hydrocarbon mines in Utah can be employed longer than eight hours per day has been decided in an opinion given from the attorney-general's office. This was in response to an inquiry by J. E. Pettit, state coal-mine inspector, who asked whether Sec. 1337, Compiled Laws of Utah, 1907, regulating hours of employment in underground mines, applied to coal and hydrocarbon mines. According to the attorney-general's opinion, it is unlawful for any worker to be employed underground in any mine longer than eight hours per day, except in a case of emergency, or where lives or property are in danger. The opinion states that the inspector should investigate reported violations, and if any are found, take the matter up with the county attorney of the county in which the violation occurred, who should prosecute the violators.

Spokane, Wash.

Sept. 3—With the expected arrival in Spokane in a few days of Secretary James F. Callbreath and Assistant Secretary Walcott, of Denver, active preparations for the annual convention of the American Mining Congress will be made. The convention will be held Nov. 25 to 30. *En route* from Washington, D. C., to Spokane, Secretary Callbreath is making stops in Pittsburgh, Chicago and other Eastern cities, arousing interest in the Congress. Local offices in charge of Sydney Norman have been opened in Spokane, at 701 Paulsen Bldg. On the arrival of Mr. Callbreath, a large gathering of mining men will be held to welcome him and to take up further arrangements for the convention. Dr. Joseph A. Holmes, director of the Bureau of Mines, will be on the list of speakers. Conservation will be one of the topics to be discussed.

To secure the enactment in the State of Washington of an act similar to the "blue sky" law of Kansas, the Spokane Mining Men's Club will coöperate with Governor Marion E. Hay. The club adopted resolutions in favor of the governor's stand for the law, and, in case a commission is appointed to frame the bill, the local club will have the privilege of naming some of the members. In an effort to secure all views regarding such a law, the Mining Men's Club has invited many representative men to give their opinion. During the Interstate Fair, to be held Sept. 30 to Oct. 6, the Spokane Stock Exchange and the Mining Men's Club will entertain and give a luncheon to the mining men of the West.

Porcupine

Sept. 5—A rush has started to Gauthier township where a French prospector has staked some claims with extremely good free-gold showings. Gauthier is west of Larder Lake and is reached from Porcupine by the Timiskaming & Northern Ontario Ry. Several parties have left Cobalt and Haileybury for the new field, and more authentic information will be available upon their return.

The Arbitration Board to settle the dispute as to wages between five of the Porcupine mines and their employees has been organized with Peter Macdonald, of Woodstock, as chairman, Professor Haultain, of Toronto University, representing the employers, and the secretary of the local branch of the Western Federation of Miners as representative of the men.

Toronto

Sept. 7—In the course of the investigation by Samuel Price, mining commission, as to the necessity for an 8-hr. day for underground workers, a hearing was given at Cobalt, Aug. 31. The Cobalt Mine Managers Association presented its views in a written document setting forth that if the hours were reduced wages would also be cut down. The average number of hours men drilled in a 10-hr. shift was 6.45, which, it was presented, would be reduced to 4.45 in an 8-hr. shift or a reduction of 31% in the production. The Cobalt mines had to make a heavier outlay than their competitors in warmer countries, to protect the men against severe climatic conditions and had also heavy marketing expenses. They paid large royalties and heavy taxes and were preparing to adopt a workmen's compensation bill, and the additional burden would be detrimental to provincial interests. Like legislation had a disastrous effect in British Columbia and many mining districts of the United States and its tendency would be to divert capital from Canada. Statistics showed that underground mining at Cobalt was not unhealthy, 90% of the employees preferred underground to surface work. Under an 8-hr. day operations would be hurried and there would be more accidents. The case for the 8-hr. day was presented verbally by officials and members of the Western Federation of Miners. William Davidson said that in British Columbia after the 8-hr. day had been adopted the mining industry had expanded and there was more capital in the province than ever. The Cobalt camp had a world-wide reputation as a dividend-payer and could afford to have shorter hours. Butte had the 8-hr. day, yet paid all miners not less than $4 per day and the companies were paying big dividends. Other speakers claimed that the Cobalt mines were unhealthy. A. G. Slaght of Haileybury, appealed for an 8-hr. day for the mill men who, he declared worked from 11 to 13 hr. daily under conditions which produced deafness. At the hearing at Porcupine there was no organized opposition to the 8-hr. day.

Johannesburg

Aug. 12—The Apex gold mine has been closed down owing to shortage of funds and the failure of the negotiations to amalgamate with the Benoni mine which has also been closed down. Only another boom and the restoration of confidence in the prospects and management of the mines of the Rand wil enable funds to be raised at reasonabl rates to allow development work o these and several other mines to be resumed. The Rand will shortly be i need of new mines to take the place o several outcrop mines approaching exhaustion. The mining groups with the exception of the Randfontein, have a last arrived at an agreement to discontinue individual recruiting in Britis South Africa and there is now a prospec of the industry saving nearly as muc as it must spend under phthisis compensation. In further reviewing the native labor situation it must be remembered that nearly 80,000 natives per yea are recruited from Natal and that th industry of sugar planting is an important and growing one there. In th past the unskilled labor was supplied b indentured Hindoo natives from India This has however, been made impossibl by a law prohibiting further importation of indentured Indians. Thes planters are now being compelled to compete with the mines for Kaffir labor.

There are said to be about 4500 case of phthisis awaiting compensation o the Rand itself and over 500 widows ar expected to arrive from Cornwall an elsewhere to have their claims investigated.

The Mining News

The Current History of Mining

Alabama

Quenelda Graphite Co.—This company
ill rebuild its plant at Quenelda, that
as recently destroyed by fire.

Alaska

A Bucyrus dredge of 3000 cu.yd. daily
pacity is being built at Nome by H.
reenburg.

Overland, and Three Lakes—As soon
mine developments warrant it a small
ill will be built at this Porcupine
reek property owned by James R. Hay-
en.

Skeen-Lechnor—The mill will be en-
rged and an aërial tramway will be
uilt this autumn at this Falls Creek
operty.

Brewer-Alaska—The tunnel being
iven on this Lost Creek property is
ported to be in ore.

Alaska-United—During the month of
ly 17,374 tons of ore was crushed in
e Ready Bullion mill, from which 491
ns of concentrate estimated to contain
6,176 in gold, and $25,805 in free gold
as saved. The total realizable produc-
on was $51,461. The operating ex-
enses were $23,563; the estimated oper-
ing profit was $27,898; construction
penses were $2034; the estimated net
ofit was therefore $25,865. The yield
r ton of ore milled was $3.56. In the
0-ft. Claim mill 20,076 tons of ore was
ushed, from which was produced $27,-
3 in free gold, and $30,885 in 370 tons
concentrate. The total realizable
lue of the product was $57,903. The
erating expenses were $27,168; the
nstruction expenses were $2656; the
timated net profit was $28,079. The
eld per ton of ore milled was $2.91.

Alaska-Mexican—During the month of
ly 19,824 tons of ore was crushed,
om which 402 tons of concentrate was
ved. The estimated gross value of
ee gold recovered was $29,547, and
e estimated value of the gold in the
ncentrate $33,895. The total realiz-
le value was $62,808. The operating
penses were $24,847; construction ex-
nses amounted to $4922, leaving an
timated net profit of $33,039. The
eld per ton of ore milled was $3.20.

Dickey Copper Co.—This mine, on
dalgo Bay, near Landlock, has been
ipping from 400 to 600 tons of ore per
onth, the average grade for the ship-
ents during the summer being about
% copper.

Arizona

COCHISE COUNTY

Commonwealth Mining & Milling Co.—Plans for a 300-ton mill have been prepared, the preliminary specifications issued and bids asked for. The plans were prepared by Edgar A. Collins and A. L. Wartenweiler.

GILA COUNTY

Miami—The production in August was 4322 tons of concentrate assaying about 36% copper, which will yield about 2,900,000 lb. of fine copper. The mill recovery is reported to be 70%. There was mined during the month 97,890 tons of ore and 4802 ft. of development work was done. About 30% of the ore came from development work, 25% from the shrinkage stopes, 35% from square-set mining next to the capping, and 10% from the stockpile. The second 500,000 gal. mill-water storage tank has been erected, making a total capacity of 1,000,000 gal. A 600-hp. Babcock & Wilcox boiler is being installed in the power house at Miami, making a total of 2400 b.hp. When the installation is complete, the second 4000-cu.ft. Nordberg air compressor will be operated. Foundations are being laid for the new steel-and-concrete change house, and the construction of the new hospital, jointly with the Inspiration company, has been started. It is designed to accommodate 40 patients and will be equipped with the most modern appliances. Two churn drills are steadily at work developing the northeastern part of the property and diamond drilling continues on the 570-ft. level. About 1000 men are employed.

Inspiration Consolidated—About 600 men are employed in underground development, and in construction work. Mine development is proceeding through five shafts and two tunnels and two main working shafts are rapidly being sunk. The main east shaft is over 180 ft. deep and was sunk 172 ft. in August, which is claimed to be the record for a standard, 3-compartment shaft in the United States. The main west shaft is more than 350 ft. deep and was sunk 146 ft. in August. The company has made a contract with the U. S. reclamation service to take 7500 kw. of electric power from the Roosevelt dam, about 40 miles distant, and a survey for the transmission line has been started. The government does not guarantee continuous service, however, and the company will build an emergency steam power plant capable of generating 7500 kw. H. Kenyon Burch and assistants, who are working on the plans for the 7500-ton concentrator, have moved into the new temporary office at the mill site.

Southwestern Miami—Churn-drill holes Nos. 6, 7 and 8 are respectively 925, 927, and 880 ft. deep and are all to be enlarged by under-reaming preparatory to drilling deeper. Hole No. 8 is reported still to be in chalcocite-bearing schist, which it first encountered at 720 ft. and which was reported to be of commercial grade at 820 ft. Hole No. 7 is in silicified, iron-stained schist and hole No. 6 is in schist slightly mineralized.

Iron Cap—At this mine on Copper Hill, the drift east from the Williams shaft on the 650-ft. level is reported to be in ore.

Black Warrior—W. D. Fisk and Henry Snell have taken a lease on this mine near Miami and will start work soon.

MARICOPA COUNTY

Vulture—A pipe line is to be built from the Hassayampa River to this mine. The wells near the mine, which were drilled several years ago, do not supply enough water for the mill.

Buffalo-Arizona Consolidated—This company expects to place its mill, near Morristown, in operation during September. Much development work has been done on the property.

Monarch Mining Co.—The company is installing a pump on the Hassayampa River below Wickenburg. A pipe line will run from the pump to the mill, which is four or five miles away.

SANTA CRUZ COUNTY

Austerlitz—This old property, which has lately been developed by Doctor Noon and associates, of Nogales, has been bonded to Woodworth and Layne, formerly operating in Sonora. The mine was worked in the old days, but was abandoned because it was thought to have been a surface enrichment. The owners think they have disproved this theory, and show their faith by works. Since this property has been taken up, there is something like a boom on in the whole Oro Blanco district, lying next to the international line, and including the Old Glory mine, another old mine, which has been a producer, and also the Yellow Jacket and the Montana, now under bond to Capt. L. W. Powell and W. J. McDermott.

California

AMADOR COUNTY

Defender—This mine near Volcano, has been closed down temporarily on account of scarcity of water. The water supply comes through the McLaughlin ditch. F. B. Joyce, manager.

Bunker Hill—The 74th monthly dividend was paid Aug. 15 at the rate of 5c. per share. The reduction is a result of appropriations for improvements, including a steel headframe, compressor, and the sinking of a new shaft. A residence for the superintendent will also be built. E. Hampton, Amador City, superintendent.

East Eureka—The new 20-stamp mill is now being steadily operated. E. A. Davis, Sutter Creek, superintendent.

BUTTE COUNTY

The miners near Magalia are complaining of shortage of water. It is said that this is the dryest season in years. Some mines are idle and others are working only part time, or with reduced forces. There is reported to be trouble between the miners and the power company. The contention of the power company is that it wishes only to conserve the water to best advantage.

CALAVERAS COUNTY

Chapman—The mill is running regularly on good gravel. A good vein of low-grade ore has been disclosed. This will not be worked at present, operations being confined to mining and milling the gravel; 25 men are employed.

Ford—The vein recently uncovered is reported to be wider and richer than where first cut.

Gold Hill—A vein of soft quartz has been disclosed in this mine at Bear Mountain. It is milling ore, and carries iron pyrites impregnated with gold.

ELDORADO COUNTY

Lukens—H. C. Rantz, G. W. Davis, L. N. White and E. L. Cleveland have leased this mine near Cool. The development is reported to be making a good showing.

Mulby Point—This mine, two miles from Georgetown, recently bonded to Robinson and Costello, is being developed.

Cedarburg—It is reported that work will be resumed on this mine, near Spanish Dry Diggings. It is an old property that was a large producer at a depth of 140 ft., but has been idle for 36 years. E. W. Hulford, Georgetown, owner.

Mother Lode Mines Consolidated—The Union mine and adjoining properties have been taken over by Greeks of San Francisco and Oakland and this corporation has been formed to operate them. Alexander K. Pavellus, editor of *Eirenokos*, a Greek newspaper, and secretary for the Greek consul at San Francisco, is a member of the corporation. The Union was one of the first and largest producers in the early days of Mother Lode mining. It was operated by Alvinza Hayward. A. Harpending, of El Dorado, has owned the mine for a number of years.

HUMBOLDT COUNTY

Horse Mountain—The new sawmill being constructed will soon be ready for sawing lumber for surface improvements; 35 men are employed in development and installation of equipment.

INYO COUNTY

Skidoo—During the month of July, 10½ days were lost, but 1201 tons of ore was milled from which amalgam bullion worth $15,684 was produced, and $6049 was recovered in the cyanide plant. The costs were $6794 for operation and $1054 for development, a total of $7848, leaving $13,885 net profit.

NEVADA COUNTY

Pennsylvania—Preparations are being made for the installation of a 75-ton cyanide plant, to be built on the same lines as the plant now in operation at the Empire mine. An Oliver continuous filter will be part of the equipment. The mine is under bond to the Empire.

Colorado

CLEAR CREEK COUNTY

New Era—The development of this property, at Freeland, is progressing with favorable results. James Cousins, manager.

Castle Rock—Development of this group of claims, near Freeland, has been resumed. R. D. Blair, manager.

Legal Tender—David Jones and Edward Reiling have secured a two-year lease on this property, in Gilson gulch. Recent development has disclosed a vein of lead ore.

Franklin—This property has been leased to John Peterson, who will reopen the mine at once.

Humboldt—This tunnel will be advanced 1300 ft. The contract has been awarded to Mr. Banard, who will commence work at an early date.

Bride—The west drift has been advanced 60 ft. to a place under the shaft. A raise will now be extended to connect with the shaft for ventilating purposes. An Ingersoll-Rand drill has been added to the equipment. A vein of lead and iron sulphides has been opened.

Treasure Fault—The operation of this property has been resumed and small shipments of gold ore are being made to the local sampler.

Gold Quartz—Development of this property, in the Alice district, has been resumed. The work is being done under contract.

LAKE COUNTY—LEADVILLE

Ella Beeler—A. S. Sharp & Co., lessees, have opened two good streaks c silver-lead ore in two raises from th tunnel. The veins are about 12 ft. apa and about 1 ft. in width. Two carload have been shipped to the Arkansas Valle plant. The ore is galena with nativ silver.

Siwatch Tunnel—It is reported that pa ore has been opened in the tunnel.

Minnie Lee—Medium-grade, zinc-su phide ore has been opened in this min operated by lessees through the Yak Tu nel. Shipments will commence at onc

Matchless—Shipments of ore are bein made by lessees. The ore comes fro the bottom level.

Sugar Loaf Consolidated Co.—The b tunnel is being driven ahead; the shi ments are about 20 tons of good-grad ore daily.

Long & Derry—Two carloads of th rich silver-lead carbonate ore recent opened in the Anona workings are bein shipped, and the drift in which it wa found is being connected with the ma workings.

SAN JUAN DISTRICT

Brown Mountain Pyritic Smeltery—This new mill, at Ouray, is assured of steady supply of ore from the India mine, in the Ironton district, and fro the Wanakah company, which later wi furnish 65% of the 80 tons per day r quired, besides the high-grade ore th is shipped to the Salida smeltery.

Wellington—From these mines, ne Rico, which are owned and operated Jesse Knight and associates, of Utah, abo three carloads of lead, zinc and copp ore are being shipped weekly to Sa Lake City. About 30 men are employe It is said that a new tramway and co centrator will be built shortly.

Wagner Developing Co.—This com pany is developing the Alta property; stamps are dropping in the mill at th lower end of Gold King basin. Durin the last few months the lessees have do considerable surface prospecting and d velopment with favorable results. In th company's Hancock property much pa ore has been opened. A 2-bucket aux liary tramway has been built from th property to the mill loading station. Th buckets have a capacity of 1000 lb. eac The tram is 700 ft. long and has a fa of 400 ft. John Wagner is manager.

TELLER COUNTY—CRIPPLE CREEK

Black Belle—A discovery of rich go ore was made recently at shallow dep by H. Barbee, lessee. An electric hoi will be installed at once and the o broken with machine drills.

Free Coinage—Smelting ore has be opened in the Pinto claim by Hodgin Johnson, lessees.

Henry Adney—The output is increasing and from now on will be about three carloads per week. The shoot is over 100 ft. in length, and 500 ft. below the surface.

Ocean Wave—Ore is being hoisted from the 100-ft. level by W. S. Copeland, lessee. The output will be two carloads per week.

School Section Leasing Co.—This lease is producing from two to three carloads per week of milling ore. The company is considering the erection of a mill.

Idaho

COEUR D'ALENE DISTRICT

Snowstorm—The mill has been closed temporarily in order that necessary repairs may be made. The machinery for the new unit is now being installed in the old original Snowstorm leaching plant. Both the old and new units will be in operation in a short time. Development work has again been started in the No. 4 tunnel, in which the orebody has never been found. The company has a large tonnage of ore in the No. 2 and 3 tunnels already blocked out ready for treatment.

Silver Cable—The new intermediate tunnel at this property is nearing the vein. This tunnel is being driven between the upper and lower workings and will give a depth of about 100 ft. Much iron oxide and a large flow of water have been encountered on this level. The vein will be thoroughly prospected on this level so that it may be located on the lower level.

Electric—The owners of of this group of claims have settled differences and work is to begin at once. There is an excellent surface showing on the property but owing to the internal trouble no work has been done. A compressor is to be purchased and a large amount of development work is contemplated.

Nellie—The first shipment of ore for several years from this property is now being hauled to the railroad. All the ore is first-class, hand picked, for the company has no mill. It consists chiefly of gray copper, rich in silver. This ore has come from the drift from the winze in the lowest level. The ore is hauled 1½ miles to the railroad.

Surprise—A consolidation of this property with the Highland Chief group is being planned. Such a consolidation would greatly benefit both companies for it would greatly reduce the operating costs. The Surprise is practically the only shipper in the Pine Creek district, shipping both lead and zinc concentrates. The property is equipped with a 100-ton concentrator and a power plant. During the last year 650 tons of lead concentrates were shipped. The orebody is small, however, and the cost of extraction through a shaft would be too great unless a larger tonnage could be developed. This might be done by working the Highland Chief ground which is on the same vein and covers the vein for a distance of 4500 ft. Milling ore has already been developed on this part of the vein, although comparatively little work has been done. The latter property also controls water rights which would assure the company plenty of cheap power.

IDAHO COUNTY

Mascot—Work on the mill foundation at this mine on the American River is nearing completion. The pipe line has been put in place and the ore bins at the mine and the tramway are completed.

Black Pine—The custom plant is running on a test shipment from this mine, owned by John Williams.

Kansas

Quick Eight—This mine on the old Taylor-Foster land at Galena produced 280,000 lb. of ore during a recent week, which yielded 54,230 lb. of concentrate. The ore is being mined from the 80-ft. level. Rich ore has been opened.

Wyandotte—A high face of rich ore has been opened in this mine, 1¼ miles west of Galena. The land has been idle for 18 years, former operations having been carried out near the surface. The company now operating the property has penetrated the ore at the 90-ft. level after sinking through a tough formation.

Blackburn Mining Co.—This company is mining ore at a depth of 84 ft., on the Playter land, and 140 tons of ore recently sent to a custom mill produced 39 tons of jack.

East Galena Co.—A drilling campaign is being conducted by this company. A sheet-ore formation is said to have been penetrated at a depth of 200 ft., which seems to be in the Grand Falls chert and is similar to the sheet ground of West Joplin. Former mining has been conducted in pocket formations which seldom extend below a depth of 90 feet.

Michigan

COPPER

The John A. Roebling Sons' Co. has purchased from the Bigelow-Hyams interests the Dollar Bay Land & Improvement Co. and the Tamarack & Osceola Manufacturing Co., which involves a total of 3045 acres of land and the wire mill. The Roebling company has had this mill under lease for several years, and it is stated that it will be enlarged to take care of the company's product for the northwestern part of the country. It is also stated that eventually the wire ropes, etc., sold in this territory will be manufactured at this plant.

Winona—This company is experiencing considerable difficulty in securing the necessary labor to increase production. Shipments of 300 to 400 tons of ore daily are being made to the mill while the underground openings are ample and the stamp facilities are such that between 1200 and 1500 tons could be crushed. The nature of the formation is such that a large percentage of the copper remains in the slimes, but it is stated that a large portion of this is being recovered by the use of tube mills and tables and that additional tube mills are to be installed. The company is also installing a number of the one-man drilling machines.

Lake—Underground conditions at this property are satisfactory. Shipments averaging about 300 tons daily are being made to the mill and as soon as the necessary additional trammers can be secured production will be materially increased, as the openings are sufficient to produce a much larger tonnage. About one-third the present tonnage is being taken from the stockpile.

Hancock—The crosscut from the 34th level of the shaft has been extended a distance of about 665 ft. and is breasted in a formation carrying much copper. This condition has been in evidence for the last 70 ft. The No. 4 lode, which this undoubtedly is, was reached in the shaft at a depth of about 3100 ft., and showed copper in commercial quantities. Shaft sinking continues from a depth of about 3385 feet.

IRON

Oliver Iron Mining Co.—A diamond drill is being operated on Sec. 2, 42-35, near Iron River, where two "forties" are held by this company, lying west of its Dover mine.

McGreevy—Two drill holes have been sunk on Sec. 29, 43-34, and prospecting is being done on the May tract on Sec. 20. Both of these Iron River explorations are north of the Rogers mine of the Rogers Brown company.

M. A. Hanna & Co.—A temporary hoist will be installed at the Carpenter property in the Crystal Falls district preparatory to sinking. The shaft will be 12x18 ft. and will be lined with timber; it will be sunk with four compartments. The overburden is 85 ft. thick at the shaft site and it is anticipated that considerable water will be encountered. In preparation for this a permanent steam plant will be installed at the start so that adequate pumping facilities will be available. Wickes mechanical-stoked boilers will be used.

Bristol—At this Oglebay-Norton mine at Crystal Falls only a small proportion of the stockpile is now left, and the steam shovel has been sent to the Iron River mine of the company.

Corrigan, McKinney & Co.—At Crystal Falls, the Dunn and Tobin stockpiles are cleaned up, also all of the Armenia stockpile except a small one of its second-class ore. The first two mines are shipping ore from pockets.

Mansfield—At this mine of the Oliver Iron Mining Co. in the Crystal Falls district, the ore is being put on the stockpile as it is hoisted.

Cleveland-Cliffs Iron Co.—It is the plan of this company to equip all its Marquette and Swanzy Range mines with electrically operated machinery. At present the North Lake, Negaunee, Princeton, and Smith mines have been so equipped, although the last two properties are idle; steam power is still in use at the Maas, Cliffs Shafts, Austin and Stephenson mines.

Minnesota

Mesabi Range

Buffalo—Four more shovels are now working in ore at this mine.

Arthur Iron Mining Co.—The Winston-Dear company has four steam shovels on the ground at the Sec. 27 property of this company in Chisholm district. Only two shovels are working at the removal of overburden at present, but two more shovels will be put in commission in a few days. These are new shovels recently received from the manufacturers and are the most uptodate machines on the range. New cars and locomotives have been ordered. It is the intention to work all winter. The overburden formation is largely clay which can be worked to good advantage during cold weather.

Rogers-Brown—It is reported that 50 more men are to be added to the force at each of the mines of this company.

Crosby—A small force of men is at work getting things in shape for working a large force during this winter. About 20,000 tons of ore remains to be shipped from the stockpile; then work will be started underground.

Missouri

Joplin District

Richinore—The ore at this mine at Thoms Station has changed recently from galena to blende, necessitating a change of milling methods.

Weneta Pearl Mining Co.—A drill strike of unusual richness was recently made by this company on the Clark and Ward land. Ore was found between depths of 90 and 135 ft., and 135 and 150 ft. The cuttings assayed high in zinc.

Alice of Old Vincennes—A prospecting company has opened a good face of ore in this mine at Chitwood. At present the ore is being treated on hand jigs, but a mill will be built if development justifies the expense.

Continental—H. B. Crossman is carrying on drilling operations on a lease of this property near Carterville, for Johnson & Bruce, and new strikes have been made near the mines of the American Lead, Zinc & Smelting Co. An upper sheet ground formation was found at 190 ft., extending to 198 ft. Beneath was a foot or so of barren chert and then a 10-ft. face of lower sheet ground richer than the upper run. The holes are being sunk 500 ft. apart.

Newsboy—This old mine at Duenweg is being reworked. A shaft has been sunk 239 ft. by the side of an old cave-in and a good face of ore has been found above the old workings.

Lucky Ben—This mine on the Clark land five miles west of Sarcoxie is proving to be a good prospect. It is in virgin territory and the shaft is 142 ft. deep. The ore is ruby jack in clean ground.

Eureka—The Eureka mill on the Crown Crest land is in operation after a campaign of drilling. Ore is found from 102 to 180 ft. deep at this Duenweg property.

S. Y. Ramage Mining Co.—This company is sinking a large shaft on the Burch land at Duenweg, following several rich drill strikes.

Little Bob—This mine at Duenweg belonging to Chapman and Lennan is proving to be a good producer. A 200-ton mill is being operated on ore from three shafts.

Montana

Butte District

Davis-Daly—The crosscut being driven northwest from the Colorado shaft on the new 1900-ft. level, has encountered a vein, 410 ft. from the shaft. This is the same vein upon which mining is being done on the 1700-ft. level. The width and quality of the ore is about the same on both levels. The crosscut from the Gagnon mine of the Anaconda company is being advanced steadily into the western territory of the Davis-Daly company. The recent strike made by lessees operating the Silver King mine of the Davis-Daly company is being explored with satisfactory results.

North Butte—Rich ore was recently encountered on the 2400-ft. level of the Speculator mine, southeast of the shaft, on what is believed to be the real Edith May vein. While crosscutting south on this level to the High Ore mine workings, a vein badly faulted and broken up, which was at that time believed to be the Edith May vein, was encountered. A drift was driven west but the same faulted condition continued, and as the ore was of a poor grade, drifting was stopped. Then the crosscut was advanced again toward the High Ore mine, and several stringers were cut. A drift was driven with the result that a strong vein between unbroken walls was discovered. This is believed to be the true Edith May vein and there is strong reason to think that it exists on the levels above, where it was overlooked, owing to the fact that the same faulted vein material was found and believed to be the Edith May. Drifting will at once be started in both directions on the vein.

Anaconda—At the Badger State mine, of the Anaconda company, about 700 tons of ore is being hoisted daily and about 300 men are employed. The concrete foundations for the new chippy hoisting engine have been completed and the engine will be installed soon. The new extension of the combined office building and will be ready for occupancy in about a month. The surface ore bins have been and change house is nearing completion enlarged to nearly double the former capacity by an addition built on the north end, and a tramway has been laid from the north end to the collar of the shaft. The Emily shaft is being sunk two compartments wide, and is about 900 ft. deep. Preparations are being made to raise from the 1300-ft. level of the Badger State to meet the sinking force in the Emily, and a crosscut is being driven to a place underneath.

Tuolumne—This company is shipping about 35,000 tons of ore monthly to the Washoe smeltery, most of it coming from the 1600- and 1800-ft. levels. The ore on these two levels has been of lower grade than on the levels above, and in this respect it has been similar to the adjoining properties, which, upon sinking deeper, found much improved conditions. The shaft is being sunk, and has reached a place below the 1900-ft. level. It will be continued to the 2000 and possibly to the 2200-ft. level before stations are cut and development work begun. A portion of the Jessie vein, upon which the North Butte company recently made a rich strike on the 2400-ft. level, may be found to pass through a part of the Tuolumne ground, and as the North Butte 2400-ft. level corresponds to the Tuolumne company's 2200-ft. level, it is likely that the same orebody will be found in the latter property with development on that level.

Fergus County

Barnes-King—It has been announced that operations will be commenced at once on the lately acquired North Moccasin property at Kendall. George T. McGee, general manager.

Jefferson County

Norma—At a meeting of the stockholders in Butte, Aug. 20, the following officers were elected: W. J. Swartz, of Butte, president; Norris Climer, vice-president; A. B. Keith, treasurer. Three directors were elected: Henry Hopkins and William Bailey, of Butte; and John Mackin. The company owns eight claims at Clancy, and is doing development work by tunneling with satisfactory results.

LEWIS & CLARK COUNTY

General Sherman—It is likely that this nine, situated on the west fork of Prickly Pear Creek, in the Empire district, may e reopened after 20 years of inactivity. . J. Seligman, of New York, owner.

Nevada

ESMERALDA COUNTY

Goldfield Consolidated—The official stimated production for August is as ollows: Tons of ore mined, 32,480; ross value of gold recovered, $426,000; perating expenses, $195,000; and net ealization $231,000.

EUREKA COUNTY

A new tariff will go into effect on the ureka-Nevada R.R. within a few days, ringing a much needed relief in the orm of a reduction in rates. Among the eductions are, flour in carload lots from 10 to $7.60 per ton and in less than arload lots from $20 to $10 per ton. istillate in drums from $8 to $4.50 per on. All ore rates have been reduced, ut no figures have yet been given ut.

Buckhorn Mines Co.—For the last wo years work has been confined to evelopment of ore. It is now planned o open and actively work this property t once. Power will be generated at eowawe, on the Southern Pacific and Vestern Pacific railways and a transmission line run from there to Buckhorn, distance of about 28 miles. A long unnel has been started and the mill vill be erected near the portal. Stock in he company is closely held by George Vingfield and associates. Construction f a spur line from Blackburn station n the Eureka-Nevada R.R. has been tarted.

LINCOLN COUNTY—PIOCHE DISTRICT

Home Run Copper Co.—Development work on the property recently acquired in the Bristol district has opened opper-silver ore, occurring in caves in he lime. Three carloads have been hipped. For preliminary work, a 9-hp. 'airbanks-Morse gasoline engine is being used, but the company will soon install a heavier engine and a compressor.)re is hauled 12 miles by wagon to the 'ioche-Pacific R.R.

Virginia-Louise—This company, organized last year, owns property adjoining the Prince on the South, where it s sinking a vertical shaft near the Prince end line. For the last 100 ft. t has been going through a bed of manganese ore, and at a depth of 250 ft. idneys of rich silver-lead ore are being found in the manganese. A 20-hp. 'airbanks-Morse gasoline engine is in use t present, but a steam plant will be nstalled before shipments are commenced.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Aug. 29, are as follows:

Mines	Week	Year to Date
Tonopah Mining....	3,000	116,819
Tonopah Belmont	3,091	78,942
Montana-Tonopah..	1,159	36,092
Tonopah Extension	1,065	34,633
West End ..	835	25,454
Midway ..		420
MacNamara ..	450	12,302
North Star	......	130
Mizpah Extension..		40
Jim Butler	300	700
Totals........	9,900	305,532
Estimated value	$250,000	......

New Mexico

OTERO COUNTY

J. J. Murray, of Oro Grande, is about to renew work on the placer deposit, near Lucky Flats.

E. T. Becham and associates, of El Paso, are prospecting the old Lucke and Lincoln properties, belonging to New York men, with the idea of taking them over under lease and bond.

By Chance—Several cars of ore have been shipped to the El Paso smeltery. A new hoisting plant was recently installed. The ore contains on the average about 2½% copper and about ¼ oz. of gold. R. B. Hutchinson is consulting engineer.

Garnet—From this group of claims, west of the By Chance, about 200 tons of 3% copper ore is being shipped monthly. A hoist was recently installed, and it is the intention of the owners to begin the erection of a concentrator in the near future. E. B. Baker, Lucky Flats, is manager.

SOCORRO COUNTY

Ernestine Mining Co.—During the first 20 days of August, 18,160 oz. of gold and silver was recovered and nine tons of concentrate was saved. Between August 20 and 27, 750 tons of ore was treated.

Socorro Mines—The water recently encountered on the 500-ft. level of the Queen vein is now completely under control and the lower levels have been drained. An average of 150 tons of ore is being treated in the mill each day, a small portion of which is custom ore.

Deadwood Mine—New bins for custom ore are being built. Machinery for an automatic sampler has been shipped.

Mogollon Gold & Copper Co.—The Little Charley mine of this company is producing 15 tons of milling ore per day in addition to some high-grade shipping ore. Work may be started soon on some of the other properties of this company.

Oaks Co.—From the Pacific mine of this company 90 tons of ore was shipped recently to the Deadwood mill. This was produced from one week's development work. The Johnson mine yielded 31 tons of ore in the same time.

Utah

BEAVER COUNTY

There has been some shortage of railroad cars lately, on account of the increased activity in mining.

Horn Silver—During August this company shipped 50 cars of lead-silver ore and six cars of zinc ore. Leasing is being discontinued, and only five leases are being worked at present. There are 110 men employed on company account.

South Utah—During June and July, half of the mill was closed for alterations and repairs, according to the company's report. The production was reduced, the cost increased, and there were no profits. August operations are understood to have been somewhat more favorable. The grade of ore handled in June was 1% copper, and in July 1.13%. There has been some disposition on the part of shareholders to call for a report on mine and mill conditions.

Majestic—During August this company marketed about 40 cars of ore, largely copper. This came from the Old Hickory with some silver-lead ore also from the Harrington-Hickory. A 4-mile railroad spur was recently built, eliminating the wagon haul to Milford, and reducing the cost of production. The July output amounted to 28 cars. New machinery has recently been installed, and the large compressor will allow the company to operate six or eight drills, as compared to four formerly used.

North American—This property, in the Lincoln district, has recently been reorganized. C. W. Corfield is president. The company owns four claims covering the contact of limestone and granite. Silver-lead ore occurs along the contact and in the cross-fissures. Little development has as yet been done, but work is soon to be undertaken.

Beaver Butte—Stringers of ore rich in gold have been cut recently on this property, which adjoins the Sheep Rock on the south.

Granite Copper—A contract for 600 ft. of work has been let on this company's King of the Hills group, in the Granite district. Tunneling will be continued from the face of a 230-ft. adit, about 350 ft. below the surface. A shaft, sunk on the contact of limestone and granite, opened low-grade copper ore.

JUAB COUNTY

Tintic shipments for the week ended Aug. 23 amounted to 155 cars.

Uncle Sam—At the adjourned meeting the capitalization was increased from 500,000 to 750,000 shares. Of this increase, 200,000 shares will be retained in the treasury, and 50,000 are to be used for taking over the 100,000 shares of Richmond-Anaconda stock outstanding. The Uncle Sam owns 400,000 out of the 500,000 Richmond-Anaconda shares, and at a meeting of the Richmond-Anaconda stockholders, following the meeting of the Uncle Sam, the exchange on the basis of two shares for one of Uncle Sam was approved.

SALT LAKE COUNTY

Utah Copper—Twenty thousand tons of ore are being treated daily by the Garfield mills. The output for the first seven months of 1912 amounted to 64,461,413 lb. copper, as compared to 53,193,216 lb. during the same period of 1911. Ore running between 2 and 3% copper is reported to have been cut recently by one of the prospecting drills.

New Bingham—Articles of incorporation have been filed for this company. The capitalization is $100,000, divided into shares of 20c. par value. Frederick Eberhardt is president.

Ohio Copper—The third unit of the mill has been started, but has not yet been brought up to capacity. It is reported that about 2400 tons per day is being treated, compared to the former output of 2000 tons. Chilean mills will be used in the third unit.

TOOELE COUNTY

Consolidated Mercur—The annual report is being prepared, and it is stated that net earnings of approximately $10,000 will be shown.

Canada

BRITISH COLUMBIA

Consolidated Mining & Smelting Co.—This company, operating mines near Rossland, recently purchased the Iron Horse claim which adjoins the company's other properties on the east, and which gives it additional ground along the strike of the main Le Roi-Center Star vein. There is a shaft on the claim 100 ft. deep and some lateral workings on the 65-ft. level. The aërial tramway, formerly used to convey the ore from the Le Roi mine to the ore bins on the Red Mountain Ry., has been taken down and shipped to Ainsworth. It will be erected again at No. 1 mine and used to transfer ore from that property to barges on Kootenay Lake. The No. 1 mine, at Ainsworth, has been purchased by the company and several smaller properties have been taken under bond and lease. Ore from these mines is now being shipped to the Trail smeltery.

Blue Bird—Since the installation of the air compressor at this property last month, work has been resumed in the shaft.

Phoenix—Three men are now working on this lease for Mathew Trewhella, who is sinking a small shaft on a vein of chalcopyrite that carries some gold. Two carloads of ore have been shipped to the Trail smeltery.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Sept. 7, and for the month of July are:

Beaver		244.26
Buffalo	65.36	803.75
Casey Cobalt		212.15
City of Cobalt		887.99
Cobalt Lake	32.15	586.91
Cobalt Townsite	38.81	1,142.98
Chamb.-Ferland		289.05
Coniagas	163.95	1,515.41
Crown Reserve		351.10
Drummond		330.30
Hudson Bay		502.86
Kerr Lake		529.92
La Rose	32.60	2,415.79
Lost and Found		15.00
McKinley-Darragh	41.80	1,843.79
Nipissing		1,527.77
O'Brien		345.62
Penn-Canadian		29.70
Provincial		22.22
Right of Way	32.20	242.82
Timiskaming		744.93
Trethewey		353.89
Wettlaufer	36.70	265.74
Colonial		63.14
Totals	443.58	15,317.12

ONTARIO-COBALT

Cobalt Lake—The record production was reached in July when 100,000 oz. was shipped. A large part of the output was from the rich vein in the No. 4 shaft. The August production is estimated at 120,000 ounces.

Timiskaming—A carload of ore has just been shipped which will meet the dividend requirements for this quarter. The No. 6 vein has been found on the 575-ft. level and still carries rich ore.

Cobalt Central—Developments continue to be favorable and good ore is being opened on the lowest level.

Bailey—This property will rank among the "come-backs," having developed consistent bodies of high-grade ore for the first time in its history.

Green-Meehan—An offer for the purchase of this property has been made.

ONTARIO-PORCUPINE

Lucky Cross—Ground has been broken for a 10-stamp mill on this Swastika property.

Dome—A double-drum electric hoist is to be installed at the head of the incline to handle the ore from the 45- and 100-ft. levels. Trouble has been experienced in discharging the tailings from the mill, and a tailings wheel will be installed.

Mexico

BAJA CALIFORNIA

Progreso Mining Co.—At this mine at Triunfo, experiments are being made to determine the proper treatment for the refractory gold-silver ore. Indications are that heavy stamps will be used to crush through coarse screens, the product to be sized and the undersize to be concentrated. The oversize will be passed through tube mills. Tailings from the concentrator will be recrushed in another tube mill and treated directly in Merrill presses. These are the tentative plants only. Arthur C. Nahl is manager.

HIDALGO

Santa Gertrudis—The suit against this company commenced in Mexico about two years ago by the Recuperadora company has been dismissed by the higher court of Mexico.

SONORA

Much damage has been done to the railroads by the Yaqui Indians and rebels. Supplies are short in many places and will probably cause a temporary shutdown of some of the more isolated mines.

Creston-Colorada—Since Jan. 1, 1912, this company in the Minas Prietas district, has mined and milled 138,700 tons of ore, recovering 256,000 oz. silver and $293,000 gold; 120,020 tons coming from the Creston and 18,680 tons from the Colorada mine. A break occurred in the gearing of the hoist at the West shaft of the Creston. While repairs were being made, the ore was hoisted through the old shaft. The pumps have been removed from the 1022-ft. and installed on the 722-ft. level. Development work is being pushed on the 622-ft. level, on a vein recently opened up, called the East vein. Six machine drills are on development and assays show a good grade of milling ore, averaging in width about eight feet. At the Colorada a large body of milling ore has been developed within the last few months; some rich gold-silver ore was extracted from stringers in the main vein. The old Colorada incline shaft is being retimbered, and a new headframe, electric hoist, ore bin and rock breaker are being installed. A surface tram 800 ft. long is being built to convey the ore from the shaft to mill.

Zubiate—This mine is 12 miles north of Minas Prietas. The Mines Company of America has an option on the property and is removing the water and sampling the mine. This mine has been a rich producer of silver in past years, but has been idle for about seven years; depth of old workings 650 ft. perpendicular.

Lapiz—This mine, about 15 miles south of Minas Prietas, is being worked steadily. A gas engine, electric generator and electric pumps are being installed with the purpose of pushing development on the lower levels. This mine is one of the largest producers of high-grade graphite. The property is owned by the U. S. Graphite Co. of Saginaw, Mich.

Tarasca—This mine is in the Hermosillo district and near Torres station on the Sonora Ry. A 3-ft. vein carrying native silver has been cut in one of the crosscut tunnels and raises and drifts are being pushed on the orebody.

Asia

CHOSEN

Oriental Consolidated Mining Co.—The cleanup for August was $136,000.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Sept. 11—Anthracite collieries are still hard at work to catch up with the demand and fill orders on time. The figures below show heavy production for August and this probably cannot be increased unless more labor and more cars can be had.

The seaboard bituminous trade is in fair shape, demand being good and prices rather firm. The coastwise trade is increasing in activity.

The coal trade in the West is active, the demand for steam coal being good. Prices are fairly firm though they are rather kept back by large production. Some of the West Virginia mines are still disorganized by labor troubles.

The Southwestern Interstate Coal Operators' Association reports shipments for the five months ended May 31 as follows, in short tons:

	1911	1912	Changes
Missouri.........	973,981	1 336,782	I. 362 801
Kansas...........	1,905,828	2,183,406	I. 277,578
Arkansas.........	532,712	718,531	I. 185,819
Oklahoma........	930,000	1,223,795	I. 293,795
Total.	4,342,521	5,462,514	I. 1,119,993

Total increase this year was 21%. These shipments cover over 90% of the coal mined in the states named.

Anthracite shipments in August were 6,576,591 long tons, the heaviest ever reported in a single month, and 1,044,795 tons more than in August, 1911. For the eight months ended Aug. 31 the total shipments were 45,645,444 long tons in 1911, and 38,958,723 in 1912; a decrease this year of 6,686,721 tons, or 14.6%. The heavy tonnages of June, July and August have not yet made up for April-May stoppage.

IRON TRADE REVIEW

New York, Sept. 11—The only change apparent in the iron and steel markets is some cessation of the rush of new orders. This is probably due to discussions over price and the unwillingness of makers to contract far into 1912 just yet. Specifications on contracts continue heavy and the mills are pressed for deliveries everywhere.

The statistics issued by the American Iron & Steel Institute for the first half of 1912—given on another page—show record productions of steel and of many lines of finished materials.

The National Tube Co., under date of Sept. 10, issued a new list of discounts on merchant steel pipe, by which several sizes, particularly of galvanized, are advanced from one to three points, or $2 to $6 a ton, other sizes being unchanged. The average advance is probably in excess of $1 a ton on the whole list. The rearrangement is stated to be due to a desire to bring the discounts on different sizes more in harmony with the actual cost of manufacture. Steel boiler tubes under the same date are advanced one point throughout the list, equivalent to $2 a ton.

The statement of the United States Steel Corporation, of 6,163,375 tons of unfilled business at the close of August, indicates an increase during August of 206,296 tons, which is equal to about 18% of the corporation's capacity for the month. Its shipments were presumably between 90 and 95% of capacity, so that its bookings, being about 18% heavier than its shipments, must have run considerably beyond maximum capacity, or more than could be made in August, even though the entire theoretical capacity was in operation, for an account of the heat, the labor scarcity and the car shortage, which is being felt still more, the full capacity could not be realized.

Pig-iron sales continue large, though some large foundry interests are out of the market for the time being, having provided for their wants for some time ahead. There is a demand for foundry iron still, notwithstanding this condition, while basic iron is called for largely. Furnace production is increasing slowly, the supplies of coke and labor being limiting factors.

Pig-Iron Production—The reports of the blast furnaces, as collected and published by *Iron Age*, show that on Sept. 1 there were 257 coke and anthracite furnaces in blast, having a total daily capacity of 82,100 tons; an increase over Aug. 1 of 3400 tons. Making an allowance for the charcoal furnaces, the estimated production of pig iron in the United States in August was 2,539,125 long tons; for the eight months ended Aug. 31, it was 19,048,625 tons. Of this total approximately 14,085,800 tons, or 73.9%, were made by steel works furnaces.

Baltimore

Sept. 9—Exports for the week included 226,169 lb. miscellaneous steel to Havana; 4,192,760 lb. billets and tinplate bars to Liverpool.

Birmingham

Sept. 9—Pig-iron prices in Southern territory are showing an inclination to advance. The general market conditions are strong and there are inquiries for iron to be delivered on during the first half of next year. Quotations of iron for delivery during the last three months of this year are on a basis of $12.50@13 per ton, No. 2 foundry. The $13.50 price is being asked for iron to be delivered during the second quarter of 1913. The Southern furnace companies have been selling their product steadily. The recent orders stipulate delivery during the last quarter of this year, though a few scattering trades are for next year's delivery. The cast-iron pipe companies continue to look after needs for next year. It is announced that the pipe demand is heavy and no time is being lost in the operation of plants. The American Cast Iron Pipe Co. is operating its Birmingham plant on double turn.

Foundries and machine shops report a little improvement in business, with labor troubles still being felt.

The make of both foundry and charcoal iron is being increased. One blast furnace was blown in this month and two others are almost ready. One charcoal furnace will be started up the last of the month, to produce about 60 tons of iron daily.

Scrap iron holds its own with very little change in demand and quotations.

Chicago

Sept. 10—Buying of pig iron has been active in the last week, with the result that prices are now firm and at least Northern foundry iron will advance 50c. within the current week. The sales of the last week have been made at $16@16.50 for Northern No. 2 foundry, which means about $16.50@17 Chicago, and $12.75@13.25 Birmingham for Southern No. 2 foundry, which means $17.10@17.60 Chicago. Sales agents for Southern hold out stiffly now for $13 on last-quarter and first-quarter deliveries. Charcoal iron is in good demand at $16.75, Chicago.

The buying of pig iron is chiefly for first quarter; there is still a considerable sale of small lots for last-quarter needs, at practically the same prices on the average, though some lots bring the low prices quoted. In general, the week's sales have been of small to medium lots—250 to 2000 tons, the aggregate having been satisfactory to the sales agents. Some disposition exists among the larger users of iron to contract for first-half needs, but the more general practice is to provide for the first quarter.

In the finished material market the demand continues large, but there is much doubt as to 1913 contracts and in many lines new business for the rest of this year cannot be taken because of the pressure on the mills. Iron bars on several sales have brought more than the 1.40c. nominal quotation; soft steel bars hold to 1.48c. and are likewise in heavy demand. Railroad supplies are very much in demand, both standard rails and fastenings, but the larger contracts for next year's deliveries are said to be yet held off. Structural material is much sought, but mills are so crowded as to make deliveries doubtful. Sheets, plates and wire goods continue active and prices are firm.

Cleveland

Sept. 9—Ore shipments in August were heavy, in spite of bad weather. Some shippers have had to hire wild boats, and such boats are now asking advances on contract rates.

Pig Iron—August sales were large and business continues active. Prices are advancing. Bessemer is now quoted $15.65 and No. 2 foundry $15, Cleveland delivery.

Finished Material—The mills are finding difficulty in shipping as fast as material is wanted. They are not willing yet to make contracts running into next year. Steel bars are in special demand. Jobbers report heavy trade.

Philadelphia

Sept. 17—Buyers and sellers have drawn apart, sellers because they have booked all the business they care to take at the present time under existing conditions and buyers because they find it difficult to place orders at prices they are willing to pay. There is a good deal of business that needs to be placed soon. The market is taking a breathing spell and buying must shortly be resumed on the best terms consumers can make. A good many purchasers who placed orders a month or more ago are unable to get iron according to contract. All foundries are either in the market or would be if they could get in. Southern furnaces monopolize the current business. Basic-iron transactions are pending for large lots and makers are quoting the outside figure of $16.50. The recent heavy transactions in forge leave the market with very few inquiries. The situation is one of delay until conditions shape up differently. No. 2 X foundry is quoted as high as $16.75; gray forge $16, basic $16.50, and low phosphorus $21.50 per ton.

Steel Billets—Large transactions in billets are promised with premium prices ruling. Forging billets have advanced to $30, bottom price, with $31.50 in one recent sale for early delivery. Rolling billets have moved up to $25.40 with probabilities of an advance.

Bars—Bars have moved up fractionally on early deliveries to 1.45c. for steel and 1.47½c. for iron. Jobbing demand has picked up but there is difficulty in accommodating all buyers, owing to the urgency for delivery.

Sheets—Several buyers of sheets are now awaiting the action of manufacturers as to deliveries, the question of price not being brought up.

Pipes and Tubes—Wrought-iron pipe has advanced $2 per ton but this does not represent the actual price paid in two or three recent cases. Premium prices have been paid on orders for tubes.

Plates—Large orders have been placed for steel plates and these represent only a small percentage of the inquiries that are crowding in. Much business is being done at premium rates and a formal advance is close at hand. Sheared plates 1.55c. with 1.65c. for universal.

Structural Material—Today's quotations on paper are 1.65c. and inquiry has lightened up, but there is a great deal in the way of negotiation.

Scrap—Scrap is active at advancing prices, especially for railroad, heavy melting steel, No. 1 yard scrap and old iron rails.

Pittsburgh

Sept. 10—September has produced no marked change in the finished-steel trade, there being a continuance of the heavy specifications, in excess of current shipments, whereby mills are falling still farther behind in shipments in several of the important products. This is particularly true in the sheet trade, in which several of the producing mills are actually trying to buy sheets, some being in the market for galvanized, and others for black sheets, both for early delivery. There is very little of such material to be had, and the sheet mills are advancing their prices on such deliveries as they can make, generally in November and October. Practically all the independent tinplate mills have advanced their price on tinplate $2 a ton to $3.60 a box, but as they are sold up for this year and are not yet willing to sell for next year, the action is not of striking importance.

The iron and steel market locally shows no material change from last week, except for the stronger market in sheets and advances in certain descriptions of tubular goods. As wired briefly last week, the independent tinplate mills started advancing their price 10c. per box to $3.60, and this advance quickly became general. Independent sheet makers have been making slight advances here and there for two or three weeks, and this week the advancing tendency has become quite general, eight or ten independents being understood to have advanced their prices on black sheets $2 a ton from 2.05c. to 2.15c., and on galvanized $3 a ton from 3.15c. to 3.30c. It is likely that by the end of the week the advance in sheets will have become general.

Pig Iron—Quotations on bessemer and basic are higher, although actual transactions have been light, and it is a question what would occur on actual transactions involving large tonnages. It is claimed that higher than $15 has been asked on bessemer, and as high as $14.50 on basic, against last week's quotations of $14.75@15 on bessemer and $14@14.25 on basic. There seems to be little unsold tonnage for this year, but very few additional merchant furnaces are in position to blow in, nearly all the available merchant capacity being already in operation in the general Pittsburgh district. We quote: Bessemer, $15; basic, $14@14.50; No. 2 foundry, $14.25@14.50; forge, $13.75@14; malleable, $14@14.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market has been relatively quiet as to contract buying since the $2.50 advance of a fortnight ago, but there is considerable demand for prompt, which frequently brings premiums. We quote the market at $53.50@55 for prompt and $53.50 for contract, f.o.b. Baltimore.

Steel—There is very little steel to be had and fancy prices are frequently paid for early deliveries, frequently involving fairly large lots. Regular quotations, at which it is difficult to buy, are approximately as reported last week: Bessemer billets, $23@23.50; bessemer sheet bars, $23.50@24; openhearth billets, $24@24.50; openhearth sheet bars, $24.50@25; rods, $25.50@26, f.o.b. maker's mill, Pittsburgh or Youngstown. Several of the large mills are practically out of the market for this year's delivery, while none of the mills is quoting for next year as yet.

Sheets—As noted, the independents have been advancing prices, and eight or 10 have marked up their prices $2 a ton on black and $3 a ton on galvanized. Others are practically out of the market, so that the market seems fairly quotable at the advance. The mills are from six to ten weeks behind in deliveries and at the recent rate of specifying they will be kept busy on contracts throughout the year, without making any fresh sales. Thus far there is practically no selling for next year. Some buyers are trying to buy additional tonnages, ostensibly for this year, but in the knowledge that if the material were specified late in the year it would not be delivered until next year. We quote black sheets, 28 gage, at 2.15c.; galvanized, 28 gage, at 3.25@3.30c.; blue annealed unchanged at 1.50c.; painted corrugated, 28 gage, 2.30@2.35c.; galvanized corrugated, 3.30@3.35c. for 28 gage.

St. Louis

Sept. 9—The market for the past week has been on the "up-turn" considerably. A number of buyers have come into the market for both last- and first-quarter delivery. Producers are quoting for Southern No. 2, $12.50 Birmingham, or $16.25 St. Louis, on last-quarter delivery and $13 Birmingham, for next-year's delivery, or $16.75 St. Louis. Founders are buying mostly in small quantities and often. Northern iron is quiet and is bringing around $15.50 for No. 2 Foundry. Good foundry coke is bringing around $5.40 St. Louis.

Iron Ore Trade

Total shipments of iron ore from the Lake Superior region in August were 7,760,248 tons, the heaviest for any month this year. For the season to Sept. 1, the totals were 19,606,268 tons in 1911, and 29,051,152 in 1912; an increase of 9,444,884 tons, or 48.2% this year.

Sales of Cuban ore to merchant furnaces in the East are estimated at 200,000 tons. This is the first year that Cuban ore has been offered on the market in any considerable quantity.

Foreign Iron Trade

Exports and imports of iron and steel and of machinery in Great Britain, seven months ended July 31, as valued by the Board of Trade returns, were:

	Exports	Imports	Excess
Iron and steel	£25,727,345	£6,878,122	Ex. £18,849,223
Machinery...	18,447,691	3,981,186	Ex. 14,466,505
Hardw're, etc.	6,864,037	4,445,593	Ex. 2,418,444
New ships....	3,134,990	....	Ex. 3,134,990
Total..... ..	£54,174,063	£15,364,901	Ex. £38,869,162
Total, 1911..	52,326,657	13,767,808	Ex. 38,558,849

Increase in total exports this year, £1,847,406; increase in imports, £1,537,093. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports	2,585,894	2,678,062	I. 92,168
Imports	1,026,750	1,069,334	I. 42,584

Increase in value of exports this year was mainly in machinery and hardware.

German Iron Trade—Exports and imports of iron and steel, and of machinery, in Germany, six months ended June 30, metric tons:

	Exports	Imports	Excess
Iron and steel...	2,928,130	326,653	Exp. 2,601,477
Machinery	247,138	44,127	Exp. 203,011
Total....	3,175,268	370,780	Exp. 2,804,488
Total, 1911......	2,699,759	339,898	Exp. 2,359,861

The total increase in exports was 475.509 tons.

METAL MARKETS

New York, Sept. 11—The metal markets have been generally active and stronger, while consumption appears to be increasing.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January.....	110	111	July.	112	114
February ..	115	109	August. ...	117	120
March......	112	111	September	111	.
April.......	114	115	October	112	.
May........	118	118	November .	111	.
June.......	115	117	December..	1.0	.

Year 1909, 115; 1910, 115; 1911, 112.

Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
July 1912..	$ 7,263,624	$ 3,747,869	Exp. $3,515,755
" 1911..	2,178,088	2,594,653	Imp. 416,565
Year 1912..	40,660,460	29,012,211	Exp. 11,648,249
" 1911..	15,429,650	36,367,679	Imp. 20,938,029
Silver			
July 1912..	6,591,054	3,449,716	Exp. 3,141,338
" 1911..	5,275,008	3,920,794	Exp. 1,354,214
Year 1912..	40,260,276	28,713,965	Exp. 11,546,311
" 1911..	39,718,211	25,881,395	Exp. 13,836,816

Exports from the port of New York, week ended Sept. 7: Gold, $7415; silver, $1,255,743, to London and Paris. Imports: Gold, $324,362; silver, $146,850, chiefly from Mexico and South America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. There is some talk in London and Paris of probable exports of gold to New York at an early date.

Iridium—This metal is quoted at $63@64 per oz., New York.

Platinum—Prices hold steady, both here and abroad, and no change is reported. Dealers here ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

Our Russian correspondent writes, under date of Aug. 29, that there is little change.. Foreign demand is insignificant for the present, and no business is being done at St. Petersburg. From Ekaterinburg, it is reported that speculative purchases have kept up the price. The offer of platinum by the starateli is increasing, many miners having left the gold mines in the Urals for the platinum placers. Quotations for crude metal, 83% platinum, at Ekaterinburg, are 9.8 rubles per zolotnik—equal to $36.85 per oz.; at St. Petersburg, 37,300@37,500 rubles per pood—equal to $36.65 per oz., average.

Silver—The market has ruled dull and steady the past week. China has been out of the market, but India Bazaars have been steady buyers. Crop prospects in India and China continue good and the outlook for silver demand is favorable.

SILVER AND STERLING EXCHANGE

September	5	6	7	9	10	11
New York....	62¾	62⅝	62⅝	62½	62½	62½
London .	28⅞	28⅞	28⅞	28 11/16	28 11/16	28 11/16
Sterling Ex..	4 8655	4.8640	4.8640	4.8630	4.8610	4.8595

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Aug. 29, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India........	£5,292 700	£5,892,700	I. £600,00
China.... ...	949,700	933,500	D. 16,20
Total	£6,242,400	£5,826,200	I. £583,800

Imports of silver into Great Britain, seven months ended July 31, were £8,894,802—of which £7,205,866 is credited to the United States. Exports were £8,114,851; excess of imports £779,957, which compares with an excess of exports of £1,156,996 last year.

Copper, Tin, Lead and Zinc

NEW YORK

September	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
5	17⅝ @17¾	17.52½ 17.57½	47½	4.85	4.75 @4.77½	7.30 @7.40	7.15 @7.25
6	17⅝ @17¾	17.52½ 17.57½	47½	4.85	4.75 @4.77½	7.35 @7.40	7.20 @7.25
7	17⅝ @17¾	17.52½ 17.57½	47½	4.85	4.75 @4.77½	7.35 @7.40	7.20 @7.25
9	17⅝ @17¾	17.50 17.55	48	5.10	4.95 @5.00	7.35 @7.45	7.20 @7.30
10	17⅝ @17¾	17.50 17.55	48¼	5.10	4.97½ @5.00	7.40 @7.45	7.25 @7.30
11	17⅝ @17¾	17.50 17.55	48½	5.10	5.00 @5.02½	7.40 @7.45	7.25 @7.30

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market is without special feature. There is a fair demand in this country, which is being freely met, while European buyers are still holding aloof, their previous purchases evidently having been larger than generally supposed. However, the cables report that refined copper for near-by delivery is scarce, and it is hoped that European manufacturers will soon have to come

LONDON

Sept.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
5	79⅛	79 11/16	84¼	217½	215½	21¾	26¾
6	79	79⅝	84	217¼	215¼	22⅞	26¾
7	.	...	...	...	..	...	
9	78 15/16	79 11/16	84	219½	217	23¾	26¾
10	78½	79¼	83¾	220½	217¾	23	26¾
11	78 5/16	79 1/16	83¾	222¼	219¼	23	27

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

into the market, but the August statistics have not been received very favorably either abroad or at home. Some moderate sales of Lake copper have been made at 17⅝@17¾c. Electrolytic has been freely sold at 17.70c., delivered in Europe, corresponding to about 17.52½c., cash, New York, and some sales at 17.50c., cash, New York, have been made.

At the close Lake copper is quoted 17⅝@17¾c.; electrolytic copper in cakes, wirebars or ingots, 17.50@17.55c., while casting copper is quoted nominally at 17.30@17.40 as an average for the week.

The London Standard market has been dull and has fluctuated within narrow limits, with a tendency to ease off somewhat. On Sept. 5, spot was £79 2s. 6d., and three months £79 13s. 9d. On Sept. 9, spot was £78 18s. 9d., three months remaining £79 13s. 9d. On Sept. 10, both positions declined, spot to £78 10s., and three months to £79 5s., and the market closes at £78 6s. 3d. for spot, £79 1s. 3d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6112 long tons. Our special correspondent gives the exports from Baltimore at 2811 tons for the week.

Tin—The London market has been strong and advancing, due to heavy bull speculation. In this country, the market has lagged somewhat behind the import price, as the recent heavy arrivals had not yet been entirely absorbed. The statistical position of the metal is a strong one, and in many quarters it is expected that the market will go still higher. Over here tin for early delivery has sold at 47½@48½ at the close.

The London market, which on Sept. 5, closed at £217 10s. for spot, and £215 10s. for three months, advanced on Sept. 9, £2 for spot and £1 10s. for three months. On Sept. 10, the market was again higher, spot being quoted £220 10s., and three months £217 15s. On Sept. 11 it closed at £222 5s. for spot and £219 5s. for three months.

Lead—On Monday, Sept. 9, the principal producers raised their price to 5.10c. and the demand continues good at the higher level. At the close New York is quoted 5.10c. and St. Louis 5@5.02½ cents.

The foreign market is strong and advancing. Lead for early delivery is very scarce and there is no relief in sight. It seems that the consumption has overtaken production and there are no stocks. Spot lead sold as high as £23 15s. on Sept. 9 and closes strong at £23 for Spanish and 2s. 6d. higher for English lead.

The smelting plant of the Granby Mining & Smelting Co., at Granby, Mo., was destroyed by fire on Sept. 10.

Spelter—There has been a fair demand and business has been done at somewhat higher prices. Consumption is excellent, both in the galvanizing as well as in the brass trade. At the close St. Louis is quoted 7.25@7.30c.; New York 7.40@7.45 cents.

The London market is firm at £27 for good ordinaries and £27 5s. for specials.

Base price of zinc sheets is $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7⅜@7½c. per lb., New York.

Other Metals

Aluminum—Business has been good and the market is firm. Quotations are a little better, 24½@25c. per lb. being asked for No. 1 ingots, New York.

Antimony—The market is quieter than it has been, but there is still a fair business. Cookson's is quoted at 8.45@8.60c. per lb.; Hallett's 7.90@8c.; while 7.50@7.70c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price has been reduced 5s. and is now £8 per flask, with £7 17s. 6d. quoted from second hands.

Spanish Metal Exports

Exports of metals and minerals from Spain, six months ended June 30, as reported by *Revista Minera*, in metric tons:

Metals	1911	1912	Changes	
Pig and manuf. iron	24,241	25,625	I.	1,384
Copper	7,680	11,958	I.	4,278
Copper precipitate..	8,256	7,781	D.	475
Lead.	84,739	92,175	I.	7,436
Zinc..............	641	1,331	I.	690
Quicksilver....	1,233	1,472	I.	239
Minerals				
Iron ore............	4,060,890	4,185,760	I.	124,870
Manganese ore	16,689	11,025	D.	5,664
Copper ore.	189,611	77,838	D.	111,773
Lead ore............	1,694	1,895	I.	201
Zinc ore	79,053	57,460	D.	21,593
Pyrites	1,258,762	1,459,053	I.	200,291
Salt................	296,876	346,940	I.	50,064

Pyritic ores are now classed as pyrites unless they carry 2.5% or over in copper. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 7—The high price of zinc-sulphide ore is $61, the base per ton of 60% zinc $54@58. Zinc-silicate sold at $29@31 per ton of 40% zinc. The average price, all grades of zinc, is $55.12. Lead ore sold on a base of $61 per ton, 80% metal, the high price reaching $62. The average, all grades, $59.16. Buyers this week introduced the purchase of lead ore on a dry weight. This has been pending some months. Buying on a base of 80% metal is more general again.

SHIPMENTS, WEEK ENDED SEPT. 7

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,095,810	. .	1,172,210	$180,395
Joplin	3,620,830	....	301,290	114,040
Galena.......	961,940	. ....	316,200	31,645
Miami.... ..	582,610	.. .	211,740	21,285
Alba-Neck....	577,480		43,150	18,575
Duenweg. .	396 140	......	172,700	16,500
Oronogo ...	624,[illegible]20		85,770	16,480
Carl Junction	409 350		. ..	12,280
Spurgeon	162 560	306,220	7,080	9,640
Cave Springs.	316,000	.....	......	8,850
Granby .	58,380	297,280	24,200	7,710
Jackson . . .	162,150	..	2,700	5,615
Springfield...	173,000	. . ..	....	5,160
Carthage	178,700	..	.....	4,990
Wentworth...	176,980		.....	4,780
Sarcoxie.	130 010	. .	.....	3,640
Lawton.......	73,240	..	......	2,120
Aurora .	52,460	..	....	1,470
Totals	13,752,360	603,500	2,337,040	$465,175
36 weeks...	375,733,830	23,084,570	63 972,400	$11,958,635

Blende val., the week, $385,175; 36 weeks, $9,823,469
Calamine, the week, 10,560; 36 weeks, 352,652
Lead value, the week, 69,140; 36 weeks, 1,782,614

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January....	$41 85	$44 90	$40 55	$43.54	$55 68	$58.92
February .	40 21	45 75	39 16	43 31	54 46	52.39
March.	39 85	51.56	38.45	49.25	54.57	54.64
April	38 88	52 00	37 47	50.36	56 37	54 18
May	38 25	55.30	36 79	53.27	55 21	52.45
June	40 50	55 88	38 18	54 38	56 49	55.01
July. .	40 75	58 85	38 [illegible]	56 59	58 81	58 83
August ..	42 50	55 13	41 28	53.27	60 74	57 04
September .	42 63	....	41 29	...	59 33	.....
October .	42 38	..	40.89	......	54.72	....
November.	45 40	.....	43.25	..	57 19	....
December..	44 13	. ..	40.76	. ..	62 03	....
Year.	$41.45		$39.90	.....	$56.76	.....

NOTE Under zinc ore the first two columns give base prices for 60 per cent. zinc ore: the second two the average for all ores sold Lead ore prices are the average for all ores sold

The stiff lift in spelter benefited producers, the average price being advanced $2.42 per ton. The shipment was a large one, and yet it was reduced from lack of cars. Purchasers are getting out all the ore possible now, fearing a car blockade a little later. Some buyers have shifted a large portion of their buying from Wisconsin to the Joplin field.

Platteville, Wis., Sept. 7—The base price paid this week for 60% zinc ore was $55@56 per ton. No sales of lead ore reported.

SHIPMENTS, WEEK ENDED SEPT. 7

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,074,800	. .	371,400
Mineral Point	735,260	. . .	....
Galena	460,700	.	.
Shullsburg	414,000	50,000	
Platteville	262,700	....	66,000
Cuba City	220,360	.	198,700
Hazel Green	200,000	. ....	.
Highland	189,700	.. ....	
Harker	132,230	...	. .
Rewey	80,000	.	.
Montfort	68,000	. .	. .. ..
Total	3,837 750	50,000	636,100
Year to date	141,080,156	5,937,420	24,107,530

Shipped during week to separating plants, 2,408,390 lb. zinc ore.

Other Ore Markets

Manganese Ore—The price for domestic ores as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49% or over in manganese, not over 0.20 phosphorus and 8% silica. Prices range down to 23c. per unit for 40% manganese; with deductions for excess phosphorus and silica. Most of the manganese ore used here is imported—from India, Brazil and Russia—and is bought abroad on the open market.

There has been a still further advance in prices abroad. The current quotations in Great Britain are: Indian and Brazilian ore, 50% manganese, 22½@24c. per unit; 48%, 22@23c.; 45%, 21@21½. Russian ore, 50% manganese, 18@18½c.; 48%, 17½@18c. per unit.

Chemicals

New York, Sept. 11—The general markets continue fairly active and steady.

Arsenic—Supplies are still scarce and quotations are unchanged, $4.50@5 per 100 lb. being paid for white arsenic.

Copper Sulphate—Business is fair. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is improving and the market is strong. Prices are firm at 2.52½c. per lb. for spot nitrate and 2.55@2.57½c. for futures, according to date.

Petroleum

The monthly report of the *Oil City Derrick* gives new wells completed in August as follows: Pennsylvania, New York and West Virginia, 575; Lima-Indiana, 63; Kentucky, 18; Illinois, 126; Kansas-Oklahoma, 648; Texas-Louisiana, 134. In all the divisions there were 1564 wells completed, or 125 more than in July. The new production was 49,950 bbl., a decrease of 5047 bbl. from the July report. Among the completions there were 255 dry holes and 137 gas wells, an increase of 15 in the failures and of 30 in the number of gas wells. The productive oil wells numbered 1272, as against 1092 in July, 1148 in June and 981 in May. At the close of August there were 513 rigs and 1492 drilling wells. These figures show a decrease of one in the number of rigs and an increase of 18 in the drilling wells.

Mining Stocks

New York, Sept. 11—On Sept. 5 trading on the Exchange was still on a limited scale, but prices were stronger. On the Curb business was more active, the copper stocks making some gains, while other mining stocks were firm.

Sept. 6 trading on the Exchange was again light and the price movement without significance. The Curb was rather narrow on mining stocks. Coppers were quiet, with little change, and only a few of the Cobalts were in evidence. Trading in other stocks was confined to the low-priced issues.

Sept. 7 the Exchange was dull but firm. On the Curb business in mining stocks was light and prices irregular on small margins.

Sept. 9 the Exchange was unsettled and business light. Mining stocks on the Curb were in small demand. Braden Copper was the most prominent and gained a fraction.

Sept. 10 and 11 the Exchange continued dull and quiet, with very small changes in quotations. The Curb was also quiet and business in mining stocks was small and unimportant.

Boston, Sept. 10—Another favorable Copper Producers' statement failed to put any life into the stock market, although, to use the stereotyped phrase, the undertone is strong. Wolverine has been a particularly weak feature and broke $12 to $91, with some comeback from this level upon declaration of the regular $5 per share dividend. The decline was due to talk of the limited lease of life that the mine has.

Copper-share prices are off for the week in the main and money is short for stock-market purposes, call money being marked up to 6% today. Copper Range directors in declaring but a 50c. dividend gave some disappointment which was reflected temporarily in the price of the stock. Chino made a new high in this market. Butte & Superior has also been an active feature, advancing $5.75 during the week to $49.50, with subsequent setback to $47.75. Both Calumet & Hecla and North Butte are off from the recent high prices.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments	4,134,569	2,224,441	1,242,836
Anaconda	22,750,000	23,000,000	25,250,000
Arizona Ltd.	3,300,000	3,200,000	3,260,000
Copper Queen	7,622,730	7,708,147	8,040,424
Calumet & Ariz.	4,160,000	4,748,000	4,514,000
Chino	1,474,979	2,945,000	3,437,309
Detroit	1,959,634	2,194,090	1,882,289
East Butte	... ...	....	1,410,500
Mammoth	....	....	... ...
Mason Valley	1,438,580	1,500,000	....
Nevada Con.	5,913,832	6,084,274	.....
Ohio	665,000	617,500	. . .
Old Dominion	2,130,000	.. ..	2,620,000
Ray	3,004,195	2,985,965	2,888,095
Shannon	[illegible]	1,446,000	1,400,000
South Utah	162,335	142,555	224,855
United Verde*	2,500,000	... ...	. ....
Utah Copper Co	8,772,742	10,602,000	. . ..
Lake Superior*	15,600,000	19,500,000	21,000,000
Non-rep. mines*	8,300,000	8,970,000	8,970,000
Total production	....	.... ..	. . ...
Imports, bars, etc.	24,262,292	....	... .
Total blister	....	....	....
Imp. in ore & matte	8,404,936	....	. ....
Total American	....	. . .	. . .
Miami†	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	996,000	1,026,006	. . ..
Granby	1,888,400	1,802,753	. ....
Mexican Cos.:			
Boleo †	1,851 920	2,386,480	... .
Cananea	4,310,000	4,000,000	4,044,000
Moctezuma	3,176,819	3,094,016	3,229,839
Other Foreign:			
Cape Cop., S. Africa	....	....	.. ..
Kyshtim, Russia	... .	1,325,000	.
Spassky, Russia	757,120	795,200	. .
Famatina, Argen.	. ....	.	... ..
Tilt Cove, Newf'd.	.	. . .	. .
Exports from:			
Chile	9,856,000	8,960,000	... .
Australia	8,176,000	8,288,000	....
Arrivals in Europe‡	12,667,200	14,114,240	... .

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VIII, 1911	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,964
II	116,035,809	56,228,368	64,148,096
III	125,694,601	67,487,466	58,779,501
IV	125,464,644	69,513,846	73,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,487,[illegible]

VISIBLE STOCKS

	United States	Europe	Total
IX, 1911	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374

Alaska Gold Mines stock has been the Curb feature, selling up to \$9.12½ on very heavy trading. This is \$5 paid in, and deliveries of the stock will begin tomorrow. Corbin Copper is off to 90c. Bingham Mines is up to \$5.37½ on a good volume of trading.

Assessments

Company	Delinq	Sale	Amt
Andes, Nev	Sept. 26	Oct. 17	\$0 05
Black Bear, Ida	Sept. 26	Oct. 26	0 01
Black Pine M. & M., Utah	Aug. 29	Sept. 19	0.00¼
Cedar Talisman, Utah	Sept. 14	Oct. 3	0 00½
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Dalmatia, Ida	Aug. 24	Sept. 21	0.002
Empire, Ida	Sept. 23	Oct. 23	0 002
Great Eastern, Ida	Sept. 28	Oct. 28	0.002½
Hilarity, Ida	Sept. 5	Oct. 5	0.002
JohnnyGold M.&M Co.,Utah	Aug. 30	Sept. 20	0.00⅝
Laclede, Ida	Aug. 1	Aug. 24	0 003
Little Butte, Ida	Sept. 21	Oct. 21	0.001
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
New Hope, Ida	Sept. 3	Oct. 3	0.002
New Reliance, S. Dak.	....	....	0.01
Ohio Copper, Utah	Aug. 28	....	0.50
Reindeer, Ida	Sept. 7	Oct. 5	0.003
Savage, Nev	Oct. 2	Oct. 24	0.10
Sierra-Nevada, Nev	Sept. 25	Oct. 16	0.05
Smuggler, Utah	Aug. 20	Sept. 20	0.00¼
Twin Star, Ida	Aug. 31	Sept. 28	0 02
Wasatch, Utah	Sept. 27	Oct. 16	0 01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53 795	56 260	24.154	24 865	25 887
February	51 534	52 222	59 043	23 794	24 081	27 190
March	51 454	52 745	58.375	23 690	24.324	26 875
April	53 221	53 325	59 207	24 483	24.595	27 284
May	53 870	53 308	60 880	24 797	24 583	28 038
June	53 462	53 043	61.290	24.651	24 486	28 215
July	54.150	52 630	60 654	25 034	24.286	27.919
August	52 912	52.171	61.606	24.428	24.082	28.375
September	53 295	52.440	......	24.567	24.209	......
October	55 490	53.340	.....	25.596	24.594	.....
November	55 635	55 719	.. ..	25.680	25.649	.. ..
December	54.428	54.905	. ....	25.160	25.349	. ..
Year	53 486	53 304	......	24.670	24.592	....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12 295	14.094	12.680	14.337	55.600	62.760
February	12 256	14.084	12.611	14.329	54.974	62 893
March	12 139	14.698	12.447	14.868	54.704	65.884
April	12 019	15 741	12 275	15.930	54.034	70.294
May	11 989	16.031	12.214	16 245	54.313	72 352
June	12 385	17 234	12.611	17 443	56.365	78 259
July	12.463	17.190	12.720	17.353	56 673	76.636
August	12 405	17.498	12.634	17.644	56 266	78.670
September	12.201	..	12.508	......	55.253	....
October	12.189	...	12 370	. .	55 170	. .
November	12.616	.	12.769	. .	57.253	
December	13.552		13.768	...	62 068	..
Year	12.376		12 634	.	55.973	....

New York, cents per pound, London, pounds sterling per long ton of standard copper

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	44 519
February	41 614	42 962	August	43 319	45 857
March	40 157	42.577	September	39 755	
April	42 185	43 923	October	41 185	
May	43 115	46.053	November	43 125	
June	44 606	45 815	December	44 655	
			Av. Year	42 281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4 435	4 334	4 327	13 009	15.619
February	4 440	4 026	4 266	3 946	13 043	15 738
March	4 394	4.073	4 238	4.046	13 122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4.373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13 260	17 588
July	4 499	4 720	4.397	4.603	13 530	18 544
August	4 500	4 569	4 406	4 452	14 260	19 679
September	4 485	....	4 356	......	14 744	......
October	4 265	....	4.139	....	15 332	. ....
November	4 298	....	4.181	.... .	15 821	. .
December	4 450	. . .	4.332	...	15 648	. . .
Year	4.420	......	4 286	......	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23.887	26 642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5 563	6.626	5 413	6.476	23 016	26.048
April	5 399	6.633	5.249	6 483	23 743	25 644
May	5 348	6.679	5.198	6.529	24.375	25.790
June	5 520	6.877	5 370	6 727	24.612	25.763
July	5 695	7.116	5 545	6 966	25.006	26 174
August	5 953	7.028	5 803	6.878	26 801	26 443
September	5 869	.. .	5 719	.....	27 750	......
October	6 102	.. .	5.951	......	27.256	.....
November	6 380	.	6.223	. ....	26.795	. . ..
December	6 301	. ..	6.151	....	26.849	. ...
Year	5.758		5.608	.....	25.281	. ...

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	\$15 90	\$15.12	\$14 40	\$13.32	\$14.75	\$14.00
February	15 90	15.03	14 50	13.28	14.81	14.01
March	15.90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13.90	15 00	14 15
May	15 90	15.14	14 30	13.90	14.72	14.12
June	15 90	15.15	14 06	14.11	14.56	14.22
July	15 90	15.15	14 03	14.38	14 53	14 38
August	15 90	15.43	14 00	14 90	14 47	14 85
September	15 90	.	13 57	......	14 40	......
October	15 43	......	13.44		14.34	......
November	14.92	..	13.30	. ....	14 25	......
December	15 15		13.10	....	13.90	......
Year	\$15 72		\$13 94	.....	\$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Sept. 10	
Name of Comp.	Bid.
Acacia	.04½
Cripple Cr'k Con.	01¼
C. K. & N.	17
Doctor Jack Pot	6
Elkton Con	65½
El Paso	1.08¼
Findlay	06⅞
Gold Dollar	17¾
Gold Sovereign	.02¼
Isabella	.19½
Jack Pot	05
Jennie Sample	06¼
Lexington	‡ 009
Moon Anchor	‡ 009
Old Gold	03¾
Mary McKinney	70
Pharmacist	01½
Portland	96
Vindicator	80½
Work	01

SALT LAKE Sept. 10	
Name of Comp.	Bid.
Beck Tunnel	09¼
Black Jack	12
Cedar Talisman	00¾
Colorado Mining	.17
Columbus Con	15
Crown Point	02¼
Daly-Judge	‡5.75
Grand Central	62
Iron Blossom	1 20
Little Bell	‡ 30
Lower Mammoth	06¾
Mason Valley	‡12 00
May Day	14½
Nevada Hills	1 90
New York	‡ 03
Prince Con	1 70
Silver King Coal'n	2 75
Sioux Con	.04½
Uncle Sam	14
Yankee	‡.11

TORONTO Sept. 10

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 40	Hollinger	12 15
Hudson Bay	†65 00	Imperial	01
Temiskaming	38	Pearl Lake	.10
Wettlaufer-Lor	41	Porcu. Gold.	.20
Apex	.02	Porcu. Tisdale	01
Central	†5 56	Preston E. D.	02
Crown Chartered	06	Rea	25
Doble	20	Standard	‡ 00½
Dome Exten	.09	Swastika	07
Foley O'Brien	.12	West Dome	.05

SAN FRANCISCO Sept. 1

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.07	Belmont	9.90
Belcher	‡.40	Jim Butler	67
Best & Belcher	04	MacNamara	.23
Caledonia	.97	Midway	.59
Challenge Con	.10	Mont.-Tonopah	2.17
Chollar	.06	North Star	25
Confidence	.50	West End Con	1 57
Con. Virginia	44	Atlanta	.24
Crown Point	.28	Booth	5
Gould & Curry	02	C.O.D. Con	.10
Hale & Norcross	.06	Comb. Frac	.16
Mexican	2 75	Jumbo Extension	.40
Occidental	.50	Pitts.-Silver Peak	.98
Ophir	.60	Silver Pick	.10
Overman	.43	St. Ives	.30
Potosi	.02	Tramp Con	‡ 0
Savage	04	Argonaut	‡2 5
Sierra Nevada	.11	Bunker Hill	‡4 5
Union Con	‡ 73	Central Eureka	3
Yellow Jacket	.32	So. Eureka	‡2.9

N. Y. EXCH. Sept. 3	
Name of Comp.	Clg.
Amalgamated	87½
Am. Agri. Chem	58¾
Am.Sm.&Ref.,com	85⅝
Am.Sm.&Ref.,pf.	108
Am.Sm.Sec.,pf.B	87⅝
Anaconda	46
Batopilas Min	1¼
BethlehemSteelpf	72½
Chino	42½
Comstock Tunnel	‡ 10½
Federal M.&S.,pf.	45
Goldfield Con	3⅜
GreatNor.,ore.,ctf.	46
Guggen. Exp	59
Homestake	96
Inspiration Con	18⅝
Miami Copper	29¼
Nat'nalLead,com.	60⅜
National Lead, pf.	107
Nev. Consol	22¼
Pittsburg Coal, pf.	96½
Ray Con	21⅞
RepublicI&S,com.	27⅝
Republic I & S, pf.	89
SlossSheffi'd,com.	55
Sloss Sheffield, pf.	‡100
Tennessee Copper	44
Utah Copper	65⅜
U. S. Steel, com	72¾
U. S. Steel, pf.	113
Va. Car. Chem	45

N. Y. CURB Sept. 10	
Name of Comp.	Clg.
Barnes King	88
Beaver Con	.45
Braden Copper	7
B. C. Copper	5½
Buffalo Mines	1½
Caledonia	40
Con. Ariz. Sm	$\frac{11}{16}$
Davis-Daly	$2\frac{7}{16}$
Diam'field-Daisy	8
Ely Con	30
Florence	90
Giroux	5½
Gold Hill Con	$\frac{5}{16}$
Greene Cananea	10
Greenwater	06
Internat. S. & R.	‡124
Kerr Lake	$2\frac{11}{16}$
Keystone	2⅜
La Rose	$2\frac{13}{16}$
McKinley-Dar-Sa.	2
Min. Co. of A. new	3¼
Motherlode Gold.	$\frac{15}{16}$
Nev. Utah M. & S.	‡ 01
Nipissing Mines	8⅜
Ohio Copper	$\frac{13}{16}$
Pacific Sm. & M.	$\frac{5}{16}$
South Live Oak	1¾
South Utah M.&S.	⅝
Standard Oil (Old)	1110
Stand'd Oil of N.J.	411
Stand'd Oil Subs.	685
Stewart	$1\frac{7}{16}$
Tonopah	7⅜
Tonopah Ex	2¾
Tri-Bullion	½
Tularosa	1
Union Mines	‡ $\frac{3}{16}$
United Cop., pfd.	10
Yukon Gold	3⅜

LONDON Sept. 11	
Name of Com	Clg.
Camp Bird.	£1 8s 6d
Dolores	1 10 0
El Oro	0 14 0
Esperanza	1 13 6
Mexico Mines	7 12 6
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 6 3

BOSTON EXCH. Sept.	
Name of Comp.	Clg
Adventure	8
Ahmeek	‡350
Algomah	5
Allouez	46
Am. Zinc	31
Ariz. Com., ctfs.	4
Bonanza	‡.40
Boston & Corbin	‡7
Butte & Balak	‡3
Calumet & Ariz	80
Calumet & Hecla	555
Centennial	‡22
Con. Mercur	‡ 03
Copper Range	58
Daly West	‡4
East Butte	13
Franklin	11
Granby	56
Hancock	27
Hedley Gold	‡19
Helvetia	‡1
Indiana	18
Island Cr'k, com.	‡55
Island Cr'k, pfd.	88
Isle Royale	35
Keweenaw	1
Lake	36
La Salle	‡6
Mass	7
Michigan	‡2
Mohawk	67
New Arcadian	‡3
New Idria Quick.	‡6
North Butte	34
North Lake	5
Ojibway	4
Old Dominion	61
Osceola	114
Quincy	‡92
Shannon	16
Shattuck-Ariz.	‡21
Superior	46
Superior & Bost.	‡1
Tamarack	42
Trinity	6
Tuolumne	2
U. S. Smelting	40
U. S. Smelt'g, pf.	50
Utah Apex	‡2
Utah Con	12
Victoria	‡3
Winona	7
Wolverine	93
Wyandot	2

BOSTON CURB Sept.	
Name of Comp.	La
Bingham Mines	
Boston Ely	
Boswyocolo	0
Butte Central	
Cactus	1
Calaveras	2
Chief Cons	
Corbin	.3
Cortez	3
Crown Reserve	3
First Nat. Cop.	
Majestic	.4
Mazatan	
Moneta Porc.	‡ 0
Nevada-Douglas.	
New Baltic	
Oneco	
Raven Copper	2
Rhode Island Coal	1
San Antonio	‡
S. W. Miami	
South Lake	
Trethewey	4
United Verde Ext.	4
Vulture	1

‡Last quotation

Mining Companies—United States

Name of Company and Situation		Shares		Dividends		
		Issued	Par Val	Total to Date	Latest Date	Amt
Acacia, g.	Colo	1,438,989	$1	$129,618	Jan '11	$0 01
Adams, s.l.c.	Colo	80,000	10	778,000	Dec. '09	0 04
Ahmeek, c.	Mich	50,000	25	700,000	July '12	5 00
Alaska Mexican, g.	Alas	180,000	5	3,039,381	Aug '12	0 35
Alaska Treadwell, g.	Alas	200,000	25	12,510,000	Aug. '12	0 75
Alaska United, g.	Alas	180,200	5	1,072,190	Aug. '12	0 50
Am. Zinc, Lead & Sm.	U. S.	163,280	25	711,820	July '12	0 50
Anaconda, c.	Mont	4,332,500	25	65,171,250	July '12	0 50
Argonaut, g.	Cal	200,000	5	1,200,000	June '10	0 05
Arizona Copper, pf	Ariz	1,426,120	1 20	2,053,591	May '12	0 047
Arizona Copper, com	Ariz	1,519,896	1 20	14,220,128	Feb '12	0 30
Bagdad-Chase, g., pf	Cal	84,819	5	202,394	Jan '09	0 10
Baltic, c	Mich	100,000	25	7,050,000	June '11	5 00
Bingham N. H., c	Utah	228,690	5	294,219	July '12	0 10
Bonanza Dev., g	Colo	300,000	1	1,425,000	Oct '11	0 20
Bunker Hill Con., g	Cal	200,000	1	616,000	Aug '12	0 07½
Bunker Hill & Sul., l.s.	Ida	327,000	10	13,715,550	Sept. '12	0 20
Butte & Ballaklava, c	Mont	250,000	10	125,000	Aug '10	0 50
Caledonia, l.s.c	Ida	1,300,000	1	52,000	June '10	0 01
Calumet & Arizona, c.	Ariz	596,353	10	14,881,765	June '12	1.00
Calumet & Hecla, c.	Mich	100,000	25	117,650,000	June '12	10 00
Camp Bird, g.s.	Colo	1,100,000	5	7,848,900	Feb '12	0 48
Centen'l-Eur., l.s.g.c.	Utah	100,000	5	3,450,000	Apr. '12	1.50
Center Creek, l.z.	Mo	100,000	10	440,000	July '12	0.05
Champion, c.	Mich	100,000	25	7,100,000	July '12	1 00
Cliff, g.	Utah	300,000	1	90,000	Feb '12	0 10
Cliff, g.	Alas	100,000	1	140,000	May '11	0 25
Colo. Gold Dredging	Colo	100,000	10	150,000	Aug. '12	0 25
Colorado, l.s.g.	Utah	1,000,000	0 20	2,570,000	June '12	0 03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct '07	0 20
Commercial Gold	Ore	1,750,000	1	43,750	Dec. '10	0 00½
Con. Mercur, g.	Utah	1,000,000	1	3,415,313	July '12	0 03
Continental, z. l.	Mo	22,000	25	275,000	July '12	0 50
Copper Range Con., c.	Mich	393,445	100	12,709,988	July '12	0 50
Daly Judge, s.l.	Utah	300,000	1	360,000	July '12	0 15
Daly West, s.l.	Utah	180,000	20	6,538,000	July '12	0 30
Doctor Jackpot, g.	Colo	3,000,000	0 10	90,000	Mar. '11	0 00½
Doe Run, l.	Mo	65,782	100	3,040,523	June '12	1 50
Elkton Con., g.	Colo	2,500,000	1	2,991,960	May '12	0 01
El Paso, g.	Colo	2,450,000	1	1,548,295	June '12	0 01
Fed. M. & S., com	Idaho	60,000	100	2,708,750	Jan. '09	1 50
Fed. M. & S., pf	Idaho	120,600	100	7,211,250	June '12	1 50
Florence, g.	Nev	1,050,000	1	840,000	Apr. '11	0 10
Frances-Mohawk, g.	Nev	912,000	1	546,000	Jan. '08	0 05
Free Coinage, g	Colo	10,000	100	180,000	Dec '09	1 00
Fremont Con., g.	Calif	200,000	2.50	154,000	Aug '12	0 02
Frontier, z.	Wis	1,250	100	141,272	Sept. '12	2 00
Gemm-Key'ne, l.g.s.	Utah	5,000	100	2,130,000	Oct. '11	6 00
Gold Chain, g	Utah	1,000,000	1	20,000	July '12	0 02
Gold Coin of Victor	Colo	1,000,000	1	1,350,000	Feb '09	0 02
Gold Dollar Con	Colo	2,500,000	0.10	75,000	June '12	
Gold King Con., g.	Colo	5,750,370	1	1,407,319	Dec. '11	0 03
Golden Cycle, g.	Colo	1,500,000	5	2,100,000	Sept. '12	0 02
Golden Star, g.	Ariz	400,000	5	140,000	Mar '10	0 05
Goldfield Con., g.	Nev	3,558,367	10	22,771,322	July '12	0 30
Grand Central, g.	Utah	500,000	1	1,445,750	Aug. '12	0 05
Granite, g.	Colo	1,650,000	1	253,000	Dec '10	0 01
Hazel, g	Cal	900,000	1	864,000	July '12	0 01
Hecla, l.s.	Idaho	1,000,000	0 25	2,510,000	Aug '12	0 02
Hercules, l.s.	Idaho	1,000,000	1	3,650,000	July '11	0 06
Homestake, g	S. D.	218,400	100	28,522,040	Sept '12	0 50
Iowa, g.s.l.	Colo	1,666,667	1	200,166	June '11	0 00½
Iowa-Tiger Leasing g.s	Colo	12,655	1	13,921	Jan. '12	0 10
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	1,270,000	July '12	0 10
Iron Silver, s.l.g.	Colo	500,000	20	4,500,000	Jan. '12	0 10
Jamison, g	Cal	390,000	10	378,300	Jan. '11	0 02
Jerry Johnson, g.	Colo	2,500,000	0.10	150,000	Aug '11	0 01
Kendall, g.	Mont	500,000	5	1,375,000	Jan '12	0 02
Kennedy, g	Cal	100,000	100	1,831,001	Apr '10	0 03
King of Arizona, g	Ariz	200,000	1	396,000	Aug '09	0 12
Knob Hill, g.	Wash	1,000,000	1	45,000	May '12	0 00½
Liberty Bell, g.	Colo	130,551	5	522,093	Oct '10	1 00
Little Bell, l.s.	Utah	300,000	1	75,000	Mar '11	0 05
Little Florence, g	Nev	1,000,000	1	430,000	Jan '08	0 03
Mammoth, g.s.c	Utah	400,000	25	2,220,000	Mar '08	0 05
Mary McKinney, g.	Colo	1,309,252	1	959,826	July '12	0 02
May Day, g.s.l	Utah	800,000	0.25	108,000	Sept '08	0 01½
Mexican, g.s.	Nev	201,600	2.50	20,160	Aug '11	0 10
Miami, c.	Ariz	664,993	5	664,993	Aug '12	0 50
Modoc, g.s	Colo	500,000	1	275,000	Dec '11	0 01
Mohawk M. Co	Mich	100,000	25	2,675,000	Aug '12	2 50
Monarch-Mad'a, g.s.l.	Colo	1,000,000	1	40,000	May '11	0 01
Montana-Tonop., s.g	Nev	921,865	1	130,000	June '12	0 10
Mountain, c.	Cal	250,000	25	4,216,250	May '08	0 14
National, g.	Nev	750,000	1	570,000	May '11	0 10
Nevada Con., c	Nev	1,999,394	5	8,228,086	June '12	0 37½
New Century, z.l.	Mo	330,000	1	237,600	Oct '09	0 01
New Idria, q.	Cal	100,000	5	1,600,000	July '12	0 30
North Butte, c.	Mont	410,000	15	10,248,000	July '12	0 50
North Star, g.	Cal	250,000	10	3,624,189	July '12	0 15
Old Domin'n, M. & Sm	Ariz	162,000	25	2,351,000	July '12	1 25
Ophir, s. g.	Nev	201,600	3	2,068,360	Jan '12	0 10
Opohongo, g.s.l.	Utah	898,978	0 25	11,948	July '12	0 02
Oroville Dredging	Cal	700,000	5	1,383,036	Dec '09	0 12½
Osceola, c.	Mich	96,150	25	10,593,200	July '12	6 00
Parrot, c.	Mont	229,850	10	7,114,942	Aug '12	0 15
Pearl Con., g.	Wash	1,909,711	0 05	181,422	Dec '10	0 02
Pharmacist, g.	Colo	1,500,000	1	87,500	Feb '10	0 00½
Pioneer, g.	Alas	5,000,000	1	4,041,526	Oct '11	0 03
Pittsburgh-Idaho, l.	Ida	803,000	1	184,690	Aug '12	0 04
Pittsburgh Silver Peak, g	Nev	2,900,000	1	288,000	July '12	0 16
Portland, g.	Colo	3,000,000	1	9,097,080	July '12	0 02
Quilp	Wash	1,500,000	1	67,500	Feb '12	0 01
Quincy, c.	Mich	110,000	25	20,177,500	June '12	1 25
Republic, g	Wash	1,000,000	1	85,000	Dec '10	0 01½
Rochester, l.z.	Mo	4,900	100	188,396	Dec '10	0 50
Round Mountain, g.	Nev	866,426	1	328,404	Sept '10	0 04
Seven Troughs Coal. g.	Utah	1,500,000	1	37,500	July '12	0 02½
St. Joseph, l.	Mo	1,000,000	10	8,258,357	June '12	0 15
Shannon, c.	Ariz	300,000	10	450,000	July '07	0 50
Shattuck-Arizona, c.	Ariz	350,000	10	1,050,000	Jan '11	1 00

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares		Dividends		
		Issued	Par Val	Total to Date	Latest Date	Amt
Silver King Coal. l.s.	Utah	1,250,000	5	1,659,885	Jan. '10	$0 15
Sioux Con., s.l.g	Utah	745,389	$1	872,097	July '11	0.04
Skidoo, g	Cal	1,000,000	5	275,000	May '12	0 02½
Smuggler, l.s.z.	Colo	1,000,000	1	$2,235,000	Nov '06	0 03
Snowstorm, c.g.	Ida	1,500,000	1	1,005,000	Aug. '10	0 01
South Eureka, g.	Calif	299,981	1	366,881	Apr. '12	0 07
Standard Con., g.s.	Cal	178,394	10	5,229,809	Jan. '12	0 10
Stratton's Ind., g	Colo	1,000,000	0 60	364,500	Apr. '12	0 06
Success, z	Ida	1,500,000	1	730,000	May '12	0 02
Superior & Pitts., c.	Ariz	1,499,793	10	3,089,574	Aug '12	0 30
Tamarack, c.	Mich	60,000	25	9,420,000	July '07	4 00
Tennessee, c.	Tenn	200,000	25	3,106,520	Aug. '12	1 00
Tomboy, g.s.	Colo	300,000	4 85	2,843,100	Dec. '11	0 24
Tom Reed, g	Ariz	909,555	1	736,824	Aug. '12	0 05
Tonopah Belm't, s.g.	Nev	1,500,000	1	3,218,003	July '12	0 25
Tonopah Ext., g.s.	Nev	943,433	1	306,615	July '12	0 02½
Tonopah of Nev., s.g.	Nev	1,000,000	1	9,250,000	July '12	0 40
Tri-Mountain, c.	Mich	100,000	25	950,000	Dec. '10	1.00
Tuolumne, c.	Mont	800,000	1	360,000	Aug. '11	0 15
Uncle Sam, g. s. l.	Utah	500,000	1	495,000	Sept. '11	0 05
United (Crip. Ck.) g.	Colo	4,000,100	1	140,455	Jan. '10	0 04
United Globe, c.	Ariz	23,000	10	667,000	July '12	4 50
United Verde, c.	Ariz	300,000	10	30,322,000	June '12	0 75
Utah, s.l.	Utah	100,000	10	325,000	Dec. '10	0.02
Utah, c.	Utah	1,562,599	10	13,876,106	June '12	0 75
Utah Con., c.	Utah	300,000	5	7,200,000	May '12	0 50
Valley View, g.	Colo	1,000,000	1	240,000	Dec. '10	0 04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0 04
Vindicator Con., g.	Colo	1,500,000	1	2,497,500	Apr. '12	0 03
Wasp No. 2, g.	S. D.	500,000	1	341,966	Aug. '12	0 02
Wellington Mines, g.	Colo	10,000,000	1	200,000	July '12	0 00¼
Wolverine, c.	Mich	60,000	25	7,140,000	Apr. '12	5.00
Work, g	Colo	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Colo	1,000,000	1	1,417,685	Oct. '10	0 04
Yankee Con., g.s.	Utah	1,000,000	1	182,500	July '07	0.01½
Yellow Aster, g	Cal	100,000	10	1,081,780	Jan. '12	0 05
Yellow Pine, g.	Nev	950,000	1	47,500	Aug. '12	0.02
Yukon Gold, g.	Alas	3,500,000	5	3,047,500	June '12	0 07½

Coal, Iron, Industrial and Holding Companies

Amalgamated, c.	Mont	1,538,879	$100	$69,734,840	Aug '12	$1 00
Am. Sm. & Ref., com	U. S.	500,000	100	22,708,333	June '12	0 66⅔
Am. Sm. & Ref., pf.	U. S.	500,000	100	40,833,333	June '12	1 16⅔
Am. Smelters, pf. A.	U. S.	170,000	100	6,855,000	July '12	1 50
Am. Smelters, pf. B.	U. S.	300,000	100	10,232,000	July '12	1 25
Cambria Steel	Penn	900,000	50	15,647,500	Aug '12	0 62½
Central C. & C., com.	Mo	51,250	100	3,539,375	July '12	1 50
Central C. & C., pf.	Mo	18,750	100	1,714,370	July '12	1 25
Consolidation Coal	Md	190,247	100	20,533,894	July '12	1 50
Greene Cananea	U. S.	2,471,314	25	1,237,656	Aug '12	0 25
Guggenheim, Expl.	U. S.	207,033	100	14,170,153	July '12	2 50
Inter'l Nickel, com	U. S.	115,826	100	5,659,471	June '12	7 00
Inter'l Nickel, pfd	U. S.	89,126	100	3,609,500	Aug '12	1 50
Inter'l Sm. & Ref.	U. S.	100,000	100	2,500,000	Aug '12	2 00
Lehigh Coal & Nav.	Penn	482,956	50	22,052,156	Aug '12	1 00
National Lead, com.	N. Y.	206,554	100	6,866,736	June '12	0 75
National Lead, pf.	N. Y.	243,676	100	25,005,332	June '12	1 75
Old Dominion, c.	Ariz	293,245	25	2,846,735	July '12	1 00
Phelps, Dodge & Co.	U. S.	450,000	100	19,334,304	June '12	4.50
Pittsburgh Coal, pf.	Penn	297,010	100	15,137,583	July '12	1 25
U. S. Steel Corp., com.	U. S.	5,083,025	100	162,634,934	June '12	1 25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	313,519,063	Aug '12	1 75
U. S. S., R. & M., com.	U. S.-Mex	486,320	50	4,255,538	July '12	0 50
U. S. Sm., R. & M., pf.	U. S.-Mex	351,105	50	10,837,575	July '12	0 87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$5	$185,000	Apr. '12	$0 25
Amparo, g.s.	Mex.	2,000,000	1	860,000	Aug. '12	0 03
B. C. Copper	B. C.	591,709	5	437,886	July '12	0 15
Beaver Con., s.	Ont.	1,996,490	1	289,901	July '12	0 03
Buffalo, s.	Ont.	1,000,000	1	1,480,000	Aug. '12	0 05
Cobalt Townsite, s	Ont.	1,000,000	1	150,000	May '12	0 05
Coniagas, s.	Ont.	800,000	5	3,800,000	Aug. '12	0 30
Crown Reserve, s	Ont.	1,768,814	1	4,245,153	Aug. '12	0 05
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0 25
Dominion Coal, com.	N. S.	150,000	100	5,400,000	July '12	1 00
Dominion Coal, pf.	N. S.	50,000	100	4,915,000	Aug. '12	3 50
Dos Estrellas, g.s.	Mex.	300,000	0 50	6,780,000	Jan. '11	2 50
El Oro, g.s.	Mex.	1,147,500	4.85	8,295,564	Dec. '11	0 36
Esperanza, s.g.	Mex.	455,000	4.85	10,835,127	June '12	0 36
Granby, s.l.c.	B. C.	148,496	100	4,197,111	Dec. '10	1 00
Greene Con., c.	Mex.	1,000,000	10	6,794,400	Mar. '12	0 60
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3 00
Hedley Gold	B. C.	120,000	10	621,000	June '12	0 50
Kerr Lake, s	Ont.	600,000	5	4,020,000	June '12	0 25
La Rose Con., s	Ont.	1,498,407	5	2,951,851	July '12	0 12½
Le Roi No. 2, g	B. C.	120,000	[illegible]	1,428,810	July '12	0 24
Lucky Tiger Com., g.	Mex.	715,337	10	1,446,435	Aug. '12	0 05
McK.-Dar. Sav. s	Ont.	2,247,692	1	2,607,320	July '12	0 10
Mines Co. of Am. (new)	Mex.	1,700,000	10	*877,500	Jan. '12	0 15
N. Y. & Hond. Ros.	C. A.	150,000	10	3,082,500	Mar. '12	0 15
Nipissing, s	Ont.	1,200,000	5	8,640,000	July '12	0 37½
Peñoles, s.l.g.	Mex.	80,000	25	5,760,688	June '12	1 25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3 50
Pinguico, pf., s.	Mex.	20,000	100	600,000	Oct. '11	3 00
Right of Way Mns†	Ont.	1,685,500	1	202,260	Dec. '11	0 02
Rio Plata, s.	Mex.	373,437	5	354,990	Mar. '12	0 10
San Rafael, g.s.	Mex.	2,400	25	1,437,624	Jan. '12	2 00
San Toy, g.s.	Mex.	6,000,000	1	360,000	Dec. '11	0 10
Sopresa, g.s	Mex.	19,200	20	1,517,438	Jan. '11	34 00
Stand'd Silver-Lead	B. C.	2,000,000	1	225,000	Aug. '12	0 02½
Temiskaming, s.	Ont.	2,500,000	1	1,159,155	July '12	0 03
Tem. & Hud. Bay, s.	Ont.	7,761	1	1,659,854	Aug. '12	3 00
Trethewey, s	Ont.	1,000,000	1	861,998	July '12	0 10
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	424,977	July '12	0 05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644

Industrials

The Canadian Copper Co., Coppercliffe, Ontario, have ordered a Ruggles-Coles Class F-8 dryer.

The American Smelting & Refining Co., Omaha, Neb., have purchased a Ruggles-Coles F-7 dryer for treating ore.

The Nichols Copper Co., Laurel Hill, L. I., have placed the order for a Terry turbine driven 350 g.p.m. boiler feed pump and a 1200 g.p.m. double suction pump.

The Dodge Mfg. Co., Mishawaka, Ind., has just received an order from the American Boston Mining Company, Clowry, Mich., for twelve lineshafts equipped with chain oiling ball and socket pillow blocks.

The Tarred Granites Co., Ltd., London, have purchased from the Ruggles-Coles Engineering Co., 50 Church St., New York City, a class A-2 dryer for treating crushed granite, the capacity of the dryer being 8 tons per hour.

The Mill & Smelter Engineering Co. of 114 Liberty St., New York, advise a great improvement in their business, having lately shipped to Guatemala a complete silver lead smelting plant sectionalized, and a 20 stamp amalgamating plant with steam power to Venezuela.

The Braden Copper Company of South America has just placed an order for four 8-foot diameter Hardinge pebble mills, all steel trunnions with cut gears for concentration grinding. These mills are similar in type to those furnished to the Miami and other Copper Companies of Arizona.

The Keystone Driller Co., Monadnock Block, Chicago, announce the establishment of a Southern branch office at 1629 Candler Bldg., Atlanta, Ga. The office is in charge of Mr. McCarthy, who will look after the sale of Keystone well drilling machinery and Downie deep well pumps in the Southern states.

The G. P. Keller Mfg. Co., Salt Lake City, Utah, maker of the "Keller" assay and analytical balances, has opened a department for the repair and adjustment of engineers' instruments—transits, levels, etc.—in charge of Mr. Gustav Warkentin, head of the firm of Warkentin & Krause, Leipzig, Germany, an expert in this line.

A. O. Krieger has resigned his position as Publicity Manager of the Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, with whom he had been connected for a number of years, to open an office at 916 Victoria Building, St. Louis, for the sale of the Tacchella Oil Burning Device, a new device which will be suitable for domestic heating purposes, japanning and annealing ovens, baking ovens and cooking ranges.

The Sullivan Mchy. Co., Chicago, announces that they will hereafter maintain for the convenience of customers, a complete stock of parts and supplies for Sullivan continuous electric undercutters, compressed air punches, rock drills and hammer drills at Huntington, W. Va. A stock of parts at this point will, they feel, make them better able to serve their customers in West Virginia, Virginia, Southern Ohio and Eastern Kentucky.

Mr. R. L. Sites, formerly assistant to president of The Wm. J. Oliver Manufacturing Co., and who has represented this company in the New York territory for the last eighteen months, has been given an exclusive agency in this territory by the Oliver Company for the sale of the "Oliver" dump cars, spreaders, industrial cars, marble mill and mining equipment. Mr. Sites will retain his present suite of offices in 50 Church Street, New York City.

The Taylor Iron & Steel Company of High Bridge, N. J., announce the opening of an office in Pittsburgh, Penn., at 301 Oliver Bldg. Phone 2192 Grant. This office is opened as a result of the increasing demand for Tisco manganese steel castings in Pittsburgh and vicinity. The office will be in charge of James S. Morrison. In order to handle matters most expeditiously it is requested that all inquiries and orders for Tisco manganese steel castings from customers in this immediate vicinity be sent through the Pittsburgh office.

The Jeffrey Mfg. Co., have moved their Chicago headquarters and offices from the Fisher Bldg., to the McCormick Bldg., recently completed and which is considered the most modern and up to date fire-proof office building in Chicago. S. S. Shive, sales engineer, is the district manager in charge of the Chicago office, and Jeffrey customers and friends will find a welcome on the 17th floor where the Jeffrey offices are located. The Jeffrey Mfg. Co., maintain fourteen branch offices in the United States and over one-hundred agents in the leading commercial centers all over the world.

Mr. Leroy A. Kling, who has been connected for some time past with two well known crusher companies in Cedar Rapids, Iowa, has just accepted a position with the Wheeling Mold & Foundry Company, of Wheeling, W.Va., as Sales Manager of the Road Machinery Department. This is the concern that has built so much of the important machinery for the Panama Canal. They will eventually manufacture a complete line of road building machinery, including a modern crusher, adjustable to crush to any size, pulverizers, rolls, screens, elevators, trucks and graders. Mr. Kling announces that his connection with these people begins at once.

The Bethlehem Steel Company of South Bethlehem, Pa., manufacturers of Tool Steel, Armor Plate, Projectiles and other lines of High Grade Steels, have decided to install the Girod Electric Furnace which shall enable them to produce a much larger quantity of special steel.

It is claimed that the Girod Electric Furnace has given unusually good results in the manufacture of large heats of the better grade of steels, and that the prominent works in Europe were quick to take advantage of this new method making the higher grades of steel.

Fried. Krupp & Co., the well known steel manufacturers of Essen, Germany, also use the Girod Electric Furnace.

The first Girod furnace to be installed by the Bethlehem Steel Company will have a melting capacity of ten tons per heat.

The Ruggles-Coles Eng'r. Co., 50 Church St., New York City, tell us that recent experiments made at the laboratory of the Board of Water Supply, New York City, indicate that Monel metal possesses about the same resistance to corrosive action as the better known bronzes, while it had the additional advantage that it presented the least change in appearance as result of the corrosive action. Specimens of several bronzes, monel metal and steel were weighed and embedded in rich earth which was kept wet for six months by periodical additions of very dilute solutions of corrosive salts. At the end of the test period all of the specimens were taken out, scrubbed, dried, and weighed to ascertain the comparative loss from corrosion. The results in percentage of loss were as follows: Phosphor bronze 0.09; tobin bronze 0.11, monel metal 0.12, parsons manganese bronze 0.12, muntz metal 0.33, steel 1.04; Another test of the same kind under somewhat different conditions but the same period, gave about the same relative results.

The Standard Spiral Pipe Works, 25 No. Dearborn St., are placing on the market a reinforced galvanized spiral pipe which is made from two strips of steel of different widths and with a continuous interlocking seam. Both strips of steel are rolled to shape on the edges and are interlocked and rolled down under very high pressure in a special machine which this company have patented. The strips of steel are first cut to the required width from long sheets of steel and the ends are welded together. The steel is then placed on large spools. The strip used for the outside or reinforcing band comes from the steel mills in long lengths on reels. Both of these strips are fed into the machine at one end, rolled down interlocked in the machine, coming out at the other end in the shape of pipe. The pipe is smooth on the inside and has the reinforcing band running on the outside the entire length of the pipe, and can be made endless.

Within the last month the General Electric Company, Schenectady, N. Y., has received the following orders for multistage centrifugal air compressors for service as blast furnace blowers: One 25,000 cu.ft. per minute, 15 to 25 lbs. pressure compressor driven by a high pressure steam turbine from the E. & G. Brooke Co., Birdsboro, Penn. One 13,000 cu. ft. per minute 16 to 25 lbs. pressure compressor driven by a mixed pressure turbine, Chattanooga Coal & Iron Co., Chattanooga, Tenn. Three 40,000 cu.ft. per minute, 15 to 30 lbs. pressure compressors driven by high pressure steam turbines, Woodward Iron Co., Woodward, Ala. The General Electric Company has six multistage air compressors already installed as blast furnace blowers. The principal advantages of this type of compressor are said to be great saving of floor space, great saving in net weight, large saving in oil supplies and maintenance, and excellent control of required volume of air against whatever pressure may be required in the operation of the blast furnace. This close control of air is accomplished by a constant volumn governor which is one of the unique features of these blowing engines.

Among the recent sales made by the Dorr Cyanide Machinery Company, Denver, Colo., we include the following: One Dorr Continuous Thickener to El Tigre Mining Company, Yzabal, Sonora, Mexico. Two Dorr Classifiers and one Dorr Thickener to the Homestake Mining Company, Lead, S. Dak. One Classifier to the Ewana M'Cubwa Copper Company, Rhodesia, South Africa. One Classifier to the Motherlode Mining Co., Sheep Creek, B. C. Two Classifiers to the Goldroad Mining Co., Kingman, Ariz. One Classifier to W. B. A. Dingwall, Matehuala, S. L. P. Mexico. One Thickener to the Vulture Mines Co., Wickenburg, Ariz. One Classifier and one Thickener to the Cia. Minera Las Vaca, San Diego, Chili. Two Classifiers to the Tom Reed Gold Mines Co., Kingman, Ariz. One Classifier to Chas. Butters & Co., Ltd., Virginia City, Nevada. One Classifier and five Thickeners to the Ophir Gold Mines Milling & Power Co., Ophir, Colo. Three Thickeners to the Beck Mining Co., Atlantic City, Wyo. Four Thickeners to the U. S. Treasury Mining Co., Engle, N. M. Four Thickeners to the Blue Flag Mining Co., Victor, Colo. The last four named companies are installing continuous decantation process of cyaniding.

The Engineering and Mining Journal

Vol. 94. SEPTEMBER 21, 1912 No. 12

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Robt. McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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Aluminum

In view of the broadening uses of aluminum and its possible substitution for copper in electrical and other work, it is of interest to trace the recent course of the metal in the markets. The dissolution of the old aluminum convention in Europe nearly three years ago, was followed by a strong competition among the makers of the metal in France, Germany, Switzerland and England, which brought the price of ingot aluminum down below 12c. per pound; the metal being quoted at London in January last at £52@54 per long ton, which is equal to 11.30@11.73c. per lb. These low prices resulted in large imports into this country, and also brought about low prices here. The imported aluminum made the market here and the quotations for No. 1 ingots in New York at the first of the year were 18½@19c. per lb., duty paid, which was about the parity of the London price. American producers never formally cut their quotations to so low a point, but they were forced practically to meet the foreign competition to hold their trade.

At prices under 12c., the foreign companies, with possibly one exception, claimed that they were losing money, and this state of affairs gradually brought about a disposition to compromise their dissensions. After long discussion, a new convention was formed, which included all the important producers. The first and immediate result was a general and rapid advance in prices, which went up to £72@74 per ton in London—equal to 15.68@16.08c. per lb.; while £80 per ton—17.73c. per lb.—is quoted for next year's delivery. For obvious reasons the American producers could not join the convention, but they profited by the advance; the foreign quotations continued to control the market here, which now stands at about 25c. The advance does not seem to have checked the consumptive demand, which has continued good. While a good part of the increased demand for the metal comes from the automobile trade, there are other uses, especially in electrical work, which have expanded largely of late. It is in these that aluminum has come more or less into competition with copper. Considering the specific gravity and bulk, aluminum has been for some time the cheaper metal, but its use must be limited by the present comparatively small production. Preparations are being made, however, to increase this output, and it seems likely that larger supplies will be available within a year or two.

In this country accurate statistics of production are not available, but it is estimated that the quantity of ingots made in the first half of the current year approached, if it did not exceed 20,000,000 lb. The imports for the half-year were 10,660,668 lb., exceeding considerably the production. The total supply, therefore, exceeded 30,000,000 lb., which is the largest quantity ever reported in a similar period. We do not hear of any large stocks held anywhere, so that it seems probable that most of this metal has entered into consumption.

By far the larger part of the aluminum imported into the United States is marketed in the form of ingots or crude metal to be made into finished forms. This is to be expected, since the duty imposed by the tariff on ingots is 7c. per lb., while 11c. is charged on sheets, tubes, rods and other finished or partly finished forms. Statistics as to domestic aluminum cannot be obtained, but expert estimates are that approximately 35% is sold by the makers in the form of ingots to manufacturers, perhaps 20% as wire and 45% in other finished forms. The quantity of wire, however, is variable, since it is taken largely for electric transmission purposes, and the purchases are generally in large quantities, contracts for which come at very irregular intervals.

The aluminum industry is just now of especial interest, not only because of the conviction that it is a metal that is destined to grow even more rapidly in industrial importance, but also because of the serious technical developments that are taking place in it. Undoubtedly, our second statement follows from our first. Chief among these developments are the organization of the Southern Aluminum Co. to establish competition in the American manufacture of aluminum, the introduction of the Serpek process, and the efforts to put the Cowles process on a commercial basis.

The Serpek process consists in treating purified bauxite in the electric furnace with air and coke, forming aluminum nitride, and then treating this product with caustic soda, which forms sodium aluminate and ammonia. The former is used for aluminum production, the latter to produce ammonium sulphate.

The Cowles process is a late development intended to use all of the metallurgical pig but the squeal. Clay is mixed with salt and carbon (the latter only that it may burn out and leave a porous briquette, just as in the manufacture of some building bricks), and is treated with steam and air. Sodium silico-aluminate and hydrochloric acid are formed; the latter is condensed to a commercial product. The sodium silico-aluminate is then decomposed with lime, giving calcium silicate and sodium aluminate. The latter is used to manufacture alumina and soda, the former is calcined with more lime and makes a white hydraulic cement.

The Cowles process, which is described fully in another part of this issue, has been developed at Sewaren, N. J., and commands especial respect from the name of its inventor, Alfred H. Cowles, who was one of the pioneers in the aluminum industry. Be it that the Cowles brothers fell a little short of complete success in their early inventions and exploitations, or be it that they suffered chiefly from adverse patent litigation, the great honors and rewards went to Hall and Heroult. However, the work of the Cowles undoubtedly constituted important stepping stones in the development of the metallurgy of aluminum, and they failed to get the returns from their work that probably they should have obtained. It is, therefore, particularly gratifying that Alfred H. Cowles has now come forward with a new discovery of first-class importance, and it is to be hoped that this will become a great commercial success, will realize the dream of making aluminum mines out of many clay banks, and will reduce the cost of making aluminum by the 4 or 5c. per lb. that is estimated.

The Cunningham Claims

By order of the acting Commissioner of the General Land Office, the register and receiver of the Juneau, Alaska, land office, has placed on record the cancellations for fraud of the so called Cunningham coal claims in the Bering coal field. The lands now are a part of the public domain, and the $52,800 paid into the United States Treasury by the claimants is forfeited. The claimants may apply for a writ of mandamus in a District of Columbia court, but cannot appeal from the final decision of the Secretary of the Interior, dated Aug. 29, cancelling the claims. The money paid by the claimants cannot be refunded to them except by an act of Congress. Thus read the press dispatches of Sept. 13.

Secretary Fisher's decision, in part, is as follows:

> I have again reviewed the cases. No new considerations are presented in the argument, although it contains many statements, reflecting upon the animus and attitude of the commissioner which are, in my opinion, totally unwarranted. After full consideration, I am of the opinion that the findings of fact and the conclusions both of law and fact of the commissioner as expressed in his opinion in these cases, are correct, and they are hereby adopted as the findings and conclusions, both of law and of fact, of the department. The decision of the commissioner in each of said cases is affirmed. The applicants have had a full and fair hearing both before the commissioner and myself, and, indeed, the consideration by me of this appeal has in all respects also the effect of a rehearing of the case after my own decision. The decision will, therefore, be carried into immediate effect and the entries cancelled.

This will probably be the end of a famous case. The general public will rest with the belief that the Washington government checked the plans of a Morgan-Guggenheim syndicate to gobble a great area of coal land, whereof the value "ran high into the millions." A few persons only will know that the Cunningham claimants were men of substance and character, not dummies, that they thought that they were engaged in a legitimate adventure in connection with the development of Alaska, that their actions we in conformity with the laws of Apr. 2 1904, and May 28, 1908, and that the go ernment is in the position of disregardi its promises. Only a few persons, als will know that the Bering coal field regarded by experts as being of b slight value, and that the Cunningha claimants had no great commerci chances anyway. The climax of the misfortunes is reached in the confiscati of the $52,800 that they paid into th land office. The historian of the futu desiring to know the facts of this controversy will turn to Mr. Winchell's pape in the JOURNAL of Apr. 23, 1910, and n doubt will conclude that Justice was n blindfold in this case, but wore blinker

The eighth International Congress Applied Chemistry, the first to be hel in the United States, was a success which we may well be proud, and show a truly remarkable world-wide intere in this movement. That the day of epoch making discoveries is not over is show by Bernthsen's lecture on synthetic ammonia, Eyde on nitrogen fixation as oxides, and Duisberg on synthetic rubbe and similar problems. While the nitrogen lectures in a way touch the field o mining, in suggesting substitutes for ou present nitrates, the general mining an metallurgical program was not showy. was a record of great improvement made, but already known to the public or of small improvements suggested However, as Mr. Herreshoff remarked one of the main pleasures of such a congress is, after all, not so much to hea the paper, but to see what manner o man has written it.

The offering of European spelter i New York makes this market a basing point and changes the differential that ordinarily exists between the New York and St. Louis markets corresponding to the freight rate. Imported spelter can be shipped to Connecticut and to such points west of New York as freight rates permit, but interior points continue to be supplied from St. Louis.

The high price for tin stimulates the use of aluminum as a substitute for it. Aluminum foil is now being extensively used in Europe for the wrapping of chocolate, tobacco, etc. One concern alone is reported to be using about 50,000 kg. per month.

By the Way

"The desert of Sahara, with its 6,000,000 square kilometers," said Giacomo Ciamician, of Bologna, at the recent International Congress of Applied Chemistry, "receives daily solar energy equivalent to 6,000,000,000 tons of coal."

One thousand tons of Japanese sulphur, valued at $50,000, was ablaze today in the hold of the British steamer "Fitzclarence," says a San Francisco dispatch of Sept. 12. Considering the liberal fire damages usually announced in press dispatches, it would be pleasing to have reporters adjust one's fire losses.

Chino is going to $60 or $65 and Butte & Superior to—. Thus runs the tip (private and confidential, of course). Also it is said that Chino's cost of producing copper will be nothing at all and that zinc will sell for 10c. per lb. The gullible may believe what they please and the lambs will continue to be meat for the bulls and bears.

The town of New Pine Creek is situated half in California and half in Oregon. A recent letter states that the saloons and mercantile houses are on the Oregon side, the mine offices and barber shops being in California. Apparently one can attend to the serious duties of mining and shaving in California, while for the frivolous "smile" one must cross the line into "Happy Oregon."

Another vibration of the old note comes from Canada. A prospector, so the story runs, in attempting to step ashore from his canoe, lost his foothold and slipped into the lake. In an effort to drag himself out of the water, he grasped at a convenient bunch of moss which was near the waterside. The moss stripped off the rock and disclosed—what?—why certainly, a vein of silver of marvelous richness. The prospector has samples to prove it.

A number of thefts of platinum from laboratories have occurred recently; as a warning to those responsible, *Science* publishes the following description of the thief: "A German Jew, with a German accent; age, about 40 years; height, 5 ft. 8 in.; weight, about 200 lb.; peculiar-shaped head; bald; clean shaven; large, short neck; heavy jaws; dark complexioned; dark hair and eyes; intelligent; when last seen wore blue-serge suit and panama hat, and represented himself to be a book and magazine agent."

A European contemporary calls attention to the copper mines of the world, stating that "North America alone, with its mines of New York, Maryland, Pennsylvania, Massachusetts, California, and above all, Lake Superior, furnished the world 527,000 metric tons of copper in 1911." Will Arizona, Montana and Utah kindly consider themselves put in their proper places, and not feel depressed by foreign recognition of their Eastern sisters, who are only "also rans" or scratched entries in the copper race.

There is a story told concerning Senator Cummins, of Iowa, who is known as an ultra-conservative. One of his acquaintances who knew of this made a bet that he would entrap him in a categorical statement, and one day pointed out a passing flock of sheep, "They've just been sheared, Senator?" Prolonged meditation —"Well, they do look that way on this side." That some such caution is necessary in mine inspections seems to be indicated by a dispatch from the town of Indiana, Penn.: "A few hours after United States experts had declared the mine nongaseous, one man was killed and two others were seriously injured by the explosion of a gas pocket in one of the Wharton Coal Co's. mines at Coral, Penn."

We do not anticipate a copper rush to Coronation Gulf or Victoria Land where Dr. Vilhjmar Stefansson reports finding a tribe of blonde Esquimos, supposed to be descendants of Norsemen who settled on the northern end of Newfoundland about 800 years ago. According to preliminary dispatches, "they use bows made of willow bound together with sinews, and their arrows are tipped with flint and native copper, which is pried out of ledges or found in stream beds on the mainland. Their knives are made of copper with horn handles, in much the same manner as implements were made by the early Norsemen who settled on Greenland." As a mining report, the account is wanting in detail, but copper doesn't start rushes in these days. Greenwater is the last one we remember and hardly anybody hears of that now, except when Greenwater Copper Mines tries to dispose of its surplus and examines a new property.

Those who have brought mining propositions to New York and gone "broke," waiting for capitalists to snap up their brilliant prospects, are legion. Every engineer has encountered them and sad to say there is but little diminution in the steady stream of those who think that New York money is restless to get away from the safety vaults into undeveloped mines. In James Montgomery's buoyant comedy "Ready Money," now playing at Maxine Elliott's theatre, the hero, *Stephen Baird*, has sunk his all in a gold mine that has refused to develop. All his pals, his fiancee and her family are preparing to see the old year out, but *Baird* refuses to participate. On Jan. 2, if he cannot find $20,000 to pay a note he must lose his mine. While his friends are indulging in high jinks downstairs, *Mr. Jackson Ives*, a gentleman who wears an ermine-lined coat in the easiest sort of a way, drops in on young *Baird* to pay a New Year's call. Not only is *Mr. Ives'* overcoat fur lined, but his heart seems to be bursting with generous intentions and all his pockets are stuffed with thousand-dollar bills. He offers to loan *Baird* as many as he wants, but after he had handed over a roll of them to the young prospector he mentions the fact, incidentally and with an air of pride worthy of an artist who has just turned out a masterpiece, that the bills are all forgeries of his own creation. He is so well known, however, that he can no longer put his own money in circulation. He proposes that *Baird* shall do this little service for him on a 50% basis. *Baird*, being the hero of a modern comedy and consequently almost abnormally honest, refuses indignantly, of course. Then *Mr. Ives* assures him that he needn't pass the money; if he will only flash the bills in the eyes of his friends and agree to give *Ives* half of the real money which the mere sight of the bogus roll will produce, the counterfeiter guarantees that they can both make an "honest" fortune. *Baird* agrees to do this for a single day just as an experiment. The result makes the play which Acton Davies reports as a rattling little comedy, as clever as it is amusing, and one that has already panned a pay streak in London and Chicago.

Some months ago we chronicled the departure from St. Johns of a gold-hunting expedition to Baffin Land and other points in the Arctic Circle. Two ships were outfitted and a rival overland party was also reported to have started about the same time from Cobalt for Ungava, which was then the assumed destination of the "Algerine," an old British gunboat, which left St. Johns in June, in command of Capt. John Bartlett; the "Neptune," commanded by Capt. A. W. (Lucky) Scott, sailed a few weeks later. Dispatches now announce the return of the "Neptune" to St. Johns on Sept. 15, Capt. Scott reporting the loss of the "Algerine" in an ice pack, the discovery of extensive coal deposits, but no gold. The "Neptune" brought back the crew of the "Algerine," two tons of ivory, 60 bear skins, one muskox and a live polar-bear cub belonging to S. Osgood Pell, of New York, who accompanied the party. From which it may be deduced that the expedition was not as fruitless as some prospecting trips have been. When the "Neptune" reached latitude 74° N., the ice field became so massive that Captain Scott decided to turn back. The "Algerine" was crushed by ice in Pond's Inlet, and sank in 35 min. The crew walked 40 miles over the floes to land, where they found a cache. For two weeks they subsisted on four crackers per day, working their way to Button Point, 70° N. latitude, where they succeeded in signaling the "Neptune" as she was passing.

The Situation in Chihuahua

CHIHUAHUA CORRESPONDENCE

During the last 30 days, mining conditions throughout the state of Chihuahua have generally improved, first on account of the dispersion of the rebel forces from the larger settlements and the subsequent reëstablishment of railroad traffic on the National and Mexican-Northwestern lines into Chihuahua. At places in the western part of the state and remote from railroads, however, operations have been harassed by the marauding bands of rebels, who have looted mine stores, robbed and maltreated both foreigners and Mexicans and even compelled the shutdown of some of the larger mines, such as the Dolores, Concheño and Yoquivo. At these, as well as at other mines, advantage is being taken of the enforced situation to make a general overhauling of mine and mill plants, with the expectation of running at full capacity within 30 days or so, by which time it is anticipated that the roving rebel bands will have been driven into the adjoining state of Sonora or maybe run down by the federals. The main losses, other than such as are attendant on the forced suspension of operations, have been in store stocks and firearms, sufficient care having been taken in most cases to send out or conceal all bullion before the appearance of the thieving bands. In several instances, however, money was paid over to the marauding chiefs under threats of property or personal injury. Foreign companies, which are the main operators, suffered most from these predatory bands. It is not anticipated that there will be a repetition of these outrages on account of the nearness of the federal soldiers, who are in as close pursuit as permissible with their inferior knowledge of the country.

Prior and since the evacuation of Chihuahua by the Orozco forces, the Chihuahua plant of the American Smelting & Refining Co. operated uninterruptedly, inasmuch as an abundance of ore was obtained locally and the supply of coke and coal was ample. The Rio Tinto smeltery, at Terrazas, however, was forced to suspend for about 40 days, on account of fuel shortage, but is again in commission.

Operations must be more or less hampered for some time on account of uncertain railroad traffic, resultant first from the wanton track and bridge destruction of the retreating rebels, and second by subsequent heavy rains. The National line is open to Torreon and Parral, but it will require at least two months for establishment of service between this city and El Paso. The Mexico-Northwestern Ry., however, is operating regularly from Chihuahua to El Paso, via Madera. Owing to the temporary repairs and the generally bad condition of the roadbeds, traffic is more or less irregular and the movement of heavy trains is impracticable at present.

Activity in the Parral and Santa Barbara camps is confined to a half dozen of the larger producers, such as Minas Tecolotes, El Rayo, Alvarado, Moctezuma and San Francisco del Oro. Work has been resumed at the Indé and Guadalupe mines, in the Indé camp, in Durango, but very little activity is reported from Guanaceví. Both of these camps are best reached from Rosario, on the Parral branch of the National Railways of Mexico.

The Cusihuiriachic camp has been remarkably free from trouble, except the impossibility of shipping its ores on account of lack of railroad facilities. The development activities continue uninterruptedly.

A few investors, particularly English, are taking advantage of the present lower prices asked for meritorious properties, and it is likely that a number of transfers will be shortly recorded from several camps. Donald B. Gillies and associates are reported to have acquired several heretofore productive mines controlled by the Terrazas-Creel interests, and in fact work has already been started on one, namely, the Magistral, about 25 miles west of Chihuahua. Mexicans in particular are offering properties at greatly reduced prices.

An important Federal ruling was to the effect that mining taxes paid to the revolutionists during their control of Chihuahua affairs need not be paid a second time to the Federal authorities, and of the extension of the final limit of payment to Oct. 1. Prior to this ruling there was considerable anxiety among mine owners, who feared that the payment of these annual taxes to the rebels might be no bar to their second payment to the constitutional government.

Rebels at El Tigre

Mexican rebels under the command of Inez Salazar, captured the town of El Tigre, in Sonora, after two attacks, Sept. 15. While the rebels were attacking the town, a detachment of federal troops was within a distance of nine miles, yet made no effort to aid the garrison that was eventually driven from the place.

The rebels looted the store of the Lucky Tiger Combination Gold Mining Co. and, according to the dispatches, departed with 21 bars of bullion. A threat was made to hold L. R. Budrow, general manager, R. T. Mishler, assistant manager, and H. L. Nix, manager of the El Tigre Merchandise Co., as hostages for a $100,000 ransom, but it was not carried into effect. The federal troops returned to the town after the rebels departed. Telephone communication was restored long enough to announce that no American had been killed or seriously hurt. Later dispatches state that Consulting Engineer James W. Malcomson, of the Lucky Tiger company, has offered a reward of $5000 for the recovery of the stolen bullion. Automobiles were being sent into Sonora to bring out the women and children of Nacozari who were to come by train as far north as the condition of the railroad would permit.

Southern Aluminum Co.

The Southern Aluminum Co. (cf. ENG. AND MIN. JOURN., June 22, 1912, p. 1212; Sept. 7, 1912, p. 453) organized to manufacture aluminum and its byproducts and to operate in the State of North Carolina, with principal office in New York City, has been incorporated with a capital of $6,400,000, of which $4,000,000 is to be 7% cumulative preferred stock. In addition, the balance of the net profits is to be divided equally between the preferred and the common stock.

The directors are Adrien Baden, Leon Bartholin, George Bergès, Hippolyte Bouchayer, Henry Brunner, Charles Dubreuilh, Jules Dreyfus and Charles Michel-Côte, of Paris, France; Hubert Chalmeton de Croy, of Lorette, France; Henry Gall, of Versailles, France; Jean Sonnery-Martin and Lazare Wolff, of Lyons, France; Zachary Hochschild, of Frankfort-on-the-Main, Germany, and Dr. Paul Heroult, of 149 Broadway, New York.

Western Phosphate Field

The phosphate field of Idaho, Montana, Utah and Wyoming, most of which belongs to the government, is the largest ever discovered in the world, according to the U. S. Geological Survey. The exact boundary of the phosphate-bearing area is gradually being determined by detailed and reconnaissance examinations, and the original tract of 4,541,300 acres, withdrawn Dec. 9, 1908, as a phosphate reserve, has been altered from time to time by the restoration of nonphosphate areas and by additional withdrawals. On Sept. 1, 1912, the outstanding land withdrawn in this general region amounted to 2,211,867 acres.

U. S. Geological Survey Appropriation

A total of $1,477,920 was appropriated by the last Congress for the use of the U. S. Geological Survey for the fiscal year ending June 30, 1913. The principal items are: Topographical surveys, $350,000; geologic surveys, $300,000; mineral resources of Alaska, $90,000; mineral resources of the United States, $75,000; chemical and physical researches, $40,000; geological maps of United States, $110,000; gaging streams, etc., $150,000; surveying national forests, $75,000.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Selling a Mine

There has appeared from time to time so much advice to prospectors and vendors of mines and prospects—well, not prospects; investors do not want these; prospects never made a mine, you know—that it may be interesting to look at the situation through the prospector's or vendor's eyes for once and the following letter prompts me to send this to you, with little comment.

The suspicion gains ground in the West that the kind of stuff that has been so persistently forced on the reader for months past, has been written from a well cushioned chair and, in many cases, by writers who know not the life of the prospector, and whose days have been since all the big mines of the country were prospects, and who have forgotten that they themselves once were babies without an original thought in their heads.

The prospector reads the technical papers; the development of his mines makes business for the machinery man and advertising for the paper. He, therefore, has some rights to be heard in the way of advice to the investor. The kind of stuff that has been appearing has an adverse influence on the industry in many ways. It is discouraging to the prospector, to the legitimate vendor of partially developed mines and prospects; it has influenced the less thinking possible small investor in prospects and leaves the field, as far as this influence is felt, to a class of investors whose desire seems to be to dictate all terms and conditions.

The experience of the prospector given below is common and the sentiments he expresses are gaining ground throughout this section and will bring about a condition that can mean only continued setback to the advance of a legitimate and highly profitable industry.

Not the least objectionable feature is that referred to in the remarks on "that kind of engineers" in the letter.

I commend the following letter to the attention of your readers and to investors in particular.

VENDOR.

Creede, Colo., Sept. 7, 1912.

Dear Pard:

Another glittering dream vanishes with the dawn, the deal is off and yours faithfully is a wiser if not richer "tenderfoot." I say "tenderfoot" in the light of looking backward, we of the pick and shovel are kids to these wise finance men of the east—give me the western mining man to deal with, they are on the square at least. I have been reading how we should not ask money down, should have ore "blocked out," "in sight" etc., etc., and much other good advice to you and me and the rest of the boys as to how to sell a mine, how we must have a lot of mineral showing in the camp and all sorts of dope, and in the papers that we look to for information, supposed, and finally made up my mind that it was coming so strong that there must be something in it. I had a chance to make a turn so concluded I would give them a chance and see how it worked. All was lovely, believe me, they got busy, I had a chance to do business with some good home people but was tied up, I had asked nothing down, nothing mind you, for the privilege I gave them, and, to make a long story short, they dumped me, side tracked by a bunch who thought they could land me for less and one thing and another, as I found out after.

Right here I want to tell you that we have some rights in this business of tieing up our ground and the next geezer that wants a lay, will plank down enough coin to show his good faith in the deal, then if he wants to drop it and thinks he can come back on a smart 'horse trading' stunt, I will have something for the time I am idle, the delay and possible loss of other chances to make a deal. I understand that when they want stock on option, they pay something for it but they use the papers to tell us what hardships we are putting on them, if we ask a small forfeit.

This ain't the worst feature of the deal I had up, as the following which came to my hand later will show you, and you might have use of the advice for your own use. This came pretty straight. "There are two ways to deal with that kind of 'engineers!'" I am told, "one is to hand them a slice of the commission, the other is to hand them a swift-kick somewheres! I think one could hand him first the last and then the first and he would forgive you for doing it!?"

Tuck this under your hat and size up the "expert" when he comes along. If he wants 'the bullion on the dump with the eagle stamped on it,' waste not your valuable time with him, he knows not a mine.

With Everlasting hope, here's to the future.

Yours,

Bill.

Efficiency Underground

Many articles have been written in the last year on the question of efficiency in underground mining operations; for instance, there is one by P. B. McDonald in the JOURNAL of Oct. 28, 1911. It has occurred to me that a description of conditions in a certain Western mine might be interesting—especially when written by a miner.

The mine in question is a low-grade quartz gold mine hoisting 300 tons per day, and the miners are all Europeans, over half are Spanish, and over one-quarter are Italians. The labor is satisfactory, but through poor management and lax supervision the results are not nearly what they might be.

As an instance of poor management, the mine is worked by shrinkage stoping, and yet in order to keep the stamp mill going, the one large stope of the mine is drawn down so much that high stagings are nearly always necessary to drill the back. I have worked on a stage 25 ft. high, and 16 ft. is common. It is difficult to bar down all the loose ground in such a stope, and this with the fact that the hanging is inclined to slab off, and is sometimes a little wet, makes it bad. In a year one man was killed and four were badly hurt as a result of not keeping the stope full in the ordinary way. Much time is spent in building the high stages necessary, and these ordinarily must be moved back on the night shift to provide sufficient drilling ground for both shifts as two to four men work on each stage, and the ground is not hard. Ingersoll BC 21 and Waugh stopers are used. Personally I know that when I do not need to build a high stage, I am able to drill 25% more than otherwise. Some staging is needed, of course, as the muck is always lower on the hanging side, but a low stage is quickly made. The high stages are the result of a mistaken policy—that of keeping the mill going at all hazards.

Supervision is lax, especially on night shift. On day shift there is a foreman, a shift boss, and a stope boss. Although there are only four or five different working places in the mine, the night shift boss seems able to visit them only twice, once before supper, and once after, usually about 11 o'clock. One or two men usually stop work after his second visit and soon all are "tapering." Of course, some time is needed to remove machines, hose, air pipe, etc., to a place of safety, but all that is usually done by 11:30, often earlier. For months I have thus seen 10 to 12 men quit work from one to 1½ hr. before the end of the shift; it is a custom now. On day shift a half hour is lost in the same manner, corresponding to the time at which all the bosses leave the mine. There is a considerable loss of efficiency here, it seems to me, through time lost or wasted by labor. Labor at this mine forms about 60% of the total operating expenses.

During the time I have worked at this mine there never has been enough drill steel, and when new steel is purchased it is cut into lengths with no regard to the fact that certain lengths of drills are abundant and certain other lengths are scarce. The steel for each shift is sent down, after the men, who have to come to the station for it, and often then have to wait for it. Every shift, at least one-half hour is lost from actual drilling, in packing steel into the stopes. One nipper handles the steel, and necessarily he leaves much dull steel in the stopes at the end of the shift, as usually two to three hours drilling is done after his last collection of steel. The employment of two nippers on each shift, and the purchase of more steel would permit all the drill sharpening to be done on day shift, thus saving in the wages of the two sharpeners at night, and in power and fuel.

There is always a scarcity of tools such as picks, bars, wrenches, etc., and picks when sharpened are not sent down with the drill steel. Each man when he wants a pick takes it with him when he gets into the skip. There is little doubt that many tools are lost temporarily at least, in the stopes, which are never level, one end always higher than the other. The disadvantages of such a stope have been pointed out in a recent article.

At one time, small oil flasks were furnished the miners but this was not kept up, and now less than half of the men have any means of oiling their machines. A stoping drill needs oil regularly, especially after it has been used for several years. On account of a lack of system, machines when out of order, are sent to the shop on the surface with no note or record of the trouble, and many of them are sent back with no repairs made. Usually the packing is not examined, and a stoping drill with loose packing is enough to ruin the disposition of an angel, besides hindering a man in his work.

There are no spare pipe fittings or pipe kept underground. More than once I have lost from three-quarters of an hour to an hour by being compelled to take a hose to the shop because the union on the end was worn out; on other occasions I have spent as much time looking for a length of old pipe, or a pipe wrench. Extra hoses and machines when repaired are left in the shop, instead of being sent down where they will be needed.

The miners are required to report the holes drilled. In case a man has hard luck, machine out of order or the hose in bad shape, he still feels that he ought to report the usual number of holes, and so he drills the usual number, but makes them shallow. Two men are employed on the "graveyard" shift to blast almost all the holes, and these men could report the number of holes, if desired, though as a matter of fact, the foreman does not make any reports to the superintendent concerning the number of holes drilled, or in fact anything else.

The men employed to blast the holes save the mine a large amount on the powder bill—not less than 10 cases of 40% gelatin per day, over the old arrangement of having the miners blast their own holes. However, the blasters do not cut the fuse and depend upon rotation of spitting to secure rotation of blasting. Many missed holes result, and although they go back and shoot these over, the result is not good.

The above applies to miners. As I worked for three months as a mucker at the same mine, I can speak of the conditions in mucking. There is a poor track arrangement on the main level. The station chute holds 150 tons, and yet when a man brings a car out to the station, he must wait until the man ahead of him has dumped his car, cleaned off the track, and pushed his car ahead, after which he dumps his own car, the first man then resting until the second car is dumped and the track again cleared.

At the chutes "grizzly" men bulldoze the boulders instead of blockholing them, which means more powder used, and more smoke to hinder the work at the chutes. The cars are made at the mine, and have old-fashioned loose wheels and axles. Much oil is wasted, as the cars must be oiled twice a shift, and much oil gets to the stamp-mill as there is a little water in the ditches beside the track. The drifts are narrow, and before many of the stope chutes there is not sufficient room for a man to work comfortably when filling cars. In driving the drifts, the laying of new track is done by the muckers that happen to be there, and as the work is generally done near the end of the shift, when the boss has already gone up, the work is not properly done, and as the track is in constant use it is never relaid. I never saw a rail splice in the mine.

Nearly every one of the things that I have mentioned is small in importance in itself, and yet I am sure if corrected, would cut down the mining costs, or else would allow a greater production with the same number of men. But after all, it is nobody's business, for I happen to know that the management is considered satisfactory by the owners.

"Where ignorance is bliss —."

A. MINER.

Ninguna Parte, Ariz., Sept. 1, 1912.

Grinding Samples for Assay

The article on p. 446, of the JOURNAL of Sept. 7, 1912, "Grinding Samples for Assay," seems to require considerably more explanation than is there given. In his article "The Preparation of Assay Samples" (ENG. AND MIN. JOURN., June 24, 1911,) L. D. Huntoon remarks, "I prefer assay pulps pulverized through 100-mesh to assist in the furnace work, but not for the accuracy of results, providing the fashions are made properly."

In the last phrase seems to lie the key to the whole matter. It is, as Huntoon points out, absolutely necessary to run by slow fusion and to pour at a high heat on 60-mesh ores. From the article in the Sept. 7 JOURNAL, it is impossible to tell whether or not these conditions were complied with, but until information is given on this point, it seems rather premature to make the bold statement that ores ground to 60- or 70-mesh generally give low results.

It also seems that it is not enough to say that in finer grinding large quantities of foreign matter are introduced, and low assays laid to that. This can be tested by determinations on metallic iron. As a friend recently wrote me, "I find it possible to introduce ½ to 3% of extraneous iron into my samples, depending on the hardness of the ore and the energy of the Mexican employed," but it is easy to determine such external matter. (I might state here that in my own work I have cut down such introduction materially by using chrome steel mullers and bucking boards).

In short, it seems to me the article in question is "Hamlet" with the Dane omitted, and that considerable further enlightment should be afforded us on these Mexican experiments.

T. T. GRAY.

Perth Amboy, N. J., Sept. 9, 1912.

Consumption of Sulphur

I have noted with great interest the remarks on the Newberry-Fishburne calcined-phosphate process and its possible effects on the acid trade of the United States in the late JOURNALS, and thought perhaps the general run of readers might view a remark of Utley Wedge today at the Chemistry Congress with the same interest I did. It was to the effect that the uses of sulphuric acid were constantly on the increase, and instanced that the next few years would undoubtedly see a great consumption of sulphuric acid for making ammonium sulphate at regenerative coke ovens.

Perhaps by the time one branch of the fertilizer industry is through with sulphuric acid, another may be using equal quantities.

A. A. NASON.

New York, Sept. 10, 1912.

Aluminum from Clay

A process, developed by Alfred H. Cowles and the late Adolf Kayser, permits the use of cheap clays to produce a substitute for bauxite; it is claimed that with the utilization of byproducts the cost of aluminum production will be cheapened by 4 or 5c. per lb. Clay and salt are treated with steam to produce hydrochloric acid and sodium silico-aluminate. This is then broken down by lime into calcium silicate and sodium aluminate, from which cement, soda and alumina are made.

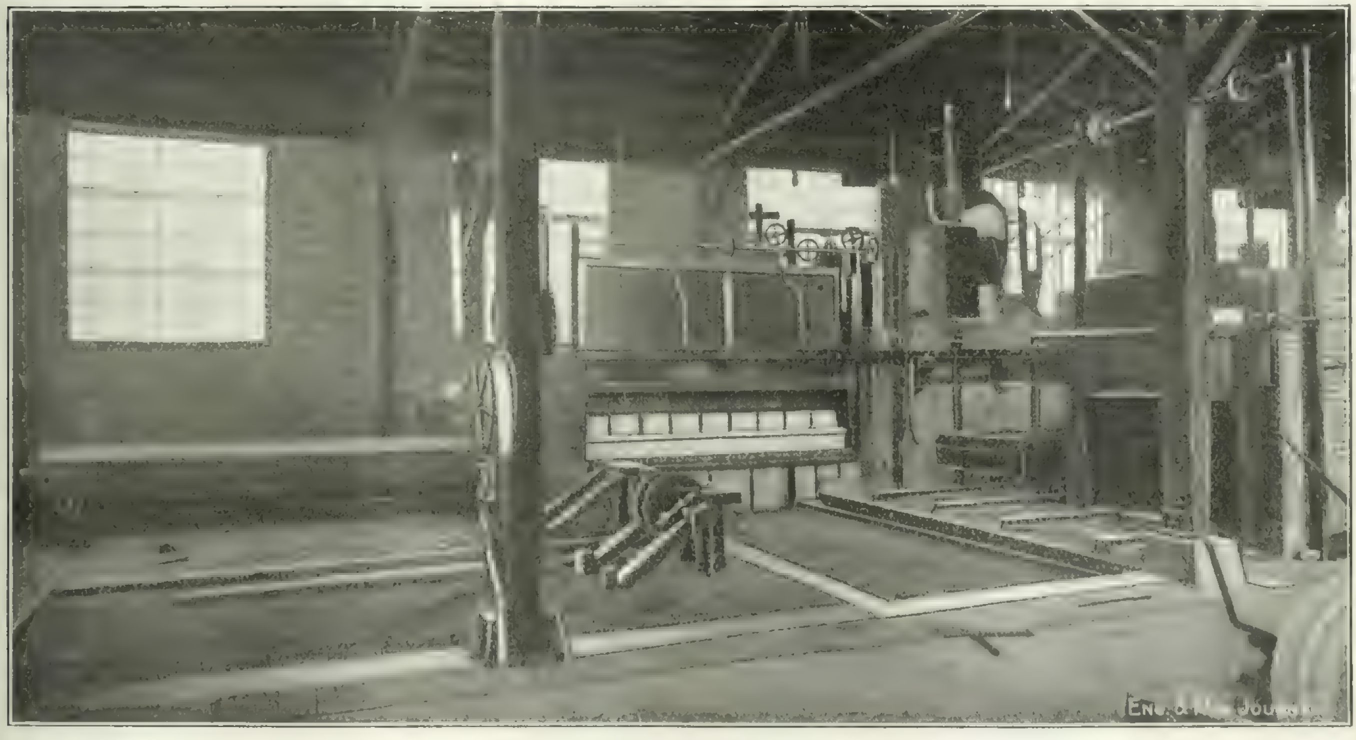
Note—Slightly abridged from a paper, "Alumina, Hydrochloric Acid, Alkalis, and White Hydraulic Cement from Clay, Salt and Lime," read by Alfred H. Cowles before the International Congress of Applied Chemistry.

Since 1862, or earlier, the proposal has been in the literature to produce hydrochloric acid and potassic or sodium compounds from salt and clay by passing steam over the mixture at a high temperature.[1] These proposals have been condemned as impracticable by Thorp's Dictionary, Lunge and other high authorities.[2] It was not until 1902 that a method was patented by Adolf Kayser to separate the silica effectively and economically from an alkali-silico-aluminate formed as one product in the above process.[3]

Cause of Early Failures

The attempts to render this process a commercial success, resulted in failure for this reason: If most clay and salt alone be mixed together, molded in the form of perforated briquettes, and after drying, be heated to a good red heat, but not high enough to melt the final product; and water vapor be passed through the mass, a chemical action begins on all surfaces of each heated briquette. The water vapor gives oxygen to the sodium of the salt, and hydrogen to the chlorine, thus hydrochloric acid passes off as a vapor, while sodium monoxide combines with the silica and alumina of the clay, forming sodic-silico-aluminate. This action slowly passes inward from the surfaces of all heated briquettes. The conversion of the material from the outer surfaces inward is slow. Kayser, in the '90's, found that it took 72 hr. for the change to penetrate through a briquette wall, from its two sides, that was scarcely more than one-half inch in thickness, and this in a furnace capable of containing many tons of such material. His briquettes had a crystalline structure. Though shrunken some, they retained their molded form.

The result of this slowness of action involved a too long heating of the briquettes, necessitating an abnormally large volume of nitrogen and fuel gases passing through the furnace to effect the result. The quantity of these inert gases was so great, that the hydrochloric-acid fumes evolved were not capable of efficient and practical condensation.



Interior of Electric Smelting & Aluminum Co's. Plant, Sewaren, N. J.

Making the Briquettes Porous

While Kayser was employed as a chemist with the Electric Smelting & Aluminum Co. of which I am president, I suggested that we make up some salt and clay briquettes, adding charcoal or sawdust to the mixture to render them porous during heating; and compare them with similar briquettes of clay and salt alone such as he had formerly used in his attempts to render the process mentioned commercial. He did not think this mixture would work, as he was positive that it would destroy the oxidizing atmosphere needed in the operation to prevent the formation of volatile aluminum chloride (Al_2Cl_6). I believed that an oxidizing atmosphere was only necessary around the briquettes, and that it would gradually penetrate the mass of each briquette, and that a reducing atmosphere at interior portions of such briquette could not interfere with the desired reaction, as any aluminum chloride formed, would of necessity, change to oxide before leaving the briquette. Without mentioning this to Doctor Kayser, I insisted upon the trial being made. The bricks containing charcoal were converted into sodic-silico-aluminate in one-ninth of the time that was required with like briquettes containing no charcoal, and acid of 17° Bé. was condensed with a small apparatus in the face of imperfect control.

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[1] Brit. pat. No. 2050 of 1862 of William Gossage. Brit. pat. No. 2679 of 1874 of Herman Gruneberg and Julius Vorster. A number of American patents to Adolf Kayser between the years 1886 and 1896, also English pat. No 11,492 to Adolf Kayser.

[2] Lunge, Vol. 2, p 429, 1895 Ed., "Heating sodium chloride mixed with clay in a current of steam, according to Vorster and Gruneberg, produces sodium silicate and steam (?) The temperature is so high and the wear and tear of the apparatus so great, that this process is not practicable." Thorp's "Dictionary of Applied Chemistry," Vol 3, p 451 Referring to the attempts of Gossage (1862), Gruneberg and Vorster (1876) and Lieber (1878), states that the temperature required for the decomposition of salt is too high and the vessels employed cannot be made to last, and on these accounts the attempts had no practical results.

[3] U. S. pat. to Adolf Kayser dated Sept. 5, 1901. Issued Sept. 9, 1902

This experiment opened up an entirely new vista of success to the process. It meant that the volume of fuel gases and nitrogen necessary to pass through a charged furnace would become so reduced, as to permit of efficient commercial condensation of the hydrochloric acid evolved. It meant a great saving of fuel, and far greater capacity of output with the same cost of plant. Dr. Kayser and I became equally enthusiastic. Our company acquired his patent for opening or rendering soluble the alumina in the form of sodic-aluminate from the sodic-silico-aluminate briquettes produced, and after two years or more of added experimental work in the laboratory, a large plant has been erected at Sewaren, N. J.

The Commercial Process

The process as a whole is easily understood. The clay, carbonaceous matter and salt are made into perforated briquettes, and after being kiln dried, are passed on flat cars through a long furnace of the tunnel type, which brings the briquette to a temperature of about 1035° Centigrade.

Knowing the composition of the clay, and the percentage of salt in the mixture, steam is blown into the discharge end of the furnace over a train of cars covered with firebrick, with their iron parts sealed off, while through a vestibule at the other end of the furnace, loaded cars are gradually pushed forward by a hydraulic pusher whose speed is under control. The weight and composition of the material on the cars thus fed into the furnace is known, and the correct proportional weight of exhaust steam is passed into the furnace from the opposite end. From the charging end, the gases at a temperature too hot to attack iron, are sucked by a large blower and forced through a large hydrochloric-acid condensing system. The temperature of the furnace is controlled by oil heat and measured by pyrometers. Most of the heat required is furnished by the carbonaceous material mixed with the clay and salt of the briquettes. The reaction that takes place will vary according to the composition and mixture of the aluminous material and the salt, but typically, the final reaction is as follows:

$$Al_2O_3\,2SiO_2 + 4NaCl + 2H_2O + yH_2O + xC + xO = (Na_2O)_2\ (SiO_2)_2\ Al_2O_3 + 4HCl + yH_2O + xCO.$$

The surplus water vapor and the hydrochloric-acid gas are carried into the condensing apparatus and are condensed. The briquettes maintain their original form as the cars bearing them are gradually pushed out of the discharge end of the furnace, having been cooled by the inflowing rush of measured steam and a limited quantity of air.

The sodic-silico-aluminate briquettes formed have been made containing as high as 33% of sodic oxide. The above reaction would give 35.8% Na_2O. There is no appreciable loss of salt. While pure clays are preferred, all small amounts of iron pass off as iron chloride with the hydrochloric acid and are condensed with the first hydrochloric acid in the first condensers of a multiple system. The acid produced is remarkably pure, free from arsenic, and but traces of sulphuric acid can come from iron pyrite if the same be in the clay. When briquettes are made containing 32% of sodic-oxide, the output of 30% hydrochloric acid should be about 1½ tons of acid to one ton of salt and clay in the charge.

Breaking Up the Silico-Aluminates

The next step in this process is, to open the sodic-silico-aluminate, which is acid, to secure from it the sodic aluminate which it contains. This is accomplished by heating a mixture of the ground acid salt with just sufficient lime to combine with the silica in it and form dicalcium silicate.

$$(Na_2O)_2\ (SiO_2)_2\ Al_2O_3 + 4CaO = 2(CaO)_2SiO_2 + (Na_2O)_2 + Al_2O_3.$$

Limestone, calcite or marl in their chemical equivalence to lime may be used instead of anhydrous lime.

In the reaction just given above, any amount over two molecular weights of calcic oxide to each molecular weight of silica, leads to formation of insoluble calcic aluminate, and less than two molecular weights, is not sufficient and leaves undecomposed sodic-silico-aluminate. In each of these cases, marked loss in the recovery of alumina may occur. The mixture of lime and the acid salt is heated in a rotary cement furnace, or in a furnace of the tunnel type as above described, just to its clinkering temperature. After its discharge from the furnace, it is broken into fragments and these are in an excellent physical condition for effective leaching. Nearly all the sodic aluminate may be leached from this clinker, while there is left behind a white mass of dicalcium silicate containing some sodic aluminate. Having secured the sodic aluminate in solution, the method of procuring the alumina and caustic soda therefrom is that already in universal use.

Manufacture of Cement

The residue of dicalcium silicate when heated in a cement furnace with one molecular weight more of lime gives a clinker that conforms in composition to Newberry's formula for the best and strongest hydraulic cement, but it has the advantage that all of the iron oxide has already been removed from the silica that goes into its composition, thus rendering it easy to secure a white cement by the use of limestone free from iron. Such cement sells at about four times the market price of ordinary cement.

This process opens the way to secure the alumina cheaply, or as a byproduct in conjunction with these other products, of great consumption in the industrial arts. There is required 1.9 lb. of alumina to produce 1 lb. of aluminum by the present method of manufacture. This costs 6½c., and is the heaviest item of cost in producing this metal. By the general introduction of this process, we may hope to see the cost of production of the metal aluminum reduced 4 or 5c. per pound.

This process also furnishes a key to unlock the stores of potash from the world's mountainous masses of potash feldspar. As one way to do this effectively, the feldspar should be ground and mixed with either chloride of sodium or chloride of potassium and made with some clay and sawdust into the form of briquettes, then passed through a furnace under conditions similar to those described above. The solid product should then be submitted to Doctor Kayser's lime-opening process. The clinker on leaching gives potassic aluminate or a mixture of this with sodic aluminate from which the alumina may be separated, and the potash or potash and soda secured for use in fertilizers. The residue from leaching can then be converted into hydraulic cement.

A study of the reactions herein given in connection with the volatilizing temperatures of the various chlorides of the common metals will throw much light upon the geological theories of formation of intrusive mineral veins.

Before closing this paper, I wish to express my pleasure at being able to do homage to Mr. Kayser and make known the splendid work of an able, enthusiastic, genial chemist, without whose aid the above described process as a whole, would never have attained the completeness that it now has, and the great usefulness that future years will confirm.

Discussion

Answering various questions as to the process, Mr. Cowles said that no attempt had been made to utilize the CO, but this may eventually be done as CO is utilized from blast furnaces. To remove small amounts of HCl from it, it should be passed through a proper scrubber.

White cement has high value for use in decorative work, although so far we have only made the dicalcium silicate. By adding one molecular weight of CaO to the same we know that we fall within the formula discovered by Arthur Newberry for the strongest hydraulic cement, which formula permits up to several per cent. of Al_2O_3 to be present in tricalcium silicate, and if iron oxide be absent this produces a strong white cement.

The reactions have been worked out on a large experimental scale during three years work previous to our starting to erect our plant at Sewaren, N. J. I expected to have here this morning converted briquettes from a channel furnace 184 ft. long, the first from the new plant; but yesterday morning an engine cylinder that operated our generator went to pieces. This stopped the furnace with the bricks just approaching the hottest zone in the furnace. Acid was condensing in our condensing system at this time.

ANY VOLATILIZED SALT CAUGHT BY INCOMING CHARGE

The NaCl is decomposed by superheated steam before it has a chance to distill off. Some will vaporize in the hot zone of the furnace and be carried over the loaded cars. For about 90 ft. the hollow briquettes act as a scrubber and carry the sublimed salt back toward the hottest zone of the furnace. Using too high a percentage of NaCl in the briquettes might clog the furnace, for it would be capable of forming more Na_2O than the clay would be able to absorb. The limit above that required to place 33% of Na_2O in the product will probably be higher with our large furnace than with the small furnaces that we formerly employed.

The reaction begins lower than the vaporizing temperature of salt. Day before yesterday the hottest part of our large furnace was 1450° F. and acid fumes so strong were passing through our condensing pipes that it was with difficulty that U-shaped pipes were connected between one set of upright acid ware pipes to permit the fumes to pass through other sets, and weak acid was drawn from the condensers. After we pass the vaporizing temperature of NaCl, about 1700° F., the reaction goes on rapidly. The higher the Al_2O_3 in the clay the higher can the temperature be carried without melting the briquettes.

The purer the clay the better, as the presence of iron oxide leads to a larger amount of iron chloride and loss of pure acid. If the iron chloride were used for leaching ores or otherwise, then its presence would not be so detrimental. The Moraine clays contain an undesirable amount of iron oxide, and are most too low in alumina for best results.

On Sept. 4, the 55,000-bbl. tank No. 1, of the Associated Pipeline Co., in the Lost Hill district, California, was destroyed by fire, the loss being about $40,000, which includes 21,000 bbl. of petroleum. About an equal amount of oil was saved by being turned into a near-by creek.

Mining at Fairbanks, Alaska

SPECIAL CORRESPONDENCE

In general, Fairbanks is enjoying a prosperous year. The output from the placer mines will not fall far short of the figure for last year, when it was about $4,000,000 for the Fairbanks district proper, or $5,000,000 for the entire Tanana Valley. The output of lode gold will be approximately $300,000, as against $60,000 for the year 1911.

At the workings of the Newsboy Mining Co., at the head of Cleary Creek, the mill has been running steadily since May 17 on ore that has returned from $10 to $20 per ton. Early in the season a pumping plant was placed on Willow Creek, 3000 ft. from the mine, to furnish water for the mill. This has been operated only when the supply of water by gravity ran short. Plans are now under way for removing the mill from the mine to Cleary Creek near the junction with Willow Creek. It is hoped that sufficient water can be developed here to continue crushing operations throughout the winter.

In the mine, the shaft is 350 ft. deep. Drifts have been driven on the 115-, 215-, and 315-ft. levels, and stopes have been operated from the upper two. The vein ranges from one to six feet in width. Assays and mill returns show a variable gold-content and an extremely erratic distribution of the gold. Some of the ore is free milling, while some carries too much stibnite and arsenopyrite to be suitable for stamp milling. The tailing is reported to assay as high as $8 per ton. The present outlook for this property is not bright. There have been financial troubles and several changes of management. George Hallock, a graduate of the University of Washington, is now in charge.

McGillivray and Fisher, lessees on the Newsboy Extension, have recently completed the installation of a boiler, a hoist, and a mill of five stamps. The shaft is down 120 ft. Drifting is in progress at 60 ft. and at 115 ft. It is probable that this property will be closed down during the winter months.

At the Tolovana mine on Willow Creek, a 2-stamp Nissen mill is being installed, in place of the Huntington mill that has been in use for the last year. The mine is developed by adit and by winzes, and there is said to be a large body of good ore available for extraction.

The Rhodes-Hall property, on Bedrock Creek, is the banner quartz mine of the camp. The 5-stamp mill is operating steadily on ore milling from $40 to $200 per ton. Many of the weekly cleanups are reported to exceed $10,000. The mill, which is in charge of Alan Cunningham, has been remodeled and is now working smoothly. A recent shipment from San Francisco for this property included a dynamo, an electric hoist, an electric pump, materials for an electric-lighting system, and supplies of all kinds sufficient to last the mine a year. In the mine, ten stopes are being worked. The main adit has been connected by a raise with the surface. A large station has been cut 800 ft. from the entrance of the adit to accommodate the hoist which will be used to deepen the winze at this place.

William Burns and associates recently purchased from Fey and Jesson a group of 17 claims at the head of Chatam and Fairbanks creeks. Although several veins have been found, development work has been confined to the most promising one. An adit was driven to tap the vein at a depth of 100 ft., and drifts have been run several hundred feet along the vein. Stopes are being opened on ore of good grade. A Joshua Hendy mill of four 1250-lb. stamps is being installed on Chatam Creek, about a mile below the mine. It is expected that this mill will be put in operation in September.

Edward Willis, lessee of the Pioneer claim, on Chatam Creek, has placed an order for a 5-stamp Joshua Hendy mill. There is a good body of rich ore lying between the surface and the drift at a depth of 80 ft., which will be extracted before further sinking is attempted. In the past, water has caused much trouble on this property, hence the determination of the operator not to go below the frost line until it becomes necessary.

On the Rexall, at the head of Wolf Creek, a promising body of high-grade ore has been developed. A Joshua Hendy mill of two stamps has been ordered and will be installed at once. A recent shipment of 10 tons of ore from this property yielded $180 per ton.

McCarty and Furseneau, on the Wolf-Fairbanks divide, are installing a boiler and a hoist at the mine. The shaft is down about 100 ft. At 60 ft., drifts were run on excellent ore. A Little Giant stamp mill is in process of erection near the head of Fairbanks Creek.

Angus McDougall, adjoining McCarty on the south, has discontinued stoping operations for the present, and is engaged in deepening his shaft. Two hundred tons of ore that is expected to mill better than $40 per ton will be put through the Burns mill on Chatam Creek at an early date. A mill has been ordered for this property, but it is not expected to arrive this season.

A hoist has been installed on the Rainbow claim, in Skoogey gulch by Zimmerman, the lessee. A narrow vein showing $40 ore has been uncovered for several hundred feet on the surface. The shaft and drifts also show good ore, so the outlook for this property is bright. A compressor, drills, and a stamp mill will be ordered soon.

The Hudson Bros., on Ester Creek, have what is reported to be the best of the many good prospects of this camp. There are several stringers ranging in width from one inch to one foot and separated by schist. Assays on samples taken across a total width of 18 ft., including schist and all, give a gold content of $38 per ton. Some of the individual stringers are very rich, but it is proposed to mill the entire lode without any attempt at sorting. The erection of a 2-stamp Nissen mill is under way.

The little Spalding mill of three 250-lb. stamps on Dome Creek is making expenses for the Reliance Mining Co., a 2-stamp Nissen mill has been ordered, however, and will be installed this season, if possible. A Joshua Hendy 2-stamp mill recently arrived for Doctor Sutherland. This is to be erected in the Kantishna district.

British Mineral Output for 1911

The production of mines and quarries in the United Kingdom in 1911, was as follows:

Arsenic, 2144 long tons; arsenical pyrites, 1170; barium compounds, 44,118; bauxite, 6007; bog ore, 2700; chalk, 4,883,706; chert, flint, etc., 72,597; clay and shale (not including fire and china clay), 10,413,170; china clay and stone, 849,538; coal, 271,891,899; copper ore and precipitate, 3262; fireclay, 2,482,846; fluorspar, 45,231; gold ore, 2752; gypsum, 276,684; igneous rocks, 6,520,696; iron ore, 15,190,512; iron pyrites, 10,114; lead ore, 23,910; lignite, 120; limestone, 12,183,255; manganese ore, 4987; mica, 24,335 long tons; natural gas, 221,400 cu.ft.; ocher and umber, 14,585 long tons; oil shale, 3,116,803; rock salt, 200,620; salt from brine, 1,882,068; sand and gravel, 2,280,248; sandstone and quartzite, 4,044,907; slate, 325,125; tin ore (dressed), 7746; strontium sulphate, 5869; uranium ore, 67; wolfram ore, 266; zinc ore, 17,652 long tons.

Mining Companies and the Corporation Tax

Washington Correspondence

Commissioner of Internal Revenue Cabell has appointed hearings and conferences at a large number of western cities at which he will shortly discuss with representatives of mining interests the question how mine property should be reported in connection with the payment of the corporation tax. Some time ago the bureau issued regulations covering this subject. The regulations were extremely elaborate but that has not prevented them from being subject to doubt and criticism relating to the question what allowance ought to be made from year to year in the value of property reported for taxation as regards ore reserves which lessen from year to year. The cities at which the commissioner of internal revenue will stop while *en route* for these conferences include St. Paul, Seattle, Los Angeles, Santa Fé, Denver, Kansas City and possibly some others. Some conferences on the same subject have been held within the last few days in Washington, but these were merely preliminary to the western trip. Mr. Cabell started Sept. 17 on his trip.

The Bureau of Internal Revenue takes the ground that it will not materially change the general principles laid down in the rules already given out but that it will endeavor to get at the facts of each individual case in which a return for the purpose of taxation is to be made, in order that proper allowances may be worked out on a definite system.

The present working of the corporation tax is unsatisfactory in the mining industry and complaints reached Congressmen frequently during the last session. It is understood that one of the pieces of legislation that will early be taken up will be a measure designed to correct some of the defects of the present enactment. The present work of the commissioner of internal revenue is being carried on without regard to the probability of changes in the law.

Workmen's Compensation Act in Michigan

Negaunee Correspondence

Regarding the new Workmen's Compensation Act which went into effect on Sept. 1, it is announced that over 2000 firms and companies throughout the state have signified their intention of coming under its terms. This number includes a great many of the mining and railroad corporations of the upper peninsula. Large employers will as a rule carry their own risks, as is optional under the law, and in hazardous industries such as mining, it is not likely the payments on account of death and injury claims will much exceed the payments of claims and lawyer fees under the old conditions. But the small employer who has in the past protected himself by liability insurance, will have to pay a much heavier premium for protection under the new law. The insurance companies have announced their rates for liability insurance under the new law, based on their experience in Wisconsin where the liability law has been in effect for one year and in Connecticut where it has been in effect two years. In many occupations the rate has been increased, thus on laundries has been increased thus was 40c. on $100 of annual payroll, and on saw mills was $0.60 for $100 of annual payroll; under the new rules these have each been increased to $4.95. Underground iron mining is rated as one of the most dangerous occupations, as the new rate is $10.50 per $100 of annual payroll. Copper mining is considered less dangerous, being rated at $6.60 per $100 of annual payroll. Blast furnaces and smelteries are rated at the same figure, $6.60; and logging and lumbering are scheduled at $3.85 as compared to the old rate of 85c. The following rates are also announced: Masons $5; carpenters, $3.50; concrete workers, $4.75; machinists, $1.65; blacksmiths, $3.85; stores, $0.44 to $0.55; hospitals, $0.55; public libraries, $1.38. If, after trial, these rates are found to be too high, it is announced that they will be lowered, for excessive rates would encourage excessive competition in the insurance business. If an employer fails to protect himself either by assuming his own risks under the compensation law, or by taking out liability insurance, he will be liable to face suit in case of injury or death of an employee with all but one of the old law defenses taken from him.

Chinese Tin

The tin mined in the province of Yunnan, China, so far as exports are concerned, is handled almost exclusively at Hongkong. The concentrates from the mines at Mengtze are smelted and refined at Hongkong. This year, up to June 30, the quantity exceeded that for the entire year 1911, the value of the shipments to the United States for the six months being $908,447 gold, against $789,941 for the full year 1911. This increase was due to the high prices for tin obtained this year, which resulted in the shipment of large stocks carried over from last year.

According to a recent consular report, Yunnan tin is classed in three grades, No. 1 being 98.5 to 99% pure tin; No. 2 being 97½ to 98%, and No. 3 being 95 to 96%. Current prices at Hongkong, July 1, per pikul of 133⅓ lb., were $117.50 in Hongkong dollars, for No. 1; $115.50 for No. 2 and $111 for No. 3. At current exchange these prices were equivalent to 43.45c., 42.7c. and 41c. per lb., respectively.

International Mining Experiment Station Conference

This conference is being held this week at the U. S. Bureau of Mines station in Pittsburgh and at the experimental coal mine operated by the Bureau at Bruceton.

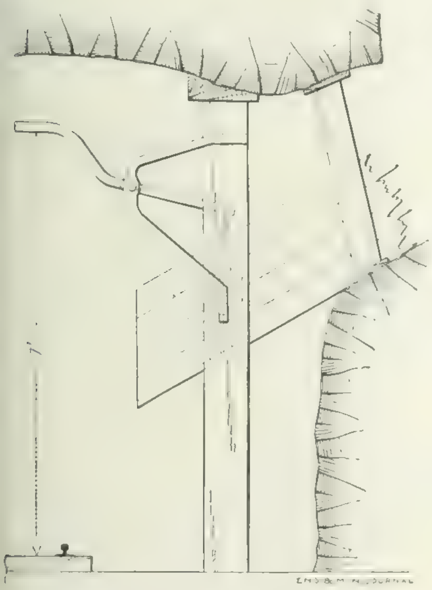
If the conference so desires, arrangements will be made for evening meetings for continuance of discussions. After the conference has adjourned further special tests may be made at the experimental mine of such nature as the members of the conference may desire. Informal visits will be arranged for guests to some of the coal mines of the Pittsburgh or other districts.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Methods of Hanging Chute Door and Lever

In the accompanying drawing is shown the manner of supporting the lever of a chute gate as used on some of the chutes in the mines of the St. Louis Smelting & Refining Co., in the Flat River district of southeastern Missouri. The gate lever is carried by two iron brackets bolted to the uprights of the chute and is bent up so that the fulcrum may be placed high enough to be out of the way of miners passing along the track; beyond the fulcrum the lever is bent downward so as to be within reach of the miner on the opposite side of the drift. The carrying braces are bent in so that they are only as wide as the gate lever bar at the point where the bolt goes through.



METHOD OF HANGING CHUTE DOOR

A slide gate is used that runs in an angle-iron guide fastened through the side planks to the main timbers of the chute. The lever is connected by a pair of clevises to the gate, which is a plate of heavy iron, but the lever also extends far enough beyond the gate to come over and to shove the gate down to its seat in case it should stick.

The gate works well and no more "runs" of ore occur than would be the case with any top-closing gate. The manner of supporting the lever allows it to be brought out straight in front of the gate so that the loader can look up into the chute as the ore runs out and shut or open the gate according to how the boulders may be coming down and how full the car is at the time. The bending of the lever up into a goose neck so that over the track it is above a man's head when the gate is only half closed, removes any objection to the gate lever extending out across the drift.

Foot-Wall Shafts in Lake Superior Copper Mines

In the Lake Superior copper district, the increase in the size of mining units and improvements in mining methods, are constantly tending to reduce costs. Methods in vogue today may be materially modified, if not discarded, some years hence. Any conclusions based on figures of today should, therefore, be scrutinized with reference to possible future improvements. It is also true that no policy of administration nor system of mining will fit all mining properties alike, or necessarily the same mining property during all periods of its activity, said L. L. Hubbard during an address before the Houghton meeting of the Lake Superior Mining Institute.

In accordance with time-honored practice, shafts have usually been sunk directly in the lode to be mined, because in and from such shafts a thorough examination of the lode is possible in the quickest and most economical way, and the average richness and physical condition of the ground are directly ascertainable. Where, however, these considerations are not of paramount importance, as for example possibly on a property where one or more shafts are already down, and others are to be sunk to increase production from the same lode, or where by diamond-drill exploration or otherwise, the lode is known to be rich in the neighborhood of the proposed shaft or shafts, we may well consider an alternative to a practice that ties up in shaft pillars a considerable amount of ore during the life of the mine. Moreover, where the dip of the lode is variable, as is often the case, or where the average dip is not known in advance, the exploratory function of the lode shaft is at least curtailed, if not altogether lost; and while the dip of the shaft can eventually be readjusted to the actual dip of the lode, a variable dip in the shaft is from an operating point of view, at least a detriment, if not a menace.

A shaft sunk in and within the limits of the vein or lode, must be supported on at least three sides, to its ultimate depth, by an envelope of lode rock capable of sustaining not only its own weight, but also the pressure induced in the overlying rock by the removal of its support under a large area. Under one system of mining, supporting pillars are left from point to point in the levels or stopes, if possible only where the rock is not worth extracting; under another system, good rock removed is replaced by a filling of waste rock, but even if the filling be complete, a settling of at least 10% of the filled area has been declared to be possible; under the first system even more disastrous results have followed, from the crushing of pillars and caving of the hanging. In either case, movements in the shaft are apt to cause delay and expense, if indeed the shaft be not ultimately wrecked.

What then are adequate shaft pillars will doubtless depend in each case, much upon the dip of the lode, the inherent strength of the rock, and the absence of "slips" or joint planes. The size of the pillars can hardly be stated in terms of an equation. Based on local practice, a minimum average width of 50 ft. in the pillars for a shaft intended for a depth of 5000 ft., seems small enough, and a mine manager would run little risk of criticism if the width were even greater. If the dimensions of the shaft be assumed as 10x20 ft., and the lode be 15 ft. thick, the block of lode material surrounding the shaft will then have 120x15, or 1800 sq.ft. of area, less the shaft opening (10x20 ft.), or 1600 sq.ft. net. This rock, if the shaft were in the foot wall, could be extracted more cheaply than any other rock in the mine, and much more cheaply than shaft pillars can ever be extracted under the most favorable conditions. However confident we may be that this ore will be eventually recovered, we are still facing the enormous loss entailed by tying it up during the life of the mine.

At first glance it may be thought that a shaft in the foot wall will be more costly than one in the lode, by reason of the crosscut necessary at each level. If the shaft is placed about 50 or 60 ft. from the lode, it will probably not be endangered by the blasting in the lode. At the end of the 60 ft. of crosscut economical mining may begin at once, in two directions, whereas with shaft pillars extending 50 ft. from the ends of the shaft, at least 100 ft. of drifting is necessary before reaching those parts of the lode that can be similarly mined. It is true on the other hand that rock extracted in the drifts may pay the whole or at least a part of the cost of drifting. It may also be true that the foot-wall rock may be harder and more costly to mine than the lode rock, and this is one of the few economic disadvantages of foot-wall shafts.

It has been suggested that in a mine where the rock appears to be particularly under stress, another advantage in a foot-wall shaft would lie in the fact that as soon as the lode matter is extracted opposite the shaft, the stresses in the rock next to the shaft are immediately relieved, and there will result a greater stability in the shaft on this account. I believe this point is well taken.

In any event, if the shaft is in the foot wall, it will be more exempt from those disasters that sometimes overtake mines even where the greatest foresight has been exercised. With the shaft intact, safe egress for the miners that can reach the shaft is assured, and ingress to any level in the mine can speedily be obtained. With a shaft out of commission by reason of earth stress, production is interrupted, costs of production are raised, and shaft repairs made necessary at considerable cost. For these several reasons will not the physical advantages of a foot-wall shaft fairly outweigh the slight probable disadvantages and miscellaneous extra costs, even if we disregard entirely the enormous capital locked up in shaft pillars?

Sampling at the Miami Mine

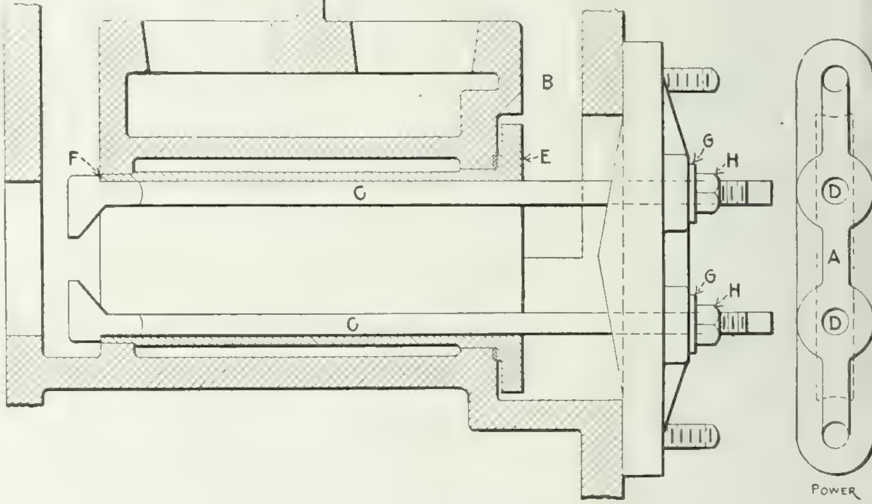
At the Miami Copper Co., the mine sampling is done under the direction of the chief engineer. The chief sampler directs the underground work in a general way, dividing his time about equally between the sample-crushing plant on the surface and underground.

Samples in all drifts and raises are taken by the assistant sampler, usually a young engineer, and two helpers. It is aimed to take samples of all drifts and raises as close behind the advancing face as possible. The crew makes the round of the mine at least once every two days, the most active portions being visited every day. Once each week the assistant sampler measures the position of every face in the mine and these data are used in keeping the mine map up to date. Measurements are made from the regular survey stations and for sampling the ore is divided into 5-ft. blocks.

The channel method of sampling is used entirely in the drifts. An iron box is held in proper position to catch the sample cut with hammer and moil. About 50 lb. of rock is the aim for each sample, one-half of which is taken from each wall of the 5-ft. section of drift. While the helpers are taking the sample the assistant sampler records the location and prepares the identification tag to be put in the bag with the rock. This tag is a block of wood about 1½ in. long and 1 in. wide; on it are noted the location of the sample and the character of the ore. The channel is made at the most convenient height, no rule being followed except to have it represent its particular block of ore. The ore from the shrinkage stopes is sampled at the chutes on the main haulage levels.

Device for Removing Water Cylinder Liners

The removal of liners from the water cylinders of pumps is usually a troublesome job, especially if the liner is stuck as it often is, says W. H. Wolfgang, (*Power*, Sept. 10, 1912). This trouble can be avoided and their removal made easy by the use of the device shown. The casting *A* is slipped over two studs after the cylinder head has been removed as at *B* and then the two pull bolts *C* are pushed through holes *D* in the casting and made to engage the back end of the liner *E* as at *F*. The washers *G* and nuts *H* are then tightened to hold the bolts in place. By screwing up on the nuts the liner can be started and thereafter easily removed. The device may also be used to drive the new liner in place.



Showing Application of Device from Removing Liners from Pump Cylinder

Novel Drilling Method

A new method of drilling with the rotary is being put in practice in well No. 10 of the Amalgamated Oil Co., in the La Habra field, in California, says *Oil Age*, Aug. 9, 1912. Instead of using water for drilling purposes, oil is being employed. If there is any water stratum passed through, there vill be no mistake about it, as it will show up plainly in the drilling oil. At present the difficulty of distinguishing intrusive water from drilling water has been one of the drawbacks of the rotary system of drilling. The method of using oil is not entirely new, but it is new in this field.

Corrosion of Iron and Steel Pipe

The resistance to corrosion of iro and steel pipe has been the subject o controversy for a long time, both stee and iron having adherents who believ the one would corrode less than th other under the same conditions. recent series of experiments undertake by William H. Walker, of the Massachusetts Institute of Technology, result of which were published in July, 191 by the National Tube Co., indicates tha there is no difference in the corrosion o iron and steel pipe taken on the averag

Naturally a poor steel will show les resistance to corrosion than a good iro but the converse is also true. Comparisons should be made on practicall equal grades of product.

Water which contains oxygen induce a rapid corrosion of pipe of either kin while water without oxygen, other conditions being equal, will show much les corrosion, or none at all if no oth corrosive elements are present.

Doctor Walker made 64 compariso of steel and iron pipe where the histo of the installation was known. Th cases where iron was found more corroded than steel amounted to 20, an where steel was more corroded than ir to 18. There were 9 cases where the was no difference between the two.

In order to determine the relation b tween the so-called acid-corrosion te and actual corrosion in service an e periment was made in which pipes we subjected to 20% sulphuric acid for fo hours at room temperature. Althou every care was taken to have identic conditions with all samples subjected the test, it was found that no relian could be placed in it. It was shown be erroneous and misleading. The ac test not only did not agree with the ser ice test, but the steel and iron showe no agreement when considered by ther selves.

Details of Metallurgical Practice

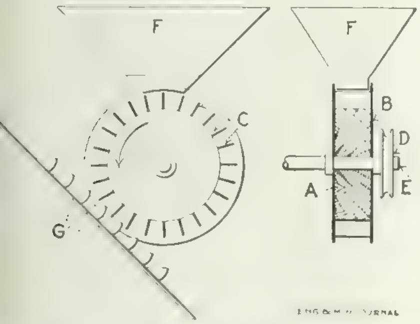
Records of Experience in Ore Dressing, Cyaniding and Smelting

A Feeder for Fine Material

By Herbert A. Megraw

A problem in ore feeding presented self to me not long ago in connection ith the treatment of a large accumulaon of dump material. This material as ore rejected in old smelting operaons in Mexico, and consisted of parcles varying in size from ¼ in. to -200 mesh. It was largely composed f iron oxides, which, with the proporon of slime contained, gave a decided endency toward packing, even in the ry state. The material was to be cyanled and as it lay on a level lower than at decided upon for the grinding mahinery, it had to be raised by means of belt-and-bucket elevator.

An important detail was the rate at hich the material should be raised, beause all the machinery following was utomatic and it was essential that the re should come up in a constant, even tream.



PECIAL FEEDER FOR FINE DRY MATERIAL

The first feeder tried for delivering the aterial in the desired way to the belt levator, was a screw, but the fine maerial packed between the screw and its asing and required so much power that he device had to be discarded. Various orms of pushers were then tried but ithout a great degree of success. The esign shown in the accompanying drawng proved to be most satisfactory.

It consists of a wooden wheel *A* with sheet-metal disc *B* on each side of it, ounted on a shaft *E* which is moved y the pulley *D*. The channel formed y the wooden wheel and the sheet iron iscs is divided into a number of pockets y the divisions *C*. These divisions do ot reach to the circumference of the etal discs but stop about one-half inch hort of it. This is in order to allow he small end of a hopper *F* to fit into he pockets and between the metal discs. By revolving the wheel in the direction indicated by the arrow, a constant supply is cut out of the hopper by the pockets, and delivered in a uniform stream to the buckets *G* of the elevator. The hopper may be of any convenient size and the other dimensions of the device will naturally vary as the requirements. By regulating the size of the pockets and the revolutions of the wheel, a constant uniform stream of any desired quantity may be delivered to subsequent machinery.

Conker Plate Details

By Percy E. Barbour*

Various types of conker plates for the bridge walls of reverberatory furnaces have been tried with the varying results to be expected. The Garfield type of conker plate, which is now giving perfect satisfaction, is the result of consistent and continual development since the first reverberatory was built at this Utah plant in 1905.

The first conker plates used in furnaces Nos. 1 and 2, and shown in Fig. 1 were built up of four 24-in., 80-lb. standard I-beams laid horizontally and fastened rigidly to two ½-in. plates standing vertically against the flanges of the beams. This conker plate failed by crippling, or better said, by warping of the webs, as it was the excessive heat rather than the pressure of the furnace burden which caused the failure. The latter was of course only gradual and did not cause a catastrophe. The total cross section is so great that unless brick-work which would make the bridge wall of prohibitive size were used, the steel section does not get sufficient protection from the heat.

On furnaces Nos. 3 and 4, the plate shown in Fig. 2 was used. This consisted of four 15-in., 42-lb., standard I-beams with two ½-in. plates built up as the former plate was. This gave a greater thickness of brickwork against the sides but no more on the top and the plate was not wholly satisfactory, due again to crippling of the webs of the beams.

Furnace No. 5 had a conker plate made of three 10-in. 25-lb. standard I-beams arranged as shown in Fig. 3, with a cast-iron plate on the furnace side, and two ½-in. plates on the flanges, at top and bottom. This section gave better results, but the air spaces were too small for the circulation required and the I-beams were changed for the No. 6 and last furnace.

This conker plate for the No. 6 furnace is excellent because it does the work and it does the work because it is excellent mechanically. It is composed of two 24-in. 80-lb. standard I-beams, shown in Fig. 3, standing vertically, with a 10-in. 25-lb. I-beam laid horizontally along the middle of the webs of the others. This small beam stiffens the long webs of the larger beams and prevents warping. The top and bottom of the steel section is completed by two ½-in. plates. All these members are riveted rigidly together. The furnace side of this plate has bolted to it a cast-iron plate thick enough to extend 1 in. beyond the flange of the 24-in. I-beam, as shown. This cast-iron plate is made in sections with the joints vertical and halved into each other so that at the joints the I-beams will not be unprotected. The blast pipe for the blast-furnaces is tapped and a small pipe delivers air at one end of this conker plate which blows through the other end and keeps up a circulation. This conker plate is satisfactory.

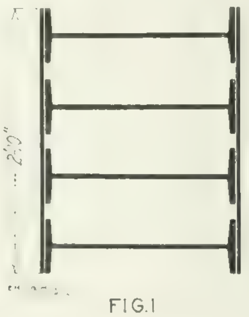


FIG. 1

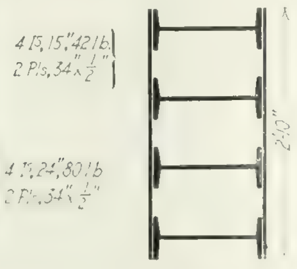


FIG 2

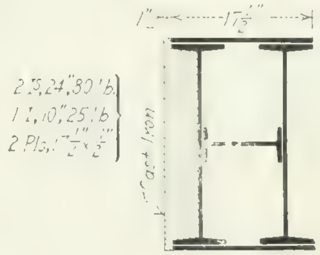


FIG. 3

DETAILS OF CONKER PLATES

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*Manager, Uwarra Mining Co., Candor, N. C.

Testing Lubricating Oils

Scientific testing of lubricating oils is outside the province of the average engineer, needing as it does elaborate apparatus and special chemical training, says Francis H. Davies (*Power* Sept. 10, 1912). Still, it is desirable that the man responsible for the running of a plant should be able to make at least a few elementary tests, as oil has directly and indirectly a material bearing upon operating costs.

A simple method of ascertaining whether an oil contains acid or not is to immerse a polished copper plate in it for a few minutes. If no acid is present there will be no change in the appearance of the plate, but a trace of acid will dim the surface.

To determine whether a mineral oil is pure and well refined, a small quantity of strong sulphuric acid should be added to a sample. This will have no effect on the color of the oil if it is pure, but if it contains fatty material of any sort, discoloration will result. The addition of sulphuric acid has the effect of raising the temperature of an oil. An increase of temperature of about 20° C. is the maximum that should occur with a good oil.

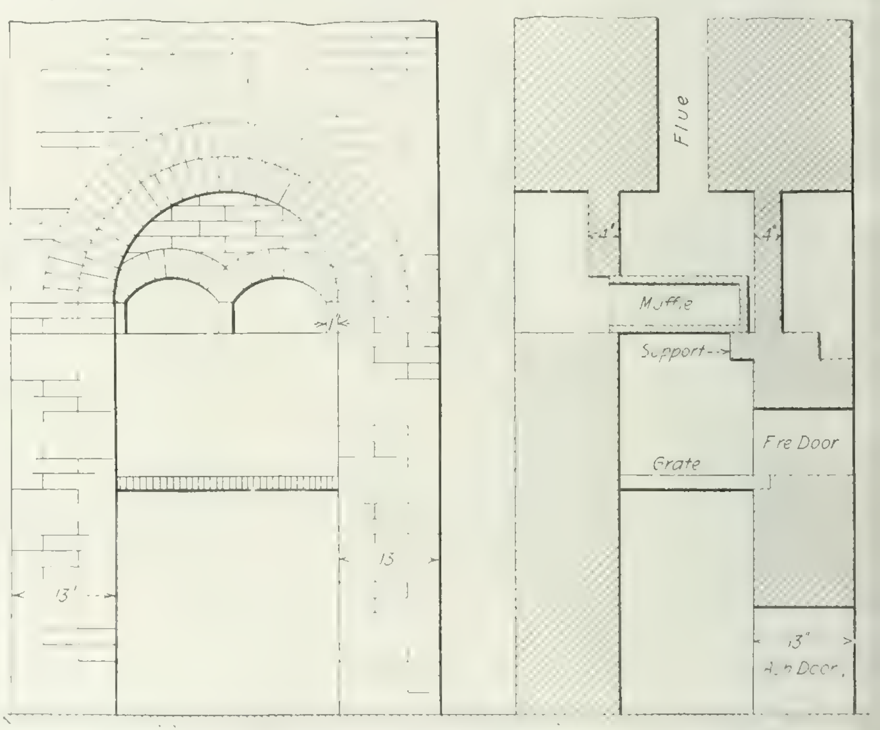
The solidification temperature of a lubricating oil is an important matter, and an approximate idea of the nature of any particular sample may be obtained by smearing it over the surfaces of two polished iron plates and laying them together. They should then be left for some days. If they do not move as freely over one another as at first it is evident that the oil used is one which tends to solidify. This is only a rough test. If it is desired to ascertain exactly at what temperature an oil will congeal, two or three inches of oil should be poured into a test tube about 1¼ in in diameter, which should then be inserted into a freezing mixture. While solidifying it should be stirred constantly with a thermometer, and the tube should be left in the mixture until the oil is solid. It should then be removed, and the stirring with the thermometer continued until the oil becomes liquid and clear. The temperature of the oil when the last portion becomes fluid, is the temperature at which solidification begins to take place. For accuracy, this test should be repeated several times and an average result obtained.

When testing mixed oils having both mineral and fatty constituents, an approximate idea of the proportions of the two for purposes of comparison may be obtained by mixing a small quantity of the oil with a strong solution of caustic potash. If the mixture is well shaken, an emulsion will be formed varying in proportion to the quantity of fatty matter present. This test is useful for making a rough comparison between several oils, but it does not give any indication of the relative proportions of the two ingredients in any one of the oils. With a pure mineral oil there will be at most a slight cloudiness, but saponification will be marked if either animal or vegetable fats are present.

Coal Fired Assay Furnace

The results obtained with the furnace shown in the accompanying illustration, in cupellation, as well as in high temperatures, excel those obtainable with any other furnace that has come under the observation of the assayer who sent the sketch. He reports that the ease with which the temperature can be regulated is greater than with a gasoline furnace.

There are three furnaces in the installation, two on one side of the flue and one on the other. The furnaces are built independent of the flue so that either furnace or the flue may be repaired without interfering with any of the others. Each furnace is also supplied with an independent opening to the flue so that there is no interference with the draft of any of them.



Coal-fired Assay Furnace

The large arch shown in the front of the furnace is concentric with the reverberatory arch on the inside, but is independent of it so that the reverberatory arch can be taken out and replaced without interfering with the front and back arches. The wall in front is 13 in. thick except in the arch, which is only one brick thick. The muffles are 12x24 in. with a 1-in. space between them and a 1-in. space between the muffles and the furnace walls. The grates are placed 18 in. beneath the muffles and the tops of the grates are on the level of the bottom of the fire doors, so that there is no depression to become clogged with clinkers

With this furnace cupellations can b made and feathers made in rings al around the buttons and down to them. I is also adapted to high-temperature work as gold and copper fusions can readil be made in a short time.

Canvas Table Concentration in California

By A. H. Martin*

California milling methods have eve been characterized by simplicity. Th generally free-milling quality of the or has militated against employment of ad vanced reduction practices, and in mos of the California mining regious millin is much the same today as in the earl years of the industry. Recently a few companies have discarded the canvas table and vanner for cyanide plants, bu in many places the old-time method stil commands popular favor.

In the early days of California prac tice, bullock hides and blanket sluices were employed to arrest the gold escap ing the amalgamating plates. Late heavy, rough woolen blankets were used these being expressly manufactured b the woolen mills for this purpose. The came the idea of constructing inclined tables with blanket surface. From this to the canvas table was but a step.

In California practice two distinc types of tables are employed, one lon and narrow; the other broad and short The latter design appears more generally favored, owing to the ease with which i may be handled, but both types have advocates. There are numerous variations of these tables, running from the most primitive design to the Darrow-Hambric concentrator, shown in the accompanying illustration.

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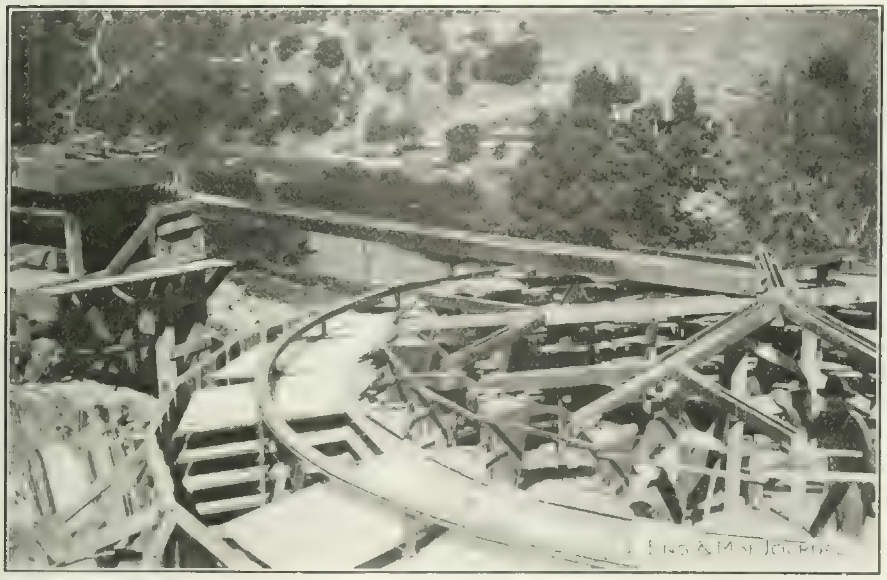
*Redding, Calif.

In installing a canvas plant a site with a natural slope is selected, one giving an inclination of 1 to 1½ inches per foot. Should the natural slope be lacking the plant must be built to obtain it. It is necessary to sink the supporting posts to bedrock, as the foundation must be secure to insure the constant maintenance of original inclination and stability. If bedrock is too deep other provisions must be made to insure permanence of foundations. The stringers usually have dimensions of 2x8 in., with the flooring of pine or redwood planks. Perfect alignment of planks must be maintained to insure an even flow of pulp and it has been found best to employ dry lumber. The planks are laid about one-half inch apart, to allow for swelling of lumber when the water is turned on. Over the planks is stretched the canvas covering, generally consisting of No. 8 material. Short lengths of hose are provided at convenient intervals to facilitate the frequent washing of concentrators. Movable strips of wood are used to deflect concentrates into the launders running alongside. The plants cost little to construct, are operated at low labor cost, and effect an excellent recovery from free-gold mill tailing. Generally the tailing from the plates passes over Frue vanners before going to the canvas tables, resulting in a more satisfactory concentration.

One of the best examples of canvas-table concentration in California is at the Kennedy mine, near Jackson. This is the largest gold producer in the State, and the deepest gold mine in America. The tailing from the amalgamating plates passes to forty 6-ft. Frue vanners, and from these over 56 canvas tables. The tables are 12 ft. wide by 13 ft. long, arranged in double rows. Short lengths of hose permit frequent washing of tables. Before the pulp passes from vanners to tables it is first received by a Gates classifier, which separates the valueless coarse sands from the fine product, thus lessening the quantity of material to be handled by tables. The concentrates gathered by the tables range from $40 to $45 per ton in value. The tailing leaving the tables assays about 60c. per ton, but to release this small per cent. of gold, fine grinding is required, a practice that the Kennedy management deems economically impracticable. The total mining and milling cost at this mine averages about $3 per ton. 60-in of water are required in the operation of batteries, vanners and tables. The Kennedy is one of the most progressive companies in California and its continued employment of the canvas table demonstrates the merit of the system. Besides the Kennedy, the Argonaut, Melones and other leading companies operating in the Mother Lode also utilize the canvas table in concentration.



Darrow-Hambric Canvas Concentrator with One Section Removed

The Darrow-Hambric concentrator is modeled upon distinct lines, and is designed to secure a maximum of service at lowest economical working and labor costs. The table consists of a series of broad sluices mounted on a circular frame, with a usual diameter of 28 ft. The tables are arranged in tiers or decks with 21 to 24 trays to the deck. Each tray is 4 ft. wide by 3 ft. long, giving a total gold-saving area of 12 sq.ft. From six to ten tiers complete a machine, with the number of trays varying from 126 in the smaller machines to 240 in the larger types. The smaller tables have a surface area of 1512 sq.ft. and the larger ones an area of 2880 sq.ft. The circular platform is mounted at the center upon an upright axis, with arms radiating to the circumference. Rotation is accomplished by an encircling rope which passes over a driving pulley.

As the pulp comes from the classifier it is divided by "spreaders" located on the inner row of each tier of trays. This insures the even distribution and free flow so necessary for successful results. The trays incline slightly away from the center of the machine, the slope averaging 1¼ in. to the foot. The operator's pleasure regulates the grade, and any tray may be taken from machine and replaced with a new one at any time. Revolutions are so arranged that each tier of trays makes a complete circuit in 15 to 20 min., the speed depending upon the character of tailing handled. The feed is automatically regulated, being shut off at intervals pending the arrival of each section at the point of charging. A gentle current of water is admitted to the loaded tray and the lighter sand washed away. The concentrates are deflected into a launder, discharging into the settling tank by means of a steady spray from a perforated pipe.

It was formerly the practice to employ canvas-covered tables, but in the latter types asphaltic felt is utilized as a collecting agent. In some cases the plain lumber surface is merely covered with asphalt paint and subsequently coated with fine sand. In each instance it is claimed results have been more satisfactory than when canvas was employed. While the sand-coated tables carry less loads than those of canvas or felt, it has been found that they make a cleaner product and recover more gold than the manufactured coverings. The sand-treated tables have proven particularly satisfactory as cleaners, and, combined with the asphaltic felt trays, effect a high average saving. In operation the sand-coated tables are rotated more rapidly than the others, the rapid revolutions causing the sanded surface to become filled with fine sulphides.

The Darrow-Hambric tables are used at the Bunker Hill, Zelia and other large Mother Lode mines. The great points of superiority claimed for this plant over the ordinary canvas-table installation are the elimination of labor required in the average canvas plant, and the securing of a cleaner product. The entire operation is automatic and continuous, requiring practically no attention. At one property the product from the tables is treated by agitation with weak cyanide solution in Pachuca tanks. When this is done the concentrates are not cleaned on tables, the product running only $10 to $15 per ton. The machines are said to recover 60% of the assay values of the pulp which comes from the plates. That a larger percentage is not secured is due largely to the presence of gold in the coarse sands, which can only be released by fine grinding. The Darrow-Hambric method of concentration is the patented invention of W. E. Darrow and F. Hambric, who have long been connected with Mother Lode milling operation.

Automatic Pump Control

In mining practice it is not always convenient to discharge the water used in cooling the jackets of air compressors, where it will run to some convenient place out of the way. In one instance it was necessary to discharge this cooling water into a tank under the floor of the compressor room.

In order to keep the water level in the tank uniform, a pump was used, which discharged the water at a distant point. The steam pipe of the pump was fitted with a globe valve, the stem of which carried a sprocket wheel. A sprocket chain ran over this wheel, one end being attached to a suitable weight and the other to a float in the tank which was directly under the pump. As shown in Fig. 1, as the height of the water increased or decreased, the float opened and shut the valve, so that the water level was kept practically constant.

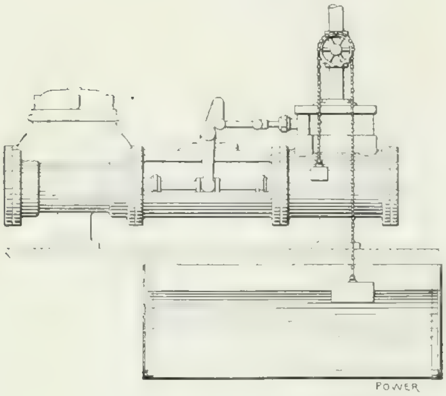


FIG. 1. VALVE OPERATED BY A FLOAT

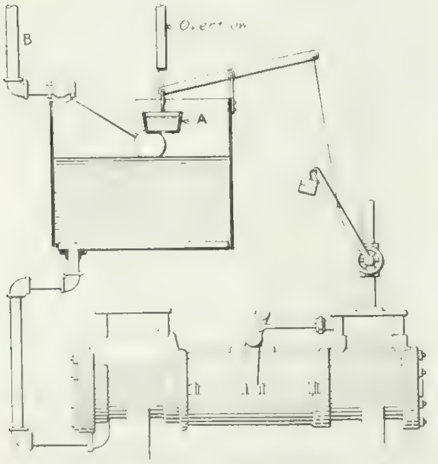


FIG. 2. AUTOMATIC PUMP CONTROL

In Fig. 2 is shown an arrangement devised by E. T. Lehman (*Power*, Mar. 5, 1912), to automatically keep a storage tank on a roof full. The small pail *A* controls the steam valve of the pump. The overflow from the tank empties into the pail, causing the valve to close. A small hole in the bottom of the pail allows the water to drain out. When no overflow is falling into the pail the water drains out and the weight on the valve lever over-balances the weight of the pail opens the valve and starts the pump. The makeup water is automatically supplied by the pipe *B*, which is controlled by a float valve, as shown.

Removing Broken Stems from Stamp Heads

Stamp shoes have to be removed so frequently from the stamp heads that they do not remain in place long enough ordinarily to become so firmly wedged into the head as to cause great difficulty in their removal.

But on the other hand the stems are seldom removed from stamp heads except when the stems break. Then it is usually the case that a small end of the stem is left in the stamp head, where it has been for some time and has become so firmly attached that considerable force is necessary to dislodge it. This is often accomplished by firing a small charge of dynamite in the head. This practice has the disadvantage that stamp heads are often cracked from the blasting.

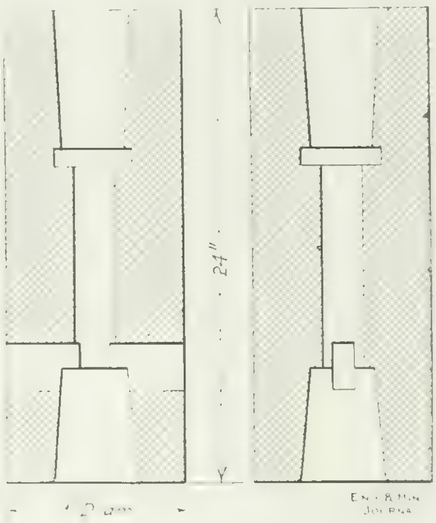


FIG. 1. STAMP HEADS WITH BORED CENTER

An improved type of stamp head is described by G. O. Smart in "A Text-Book of Rand Metallurgical Practice," and is used in some of the large stamp mills on the Rand. This stamp head is made with a conical opening at each end for the reception of the stem. There is a smaller cylindrical opening connecting these two openings, so that there is a continuous passage from one end of the head to the other, as shown in Fig. 1. This makes it possible to remove a broken stem in a hydraulic press, Fig. 2, especially equipped for the purpose.

When a stem is broken off and the short end cannot be readily removed from the stamp head, the stamp head is set upon the bed plate of a hydraulic press. A round hole is provided in the center of this bed plate. The stamp head is set over this hole so that the broken-off part of the stem is directly over it, and that end of the head in which is the broken stem is placed downward. A rod, nearly as large as the bore used in the stamp head, is dropped down upon the piece of stem. This rod extends up into the larger conical opening in the upper end of the stamp head. The plunger of the hydraulic press is tapered so as to fit easily within this conical opening. The plunger is brought forcibly down upon the rod in the stamp head, and as the pressure is increased, this rod forces the broken stem out of the bottom conical opening in the stamp head so that it drops through the round hole in the bed plate of the press.

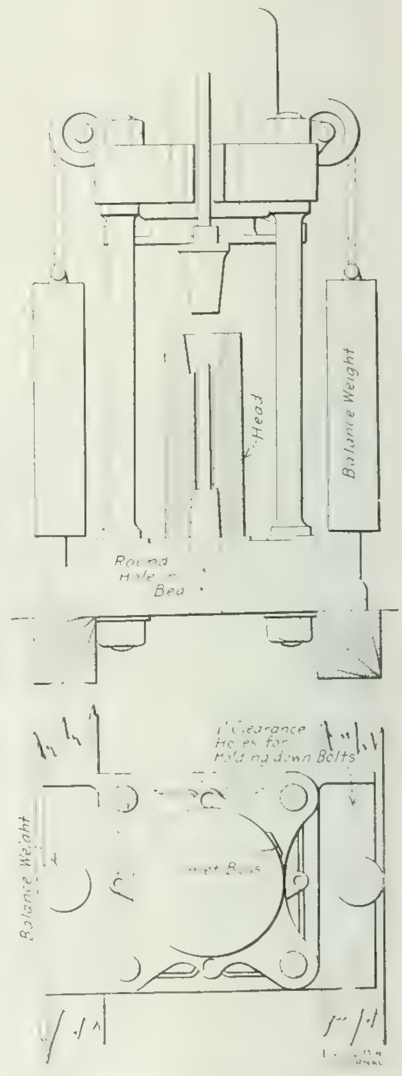


FIG. 2. HYDRAULIC PRESS FOR REMOVING BROKEN STEMS FROM STAMP HEADS

In timbering, the depth of a hitch should be governed, to some extent at least, by the nature of the rock, an inch or two often being sufficient in good ground.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Oil Mixed Portland Cement

It was found by L. W. Page, of the Office of Public Roads, that when oil was mixed with portland-cement paste, the oil disappeared from the residual mixture and did not separate when the mixture became hard. The merits of such a mixture for waterproofing, if it is strong, are self-evident. The tensile strength does not suffer in a 1:3 cement-sand mixture if the oil does not exceed 10% of the cement. The compressive strength suffers from the addition of oil, although not seriously with 10%. The elastic limit is the same as with plain concrete. The bond or grip of oil concrete for steel is much diminished with plain bars, but deformed bars, wire mesh, or expanded metal are effective for reinforcement.

The sand, cement, rock and water used for oil concrete should be of the same kind as that used in ordinary work. The oil should have a specific gravity of from 0.930 to 0.940 at 25° C., and should be soluble in carbon bisulphide at ordinary temperatures to at least 99.9%. It should contain 1.5 to 2.5% of bitumen, insoluble in 86° Bé. paraffin naphtha. It should yield from 2.5 to 4.0% of residual coke. When 240 c.c. of it is heated in an Engler viscosimeter to 50° C. and maintained there for three minutes, the first 100 c.c. which flow out should show a viscosity of not less than 40 nor over 45. The oil is added after the sand and cement are mixed with water, and the stone added last.

Determination of Ash in Coal

In determining the ash of a coal the most correct results are given by igniting the coal in an open platinum or quartz dish over the Bunsen flame, as the carbonates present are thus only slowly decomposed. (*Chem. Zeit.*, p. 757, 1912; abstr. *Journ.* Soc. Chem. Ind., July 31, 1912.) If the heating be continued after the coal is burnt, the weight of the ash is increased by the conversion of carbonates into sulphates by the sulphur trioxide in the products of combustion of the gas flame. Ignition of coal in the muffle or in a stream of oxygen gives low results owing to the decomposition of carbonates. The ash of a carbonate-bearing coal always contains sulphates. The amount of the latter is proportional primarily to the carbonate content, and in a secondary degree to the pyrites content of the coal. The true ash of a coal is given by the formula: Ash on ignition in muffle—total Fe_2O_3—total SO_3 in ash$+SO_3$ in the coal $+CO_2$ in the coal+pyrites (FeS_2)+soluble ferrous oxide in the coal. The author found no sulphates in any of the unignited coals examined by him. The carbonates in the coal are best determined by treating the ground sample with dilute hydrochloric acid, absorbing the carbon dioxide in baryta water and titrating the excess of baryta with oxalic acid. Occluded carbon dioxide, if present, must first be driven off by warming the sample for a few minutes with water. The determination of the pyrites is based on the insolubility of this material in dilute sulphuric acid and hydrofluoric acid, the ferrous oxide in the coal being easily soluble. The soluble iron and the total iron are determined and the difference is calculated to pyrites. The difference between the total sulphur and the pyrites sulphur gives the organic sulphur.

Mechanical Detinning Machine

A mechanical detinning device has been invented by William M. Connor, of Baltimore, Md., (U. S. Pat. No. 1,021,302) which consists of a series of rolls, each pair of rolls rotating at a greater speed than the one preceding. The first set of rolls is plain, the rest have wire prongs, which decrease in size and number to the last set. Owing to the difference in speeds of successive sets the faster moving set exercises a scraping action on the surface of the metal. In order to prevent "tracking" of the sets of prongs, a series of cams gives the rolls a lateral motion.

Slag Inclusions in Steel

Dr. W. Rosenhain (England) and H. D. Hibbard (U. S. A.) presented papers on the subject of nonmetallic or slag inclusions in steel, at a recent congress of the International Association for Testing Materials. Mr. Hibbard, says *Engineering News*, has coined the word "sonim" for such inclusions, while Doctor Rosenhain prefers the words "slag inclosures." The two papers set forth that much about these foreign substances is as yet unknown. The discussion further emphasized this. The discussion in which E. H. Saniter (England), J. W. Richards (U. S. A.), E. Heyn (Germany), and R. W. Hunt (U. S. A.), participated also indicated that the essential facts concerning slag inclusions are not yet known. Work at the National Physical Laboratory (England) will be undertaken to determine whether oxides are soluble in steel and if so to what extent, though this study is highly difficult. Mr. Heyn emphasized the fact that minute inclusions are often more dangerous than larger ones, provided they are sufficiently distributed, and gave an example in which a thin layer of an inclusion high in calcium made a distinct plane of weakness in steel. Professor Richards advocated dead melting of the steel in an electric furnace and holding it one-half to one hour for the purpose of allowing all impurities to separate out, and Mr. Hunt reported that about 5000 tons of rails produced in this way had gone through the past winter without a single fracture.

The Trend of Quicksilver Metallurgy

The data now available shows that the recovery of quicksilver by the retort process in the United States is insignificant, says the U. S. Geological Survey. In 1911, there were 282 tons of ore treated in retorts, and 138,243 tons in shaft furnaces, from which recoveries were 172 and 21,084 flasks, respectively. The yield of metal was 46 lb. in retorts and 12 lb. in shaft furnaces, per ton of ore treated.

Retorts for recovery of quicksilver are of two types, known as the pipe retort and the D-retort. Both work on the same principle, that of distilling off the mercury from the ore separately from the gases of combustion and conveying the volatilized metal through short outside condensing pipes to a trough in which the mercury is collected. The retorts are themselves built over fire boxes, and are filled and discharged horizontally from the furnace floor, the D-retort by means of iron pans resting on the flat bottom and the pipe retort by means of shovels and semicircular hoes. Retort plants contain from one to 15 or more retorts, are inexpensive to erect and operate, and may serve useful purposes in the early development of a mine, but are best used, perhaps, for treatment of concentrates or furnace soot. Unless carefully operated, moreover, they menace the health of the workmen; and when in operation at new mines the temptation is to gouge out the rich ore of the mines, for which they are best adapted, and quickly sacrifice a property that might otherwise be remunerative if worked on a larger scale and by better methods.

Over 99% of present domestic output is from shaft furnaces, in which the descending ore meets the upward heated furnace flames and gases, and the volatilized metal passes with the gases and impurities of combustion into a series of condenser chambers, usually of brick, in which the metal is collected and from which it is drawn off. The gases pass from the final chamber to the stack, usually through an inclined flue.

Quicksilver metallurgy has been highly perfected in California, and the best development is now observed in the various modifications of coarse-ore and fine-ore furnaces to be credited to California metallurgists. The modern tendency appears to be toward the increased use of the Hüttner tile furnace perfected by Robert Scott, formerly of the New Almaden mine, which is now adapted to both medium and fine ore. All the furnaces in Texas, and the new plant in Nevada, are of this type. At New Idria, are the coarse-ore furnaces designed by B. M. Newcombe, and at the Guadalupe mine are the Davey modified Litchfield furnaces.

Corrosion of Iron and Steel

Corrosion of iron and steel was treated by three papers by Lieut.-Comdr. F. Lyon, U. S. N.; H. Baucke (Holland), and F. N. Speller (U. S. A.), at the recent Congress of the International Association for Testing Materials (*Eng. News*, Sept. 12, 1912). Lieut-Comdr. Lyon has worked out a method for testing the relative corrodibility of iron in aqueous solutions, by using a series of dilute solutions of a given salt of successively increasing concentration and determining the concentrations at which general corrosion changes into local corrosion and at which local corrosion disappears. The smaller this range the less corrodible is the metal, he finds. Mr. Speller reviewed the recorded experiences on the relative corrodibility of wrought-iron and soft-steel water pipes in the United States and concluded that there is no evidence to show that steel pipes corrode any faster than wrought-iron pipes. The paper of Mr. Baucke (Holland), who cited cases where in his opinion the action of etching agents or electrolytes enlarged cracks and produced new cracks in metal which had been strained, was discussed by Doctor Rosenhain (England) and Mr. Heyn (Germany), both of whom raised serious doubt whether the phenomena observed by Mr. Baucke were correctly explained by him. Mr. Baucke claimed that the action of electrolytes on strained metals produced a tendency to recrystallization, which he looked upon apparently as an evidence of fatigue. P. Kreuzpointner (U. S. A.) stated that the tests of old boiler metal on the Pennsylvania R.R. for many years showed that all defects could be traced back to mechanical defects in the original working of the metal. Prof. William Campbell (U. S. A.) discussed the bearing of the electrolytic theory on corrosion, pointing out that even a uniform metal such as brass, that is, brass containing only one constituent, will pit through the whole thickness, under circumstances where local electric potential differences could hardly exist, and that in iron the pitting continues even after the small local impurity or segregated spot has corroded away. Gen. William H. Bixby (U. S. A.) described the conditions found on the wreck of the "Maine" when it was uncovered last year. Here it was found that all parts which were covered by the harbor mud, a kind of sewage deposit, were perfectly preserved and rusted only after this mud was removed and they were exposed to air. E. Heyn, discussing the corrosion of wrought iron and steel, remarked that corrosion is in his experience practically uninfluenced by small differences as to impurities contained and that a parallel corrosion test between two pieces of iron will show one or the other metal better according to the time at which the experiment is stopped, the metals often alternating many times in excellence in the course of a long-time test. Differences in composition (differences between pure and impure metal) are felt only during the first six hours, whereas after that time the behavior of pure and impure metal is substantially the same.

Cobalt-Chromium Alloys

Before the International Congress of Applied Chemistry, Elwood Haynes described some alloys of cobalt and chromium of interest to metallurgists and mechanics. An alloy made by smelting 90 grams of cobalt, 6.3 grams of tungsten and 18 grams of chromium with a little calcium silicide, in a graphite crucible, was so hard it would scratch glass and quartz crystal.

Holding the proportion of chromium at 15% of the entire mixture, and gradually raising the percentage of tungsten, the alloy becomes harder. At 10% W, the metal still forges readily, and takes a good cutting edge. At 15% W, the metal can still be forged, but requires great care to avoid checking. At 20% W the alloy can be forged a little, and can be ground to make good lathe tools for moderate speeds.

At 25% W, the alloy can hardly be forged, but can be cast in bars from which high-speed lathe tools can be ground. The tungsten can be increased to 40%, the alloy still retaining its cutting qualities, and for turning cast iron, the alloy answers even better than that containing 25%. Molybdenum also produces desirable high-speed cutting alloys.

As an example of its application to machine-shop practice Mr. Haynes said a ¾-in. bar of 40% W, was ground and used for turning cast-iron wheels, finishing 49 in 10 hours. The tool then only needed honing on carborundum to fit it for further use. With a steel tool the same man turned 26 in the same time, and ground his tool 50 times during the operation.

Samples of tools made of the alloy (stellite) were shown. They were of a beautiful silver-whiteness.

Decomposition Temperatures of Metallic Sulphates

The decomposition temperatures of metallic sulphates, a question of great importance in ore roasting, and, indeed, in general metallurgy was discussed by Dr. H. O. Hofman and Mr. Wanjukoff, before the joint meeting of the A. I. M. E. and the Congress of Applied Chemistry.

DECOMPOSITION TEMPERATURES OF METALLIC SULPHATES

Initial Substance	Final Product	Reaction Begins °C.	Reaction Ends°C.
$FeSO_4$	$Fe_2O_3\ 2SO_3$	167	480
$Fe_2(SO_4)_3$	Fe_2O_3	492	560
$Bi_2(SO_4)_3$	$5Bi_2O_3\ 4(SO_4)_3$	570	639
$Al_2(SO_4)_3$	Al_2O_3	590	639
$PbSO_4$	$6PbO\ 5SO_3$	637	705
$CuSO_4$	$2CuO\ SO_3$	653	705
$MnSO_4$	Mn_3O_4	699	799
$ZnSO_4$	$3ZnO\ 2SO_3$	702	720
$2CuO.SO_3$	CuO	702	736
$NiSO_4$	NiO	702	764
$CoSO_4$	CoO	720	770
$3ZnO\ 2SO_4$	ZnO	755	767
$CdSO_4$	$5CdO.SO_3$	827	846
$5CdO.SO_3$	CdO	878	890
$MgSO_4$	MgO	890	972
Ag_2SO_4	Ag	917	925
$6PbO\ 5SO_3$	$2PbO\ SO_3$	952	962
$CaSO_4$	CaO	1200	
$BaSO_4$	BaO	1510	...

The reason for the experiments was in the nonagreement of published data, which was probably due to different methods. Thus, work had previously been done in evacuated tubes, and in closed tubes, neither of which seemed directly applicable to metallurgic work; the first owing to the fact that metallurgists do not work with vacua, the second owing to the reversible reactions due to the presence of SO_3, SO_2 and O. The present experiments were made in a current of dry air.

In using the lead figures it should be remembered that as PbO itself volatilizes at 800° C., no final breaking-down temperature for $2PbO.SO_3$ can be given.

In personal conversation later, Doctor Hofman was asked whether his results were directly applicable to metallurgy, as his results were obtained in a current of dry air, while metallurgists were ordinarily forced to work with air carrying more or less water vapor. He stated that he believed the results were practical. With the single exception of the sulphates of iron, the dehydration temperatures of these salts lay well below the desulphatization temperatures, and that owing to this, he thought that the presence or absence of water vapor was immaterial.

Mining Problems at Santa Gertrudis

By W. G. Matteson*

At the Santa Gertrudis mine, Pachuca district, Mexico, three problems required solution: Inefficient labor, excessive water and a heavy orebody with bad hanging wall. A new pumping system is planned which will raise the efficiency from 41% to 85% and greatly reduce operating costs. The mining system, unique for this district, consists of driving a drift in the foot wall parallel to the vein and running cross cuts to the vein. A solid drift is obtained and little timbering is required.

The Santa Gertrudis mine is situated on the outskirts of the city of Pachuca, state of Hidalgo, Mexico. The famous range, of which this property is a part, is formed from Tertiary volcanic rocks, chiefly andesites and rhyolites, the general sequence of lavas being: (1) Rhyolite (Pleistocene); (2) later andesite (late Pliocene-early Pleistocene); (3) earlier andesite (Miocene).

FAULTING PRODUCED FISSURES

Faulting, preceding mineral deposition, produced the fissures which were filled later by a quartz matrix carrying the precious metals. In the highly mineralized zone of black sulphides, pyrite and argentite were often deposited at the same time as the quartz and are so perfectly blended with the latter as to make separation impracticable. The quartz was also deposited alone in places, barren and rich portions alternating continually.

SANTA GERTRUDIS MINE, PACHUCA, MEXICO

The principal veins are remarkable for their constancy and length, and contain many branches on the foot- and hanging-wall sides, forming splitting and reuniting groups. Brecciation in and along the veins, followed by propylitic alteration farther away, is common to the formations of Pachuca and the neighboring camp of Real del Monte. "Horses," displaced from the walls and floating in the quartz matrix, are found at all known depths, and of all dimensions. These "horses" are covered generally with quartz and sulphide ore.

Manganese, as the silicate combined with limestone, is found generally in close association with the vein material, often serving as a guide in the discovery of new orebodies. Pyrite is abundant in the mineralized portion of the veins and also in the immediate vicinity of the same, where it also serves to indicate the proximity of ore. Pyrite, occurring in grains or crystals, is barren; the granular pyrite of the main zone, on the other hand, is associated always with argentite, chalcopyrite, and sometimes stephanite and polybasite. Native silver is found at all depths. Generally when there is much rhodonite the ore is rich in its silver content. Numerous and extremely rich bonanzas, quite irregular in form, are found at the junction of cross fractures and branches with the main vein.

ASCENDING SOLUTIONS SOURCE OF ORE

Ascending solutions, which gathered their metallic constituents from deep-seated magmas, are generally conceded to be the origin of the Santa Gertrudis and Pachuca ores. The eruptions of andesite in this region took place through large fissures, and during these eruptions, other openings, parallel and adjacent to the fissures, were produced. Fumarolic and solfataric action with the circulation of siliceous streams of hot waters followed, bringing from below the sulphides and other metallic salts present in the magmas. The constituents of these waters were deposited in the open fissures upon the diminution of temperature and pressure.

The Pachuca and Real del Monte vein systems are shown accurately by the accompanying engraving. The Santa Gertrudis vein, which is the richest and most famous in the district, consists of one large well defined fissure zone with many branches. Chief among the latter are the south vein, the intermediate vein, the new vein and veins one and three. The south vein is of great extent and joins the principal fissure at the east end of the 11th level. All these branches are generally exceedingly rich. They are sought for continually, often at the ex-

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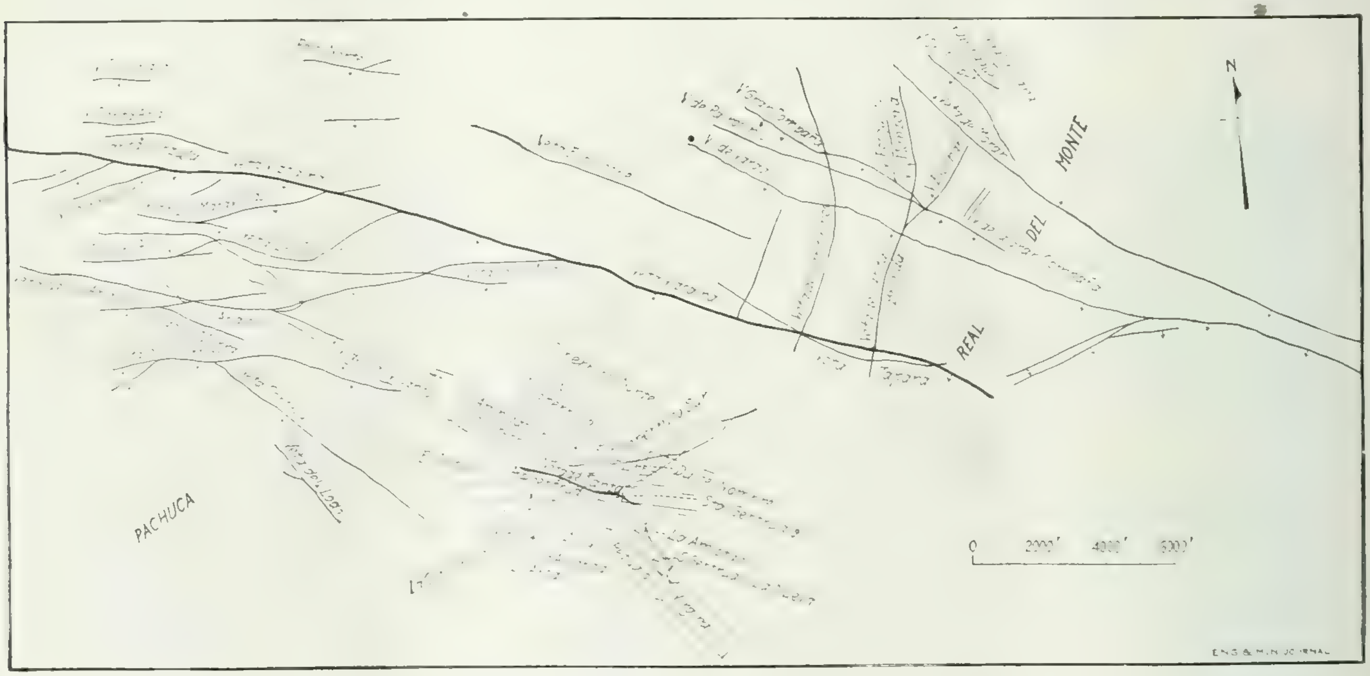
*Mazapil Copper Co., Concepcion del Oro, Zacatecas, Mex.

pense of long crosscuts, and are an important factor in the successful operation of the mine.

Labor, Water and Timbering Problems

Three serious problems confront the management in solving the question of the most economic method of ore production. They are first, the low efficiency of the labor; second, the large inflow of water from the orebody and from the neighboring properties; third, the presence of a heavy orebody with a bad hanging wall.

Many reasons, including the lack of nourishment of the native since childhood, the filthy living conditions of the average *peon,* the general illiteracy of this class, the excessive use of the native beverage, *pulque,* the warm climate and the high altitude, have been given to account for the inefficiency of Pachucan labor. Another factor, which certainly has great influence upon the labor problem, is the observance of Mexican holidays. Every *peon* has his saint's day and there are two or three feast days in every month which are strictly observed by the working class, generally necessitating an almost complete suspension of mining operations.



Pachuca and Real del Monte Vein Systems, with the Santa Gertrudis Claims

In attempting to reach the root of the evil, the Santa Gertrudis company has undertaken the construction of neat, clean, well ventilated houses on the company's property, which are to be rented to the laborer for a slight consideration. In this way, the company hopes to establish a small mining community which it can depend upon more than formerly, despite the fact that the average Pachucan is exceedingly irregular in his habits of work. A large part of the work has been placed upon a piecework basis, and the *peon* now realizes that he must earn a day's wages if he is to be paid for the same. The ultimate solution of the labor problem, therefore, lies in the exercise of patience, care and skill in instruction on the part of the mine officials.

Wages in the Pachuca district at the present time are the highest in the history of the camp and equal or exceed the average of other Mexican mining communities. The scale now in use is as follows: Shift bosses, 7 to 8 pesos per day; machine men, 3 pesos; jigger bosses, 3 to 5 pesos; mechanics, 2.50 to 3 pesos; timbermen, 2.50 to 3 pesos; timekeepers, 3 pesos; pumpmen, 2.50 pesos; *barreteros* (hand drillers), 1.25 pesos; *peons,* 1 to 1.25 pesos; trammers, 1 to 1.25 pesos; muckers, 1 to 1.25 pesos.

Sinking and opening up new levels in the Santa Gertrudis mine is rather an expensive and irksome undertaking, due to the large inflow of water from the orebody and from neighboring properties. Sinking is undertaken first through the San Guillermo shaft which, at 1900 ft., is the deepest shaft in the district.

The main pumping station is at present on the 15th level. All the water from the lower levels is lifted to this station by auxiliaries where it enters two seven-stage, centrifugal Sulzer pumps, direct connected to 460-hp. motors and possessing a capacity of 3500 liters each per minute for a head of 335 meters when operating under 60 cycles, at a speed of 1150 revolutions and an amperage of 214. These pumps lift the water to the main tunnel which is 200 ft. below the surface. The larger proportion of the water drains through the tunnel but a vertical, triplex, electrically driven, Aldrich pump has been installed here to elevate water to the surface for the mill. A large Cornish pump has been placed also at the collar of the San Francisco shaft, to be used in case of a shutdown due to accidents in the regular pumping system.

The electric power at the mine was changed lately to 50 cycles, and under these conditions the centrifugal pumps run too slowly to lift the water to the main tunnel. This difficulty was eliminated by the installation of a booster pump which delivers the water into the Sulzers under a head of 75 meters.

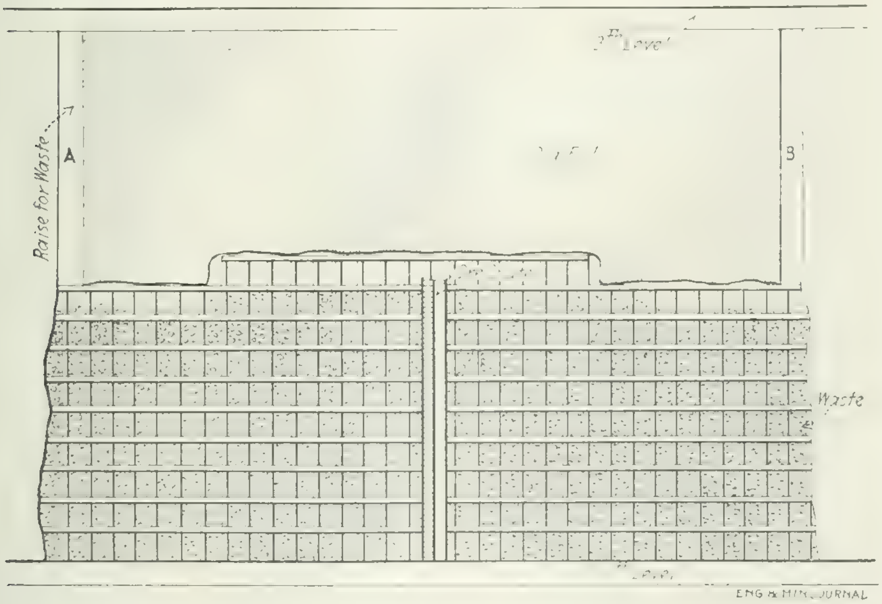
The above system has several defects of a serious nature. It requires a large number of auxiliaries; the centrifugal pumps operate at an efficiency varying from 25 to 41%; no relief is provided for the Cornish pump which must be kept ready for instant use at a large expense; and finally the excessive power consumption due to the low efficiency, repairs and labor, result in high operating costs.

Plan to Reduce Pumping Costs

To remedy these evils, it is planned to install a new pumping station behind the San Guillermo shaft on the 18th level. A two-stage centrifugal, with a capacity of 1000 gal. per min., will be placed at the 19th-level sump to elevate the water to the main 18th-level reservoir, which has a capacity of 45,000 gal. The water from the reservoir will pass then to three duplex, horizontal, direct-connected, electrically driven Prescott pumps, each possessing a capacity of 500 gal. per min., and capable of lifting the water 1500 ft. vertically. In addition, a 14-stage, centrifugal Sulzer pump will be installed as an auxiliary plant in case of accident to the main system.

The water will be lifted to the tunnel as before where the vertical, triplex, Aldrich will take care of the mill supply. The installation of the 14-stage Sulzer will eliminate the Cornish pump altogether, which saves much expense with coal at 20 pesos per ton. The Prescott installation has an estimated efficiency of 85% as compared to 41% for the present system, and the number of auxiliaries employed is reduced 75%. The saving in operating costs, under these conditions, will pay for the new system in two or three years.

When the Camp Bird, Ltd., of London, purchased the Santa Gertrudis mine, the property was found to be in bad shape for economical ore production, the most serious conditions being a large tonnage of ore, accessible to inspection, but not to extraction; totally inadequate equipment, on surface and underground, for the economical production of ore, such as hoists, head frames, surface ore bins, haulage system, underground ore pockets at the shafts, mine ore cars, winze hoists, station and sinking pumps, machine drills, etc.; no shop equipment of importance to take care of the repair work; insufficient shaft capacity; development even behind the modest tonnage requirements of the former owners; unreliable and insufficient power service.



Method of Mining, in the Upper Levels at the Santa Gertrudis

To overcome these faults and to prepare the mine for an economical ore production of 600 dry metric tons daily, or 18,000 dry metric tons monthly, as against scarcely 5000 tons extracted monthly by the former company, a most active campaign of equipment, development and improvement was commenced immediately.

Having found it impossible to sink the San Francisco shaft below the 17th level, due to the inability to handle the large inflow of water at that time on account of the poor power service, it was decided finally to retain this shaft ultimately for the service of men and materials only, and to prepare the old San Guillermo shaft for hoisting ore.

Hoisting Capacity Now 1000 Tons Daily

At that time the San Guillermo shaft, sunk vertically to a point just above the 17th level, but not connected therewith, and of a small section from the collar to the 13th level, was out of service and in a partly caved condition due to neglect. It has now been arranged to accommodate a 5-ton skip with its overbalance; the masonry from the collar to the ninth level has been put in good repair; steel dividers and end plates have been installed, and the portion from the ninth to the 13th level, where the shaft passes through the vein, has been heavily and securely timbered. Below the 13th level, the ground is hard and safe. At a point below the 15th level, a compound has been put in, and from the 16th level, the shaft has been sunk to the 19th on an incline of 60°, parallel to and in the foot wall of the vein. The shaft now has a hoisting capacity of 1000 tons in 24 hours.

A new shaft is also being constructed to provide for an increased tonnage and to insure a constant output in case an accident should cause the San Guillermo shaft to suspend operation. This new shaft is 25 ft. west of the San Francisco shaft and is to be completed from the collar to the 17th level in eight months. With the exception of the excavation to bedrock, practically all the work will be done by raising from the different levels, and herein lies one of the unique features of the undertaking.

The plans call for drifts at the tunnel, 11th, 14th and 16th levels, said drifts starting at points a few meters north of the San Francisco shaft and running in a southwesterly direction to the determined site of the new shaft. Upon completion of these drifts, raising will be started from each of the above levels at the same time. Steel timbering will be used throughout. The main advantages of such a shaft over one placed at a more distant point, are largely expediency and economy, since it is figured that the shaft under construction can be sunk at one-third the cost and in one-half the time. The ground in this locality is known also to contain no orebody or water, which is a highly important factor.

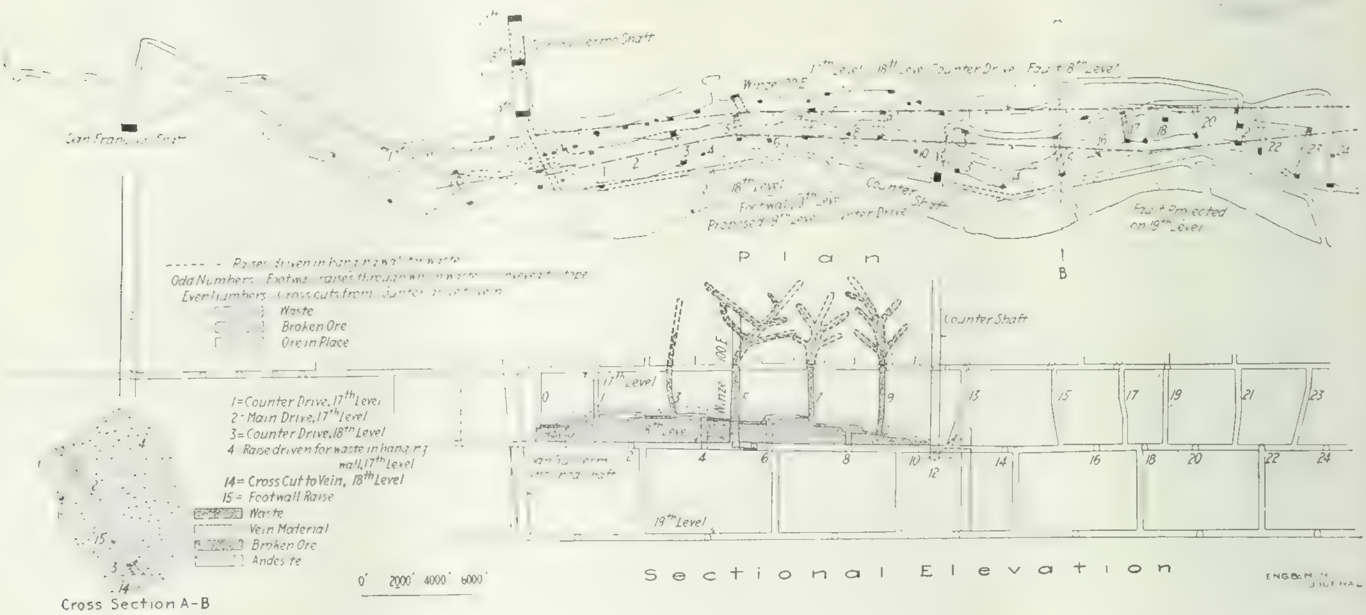
Under the former management, the general method of mining consisted in driving along the main vein, opening raises through to the level above at desired intervals, erecting an ore chute and manway between consecutive raises, and extracting the ore by overhead stoping, followed by square-setting and filling with waste. The great objection to the method lay in the inability to keep the main drive open due to the heavy character of the orebody and the tendency of the latter to move. Consequently forests of timber are found lining the levels. In order to keep the main drive of the 17th level open for tramming, it was found necessary to place 10x10-in. timber, side by side, along practically its entire length. This timber costs 50 pesos per thousand and has to be replaced about once a year. To eliminate continual retimbering, recourse was had in several instances to masonry, a compact rhyolitic brick being used for the purpose. While it cost 40 pesos per meter to construct this masonry, drifts of this character, opened several years ago, are still in good shape.

Old Filling Ore Mined First

When the Santa Gertrudis property was turned over to the new management, a careful sampling of the old stopes showed the fill to contain ore running from 200 to 2000 grams of silver and one to 11 grams of gold per metric ton. Owing to the fact that the main orebody in the lower levels was not in a state for economical production at this time, recourse had to be had to these filling ores. Since it was necessary to start stoping at once, the method shown by the accompanying engraving was adopted.

Raises A and B were driven at various intervals through the vein material to the second level above. Midway between these raises, an ore chute and manway were constructed. Starting at the chute, drives were run in a longitudinal direction and an entire floor of ore removed for the length and width of the stope. As fast as a block of ore was cut, square sets were erected to hold the ground and, at the same time, waste was thrown down the raises A and B from above and spread over the floor below by means of wheelbarrow and shovel. The ore was prevented from mixing with the waste by laying planks on top of the square sets. These stopes extended in vertical projection over a distance of about 200 ft., since only alternate levels were opened to reduce the costs.

The greatest expense attached to this method arises from the necessity of burying the timber. Distributing the filling material by barrow and shovel also adds to the stoping costs. The method is efficient, however, and with the present price of labor, is probably more economical than a method by which the handling of waste fill in this manner was eliminated. The heavy and dangerous character of the ground necessitates timbering and filling with the least possible delay.



COUNTER-DRIVE SYSTEM OF MINING, AT SANTA GERTRUDIS MINE, PACHUCA

COUNTER-DRIVE SYSTEM USED

The lower levels, where the main ore production is secured, are opened first by means of a 7x6-ft. counter drive, driven in the foot wall, approximately parallel to and 25 meters from the vein. Crosscuts are run from the counter drive to the vein at intervals of 50 to 55 m., after which the sill floor is stoped and raises driven midway between consecutive crosscuts. These raises follow the foot wall of the vein to within several meters of the next level, where they cut vertically upward across the vein and intersect the upper level on the hanging-wall side. Chutes and manways are then constructed at the end of each crosscut, the sill floor is filled with waste and stoping above the sill floor begins.

Where the foot-wall raise opens on the level above, another raise is started at an angle of 45° into the hanging wall for the purpose of extracting waste for filling. At the same time overhead stoping commences directly over the ore chutes on the new level, and proceeds in an easterly direction until one of the foot-wall raises is reached. Filling from the waste raise above is then carried into the stope through the foot-wall raise and spread evenly over that portion which has just been removed. Meanwhile stoping is being continued in a westerly direction to the west foot-wall raise. When the latter is reached, waste is drawn from the same to fill the excavated portion while stoping is proceeding at the eastern half again. By keeping the fill well up to the back of the stope, no timbering is necessary except possibly when within five or six meters of the level above. At this point, the foot-wall raises have been pretty well eliminated, the ground shows a greater tendency to cave, and the matter of filling presents a few more difficulties.

When this method of mining was first proposed, engineers agreed that seven meters from the vein was sufficient distance to run the counter drive. Crosscuts were driven at intervals of 20 to 30 meters and the foot-wall raises likewise. Experience has proven that it is necessary to keep the counter drive at least 20 or 25 meters from the vein, otherwise faults and the bad character of the ground in proximity to the orebody will cause timbering, the elimination of which is one of the chief advantages of the counter-drive system. Where the foot-wall raises were driven at intervals of 20 m., the ground was so weakened that caving resulted, with the subsequent loss of the stope for several months. It has been planned, therefore, in opening up the 19th level, to kep the counter drive at a minimum distance of 25 m. from the foot wall of the vein and to reduce the number of crosscuts and foot-wall raises 50%, thus effecting a great saving in time and expense and obtaining better conditions than previously.

SYSTEM HAS SEVERAL ADVANTAGES

The chief advantages claimed for the counter-drive system are the elimination of timbering except where the crosscut intersects the vein; it gives a well opened, firm, solid drift which will stand as long as the mine; it provides waste for the new stopes, and it is a great saver in time and money. The only argument advanced against the system is the necessity for hoisting the waste. This is accomplished at the Santa Gertrudis with little trouble and expense by means of two small shafts.

The Santa Gertrudis is the only mine in the Pachuca and Real del Monte districts employing this system. Owing to the character of the orebody, all mine superintendents find it necessary to drive these laterals sooner or later if they wish to keep their levels open without the enormous expense of timbering and retimbering at short intervals. In every instance, however, the laterals are driven long after the vein has been opened and stoped.

All ore is trammed to ore pockets on the respective levels and hoisted through the San Guillermo shaft to a 500-ton concrete pocket at the surface. It then passes on to a conveyor belt to the company's new mill, which is one of the most uptodate cyanide plants on the continent. Besides complete crushing and sampling plants, the new mill consists of sixty 1550-lb. stamps, 10 tube mills, 18 Pachuca agitation tanks, four 90-frame Merrill slime filter presses, and six 34-

frame Merrill zinc-dust precipitation presses, together with a complete equipment of auxiliary apparatus, such as Dorr classifiers, Dorr thickeners, pumps, tanks, melting furnaces, etc. Steel and concrete construction has been used throughout. An all-slime treatment is employed on ore averaging 1000 grams of silver and 5 grams of gold per dry metric ton, with an extraction of 93%. The mill is now treating 600 dry metric tons daily, but will be increased at once to a capacity of 850 dry tons per day.

Since the new management assumed charge and development work was pushed, a reëstimation of ore reserves gives: (a) 630,000 tons of positive and partly developed ore that will yield a profit of $4,610,000; (b) 520,000 tons of probable ore, $3,565,000; total estimated profit, $8,175,00. This estimate includes only the ore 30 m. below the 18th level. The width, the metal content, and the generally strong character of the orebody at this point, however, indicate the continuation of the same to great depth.

The Santa Gertrudis is controlled by the Camp Bird, Ltd., of London, which invested in holdings here when the ore reserves of the famous Camp Bird mine indicated but a short tefm of existence for that property. It is the present policy of the Camp Bird, Ltd., to become a holding company with valuable properties all over the world.

Shattuck-Arizona Copper Co.

For the year ended July 31, 1912, the Shattuck-Arizona Copper Co. reports the following: Wet tons of ore from development work only, 3094; equivalent dry tons, 2802; copper recovered, 1,253,305 lb.; silver recovered, 21,008 oz.; gold recovered, 13 oz. To date there has been 40,378 ft. of development work done, of which 4942 was done in the year under review, consisting of 2863 ft. of crosscuts; 938 ft of raises; 108 ft. of winzes; and 1033 ft. of intermediates.

It is purposed to build a $400,000 smeltery on a 251-acre site, adjoining the Copper Queen and Calumet & Arizona smeltery sites. This will have a nominal daily capacity of 400 tons, while it is also proposed that a 50-ton lead stack be built in addition, lead ores having recently been found on the property.

Development work has been confined to the upper levels, 300-, 400-, 500- and 600-ft. On the 300-ft. level a body of ore has been found carrying copper, 35%; silver, 25 oz., and gold, 0.05 oz. per ton. On this level also was discovered the lead ore which caused the plans for the lead stack to be considered.

On the 400-ft. level an important find of carbonate ores in limestone has been made (35% CaO), while ferruginous ores have been found on the 600 level.

The old stoping areas on the 500, 600, 700 and 800 levels have been well protected by bulkheading and waste filling, and can be reopened without heavy expense.

International Congress of Applied Chemistry

We continue, from last week's JOURNAL, our report of the proceedings of the International Congress of Applied Chemistry. On Wednesday, Sept. 11, the section of Mining and Metallurgy held a joint session with the section of Fuels and Asphalts, the program being as follows:

J. C. McDowell. Natural Gas Industrial Conditions.

A. W. Belden. The Beehive Coke Oven Industry of the United States.

O. Simmersbach. Koksofengas zur Beheizung vom Siemens-Martinöfen.

H. C. Porter and K. P. Ovitz. The Spontaneous Combustion of Coal.

J. J. Porter. Fuel Economy in the Cupola.

Harry A. Grine. Crude Oil Gas Producers of the Pacific Coast.

Norwood Johnston. The Use of Natural Gas in the Manufacture of Openhearth Steel.

The feature of the day was undoubtedly H. A. Bernthsen's lecture on "Synthetic Ammonia," with experiments. He gave a résumé of the early work on this problem, which was so discouraging that even as late as 1908 many experts declared that theory was against a solution of the problem being worked now. Now, however, said the lecturer, the walls of the first factory were arising at Oppau, near Ludwigshafen-on-Rhine, and next year synthetic ammonia would be a commercial product.

He then went into the history of the tedious search for a suitable catalyzer, and the investigation, involving literally thousands of experiments on the substances which poison the catalyzers, and spoke of the technical problems in finding substances to make the apparatus from, which must stand both high temperatures and pressures (the experiments in the lecture room were conducted at a pressure of 159 atmospheres) and the problems of getting pure nitrogen and hydrogen. But when the conditions were fulfilled, and the pure gases conducted over molybdenum, uranium, and other catalysts, under suitable temperature and pressure, ammonia is the result. The lecturer at this point, turned the delivery tube from the experimental apparatus toward a 5-liter evaporating dish of hydrochloric acid, and a column of ammonium-chloride fumes shot up to the ceiling; then turned the gas stream against a flag printed with almost invisible analine colors, and a bright-colored American flag appeared.

Doctors Eyde and Duisberg then moved and seconded a vote of thanks of the meeting to Doctor Bernthsen for his interesting and spectacular lecture.

For Wednesday afternoon, the Mining and Metallurgical section had the following papers scheduled, in a joint session with the Electrochemical and Inorganic Sections.

Horace W. Gillett. Effect of Pouring Temperatures on Tensile Strength of Aluminum Alloys.*

S. W. Parr. A New Alloy with Acid Resisting Properties.

Alfred Stavenhagen. Die physikalischen and chemischen Vorgänge beim autogenen Schnieden.*

Elwood Haynes. The Alloys of Cobalt with Chromium and Other Metals.

Wilder D. Bancroft. The Tensile Strength of the Copper-Zinc Alloys.

Otto Ruff. Ueber die Zustandsdiagramme des Kohlenstoffs mit Eisen, Nickel, Kobalt und Mangan.

Wilder D. Bancroft and T. R. Briggs. Blue Gelatine-Copper.

The paper concerning the alloys of cobalt with chromium was especially good, and will be abstracted at length.

On Thursday, Sept. 12, the section of Mining and Metallurgy met with the section on Analytical Chemistry. The program was:

The Chemists' Committee of the United States Steel Corporation, J. M. Camp, Chairman. The Methods of the United States Steel Corporation for the Commercial Sampling and Analysis of Pig Iron.

P. Mahler and Goutal. Dosage du carbone total des aciers et des ferro-alliages par combustion sans pression d'oxygen.*

William Blum. The Determination of Manganese as Sulphate and by the Sodium Bismuthate Method

Allen and Bishop. Method for the Determination of Sulphur in Pyrites.

J. O. Handy. Sampling and Aassying Silver Ores Containing Cobalt, Nickel, Arsenic.

F. P. Dewey. The Sampling of Gold Bullion.*

H. Milou and R. Fouret. Note sur le dosage de l'etain dans ses minerais.

Thursday afternoon was supposed to be a business session only, but later turned into an *ex tempore* experience meeting on copper smelting and refining, in which all present joined, and which was considered by the participators as one of the most enjoyable of the session.

On Friday the Congress met in joint session with W. H. Nichols, as chairman, in the Great Hall of the City College of New York, a cathedral-like auditorium capable of seating over 3000, and decorated for the occasion with the flags of the countries and foreign cities of the visiting delegates. The body accepted an invitation to meet in St. Petersburg in 1915, formally made by the Russian ambassador, and unanimously elected Dr. Paul T. Walden, of Riga, Russia, president of the ninth Congress, and Demetrius P. Konovaloff. honorary president. The former is professor of chemistry in the Polytechnic School at Riga, the latter is professor emeritus in the University of St. Petersburg, and Assistant Minister of Commerce and Industry.

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*Read by title only.

There were 1483 technical, scientific and trade societies and educational institutions invited to join the congress. Of these, 233 in 28 different countries accepted and appointed 332 delegates beside the American societies and educational institutions. Twenty-five foreign governments joined, and sent 85 delegates. In addition the United States and 49 of its territorial subdivisions appointed delegates, making 75 national and state governments officially represented.

In all there were about 4500 members from all over the world, of whom 2173, representing 30 countries, attended and registered. Five hundred and thirty-five papers were presented in the sectional meetings, and 189 in the joint sessions, of which 339 were discussed in the meetings.

At the next Congress will be considered the advisability of altering the meetings to every fifth year, instead of every third, and also of adding Esperanto as an official language. It was felt that it was unfair to vote on the latter question owing to the overwhelming majority of English-speaking delegates. The proposal to drop Italian as an official language was previously killed in the section meetings.

A resolution to have the international atomic weight table published only once every five years was killed, and for it was substituted the recommendation that the international atomic weight table of 1912 be used in commercial transactions until 1915, but the International Committee will publish its table annually, for the use of scientists who must have the greatest accuracy.

The International Committee on Analysis is to consider the question of uniform methods of ore, fuel and metal sampling. The reports of this committee will be published hereafter as part of the Congress transactions. Several other resolutions of no import to the mining and metallurgical world were also passed, and two decisively beaten, after which the Congress passed a resolution approving the work of the International Commission for the Publication of Annual Tables of Physical and Chemical Constants, recommended the treasurer of the Congress audit or have audited the commission's accounts, and formally continued its life until 1915. One fine quarto volume of tables has been issued by this commission and two others are, it is understood, in press. Then after resolutions of thanks to the various officers, organizations, etc., whose efforts had made the meeting a success, the Eighth International Congress of Applied Chemistry came to an end.

Rhedium is a white metal, of specific gravity about 12.1; melting point, 2000 deg. C. Its principal use is for making thermocouple, in combination with platinum.

The Ferrocyanide Titration for Zinc

Frank Breyer, before the International Congress of Applied Chemistry, stated that the following objections held for the ordinary methods of zinc analysis. In the precipitation as carbonate, platinum vessels must be used, or else the precipitate is contaminated with silica. Weighing as sulphide is difficult as either a stream of H_2S or of hydrogen must be used in which to ignite the precipitate. It is difficult to get a pure sulphate in order to weigh the zinc as $ZnSO_4$. To weigh as phosphate means a preliminary precipitation as sulphide, and in the subsequent re-solution and precipitation losses are likely to occur. In the Na_2S titration, the standard solution is not stable.

The following method is suggested for a standard. After getting the zinc in chloride solution, add 13 cc. ammonia, neutralize with HCl, and then add 3 cc. of HCl in excess. This insures a uniform content of ammonium chloride and a uniform acidity. Dilute to 200 cc., heat to boiling and titrate with ferrocyanide, using uranium nitrate as indicator, or an iron salt as described below. Divide the solution and titrate say one-third. Over-run the end point and add almost enough excess to take care of the remainder of the solution. Add all except a few cubic centimeters of the remainder of the solution, and over-run the end point slightly. Add the remainder of the solution and titrate to the end point.

The idea of over-running the end point is this. The zinc-ferrocyanide precipitate is not of standard composition unless the ferrocyanide is in excess. Therefore to make sure of its composition, over-run the end point on the great bulk of the solution, and confine the inaccuracy to the precipitate from only the last few cubic centimeters.

Ordinarily the blue color of the zinc titration will change to pea green at the end point, and then to creamy yellow. It will always do so if there is a trace of ferrous salt in the solution and a trace of ferricyanide in the ferrocyanide solution. To secure the first a trace of ferrous chloride may be added, the last will always be present if the ferrocyanide is old, i.e., has been allowed to stand for a month or two. The same effect can be produced by adding 300 mg. of ferricyanide to the freshly made standard solution, 2 liters, but in this case the solution must be restandardized frequently when fresh.

Under the conditions given, small amounts of ferrous chloride in the zinc solution, and ferricyanide in the standard solution, the use of an outside indicator can be dispensed with, and the color taken as an end point.

Heat Losses in Furnaces

Before the International Congress of Applied Chemistry, F. A. J. Fitzgerald spoke of the importance of conserving heat in furnaces, because under ordinary conditions each 1000 Cal. was equivalent to 1.6 kilowatt-hours. One effective method of cutting down heat losses was to heat the charge as rapidly as possible. For instance, in actual work with an electric furnace, using an 88-kw. current, and consequent slow heating of the charge, the current consumption was 1.7 kilowatt-hour per kilogram of charge, while with a 93-kw. input, the consumption of current was only 1.6 kilowatt-hour per kilogram of charge.

Another method was to make the furnace surface as small as possible. With a commercial furnace heated to about 2000° C., having a surface of 80 sq.m., the current consumed per kilogram of output was 6.1 kilowatt-hours; with a similar furnace of 53 sq.m. surface, the current consumption was only 5.0 kilowatt-hours per kilogram of product.

Some experimental furnaces were made hollow cubes with 230 mm. outside edges, and 110 mm. inside. These were heated by inner coils of nichrome wire, and supported by knife edges. These conditions made comparison of various bricks possible. Silica and magnesia were poor insulators and ought to be backed by red brick, or some other insulator.

The surface, too, is of great importance; whether a clay brick was left with plain surface, painted with lamp black, or silvered with aluminum paint made a great difference in its radiating capacity. The lampblack surface radiates most freely, the aluminum-coated the least. The effect of insulating part of a furnace might be great. In a commercial furnace with 20 sq.m. of surface, run at about 1100° C., 38 kw. were required to run it. After covering 4 sq.m. of the hottest surface with building brick, only 32 kw. were required.

In the discussion J. W. Richards stated that the good effect of quick heating was self evident, but in discussing the possibilities of this, it must always be remembered that one could pile the current on a furnace in which an endothermic reaction was going on much faster than in one where the reaction was exothermic, and in comparing furnace efficiencies, the kind of reaction must be noted. Convection losses are not well understood, and in his "Principles of Thermochemistry" he had stated they were as the square root of the velocity of the air, but he had lately been led to the conclusion they were nearly as the velocity.

He had seen a most interesting thing this last summer, in the shape of some aluminum-nitride bricks, which were highly effective insulators at 1600° to 1800° Centigrade.

The Franklin Air-Balanced Hoist

The hoisting engine at the Franklin mine is so designed that the descending skip compresses air which is used in combination with steam to hoist the loaded skip. The speed of descent is regulated by the quantity of air compressed.

Note.—An article entitled, "Description of an Air-balanced Hoisting Engine" by R. H. Corbett, read before the Houghton meeting of the Lake Superior Mining Institute, Aug. 28, 29, 30, 1912.

This hoisting engine was built in conformity with the ideas of R. M. Edwards, general manager of the Franklin Mining Co., and the other Dow properties in the Lake Superior copper district. Mr. Edwards long held the opinion that for deep mining operations a single-compartment shaft would be desirable, provided that a balanced hoisting engine could be built to operate a single skip or cage, he considered that the simplicity of a single-compartment shaft and its equipment would warrant any complication of the hoisting engine which would produce the desired result. It was apparent to him that if the power developed by the descending skip could be applied to compressing air it would furnish a solution of the problem.

Air Pistons Run Free While Hoisting

When the time arrived for ordering a hoist, the matter was placed in the hands of Bruno V. Nordberg to design an engine and work out the details of an air-balanced hoist to meet the requirements. Following this the engine under discussion was built by the Nordberg Manufacturing Co., of Milwaukee, Wis. This hoisting engine is a horizontal-duplex machine with the steam cylinders attached to the frames. The air-compressing cylinders are located immediately back of the steam cylinders. The air pistons are attached to extensions of the steam piston rods, the whole forming a complete hoisting engine and air compressor combined. Means are provided for allowing the steam pistons to run free while lowering the skip. The air pistons run free while hoisting. The engineer regulates the speed of the descending skip by controlling the quantity of air compressed. By means of the operating lever on the platform he absolutely governs the work done in the air cylinders between the limits of full cylinder capacity and no load.

The air compressing cylinders, Fig. 1, have four Corliss valves. The two lower ones *A* admit free air to the cylinders in the usual way. The two upper ones *B* are provided especially for regulating the capacity and are the ones controlled by the engineer while lowering. The air delivered under pressure passes through spring loaded discharge valves *C* located in the cylinder heads. The regulating valves *A* are fitted with releasing mechanism and dashpots like a Corliss steam engine. When they are open they afford a direct passage between the bore of the cylinder and the air inlet pipes through the channel *D* on top of the cylinder casting. Therefore, no air can be compressed while they are open.

To illustrate their action we will suppose an air piston is moving toward the end of the cylinder while lowering the skip. If the regulating valve is open the air in front of the piston will be forced back into the inlet pipe. If, however, the engineer trips the valve and the dashpot closes it at any desired point in the stroke, then the air left in the cylinder will begin to compress until it finally passes out through the discharge valves. The arrangement is such, that the further the engineer moves his lever the more air will be compressed and the resistance increased on the air pistons. The air cylinders are only used for regulating the speed while lowering. The usual steam-operated brakes are provided for landing the skip.

To enable the steam pistons to run free while the engine is lowering, the exhaust valves on the steam cylinders are arranged to be released from their connections and remain wide open and stationary until they are hooked up again, when the engine is reversed for hoisting. The releasing and hooking-up mechanism is connected to a small steam-operated thrust cylinder provided to furnish power for this purpose. The operating valve on this cylinder is attached to the reversing gear of the hoisting engine. Therefore, when the engineer reverses his engine the exhaust valves are either released or hooked up again as the case may be, without further attention on his part.

Air Mixed with Steam for Hoisting

While compressed air is usually in demand around a mine, it was decided in the present instance, that it would be best to mix it directly with steam from the boilers and use the mixture in the steam cylinders for hoisting the load. Three large cylindrical drums were installed for storing the compressed air along with the steam. They are each 10 ft. in diameter and 32 ft. long. They furnish ample receiver space at the present time for both steam and air.

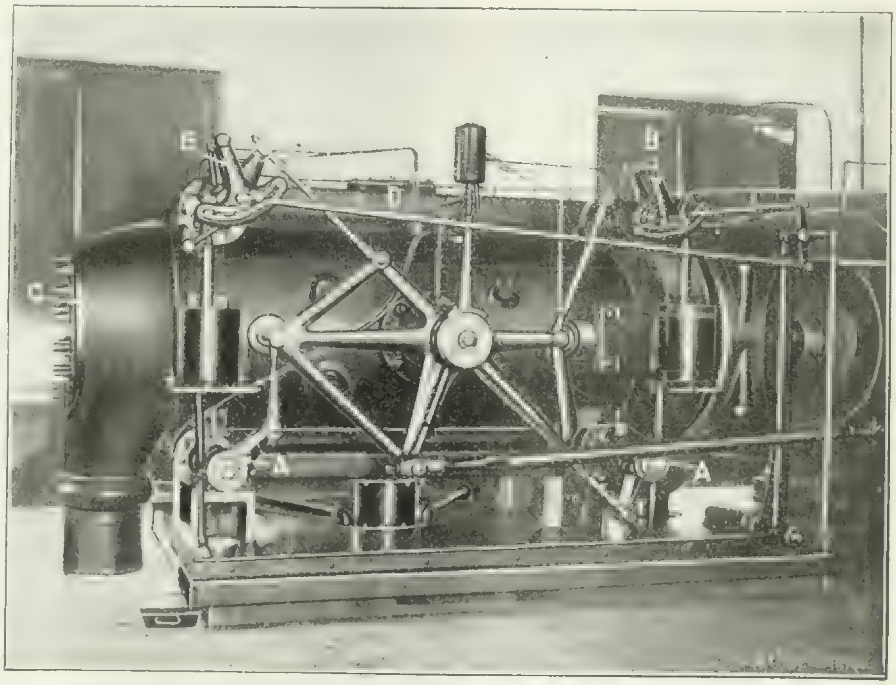


Fig. 1. Air Compressing Cylinder, Franklin Hoisting Engine

Fig. 2 is a diagram of the general arrangement showing how these receivers are connected with the boilers, air compressors and steam cylinders. A 12-in. steam pipe connects the boilers with one end of the receivers. A 16-in. pipe from the opposite end of the receivers is carried to the throttle valve. The 12-in. discharge pipes from the air compressors are connected to this same 16-in. line. This forms a convenient way for the compressed air to reach the receivers when lowering and also to supply the steam cylinders with pressure for hoisting. A reducing valve is placed in the 12-in. steam pipe between the receivers and boilers. It is set to maintain about

75 lb. pressure on the receivers. The boiler pressure is usually about 125 lb.

PRESSURE AUTOMATICALLY REGULATED

In explaining the operation of this feature of the hoisting engine, we will say that in the first place the receivers are filled with steam at 75-lb. pressure. The skip is then lowered into the mine. The air compressors begin to discharge compressed air into the receivers to mix with the steam they already contain. By the time the skip reaches the bottom of the mine the pressure will rise to 95 lb., the increase in pressure being due to the compressed air forced in by the descending skip. They will then begin to hoist the load and have 95 lb. pressure to start with. After the skip starts upward the pressure will gradually drop to below 75 lb. as the engine uses up the air stored in the receivers by the previous trip downward. The reducing valve will open after the pressure drops and steam will be taken directly from the boilers to complete the trip upward. When the hoist stops the pressure will rise to 75 lb. through the reducing valve and be in readiness for the next trip down.

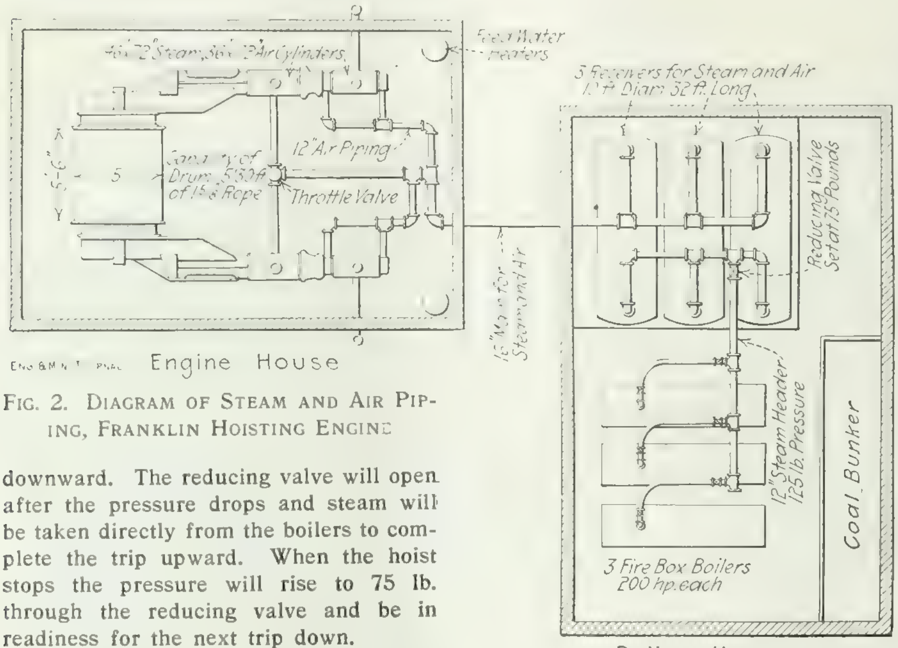

46x72 Steam, 36x72 Air Cylinders
Feed Water Heaters
12" Air Piping
Capacity of Drum 5130 ft. of 1⅝ Rope
Throttle Valve
Engine House
15" Main for Steam and Air
3 Receivers for Steam and Air 10 ft. Diam. 32 ft. Long
Reducing Valve Set at 75 Pounds
12" Steam Header 125 lb. Pressure
Coal Bunker
3 Fire Box Boilers 200 hp. each
Boiler House
Eng. & M. Journal

FIG. 2. DIAGRAM OF STEAM AND AIR PIPING, FRANKLIN HOISTING ENGINE

The following general dimensions and data is given regarding the hoist:

Diameter of steam cylinders	46 in.
Diameter of air cylinders	36 in.
Stroke of all cylinders	72 in.
Diameter of piston rods	7½ in.
Size of crank pins	12x12 in.
Size of crosshead pins	8⅝x14 in.
Size of main bearings	20x40 in.
Diameter of hoisting drum	15.0 ft.
Length of hoisting drum	15.5 ft.
Capacity of drum	5130 ft. of 1⅝-in. rope
Weight of skip	14,000 lb.
Weight of rock	20,000 lb.
Weight of rope per foot	4.15 lb.
Number of boilers required	2
Capacity of each boiler	200 hp.
Number of feed water heaters	2
Dip of shaft	40

Berryman feed-water heaters are now being installed. The boilers are of the Lake Superior firebox type with crown and arch tubes.

The engineer handles three levers in controlling this hoist, the throttle lever, reverse lever and brake lever, the same number as on other hoists in this section. The throttle lever, however, usually stands in a vertical position when the hoist is stopped. If he pushes it from him it operates the throttle valve; if he pulls it toward him it acts on the regulating valves on the air cylinders. With this exception the hoist handles about the same as other hoists in the copper country.

Cyaniding Antimonial Tailings

The treatment of the refractory tailings produced at the mines at Hillgrove, New South Wales, has had the attention of metallurgists from time to time, but until lately the results could not be called satisfactory, reports W. Archer Longbottom (*Min. and Eng. Rev.*, May 6, 1912). The chief cause of trouble is the antimony, which is present in varying quantities in all the mines. Even after careful concentration the tailings carried an appreciable amount of this metal in an exceedingly fine state of division.

Although the antimony is present as stibnite, the consumption of cyanide is never abnormal. The chief trouble is the extraction and production of gold of good quality from the zinc-box precipitate. The stibnite is broken up in the chemical action and the antimony is encountered throughout the process. The gold is not in a free state and it is a question whether the gold is contained by the stibnite as infinitely small particles or—and this seems more probable—whether the gold is thinly coated with the stibnite sufficiently to prevent further amalgamation.

The problem resolves itself into the attacking and disintegrating of the sulphide of antimony and the freeing of the contained gold for successful cyanidation. The possibility that at least some of the gold is intimately associated with the stibnite is upheld by the fact that there appears to be a limit to the value of the residue and even the most protracted treatment will not lower the gold value appreciably. A metallurgical success is practically out of the question, though a fair commercial one can be obtained.

All the mines in operation on the Hillgrove field have cyanide plants working and, in addition, the tailings from the Eleanora mines, stacked in the early days, have already been treated by cyanidation, some of them twice, and are being put through again by W. H. C. Lovely.

These tailings have been exposed to the atmosphere for many years and are strongly acid. On the whole a neutral solution or a slight protective alkalinity is aimed at to give the most successful results. The importance of the alkalinity and acidity of the solution cannot be overestimated when dealing with antimonial tailings. If the protective alkali is in excess, antimony sulphide is taken into solution and deposited on the zinc as metallic antimony, which generally means trouble in the smelting of the precipitate. Lime is used as the neutralizer and is added in calculated quantities as the treatment tank is being filled.

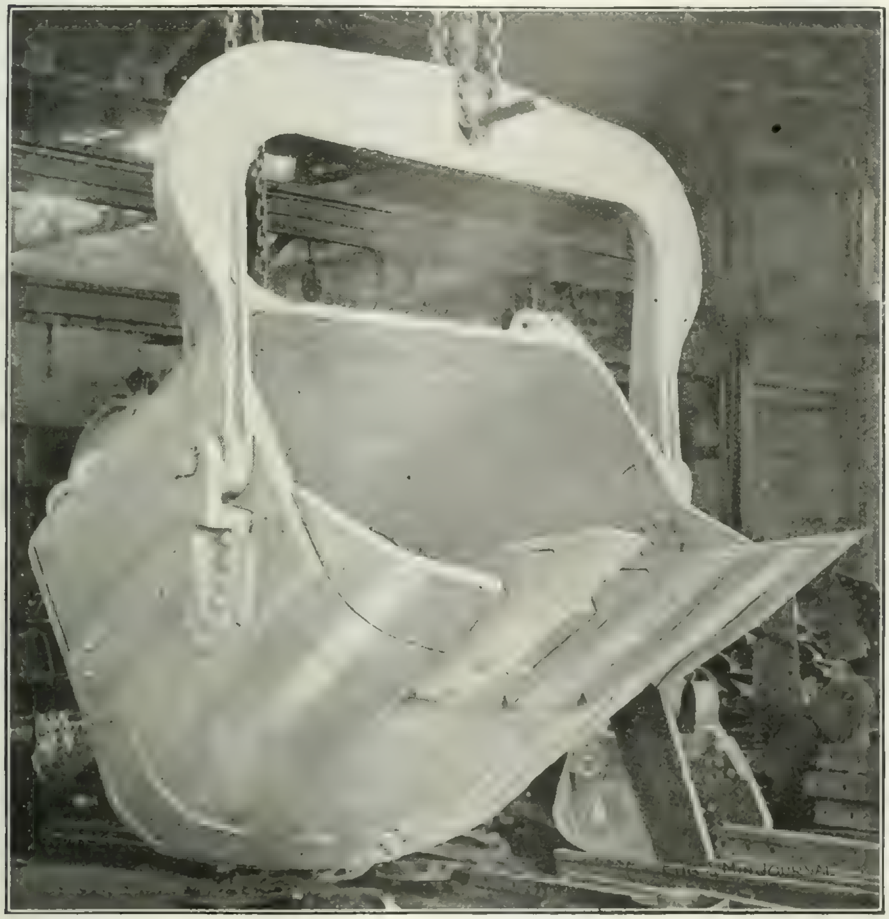
The dump is worked on the opencut system starting at the middle and working toward the edges, the sand being brought up by means of an incline tramway and taken to eighteen 30-ton bleaching tanks, each 20x4 ft. The tanks are arranged in pairs with a tram line running the full length of the series. Ample sump capacity is provided by six 30-ton tanks. There are three gold tanks, each of 15 tons capacity, connected with siphons and can be used separately at will. The precipitation boxes are six in number and measure 20 ft. long by 18 in. square section. Pumping is done by two 2-in. centrifugal pumps so arranged that the material can be pumped into any sump required.

The time of treatment is seven days, including time of emptying and filling. Altogether seven washes of different strengths are run on; the strong solution first, then a weak solution and finally a quick water wash. In this treatment 100 tons of solution are pumped on the tank daily. The solution from the tank is drained to the gold sump and from there goes to the zinc boxes. The solution from the zinc boxes, after being made up to the required cyanide strength is used again. The solution is occasionally purified by the addition of some powerful oxidizing agent as potassium permanganate. Lead acetate is sometimes used to accelerate precipitation and also to throw down any sulphide there may be in solution. At regular intervals the zinc boxes are cleaned up, the precipitate and short zinc are acid treated, dried over a wood fire, fluxed with soda, borax, silica and fluorspar and melted in o furnaces, each capable of taking six plumbago crucibles, the latter being provided with clay liners.

The gold is obtained in the form of a base bullion by the use of red lead, which is reduced by inserting rods of metallic iron. The bullion is then cupelled in specially prepared cupels, each one capable of holding 40 oz. This method has the advantage of giving remarkably clean slag. The following approximate costs of treatment are given: Labor, 2s.; cyanide, 8d.; zinc, 1½d.; fuel, 2d.; chemicals, etc., 1½d.; royalty, 1s.; total, 4s. 1d. These costs are low, the cyanide item being particularly surprising, considering the class of material being treated. All labor is on the contract system.

Manganese Steel Steam Shovel Dipper

Every part of the "Missabe" steam-shovel dippers, manufactured by the Edgar Allen American Manganese Steel Co. of Chicago, Ill., is of cast manganese steel. This fact alone insures durability and a minimum cost in repairs, owing to the toughness and wearing quality of the metal. The first three of these dippers made were put into service on the Panama Canal about one year ago; among other users are a number of large operators on the Minnesota iron ranges.



A 5-yd. Manganese-steel Steam-shovel Dipper Used at Panama and on the Mesabi Range

The "Missabe" dipper body is composed of only two castings, the front and back halves. This gives rigidity and eliminates the working and straining of the parts which, in the old style dipper built up of plates, caused loosening of rivets and frequent repairs. As shown in the accompanying halftone, the bail brackets are set at an angle conforming to the line of pull on the bail, and by putting them against projecting shoulders cast on the sides of the front casting the shearing strain is relieved from the bail-bracket rivets. Another feature is the placing of the joint, between the front and back casting, behind the bail bracket, so that the digging strain does not tend to pull the dipper apart.

The teeth are riveted on as usual, but are held unusually rigid by means of notches in the lip and offset on the outside of the lip, upon which rests that portion of the tooth which is on the outside of the lip. When extra protection for the front of the dipper is desired, a renewable bottom band and runners or shoes are furnished when desired, or they may be cast integrally with the dipper front. All pin holes in bails, hinge brackets and dipper-stick brackets are provided with renewable bushings.

Where a shovel is of high power and the digging is such as to throw great strain on the dipper it would seem that the "Missabe" dipper would give efficient and economical results. This dipper is built in all sizes for the various makes of steam shovels and dipper dredges, and is claimed by the manufacturers to have a life of three or four times that of the built-up type.

Lake Copper Co.

The report of the Lake Copper Co. for the year ended Apr. 30, 1912, states that excellent progress has been made toward preparation for regular production. Development work amounted to 12,653 ft., as against 9831 ft. in the previous year. The installation of all important equipment contemplated, has been completed and paid for.

The rock stamped by the Baltic mill, about 300 tons per day since Mar. 1, has shown a recovery of about 26 lb. of mineral per ton of rock, the mineral yielding about 60% of copper. No mine mass is included. The lode has not yet been correlated with any neighboring formation.

Giroux Consolidated Mines Co.

During the year ended Dec. 31, 1911, the Giroux Consolidated Mines Co. increased its holdings by securing two placer claims and by increasing its holdings in Butte & Ely Copper Co. to 249,575 shares out of $500,000 outstanding (par value, $1 each), according to its annual report.

During the year connection was made on the 1200-ft. level from the Giroux to the old Alpha workings, which were found to be badly caved. The 1200- and 1000-ft. levels were cleaned out, retimbered, and some drifting done, which showed good ore. On the 1200-ft. level the old workings referred to ran in ore for the full length of 160 ft., some running up to 26% copper. Drifting for 190 ft. to the south, and 90 ft. to the north of this zone also showed ore, as did drilling from the 1000-ft. level. Between the 1000- and 1200-ft. levels it is estimated that there are 25,000 tons of ore ready to stope, carrying over 10% copper.

The hard character of the ground in the Taylor and Dewey claims rendered churn drilling unwise, and development will have to be by shafts and crosscuts. However, it is believed that the orebody extends to the Pilot Knob claim, 1500 ft. away.

Efforts were made to get the Morris-Bunker Hill mine into shape for production, which necessitated a new hoisting plant at the Morris No. 2 shaft and a 3400-ft. siding to connect with the Nevada Northern R.R. The idea was to put the Giroux company on a self-sustaining basis by shipment of the porphyry ores, while developing the high-grade ores.

The fire, Aug. 23, 1911, in the Giroux shaft, cost in repairs and pumping, up to Dec. 31, $34,521, beside delaying the production program for months. In the connections from the Giroux to the Alpha working, a great flow of water was discovered and the company is now pumping over 1,000,000 gal. per day. This will be valuable if the company erects its own concentrator or smelting plant.

It was considered during the year whether or not to rehabilitate the 500-ton Kimberly concentrator, increasing it to 1000 or 1200 tons of crude ore per day. However, to avoid delay a five-year contract was made to deliver ore at the Morris No. 2 shaft to the Steptoe company, which transports, concentrates and smelts it. It is estimated that in the Morris-Bunker Hill mine are 4,010,000 tons of porphyry ore, averaging 2.14% copper.

Expenditures for the year amounted to $269,195. No balance sheet, or financial statement, except expenditures, is given.

El Oro Report

The annual report of A. F. Main, general manager of the El Oro Mining & Ry. Co., Ltd., at El Oro, Mexico, shows that the total amount of ore broken during the year ended June 30, 1912, was less than for the previous year. The 302,742 tons mined, added to the 84,459 tons of sand tailings retreated, however, reached the limit of the capacity of the mill and cyanide plant.

In order to handle the increased tonnage in the mill and cyanide plant, due to the retreatment of the tailings, several important changes were necessary. The tailings are reground in tube mills before passing to the treatment tanks.

The percentage of actual recovery on the gold is less than for the year before, the silver recovery is greater. This is attributed to the admixture of tailings which, on account of their comparatively low grade, would not pay to work for as high percentage of extraction as would the richer ore. The silver content of the tailings seems more amenable to cyanide treatment than that of the sulphide ores from the lower levels.

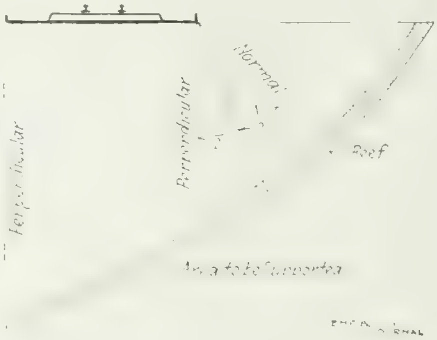
. The summary of ore reserves shows 301,934 tons of ore developed, averaging $7.46 in gold and 3 oz. of silver per ton, distributed as follows: Northern orebody, 54,696 tons at $6 per ton; Southern orebody, 116,355 tons at $4.65; lower levels, 42,674 tons at $18.27; San Patricio, 88,209 tons at $6.84 per ton. It will be noted that the richest ore will come from the lower levels as has been true during the last year. The tonnage stoped during the year was distributed as follows: Northern orebody, 54,278 tons; Southern orebody, 141,458 tons; lower levels (900 ft. and below), 32,802 tons; San Patricio, 73,665 tons, and Descubridora vein, 539 tons.

The mill ran on the average of 28.91 days per month and treated 8.88 tons per stamp per 24 hours. The percentage of assay values actually recovered was, gold 87.51% and silver 74.23%, or a total actual recovery of 85.14% of the assay value. The average assay value of ore treated was gold $6.36 and silver $1.30; the average assay value of tailings treated was gold $2.68 and silver $0.88. Bullion to the total value of $2,228,190 was recovered during the year at a total cost of $3.69. per ton of material treated. The railway and lumber department showed a net profit of $120,220 for the year.

Air Blasts and Subsidences

Johannesburg Correspondence

R. N. Kotze, government mining engineer, gave some interesting particulars regarding these occurrences on the Rand at the recent annual meeting of the South African Association of Engineers. He is responsible for perfecting the railway lines running over mining areas. He states that no precautions are taken against subsidence when the roof is stoped below 1000 ft. vertical. Where the line runs parallel to the strike on the dip or south side, the area to be supported is bounded by a vertical plane from the side of the railway reserve. On the outcrop or north side the angle between the vertical plane from the north boundary of rail reserve to the reef and a plane from the same spot normal to the reef is bisected and this area between these planes must be protected from subsidence. Where the line runs off over a coal bed a solid pillar must be left. If within less than 100 ft. of surface a solid pillar is required on the banket reefs of the Rand. Below that partial or total renewal of the ore is allowed with sand filling, packing, or waste filling, with or without pillars. These supports are ordered with regard to nature of ground, the object being to insure a gradual and regular settlement that will not interfere with the running of the line. In the past several mining companies ignored the law and secretely stoped ore, and some of these places have proved difficult to reclaim owing to falls and subsidence having already set in. Near the Geldenhuis mine today the trains slow down owing to a settlement. Where the line runs parallel to the dip, an area bounded on each side by planes 20% from the perpendicular is supported.



Pillars Under Transvaal Railroads

Of late years the inhabitants of the Rand have been subjected to shocks consisting of a single wave or vibration followed by a sound of dull thud, as distinguished from an earthquake which consists of a series of waves. Mr. Kotze considers that these shocks owe their origin to the sudden slight subsidence of large masses of ground containing millions of tons on a fault or over pillars in worked out areas. These pillars are crushed or driven into the foot walls and the release of tension causes a shock such as that seen in a testing machine when a block of stone or concrete yields.

Some so-called "air-blasts" have a similar origin, but these are mostly due to the weight at great depths, or more probably to the stresses set up by the effects of tectonic pressure caused by earth movements in the past. These have caused conditions something like that of glass in Prince Rupert drops, and when a free face is exposed by mining the rock has a tendency to crack and disrupt suddenly, mostly in smaller pieces which are projected some distance. Naturally these occurrences tend to increase in depth and have already caused serious accidents. In sinking the Brakpan Mines No. 1 shaft about the depth of 3000 ft., a band of quartzite in this state was passed through and fragments were continually breaking out with a report and being hurled about the shaft. Sinking had to be delayed until the sides could be lagged. Returning to the subject of shocks, these caused many complaints in Ophirton above the Robinson Deep mine and a seismograph was set up there. This showed that the greatest amplitude of vibration was only one millimeter, while in February, 1912, an earthquake which did no damage showed an amplitude of 11 mm., showing the shock to be unimportant at this depth, but they are more severe nearer the outcrop.

Bismuth Production in 1911

Only two lots of bismuth ore were mined in the United States in 1911, according to the U. S. Geological Survey. One was mined in La Plata County, Colo., which carried 6 to 8% of bismuth. This ore, however, was sold for its gold and silver content. Another lot of still richer ore was mined from a claim about 35 miles southwest of Tularosa, New Mexico. The imports in 1911 amounted to 172,093 lb., valued at $311,771.

According to information furnished the Journal, three works produced bismuth as a byproduct in 1911, of which the United States Metals Refining Co., at Grasselli, Ind., was the largest producer. It is understood that three other plants are experimenting on this subject, and it is believed that one will be a commercial producer in 1912.

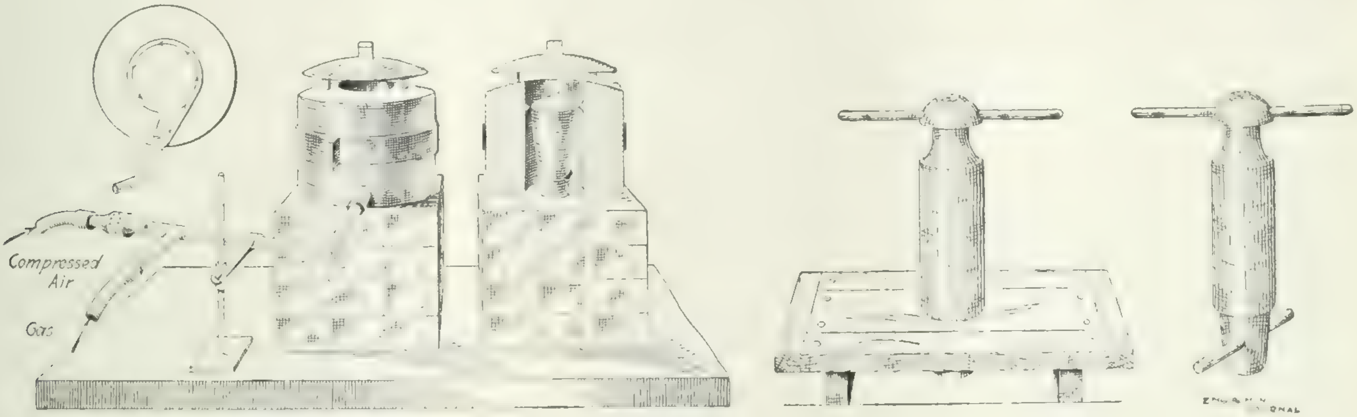
Spirally Heated Laboratory Furnace

How to build small gas fired crucible and muffle furnaces for experimenting with alloys, enamels, etc., up to temperatures of 1600° C. The furnaces are marked by simplicity and strength.

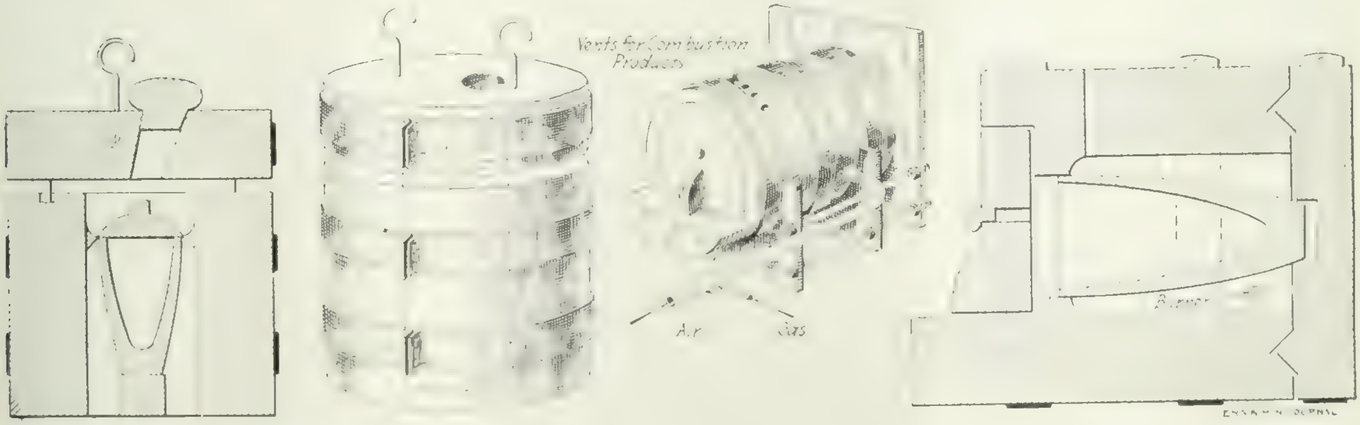
Note Translated and somewhat shortened from an article by A. Vernueil, in Bulletin de la Société Nationale d'Encouragement pour l'Industrie Nationale, June, 1912.

Essentially the furnace consists of a cylinder of refractory material having a thickness equal to two-thirds the diameter of the crucible space. The lower surface of the furnace rests upon a block formed of firebricks, cemented with fireclay, so as to form a plane square surface, of which the side is at least equal to the diameter of the furnace (Fig. 1). The lowest surface of the furnace is made with a semicircular canal, of which the radius of the outer opening is equal to the diameter of the tip of the burner. The outer side of the canal is tangential to the circle of the furnace opening, while the inner side diverges from the axis of the canal so as to form a funnel-shaped opening, which permits the flame to expand slightly. The direction of this canal may be turned from right to left, or left to right, to suit the gas and air connections, and it is often well to make two of these canals, one in each direction, when constructing the furnace, for it is easy to close with fireclay whichever one of the openings one wishes to eliminate.

In the upper surface of the cylinder forming the furnace walls are three small holes, two to three centimeters in depth, forming the vertices of an equilateral triangle. In these holes are fixed, with a little tempered clay, the little rods of baked clay which support the furnace cover. The space left between these rods and the furnace cover and walls allows the products of combustion to escape.



CONSTRUCTION OF GAS-FIRED LABORATORY FURNACE



SPIRALLY HEATED LABORATORY GAS FURNACES

An ordinary bottle or flask of the desired size serves as a core upon which to build the furnace. Its surface is slightly vaselined, and it is then placed on a conveniently sanded table, and the furnace built up, by continuous additions of small masses of pasty refractory clay, to the form of a cylinder of the desired height and thickness. When this is complete, the core is withdrawn. It is well to leave a hole two or three millimeters in diameter at the base of the cylinder (by means of a wire, for instance), so that when the core is withdrawn the furnace will not be collapsed by pressure of the air. If one is going to construct several of these furnaces, all of the same size, it is well to make a wooden core (Fig. 2), fixed on a wooden working base with a small key.

The mixture of clay recommended by the author is that used to make the so called French crucibles, or in case one wishes to make his own mixture: Work up Normandy fireclay, 100 parts; the same fireclay, calcined and then crushed to 16-mesh, 100 parts. Another mixture given is Normandy fireclay 100 parts; the same, calcined and screened to 16-mesh, 80 parts; old glass-work's pots, crushed to 16-mesh, 80 parts, mixed with enough water to make a paste. [A fine quality American refractory clay will, of course, be substituted in this country.—EDITOR.]

After the furnace is nearly dry, which takes from 15 to 21 days at ordinary temperatures, or three or four days at 40° C. after the first "sweating out" of water, the semicircular canal spoken of above is cut out with a rasp, and the edges rounded to make it less susceptible to accidental shocks. Although the cylinder is ready, after being well dried, for use, it is preferable to give it a preliminary drying at a dull red heat.

Drying at Red Heat

This operation renders the fire cracks on the interior much less important, and is very well done in a makeshift furnace a little greater in diameter than the mold to be dried. This is built of ordinary brick, on a set of grate bars. About a 4- or 5-cm. layer of coarsely crushed brick is placed on the grate bars, and on this is placed the furnace mold, which is filled with and surrounded by charcoal. This is burned slowly until the form attains a dull red, after which the fire is allowed to burn out. After burning, the furnace may be bound together with one or more strips of sheet iron, riveted as shown in the illustrations.

In the author's work he used three furnaces, suitable for 200-gram, 800-gram, and 2000-gram crucible charges. One should select the size of crucible in advance, and make the inside of the furnace only four to six millimeters more in diameter than the crucible. Damming back the gas in the lower part of the furnace helps to get high temperatures. As the shrinkage in making is 8 to 10%, for a furnace to take crucibles 67 mm. in diameter, the mold is 80 mm., allowing for 7-mm. shrinkage, and an annular space of 6 mm. If a bottle cannot be found just the size, it can be wrapped with a sheet of zinc, etc., to give the required dimensions. For height, allow again 10% shrinkage and about 10 mm. over the height of stand, crucible and cover.

To avoid shrinkage cleavage, withdraw the core immediately after modeling, and make the three small holes in the top immediately, but wait several days before turning over the furnace to cut the semicircular canal. For the author's furnace, 73 mm. diameter by 150 mm. high, a No. 19 crucible cover serves as the top, and it is heated by a small-size Schloesing burner bent at a right angle (see Fig. 1), with a total length of about 50 cm. The interior diameter of the iron tip is 10 mm. The air pipe is 4 mm. interior diameter. The crucible stands on a small fireclay pedestal, and is supported by three small pieces of fireclay bent over the rim of the crucible.

Starting the Furnace

The Schlösing burner should be started under a light air pressure with the burner tip three or four centimeters from the opening. When the furnace begins to grow hot, place the tip two or three centimeters inside the opening and pointing very slightly upward, and lute it in with a little yellow clay. One then gives the required air pressure on the burner for the temperature he wishes to attain, and then turns on the gas until the flame barely shows at the opening of the furnace. The author says with a blast pressure equal to 18 cm. of mercury, the temperature reached is 1460° C.; 19 cm., 1490° C.; 20 cm., 1530° C.; with 25 cm., about 1610° C. With blast at 20-cm. pressure, about 1400 liters of illuminating gas are burned per hour.

The Larger Furnaces

The 800-gram furnace takes a crucible 113 mm. in diameter and 155 mm. in height. The furnace after burning is 260 mm. high, 290 mm. external diameter, and 123 mm. internal diameter. The cover is provided with hooks for lifting, and a small hole for pyrometer observations. A 13-mm. Schlösing burner heats it.

The largest model is used for work on artificial rubies, etc., and takes a crucible of 130 mm. diameter and 230 mm. high. The furnace is 360 mm. high, 320 mm. external diameter, and 138 to 140 mm. internal diameter, and is fired with a 19-mm. Schloesing burner. In Figs. 4 and 5 are shown almost self-explanatory cuts of muffle furnaces, on much the same principle as the furnaces above described. The author has found with ordinary muffles that they would crack at the high temperatures he wished to work with, and that the admission of the products of combustion gave radically different results than he obtained in regular technical work. In using the round muffle he finds that cracking occurs rarely, and that using a crucible about 96 mm. in diameter, and 165 mm. high for the muffle, he has ample room to experiment on glazes, enamels, the fusibility of materials made into Seger cones, etc.

In modeling this furnace, a recess is left in the back a trifle larger than the bottom of the crucible to be used as a muffle. The crucible slides into this until it binds slightly. The crucible must, of course, be luted in front. Combustion products pass out by six or eight 10-mm. holes at the top.

New Chinese Currency

The Ministry of Finance of the new Chinese Republic has adopted preliminary articles defining the new currency plan. The standard is to be gold, based upon a dollar containing 0.75 gram pure gold. This is equivalent to the Japanese yen, and will be equal to $0.498 United States gold. No present provision is made for gold currency, but silver dollars are to be coined weighing 22 grams.

Four classes of subsidiary coins are provided. The first will be of silver and nickel, and will include pieces of 50 cents, weighing 13 grams; 20 cents, weighing 5.2 grams, and 10 cents, 2.6 grams. The second class will be of brass and nickel and will include 5-cent coins, weighing 5 grams. The third class will be of brass, lead and tin and will include 1-cent pieces weighing 6 grams and 5-cash pieces, 3 grams. The fourth class of brass and lead, will consist of 1-cash pieces, weighing 1.25 grams. One dollar will be equal to 100 cents, or 1000 cash.

The consular report, from which these particulars are taken refers to "brass," but this word probably means copper.

Effect of New Mining Legislation on the Rand

Johannesburg Correspondence

Trouble is threatened between the members of the miner's union and the mine owners on the Rand owing to the introduction of a new agreement by the companies with their contract workers. According to the Conciliation Act, the companies must give one month's notice before altering the condition of employment and during that time the miners may call for an arbitration commission to investigate any grievances. The truth about the new agreement appears to be that the mines have been badly hit by recent legislation. In connection with the eight-hour day, I wrote that I considered it would be impossible to make natives do as much work in eight hours as in nine, and inquiries from some of the largest mines show that the efficiency per boy in shoveling and tramming has fallen off about ¼ ton per day. Another mine manager considered that the act had raised costs about 10%. This law provides for an eight-hour day at the face, and the miners seem determined to press for an eight-hour bank-to-bank day, which would about render many mines unworkable. On top of this comes a heavy capital expenditure in order to ventilate the mines and provide water services and the payment of compensation to sufferers from miner's phthisis which may cost anything from 6d. to 1s. per ton for some years.

The mines have made some small economies by not paying the one-half shift extra for Saturdays and making the miners pay compensation to natives injured by their breakage of regulations; but they suffer greatly from unskilled and drunken employees who move from mine to mine, wasting explosives, damaging machines and spoiling working faces. This shortage of efficient and steady miners is due, of course, largely to the neglect of the mine operators, and of the men themselves, to check the ravages of phthisis. The new agreement seeks to protect the miners in several particulars and perhaps indirectly to reduce the large checks which must be paid to the best men.

I do not think that the trouble will lead to a strike as the miners know they are helpless without the engine drivers and these workers occupy a favored position they would be loath to forfeit.

Caving System in Chisholm District-III

By L. D. Davenport*

Square sets are used in the iron mines at Chisholm, Minn., where the upper surface of the ore is rolling and makes up into the capping for a short distance, then drops again. The manner of using square sets is described in detail.

In the Chisholm district of Minnesota, square-sets are used where the back of the ore above the top level is of a rolling nature, or where the ore runs up to a considerable height, 20 ft. or more, for a short distance, and then drops down again. It would, in some cases, be possible to put up raises close together and slice out the area, but the cost of the raises and the additional drifting, would increase considerably the cost of the ore. Moreover, by using the square sets, it is possible to get the ore out at once, whereas, if slicing were used, it would first be necessary to put up raises and to drift before stoping could be started. Furthermore it would be difficult to obtain good ventilation in a slice under these conditions.

MUCH ORE TIED UP IN SQUARE-SET SYSTEM

When square-set work was first used in the Hibbing district, it was started on the main level, and carried up to the top of the orebody, sometimes for a height of 16 sets. Rooms were worked out three sets wide, one set on each side of the drift and 50- to 60-ft. pillars were left between. The principal objection to this method of working, was that it tied up too much of the ore, since it necessitated leaving these large pillars between the working places and it was not possible to slice out these pillars until the square-set work had been finished.

Square sets are used at present only where the ore is too high for one slice and does not have sufficient extent to warrant taking it out in two or more slices. The work as done here is sometimes called square-set slicing, since as a rule two tiers in width are taken, and then the room is boarded up and blasted down as in a regular slice.

METHOD OF STARTING A SQUARE-SET ROOM

In starting a square-set room, the first bottom set or open set *A*, Fig. 1, is put in the drift, the caps are lined up so that the set stands perpendicular to the line of the drift, with the posts plumb. In all cases, the timber is hitched into the ground and firmly wedged, the caps bearing hard against the tenons of the posts as shown in Fig. 4. The top of *A* set is lagged at the sides, leaving an opening of about 18 in. at the center, which is covered with short pieces of boards laid perpendicular to the lagging.

With *A* set in place, a cutting-in-hole is put up in the back of *A* to break the ground for the first raise set as shown in *B* set Fig. 2. Before blasting the first raise set, *B*, a short piece of rail, shown in Fig. 4, is propped under the lagging to steady it, and to take the weight of the blast. After the blast the prop is knocked out and the car is run under the set some of the short boards are removed and the dirt run in the car. *B* set is squared up and trimmed out, just enough to allow the timber to be put in place and wedged. The top of *B* set is not lagged before *C* set is blasted, but the dirt from the cutting-in-blast of *C* set drops on the lagging of *A* set. *C* set is blasted and squared up in the same manner as *B* set.

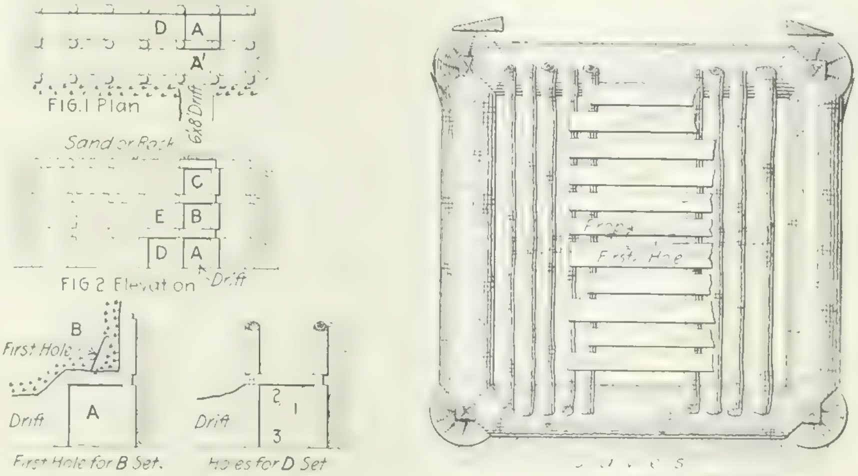
If *C* set is the top set, supposing the room to be only three sets high, the top is lagged and the back blocked and wedged solid. No side lagging is necessary. Next, the ground for *D* set is blasted (see Fig. 3) squared up, and the timber put in place and wedged in the same manner as *A* set. Lagging and short boards are used in the top of *D* set, as they were in *A* set, except that the lagging runs parallel to *A* and *D* sets, i.e., perpendicular to the drift.

The track is turned so that the car can be run into *D* set and then *E* set, on top of *D* set, is blasted. This *E* set is blasted and squared up from *B* set in the same manner that *D* set was worked from *A* set, on the bottom. The work is continued in the same manner, i. e., the bottom set is put in first, and then the raise sets as before, until the first tier is finished.

ROOMS ARE 50 FT. LONG

Usually a room six sets long (50 ft.) is worked, one set on one side of the drift, and four on the other. With the first tier in place, another open set is put in the drift against *A* set on the bottom, and then raise sets above that, and the tier continued in the same manner as the first tier. *A′*, *B′*, *C′*, etc., are put in in exactly the same manner as *A*, *B*, *C*, were; only *B′* is blasted from *B* instead of from the bottom set.

The track runs along the bottom set of the first tier and in working out the second tier, slab chutes are sometimes used to carry the dirt into the car, as shown in Fig. 7. Ordinarily a room six sets long and two sets wide is blasted down when working against caved ground. When a room is finished it is boarded up, starting at the top. Usually the two upper tiers are boarded. All the lagging used is dropped to the bottom of the room and used to lag up the bottom sets. The lagging is placed vertically, the upper ends bearing against the inside of the caps, and the lower ends against the poles which extend from post to post along the floor of the room as shown in Fig. 5. The floor of the room is covered with a single layer of boards.



DETAILS OF SQUARE SET TIMBERING USED IN CHISHOLM DISTRICT

PROPS USED BETWEEN POSTS IN UPPER SETS

In boarding up the upper tiers, props are put in between the posts from cap to cap, and make a bearing for the boards as shown in Fig. 6. After the room is boarded up, the drift is breasted up. Timber is put across the end of the drift and hitched into the ground against the open set. Diagonal braces are placed against the posts to steady them.

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*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

In Fig. 6 is shown the usual manner of placing the holes in blasting down a square-set room. At *A*, *B* and *C*, in Fig. 6, the caps are left across the room. By leaving these caps they act as props, and allow the room to fill up without disturbing the timber against the solid ground.

In heavy ground, where the sides of the old room are broken up or part of the timber is missing, it is usual to drop back one set from the caved ground, as at *A′* set in Fig. 1, and to take out a full tier up to the back, and from cave to cave. Then starting at the top, for safety, to put in the top sets between the new tier and the caved ground, then to carry the timbering down. In this way, the back is secured before the pillar between the tier and the caved ground is taken out. This pillar serves as a protection between the new tier and the caved ground. The new tier is boarded up before a start is made on the new pillar. It is sometimes necessary to cross-brace the top sets in order to take the weight of the back and the side pressure of the caved ground as shown in Fig. 8. In working out this pillar, sometimes a post or two is missing, as the ground is timbered down, these missing posts are put back.

Pillar Left Between Drift Slice and Square Sets

In starting square sets against a drift slice, a small pillar is always left between the square sets and the drift slice as shown in Fig. 9. It is usual, also, to put in *A* set and *A′* set first, and then finish the tiers at *A′* as in the case of heavy ground, and then take out the pillar, still leaving a small pillar *X*, Fig. 9, which is taken out after the room is boarded up. *A* set is called an open set or starting set; *B* and *C* sets are called raise sets. All other top sets are called drop sets. A solid set is a set in solid ground. A side set is one with an open side to break to in blasting.

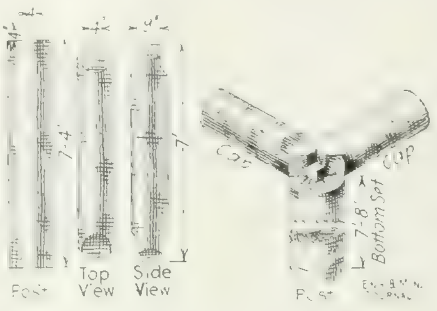

Fig. 10. Joint Used with Round Square-set Timbers

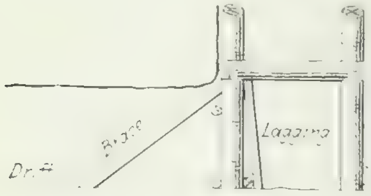

FIG. 5

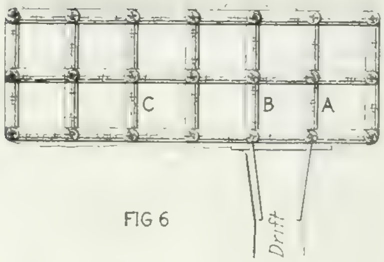

FIG 6

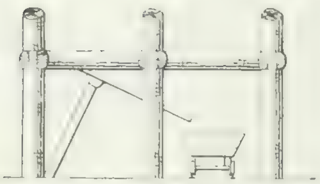

FIG. 7

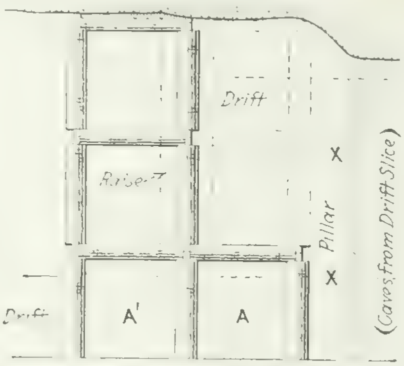

FIG. 9

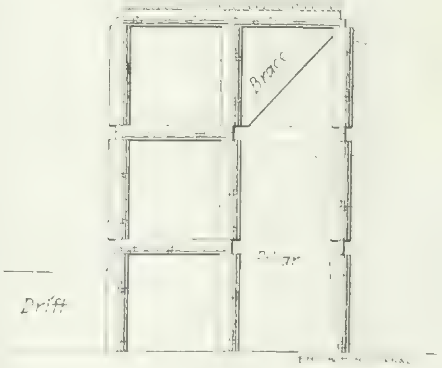

FIG. 8

Further Details of Methods of Timbering with Square Sets

The London *Mining Journal* reports that Franz Fischer, in Leipzig, Germany, has succeeded in producing iron, 99.99 per cent. pure by an electrolytic process. The metal fuses at 1600 deg. C., and can be rolled or drawn without difficulty.

Oregon Metal Production

The value of the mine production of gold, silver and copper in Oregon in 1911, according to Charles G. Yale, of the U. S. Geological Survey, was $669,016, against $700,676 in 1910. No output of lead or zinc was reported in either 1910 or 1911. The production of gold decreased from $679,488 in 1910 to $633,407 in 1911. Gold output from deep mines decreased $43,430 and that from placer mines decreased $2651, compared with the output of 1910.

The production of silver increased from 39,978 fine oz. in 1910 to 45,221 oz. in 1911. Of the silver, 34,011 fine oz. was derived from siliceous ores, 9953 oz. from copper ores, and the rest from placer mines. The copper ore shipped to smelters amounted to 4205 tons, having a copper content of 93,136 lb. This indicates an average recovery of 22.2 lb. of copper per ton. The average recovery of gold and silver from copper ores was $3.32 per ton.

Baker County led in gold production, with an output of $389,786, of which $372,405 was derived from 74,558 tons of siliceous ore and from tailings. Of the silver production of 45,221 oz., over two-thirds came from Baker County.

There were 40 deep mines and 136 placer mines operated in Oregon in 1911. Of the placer mines 88 were hydraulic, 3 dredging, 9 drifting and 36 sluicing properties.

Cryolite

No cryolite is produced in the United States, according to the U. S. Geological Survey, the entire supply used in this country being imported from Greenland. The quantity reported to have been imported for domestic consumption in 1911 was 2007 long tons, as compared with 36 long tons in 1910. Cryolite is imported free of duty.

Cryolite has been found in commercial quantities only at Ivigtut, an Eskimo hamlet on the southern coast of Greenland in latitude 61° N. Minerals containing cryolite have been found near Pikes Peak, Colo., but not in paying quantities. The deposit at Ivigtut is reported to be a solid mass having surface dimensions of about 200 ft. by 600 ft., and it has been worked as an open cut to a depth of about 150 ft. The deposit widens with depth, and the depth is unknown.

Formerly cryolite was used to produce soda and alum, but other and cheaper sources of these materials have displaced cryolite from this particular field. The more important uses at present for cryolite are in the metallurgy of aluminum, in the manufacture of opaque glass for the enameling of iron ware, and as a flux in the manufacture of white portland cement.

NEW PUBLICATIONS

THE BUSINESS OF MINING. By Arthur J. Hoskin 5x7¼, pp. 224, illus. J. B. Lippincott Co., Philadelphia, Penn.

MACHINE DESIGN — HOISTS, DERRICKS, CRANES. By H. D. Hess, 6¼x9½, pp. 368, illus., $5. J. B. Lippincott Co., Philadelphia, Penn.

RHODESIA CHAMBER OF MINES, SEVENTEENTH ANNUAL REPORT: 1911. 7x10 in., pp. 128. Buluwayo, Rhodesia; published for the Chamber of Mines.

INDEX OF MINING ENGINEERING LITERATURE. Vol. II. By Walter R. Crane. 6x9¼, pp. 461. John Wiley & Sons, New York.

COMMISSION OF CONSERVATION, CANADA. Report of the Third Annual Meeting, 1912. Clifford Sifton, Chairman. Pp. 154, illus. John Lovell & Son, Montreal, Canada.

THE PRODUCTION OF PETROLEUM IN 1911. By David T. Day. Advance Chapter from Mineral Resources of the U. S., 1911. Pp. 152. U. S. Geological Survey, Washington, D. C.

ANNUAL REPORT OF THE BRITISH COLUMBIA MINISTER OF MINES, FOR THE YEAR ENDING DEC. 31, 1911. Pp. 313, illus. Richard McBride, Minister of Mines, Victoria, B. C.

STRENGTH OF MATERIALS. A Text-Book for Secondary Technical Schools. Sixth edition, revised. By Mansfield Merriman. 5½x7¾, pp. 188, illus.; $1. John Wiley & Sons, New York.

DIE ELEKTROLYTISCHE ALKALICHLORIDZERLEGUNG MIT STARREN METALLKATHODEN. Teil I. By Jean Billiter. 6¾x9¾, pp. 284, illus., paper; 16.50 marks. Wilhelm Knapp, Halle a. S., Germany.

PRELIMINARY REPORT ON THE CLAY AND SHALE DEPOSITS OF THE WESTERN PROVINCES. By Heinrich Ries and Joseph Keele. Pp. 250, illus. Memoir 24-E, Canada Department of Mines, Geological Survey Branch, Ottawa.

INVESTIGATION OF THE COALS OF CANADA WITH REFERENCE TO THEIR ECONOMIC QUALITIES AS CONDUCTED AT McGLL UNIVERSITY, MONTREAL, UNDER THE AUTHORITY OF THE DOMINION GOVERNMENT. By J. B. Porter and R. J. Durley, assisted by T. C. Denis, Edgar Stansfield and assistants. Volume II. Pp. 189, illus., $1. Canada Dept. of Mines, Mines Branch, Ottawa, Ont.

TRANSVAAL CHAMBER OF MINES. TWENTY-SECOND ANNUAL REPORT: 1911. 7x10 in., pp. 511. Johannesburg, Transvaal; published for the Chamber of Mines.

Besides the report of proceedings of the Chamber of Mines and the statistics of production this volume contains several reports and papers of interest. Included in these are notes on current legislation and its effects on the mining industry; on patents; on explosives; on the sanitation of mines; on miners' phthisis; and on the supply of native labor. The importance of the last named question is seen by the fact that 208,858 negroes were brought to the mines during the year, of which 202,212 were discharged on expiration of their contracts. There was also a "wastage," which included 3672 men deserted and sent to jail and 3677 died. The handling of this army of recruits was no small work, and the Native Labor Association, as the labor branch of the chamber is called, was busily employed.

PRACTICAL FIELD GEOLOGY. By J. H. Farrell and Alfred J. Moses. 5x7½, pp., illus., flexible leather; $2.50. McGraw-Hill Book Co., New York.

This book differs in many respects from the usual run of pocket- or handbooks. In the first place, the author of its descriptive portion combines a wide experience in practical matters with an intimate acquaintance with the doctrines and writings of the scientists; hence the book is neither a catalogue of disconnected facts nor a judicial treatise on the merits of opposing theories. The familiar facts are there, of course, accurately crystallized but so smoothly waterworn by the stream of the discussion as to lose their sharp corners. Practical hints and theoretical deductions often elbow one another in the same paragraph.

The first five chapters describe, without excess of detail, the field methods for surveying both topography and geology. For this work the author strongly recommends the plane-table, with stadia measurements. Chap. VI, on general suggestions, outlines the scope of an investigation, and proceeds to discuss the personal equation of a geologist; his advice here is to collect data carefully and systematically and then to digest them at leisure. He does not believe in working under forced draught. Chap. VII, on interpretation of geological data, sets forth the problem that has to be solved by every engineer engaged to pass on the value of a mining property, and the next chapter illustrates methods of solving fault problems graphically.

Chap. IX is a verbatim reprint of the paper by J. W. Roe on the application of descriptive geometry to mining problems, and is a valuable section of the book. Chaps. X and XI review the leading theories of ore deposition and secondary enrichment, quoting the authorities, but the author gives a very practical bearing to the discussion by postulating a number of cases of ore occurrence, and then deducing the probable behavior of the several deposits at depth. These chapters form a most valuable exposition of this puzzling subject. Chap. XII classifies the rocks and gives a concise table by which to assign the proper name to any ordinary rock, relying only on its visible characteristics. Chap. XIII contains valuable hints on the equipment necessary for a geological survey, and includes a paper by S. K. Bradford describing methods by which an engineer in a desolate locality can make assays, roughly but with sufficient accuracy for his immediate needs, with materials which can be carried in a suit-case. Chap. XIV discusses the features of outcrops, and XV the methods of recording drill-hole data.

Of the guide to the recognition of common or important minerals, by A. J. Moses, it is only necessary to say that it is of the same high order of excellence as the same author's more extended treatise on mineralogy. By means of the scheme of classification it is possible to identify any ordinary rock-forming or ore-forming mineral by nothing else than its hardness, its color, and the color of its streak. As a further aid in doubtful cases, a set of 50 simple blowpipe tests is tabulated, the appropriate ones for each mineral being indicated. These require no elaborate paraphernalia.

The book is nicely printed and conveniently bound. As is often the case with first editions, a few typographical errors slipped past the proofreaders. For example, the "interruption" of geological data, on page x of the table of contents, and two flannel "skirts" along with socks and trousers (p. 203) as part of the equipment for a geological expedition.

HIGH EXPLOSIVES. By W. R. Quinan. 5x7, pp. 210., illus., cloth; 21s. Critchley Parker, Melbourne, Australia.

This book contains an excellent treatment of a practical matter in a scientific manner. Its author, while at West Point, distinguished himself in physics and mathematics, and this book, which was written shortly before his death in 1910, proves that his talents for close reasoning and mathematical demonstration never diminished during a long period actively devoted to the practical management of explosives works in California and South Africa. The book says nothing about the manufacture of explosives, nor even mentions the composition of more than half a dozen of them. It is confined strictly to a discussion of the physics involved in explosions, and here the author reviews the experiments and theories of his predecessors and colleagues, criticising their fallacies and praising their merits with impartiality and discernment.

Among the topics discussed are the velocity of detonation (a review of an important paper on that subject by A. M. Comey), the peculiarities of modern dynamite and gelatine, theory of explosive energy, available energy and useful work of an explosive, strength (or pressure) developed by explosives, theories of explosion and of dissociation, detonation of gaseous mixtures, dissociation of explosives (taking nitrogylcerine as an example).

Only here and there, and then mainly as incidental to the discussion, appear hints helpful to the ordinary user of explosives. Yet the book cannot be said to be lacking in practical value; its suggestions need only to be translated from the language of mathematics to that of the mining camp. Had the author been spared a little longer he doubtless would have rounded out his book with a chapter or two having this aim. In its appearance, the book is marred by a good many printer's errors, transposed or missing lines, etc., and in the mathematical portions especially the composition is below the standard set by the best bookmakers.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

V. H. Hughes has been appointed assistant state geologist of Missouri.

R. Hay Anderson left London, Sept. 11, for New York on his return to Mexico.

B. Hochschild, president of the American Metal Co., has returned from Europe.

P. Jensen, general manager of the Simau mines, Lebong Tandai, Sumatra, is visiting the United States.

W. R. Bolley has been appointed superintendent of the Baltic copper mine, in Michigan. The position is a new one.

Prof. George W. Schneider, of the Colorado School of Mines, has been examining mining property in Clear Creek County.

William F. Deaner has resigned the position of superintendent of the Original Amador mine, at Amador City, Calif., and has gone to Utah.

Hugh Park is in charge of operations of the Nipissing Mining Co., Ltd., of Cobalt, Ont., during the absence of the manager, R. B. Watson.

William J. Priestly, Jr., has resigned as superintendent of the Rhodes Hall mine, Fairbanks, Alaska, and has gone to Brigham City, Utah.

E. M. Hamilton is at Cobalt, Ont. He will assist in the final preparations and also in the initial run of the new mill of the Nipissing company.

E. W. Beidler, of Cleveland, Ohio, was recently in Cobalt, Ont., looking over the Alexandra mine, on Diabase Mountain, which will probably be reopened.

W. D. Waltman is now general manager of the Franco-Wyoming Oil Co., and vice-president of the Natrona Pipe Line & Refining Co. Address, Caspar, Wyoming.

W. L. Fleming, of New York, is visiting the Cobalt district, in Ontario, looking into the latest developments with a view of ascertaining the continuation of ore at depth.

W. Ray Cox is leaving the Doe Run Lead Co. at Flat River, Mo. He has been appointed mineral inspector for the General Land Office, with headquarters in San Francisco.

R. B. Watson, manager for the Nipissing Mining Co., Ltd., of Cobalt, Ont., is in Germany taking the baths in an effort to relieve himself of rheumatism, from which he suffers.

William Schwanhauser, chief engineer of the International Steam Pump Co., has returned to New York from a three months' trip to Europe, visiting England, Germany and Russia.

John F. Soares, electrical engineer, has resigned from the employ of the Yuba Construction Co., and has gone to Europe to engage with H. C. Peake in the construction of gold dredges.

Bernard McDonald was a recent visitor at Cobalt, Ont. He left on Sept. 7 for New York, whence he will return to Los Angeles, Calif., where he is making his home during the unsettled conditions in Mexico.

Harry G. Peake, a former superintendent with the Yuba Construction Co., and now chief engineer and part owner of the Union Construction Co., of San Francisco, is in Europe engaged in dredge construction.

W. J. McGee, general manager of the Lincoln Consolidated mines, which include the Lincoln and the Wildman-Mahoney, at Sutter Creek, Calif., has returned from a trip to Canada and to several cities of the United States.

S. R. Heakes, a mining engineer and one time manager of the Kerr Lake mine at Cobalt, Ont., was ordained a member of the Anglican clergy, at London, Ont., Aug. 25. Mr. Heakes will serve as curate of the Cronyn Memorial Church of London.

Walter Douglas, who was reported captured in Sonora, escaped through the rebel lines south of Cabullona Sept. 11, and arrived at Agua Prieta safely. With a companion he fled on a railroad motor velocipede, which the two men had to carry past two bridges destroyed by the insurrectos.

B. Magnus, general manager of the Electrolytic Refining Co., at Port Kembla, Australia, has been appointed general manager of the Mount Morgan Gold Mining Co., at Mount Morgan, Queensland. He will also continue to supervise the operations at the Electrolytic Refining Co.'s works.

A dinner, in remembrance of Edmond Fremy, the great French chemist, was given at the Union League Club, New York, Sept. 11, by his students and friends—August Aulard, Gabriel Bertrand, Leon Bourgeois, Louis Bartheleny, Emile Gaillard, Victor Watleyne and George F. Kunz. A number of delegates to the International Congress of Applied Chemistry were present. The vegetables, salads and chicken served were supplied from Mr. Kunz's farm.

OBITUARY

John Barry died at Los Angeles, Calif., Aug. 4. He had been engaged in mining in the Southwest for many years, and was one of the pioneer prospectors and miners in Mohave County, Arizona.

John Livingston Grandin died at Battle Creek, Mich., Sept. 11, aged 76 years. He was born and brought up at Tideout, Penn., and was one of the earliest operators in the Pennsylvania oilfield. He drilled the first oil well in the Warren County district.

J. W. Skeele died at his home in Madison, N. J., Sept. 17. He had had a wide experience in the anthracite trade and was one of the best known men in that trade. For a number of years he was connected with the Philadelphia & Reading Coal & Iron Co., and about 1892 he went to Coxe Brothers & Co. When that concern was consolidated with the Lehigh Valley, Mr. Skeele became a director of the Lehigh Valley Coal Co. and afterward its vice-president. When the business was reorganized recently, he became president of the Lehigh Valley Coal Sales Co., which took over the selling and marketing end. Few men were as well posted on the history and conditions of the anthracite industry.

George W. McClure died at Pittsburgh, Sept. 4, aged 76 years. He was head of the contracting firm of G. W. McClure, Son & Co., largely engaged in blast-furnace and steel-mill construction. He was born in Pittsburgh, received his early education in the public schools and when 22 years old became a contractor. His first work in the blast-furnace line was with the firm of Lyons & Schaub, in the Allegheny mountains. Later he built blast furnaces for John H. Schoenberger and James Wood, pioneers in the iron industry. Mr. McClure kept himself informed on all improvements pertaining to the manufacture of iron and steel, and was instrumental in bringing into use a number of changes in blast-furnace construction which are now being used all over this and other countries. He had extensive experience with the different methods of heating air for blast-furnace practice from the old system of cast-iron pipe stoves down to the present method of heating air through fire-brick hot blast stoves.

Societies and Technical Schools

American Mining Congress—The fifteenth annual meeting has been called, to be held at Spokane, Wash., Nov. 25-28. The annual meeting of members of the incorporation will be held Nov. 26. The general convention will be composed of the regular members of the American Mining Congress, together with all duly accredited delegates who are appointed under the authority hereby extended for the appointment of delegates as follows: The President may appoint ten delegates at large; Chief Executives of foreign nations 10; governors of states and territories 10 delegates; mayors of cities and towns, two, and one additional delegate for each 100,000 population; boards of county commissioners, or supervisors, two; boards of trade, two; chambers of commerce, two; mining bureaus and exchanges, two; mining organizations, two; scientific societies, two; engineers' associations, two; state mining schools, two delegates each.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Sept. 10—The new steel No. 10 dredge of the Natomas Consolidated of California is expected to be placed on the trial run in the present week. With the hanging of the bucket line the dredge will be ready for actual trial operation. The actual field construction work, which consisted of laying the hull, was begun in April this year, making a total of five months for construction. Considering that the design and construction of this dredge is in many respects a wide departure from the practice that has heretofore obtained, the work has been carried on with unusual expedition. It is true that the Yuba Construction Co. has had large practice in the construction of placer-gold dredges, and the unusual advantage of being directly connected with the W. P. Hammon interests as a part of the combination of dredge builders and operators. The success of the Yuba Construction Co. and of the Union Iron Works Co. which are the leading gold-dredge builders in California, is due to the careful organization and the selection of engineers and other workmen. There are two conditions which Mr. Hammon seems to have insisted upon, at least tentatively, in the conduct of the construction department of the interests he established. One affects the labor employed, the other, more directly perhaps, the engineering department and the supervision of field construction. The provision for the sustenance of the men in the construction camps is not surpassed in any camp in California, and is probably unequaled in most camps both in this state and elsewhere. The result is that both the skilled and the unskilled labor is above the average in accomplishment. The more important condition applies to the engineering department. It has apparently been the practice of the company to not only advance men in position, but what appears to be of equal importance is the practice of keeping men of experience continually in the employment of the company. The departure of the Hammon interests from the wooden hull and gantrys to the all-steel construction was evidently advanced by the destruction of the wooden hull and other wooden parts of No. 8 dredge by fire. But the expedition with which the steel construction in No. 8 and No. 10 have advanced is due very largely, if not wholly, to the fact that the company has in its employ men trained to this class of work.

The Weaverville board of trade will ask the government to apply to the construction of a 10-mile road down Trinity River from North Fork to Big Bar $20,000 of the $27,000 appropriated for roads and trails in the Trinity national forest. By this diversion of that amount of the appropriation a connection will be made between Trinity and Humboldt counties which will become a part of a proposed highway on which about $200,000 of state and county money has already been expended. Humboldt County agrees to do its share toward such a highway. This road would be of great benefit to the mining industry in both counties.

Denver

Sept. 13—The American Mining Congress was organized in Denver 15 years ago and eight years ago when in session at Portland, Ore., it was decided to make Denver its permanent home. At that time Salt Lake City tried hard to get it, and offered $50,000 and two central city lots as an inducement. At the November convention in Spokane, Wash., Salt Lake City will make another effort to capture the permanent headquarters. If Denver wants to hold it, the least it could do would be to meet the original Salt Lake City offer and build a home for the congress in this city. After Denver has made the American Mining Congress into the powerful institution that it is, it would be most regrettable if its home were moved elsewhere, but it looks as if this city would have to do something in order to hold it.

Denver mining-machinery manufacturers say the sale of their products has been greater during the last few months, than for many years. This is attributed largely to the steady advance in the price of silver and other metals. The strangest occurrence, however, is that Eastern and foreign bankers who formerly were afraid to have their names associated with the mineral industry, are now becoming interested in high-class gold and silver producers in this state. Three syndicates of Eastern bankers now have their agents and engineers here conducting negotiations and examinations.

The Rothbert Steel & Iron Co. was organized in Denver in June and announces that it is ready to erect a plant for the manufacture of its product, and that if the chamber of commerce will give the company assistance it will build a plant here having a capacity of 20 tons per day, costing $150,000. The company would manufacture high-grade steel from titaniferous magnetite, of which there is an abundance in this state.

Butte

Sept. 11—Several officials of the American Smelting & Refining Co., have been visiting the East Helena smeltery with a view to enlarging the plant and making it one of the principal smelteries of the company. The party consisted of Karl Eilers, of the New York office, and Walter T. Page, manager of the plant at Omaha, both of the executive committee, and J. C. Redmond, of the New York office. Accompanied by Frank M. Smith, manager of the East Helena plant, they left for the Cœur d'Alene district in Idaho Sept. 8 and will continue on to the coast from there.

With the remodeling of the main hoisting engine of the principal mines of the Anaconda company, for the use of air in the place of steam, the company also made efforts to operate the chippy, or auxiliary hoisting engines, in the same manner. With the large hoist it was found necessary to greatly enlarge the cylinders, but it was believed that the smaller hoists could be operated with the same cylinders used for steam. This was tried at two or three of the properties, but it was discovered to be unsatisfactory for the most part, and at length a number of engines, especially constructed for the use of compressed air, were ordered from the Nordberg company. The cylinders of these new engines are 28x48 in. inside, the diameter of the cylinder being much larger in proportion to the length of the stroke than is the case with steam, due to the fact that the air pressure is from 15 to 35 lb. less than steam pressure. The engines are built to hoist from a depth of 2800 ft. One of these has been installed at the Tramway mine, and was started Sept. 7. Another is being put in place at the Diamond mine, and as fast as they arrive from the factory they will be installed at the High Ore, Mountain View, Leonard, Pennsylvania, and others of the company mines. The Pennsylvania mine is still closed down, but preparations for hoisting with compressed air have been nearly completed, and the mine will be reopened in a few days. The shaft is being sunk, three compartments wide, and has now reached a place below the 1900-ft. level. A station will be cut on the 2000-ft. level and exploration work started at that depth.

Salt Lake City

Sept. 12—At a meeting of mining men held at the Commercial Club Aug. 2, the advisability of forming an organization to look after the mining interests of the state was considered and discussed. The question as to whether it would be better to act through the American Mining Congress or to have a separate organization was brought up and a special committee appointed to find out the sentiment of mine owners and operators throughout the state. This committee polled the state by postal vote, and found the preponderance of opinion for an independent organization, working in conjunction if possible with the American Mining Congress. A call has been issued for a general meeting of mine owners and operators to be held at the Commercial Club Sept. 14 for the purpose of completing the plans for the organization of an Independent Association to handle matters of importance to the mining industry. This organization is to be composed especially of metal mining men. The need of such an organization became evident when the tariff on lead and zinc was reduced in the Underwood bill in the last session of Congress. Utah lead operators were assured that unless they could demonstrate to the satisfaction of Congress that their industry required protection, basing their contention on actual statistics of production, costs, etc., the tariff would be reduced. A further need for concerted action was shown in the necessity for securing a more favorable interpretation of the mining laws by the Department of the Interior in the matter of locating and patenting mining claims, as illustrated in the East Tintic Consolidated case. Another matter to be looked into is the present taxation system of the state, whereby mining companies are more rigidly taxed than any other Utah industrial companies. The mining, milling, and smelting industry is the most important in the state, and has been without means of concerted action to protect its interests. The association to be formed is expressly for this purpose.

Isolated coal fields in Uintah and Wasatch Counties are described in *Bull.* 471-L. of the U. S. Geological Survey. The Deep Creek district of the Vernal coal field is of an area of approximately 25 square miles, and is on the south slope of the Uintah Mountains, west of Green River. The nearest railroad station is Dragon, distant 100 miles by wagon road. It is estimated that this field contains 49,000,000 tons of coal. The Blacktail Mountain coal field in Wasatch County is about 35 miles west of the Deep Creek district and away from railroad lines. It can be reached from Park City or Heber, a distance of about 50 miles. The coal beds occur in two groups. The higher in the Mesaverde formation, which contains at least 21 coal beds in a stratagraphic distance of 1650 ft. The lower group is in the Mancos shale, 3500 ft. below the upper group, and contains four known coal beds in a distance of 250 ft. There is estimated to be 1,857,600,000 tons. The development of the field depends on the settlement of the Uintah basin, and the extension of railroads to that part of the state. The coal in both fields is bituminous.

Negaunee, Mich.

Sept. 13—Preparations are being made to re-open the Michigan gold mine situated five miles northwest of Ishpeming and one mile north of North Lake. The property, consisting of 260 acres of land with a small mining equipment and mill, is owned by the Michigan Quartz Silica Co. of Milwaukee in which several Ishpeming men are interested. An option to purchase 40 acres and the equipment for $22,500 has been given to another company for which Morgan Wright, of Marquette, late geologist for the Vermilion Land & Iron Co., is superintendent; $2500 was paid for the option to explore, which will expire in one year. It is planned to thoroughly test the 40-acre tract under option which has been opened up by three exploratory shafts of which the deepest is about 100 ft. deep. The property was formerly operated for quartz which is the sales product of the Michigan Quartz Silica Co., but it was found that similar material could be obtained nearer Milwaukee, and the plant was closed down. Small quantities of gold have been recovered from the Michigan mine at various times. It is situated in the same periodotite belt as the old Ropes gold mine three miles to the northeast, which produced $650,000 between 1882 and 1897.

Kingman, Ariz

Sept. 12—M. W. Musgrove, who is promoting the project for a dam and power plant on the Colorado River, north of Kingman, has again gone to New York to confer with the men whom he has interested in his plans. Mr. Culbertson, the consulting engineer for the proposed company which has the project under consideration, is also *en route* to New York. It is stated that the data collected by him upon his recent trip from Pierce's Ferry to Needles will enable him to present the undertaking in a favorable light. The magnitude of the venture will, of course, necessitate exhaustive consideration of all conditions attendant upon the construction of the proposed plant, the present chief apparent difficulty being the damming of a stream with the characteristics of the Colorado. The present need of cheaper power in the adjacent district and the rapid development of the district even under existing conditions, however, gives promise of ample reward to men who have the initiative and nerve necessary to carry the project to completion.

The affairs of the late O. & C. Development Co. were wound up in Kingman recently by the sale of the Buick truck which was seized under attachment by several local creditors. The failure was chiefly due to lack of a sufficiently intelligent preliminary examination of the property and the consequent requisition of an insufficient amount of funds to place the project upon a self-supporting basis.

Toronto

Sept. 13—The first of the prospectors who went to look for diamonds in the vicinity of James Bay has returned without finding any stones. A sample of diamond matrix was, however, brought back and the geological conditions are said to be favorable for the discovery of diamonds. This party was in the precise locality where a number of stones were reported to have been found a year ago. The country is a difficult one to get into, and the discouraging results of this first party will tend to damp the ardor of other prospectors.

Cobalt

Sept. 13—A small rush has taken place to Auld township which lies a comparatively short distance from Cobalt and is reached by boats on the Montreal River. Several silver finds of importance are reported to have been made and active mining operations will be started shortly.

Gowganda is flourishing and can claim three producing mines, with several prospects that are well worthy of development. The most noticeable increase in activity has, however, been in Cobalt. No less than 27 properties having been reopened during the year and negotiations are under way for the reöpening of several others. The high price of silver and the continued prosperity of the Cobalt mines, is answerable for this activity.

Porcupine

Sept. 13—One of the most disturbing factors that the Porcupine operators have to face at present, is the shortage of labor. Despite the fact that wages paid in this district are as high or higher than the average in western camps, the supply of labor is entirely inadequate. So pronounced has it become that some of the larger companies are sending scouts between Cochrane and North Bay to find more men. It is probable, however, that this condition will right itself during the next two or three months. Outside of the operating mines, there is little work going on in the vicinity of Porcupine, and many of the men have drifted to other parts. The western harvests have drawn a considerable number, and in addition there is much railway construction going on.

The Mining News

The Current History of Mining

Alaska

KETCHIKAN DISTRICT

Polson and Ickus will resume the development of their copper-gold prospect on the north arm of Mallard Bay, Prince of Wales Island.

The London men who bonded the Martin Buggy gold property, near Smugglers' Cove last spring, have driven two tunnels to intersect the orebody. They are now enlarging the camp, in order to continue development with a larger force.

The Lhote and Sanford property adjoins the Victory on the south and in it five oreshoots, from 5 to 14 ft. wide, have been developed. The ore contains principally copper with a fair quantity of gold and a little silver. Development work consists of 420 ft. of tunnel, a 70-ft. shaft and surface stripping. An unusual feature of this property is an occurrence of barite, which, from present development, appears to be of sufficient size and purity to become of commercial value.

Gold Stream—A 5-stamp mill has just been put in operation on this property, on Gravina Island, three miles from Ketchikan; A. A. Wakefield, manager.

Lon De Van—A 2040-ft. crosscut was driven to cut the vein at a depth of 1000 ft. and about midway between the two best surface showings. The vein was found within 4 ft. of its assumed position, and is 24 ft. wide at that place. Driving has been done for a distance of 1021 ft. along the vein, which is 4 to 24 ft. wide. The ore so far found will require concentration. The ore contains gold, silver, lead and zinc. E. F. Moore is superintendent.

It—This property will resume shipments. Mining and development work is in progress. The long tunnel started last year is being continued. J. C. Barber is engineer in charge.

Moonshine—This is a silver-lead property upon which much work has been done. It is on Cholmondeley Sound, on the east coast of Prince of Wales Island. Some development work is now in progress. It is the intention of the owners to place the property on a shipping basis during the next year. W. W. Catlin is manager.

Copper Mountain—The Duluth men, who now control this property, on the west side of Prince of Wales Island, and which was formerly owned by the Alaska Copper Co., have had their engineer on the property since last January. Surveying and surface prospecting has been done. It is understood that the results have been satisfactory; that the wharf and other structures will now be repaired, and that further development of the property will be undertaken. R. L. Kilpatrick is the engineer in charge.

Alaska Industrial Co.—This property, which continued its shipments during the panic of 1907, is still a regular producer. Charles A. Sulzer is manager.

Arizona

GILA COUNTY

Inspiration Consolidated—The extension of the main line of the Arizona Eastern R.R. from Miami up Keystone and Live Oak gulches to the Inspiration tunnel and the Live Oak mine was started last week. There was 4900 ft. of underground development work done in August and the rate is increasing.

South Live Oak—Churn-drill hole No. 3, reported to be in commercial ore, is 780 ft. deep.

Southwestern Miami—The enlargement of hole No. 8 to 6¼ in. size by underreaming has been finished and drilling will be resumed.

Irene—J. A. Fleming has taken a lease on this silver mine in Irene gulch, about two miles north of Globe. The group consists of nine claims and has silver-bearing veins in quartzite, diabase and limestone. The mine was a producer of high-grade silver ore in the early "eighties."

Iron Cap—The company has just shipped a car of oxidized copper ore to the Old Dominion smeltery. Another car is now being loaded. The ore is coming from the shoot recently opened on the 650-ft. level. Drifting continues east on the ore at this level and a drift has just been started east on the 800-ft. level to cut the same shoot. There are 12 men employed. F. A. Woodward is manager and H. W. Woodward, superintendent.

Arizona Commercial—The Copper Hill shaft is now completely re-timbered and enlarged to three compartments from the collar down to the fourth level, where a pump has been installed and is being operated by compressed air from the Old Dominion power house. The shaft and workings below that level are now being unwatered preparatory to re-timbering and enlarging the shaft below the 400-ft. level.

MOHAVE COUNTY

Tom Reed—The Lovin & Withers Co., of Kingman, has a contract for hauling two carloads of pipe from Kingman to Oatman, for a water line from one of the large springs in the mountains above the mine to the mill.

Union Basin Mining Co.—This company, operating the Golconda mine, reports that shipments of zinc ore last month totaled 1070 tons, which was more than 500 tons more than the amount shipped during August, 1911. It is expected that the shipments will soon average 1400 tons per month, as the company is positive of the ability of the mine to produce that quantity. At present, there is some lack of facilities for freighting the ore from the mine to the railroad, at Mineral Station. The main shaft has reached a depth of 420 ft. and the tunnel through the Prosperity claim, which is intended to make connection with the shaft, will probably be under the shaft within a month. From this place a raise of about 70 ft. will have to be made to reach the shaft.

Frisco—The regular fortnightly bar of bullion, valued at about $7000, was recently received in Kingman. The company is reported to be milling ore which averages about $12 per ton with an ultimate extraction of nearly 90% of the gold.

De la Fontaine—Lead and zinc ore is being freighted from this mine, on Stockton Hill, to Berry, for shipment to the smeltery. The present shipment will amount to about 100 tons.

Distaff—Charles E. Sherman, of Chloride, has leased this mine to men who are now working the property. A winze has been sunk 100 ft. from the adit level and drifts are being driven on the vein, from the bottom of this winze. It is reported that in 30 ft. of the winze, 15 tons of rich ore was recovered.

SANTA CRUZ COUNTY

R. R. R.—A winze is being sunk on the vein and is now 90 ft. below the tunnel level, and a drift has been started at a place 60 ft. below that level. The sinking of the 375-ft., two-compartment shaft will be continued to the tunnel level, a distance of about 600 ft. Six machine-drills and 70 men are employed. W. S. Sultan, superintendent.

Bradford—The Copper Queen company, after an examination by its engineers and by Walter Douglas, the general manager, has taken over this mine belonging to the Ferry estate. The property is three miles west of the R. R. R. mine and one mile west of the Amster spur at Bioxton. About one car of copper-carbonate ore is being shipped each week.

Chief—This group of claims, owned by Bracy Curtis, president of the First National Bank of Nogales, William Powers and others, has been bonded to El Tigre men, and a 500-ft. crosscut tunnel has been started. The claims are 1½ miles northeast of the R. R. R. mine and adjoin the Worlds Fair mine owned by Frank Powers. The ore carries copper, lead and zinc.

California

Alpine County

Curtz Consolidated Mines Co.—It is reported that the company has secured control of water rights, stamp mill and concentrators, and that an electric power and lighting plant will be installed. Three shifts are employed, and the miners are accepting 50% of their wages in stock of the company. George Hauschild, of Hayward, is president.

Amador County

Plymouth Consolidated—The Pacific shaft is unwatered to below the 1200-ft. level. The lower workings contain comparatively little water. The shaft is 1650 ft. deep.

Zeila—The winze, being sunk near the end of the north drift on the 1500-ft. level, is showing ore that, from appearances, is of better grade than has been milled. It is being tested by mill runs. W. T. Detert, manager.

Mountain King—The deposit in this claim, at Pine Grove, is 3 ft. wide and has been disclosed for a length of 15 ft. and a depth of 15 ft. The ore is sorted and only the rich free-gold streaks are crushed in the hand battery. This discovery has attracted prospectors to the East belt, and good prospects are reported.

Reward—The mill has been idle for lack of water. Crammer brothers, owners.

Stud Horse—The mill will again be placed in commission as soon as there is sufficient water.

Butte County

W. J. Organ, 85 years old, recently relocated a claim on the middle fork of Feather River, which he originally located in 1850. It is in the Berry district, where some promising prospects have lately been found.

An appropriation of 49,000,000 miner's inches of water in the middle fork of Feather River has been filed with the county recorder by F. G. Ebey and others. The purpose is to generate electricity for mining power.

Poodle Dog—A rich streak of ore is reported to have been found at this mine, near Hurlton. Biggs brothers, of Oroville, are owners.

Calaveras County

Hardy-McCreight—The unwatering and cleaning out of the tunnel and winze of this mine, formerly known as the Hardy, on Chaparrel Hill, near the Tulloch mine, is nearing completion. A 50-gal. bucket is used. James Maltman and son, of 331 Bush St., San Francisco, have a purchase bond. The mine is said to have produced about $60,000 in the early days. Hobart and Lane once owned and operated it. The tunnel is 150 ft. long, the winze 110 ft. deep. The tunnel has been cleaned and retimbered and car tracks laid. The mine has been idle for 15 years.

South Carolina—The 10-stamp mill is nearing completion. John J. Pierano, of Carson Hill, is superintendent.

Dolling—A shoot of ore has been disclosed in the winze to a depth of about 20 ft. Good ore is also found in the west drift. D. G. Overall, of Angels, is superintendent.

Lightner—The shaft has been deepened to 1000 ft. A fair quality of ore has been disclosed in the 900-ft. level. The shaft will be sunk to the 1200-ft. level, where another drift will be driven. B. C. Clark, of Angels, superintendent.

Eldorado County

Bright Hope Mining Co.—A 12-ft. lode has been exposed in the 80-ft. shaft. The tunnel, which is expected to tap the vein at a depth of 215 ft., is in 700 ft. J. N. Lawson, of Georgetown, is president.

Nonpareil Mining Co.—E. H. Callahan, of San Francisco, one of the owners of the Virner mine, is making preparations to reopen this property.

Fresno County

Peacock—This is a new location of a copper prospect, on the west side of Copper Creek, which flows southward into Kings River cañon. Gold and silver also have been found. Charles A. Ryan, of Fresno, locator.

Coalinga-Mohawk—The well is producing 1000 bbl. of 30° oil, which is reported to be contracted to the Standard at 60c. per bbl. The well is only 400 ft. deep.

Humboldt County

A tungsten deposit is reported to have been discovered at Horse Mountain, by D. W. Stapp, of Eureka. Development will be undertaken.

Red Cap—The installation of machinery is about completed at this mine, 30 miles north of Hoopa. The installation consists of a 1500-ft. aërial tramway from the main orebin to the 10-ton Gardner crusher. The mill and concentrators are driven by water power. Earl Swan, C. W. Hayden and others, of Scotia, are owners.

Horse Mountain Copper Mining Co.—It is understood that this company will take over the Ruby Copper property of 33 claims on Horse Mountain, that was acquired by David Wilson, general manager for the company.

San Bernardino County

Desert Mining Co.—This company is operating the Edie placer property, seven miles southeast of Kramer, by the Macartney method of dry washing.

Siskiyou County

Reeves-Davis—The season cleanup has been made. One pipe will be kept working to pipe off the overburden until the rainy season. The flume is being repaired, which work will occupy about two months. The mine is near Happy Camp.

Tuolumne County

Green—A pump, engine and boiler, to be installed at this mine, near Confidence, have been received at the Sonora depot of the Sierra Ry. Active development will immediately follow the installation. John Ryan and associates are the owners.

Climax—Work is expected to be commenced soon by N. T. Nelson, of Los Angeles, who has a purchase option.

Colorado

Clear Creek County

Oneida—The foundations for the new 50-ton cyanide plant are under construction. The mill building and the cyanide equipment will be furnished by the Hendrie & Bolthoff Manufacturing and Supply Co., of Denver. Sufficient ore has been developed in the property and careful tests have been made to justify the erection of the mill. John Owen and H. T. Rogers, of Idaho Springs, are the owners and managers.

Hoosac—Excavations are now being made for the foundations of the new 10-stamp amalgamating mill. The plant will be erected near the portal of the Hoosac tunnel at Fall River station on the Colorado & Southern Ry. The mill will be supplied and built by McFarlane & Co., of Central City, and will have a capacity of 50 tons per day. The Hoosac properties are being developed under the local management of H. C. Perks.

Millington—This property, near Lawson, has been reopened and is being developed and operated by lessees. Small shipments are being made. The ore contains gold, silver and lead.

Independent—This mining and leasing company has a five-year lease on the properties of the North American

Smelter & Mines Co. which include the Donaldson, Centurian, Magalona, Kelly, Harrison and others. These properties are south of Clear Creek and along Trail Creek and Spring Gulch. Extensive development work has been undertaken, some of which is resulting in shipments of ore. From the main Donaldson level west from the Rockford tunnel a 500-ft. shaft is being sunk and is now 100 ft. deep. This shaft has opened a vein of gold ore. At present two Leyner drills and four Waugh stopers are in use. Other equipment will be added. Twenty five men are employed. The company has a well equipped power house on Clear Creek and a convenient railroad loading station. John Larson, of Idaho Springs, is president and manager.

Lake County—Leadville

New Monarch Mining Co.—From the Cleveland and Winnie claims of this company the production during August was 101 cars of medium-grade ore. Manager Watson says it is his intention to resume work in the New Monarch shaft and prospect therefrom in virgin territory. He is employing 80 men.

Penn—The output from the shafts on Breece Hill is 60 tons daily of good-grade ore. Manager Joseph Lamphier states that the output has been largely curtailed by the great influx of surface water, but this is now drying up and he expects to ship 100 tons daily from now on.

Boston Group—Manager Evans, of this group of claims at the head of Mayflower gulch in the Ten Mile mining district, reports the opening of ore rich in lead and carrying gold and silver. The work is done through a tunnel driven into Gold Hill and this is said to be one of the biggest strikes ever made in the district. The property is owned by Smith & Templeton, of Chicago and New York.

Eureka Mining Co.—In August this company shipped 26 cars of second-class silver-lead ore from the new strike in the Columbine shaft. Several cars of first-class ore were also shipped.

Siwatch Tunnel—About 4000 ft. from the portal a vein of silver-bearing iron sulphide was recently opened 700 ft. below the surface.

San Juan Region

Red Mountain Railroad Mining & Smelting Co.—The properties of this company in a receiver's hands for the last year were sold at the court house, Ouray, this week to J. F. Thompson, of Long Beach, Calif., for $175,000.

Black Bear—The entire property of this company, including mines, mills, tramways, reservoirs and water rights, is to be offered at sheriff's sale at Telluride, Sept. 30, to satisfy judgments amounting to $100,000.

Primos Chemical Co.—The miners' bunkhouse on this company's properties on Bear Creek was completely destroyed Sept. 6, by fire.

Tomboy—During August the mill was in operation 28 days, crushing 9500 tons of ore, which yielded $33,500 in bullion and $57,000 in concentrates, a total of $90,500. The operating expenses for the period were $46,500, and the expenditures on permanent improvements, $10,345.

Wanakah Mining Co.—During July the mill was in operation 29½ days, crushing 1246 tons of ore. The concentrates produced were worth $19,472, and 213 tons of ore were shipped, worth $4552. The total income for the month was $24,024, and the total operating expenses were $7288; the operating profit was $16,736.

Teller County-Cripple Creek

Henry Adney Estate—A strike of ore yielding 6 oz. gold per ton without sorting, is reported in the Little Bessie claim on Beacon Hill.

El Paso Consolidated Gold Mines Co.—The par value of the stock has been increased from $1 to $5 per share, the total number of shares reduced from 2,500,000 to 500,000 and the offices of the company authorized to list the shares on the New York Stock Exchange. At a meeting of the directors, a dividend of 10c. per share was declared on the new stock payable Oct. 31, a total for the quarter of $45,000 as 50,000 shares are still in the treasury. With this dividend the dividends paid will total $1,597,295 and for the current year $159,250. The cash balance to date is $150,000. Net mill returns for July and August average $45,000 each month.

Mary Cashen—A 30-hp electric hoist has been installed. An extensive plan of development has been outlined.

Pharmacist—The output for August by F. Matha, lessee, was three carloads of mill ore from a new shoot lately opened.

Union Leasing Co.—Twenty-four carloads of mill ore were shipped in August; 11 cars from the Gold Sovereign on Bull Hill and 13 from the Gold Dollar on Beacon Hill. The company has been mining in the district for 10 years.

Free Coinage—The output for August from the Pinto shaft was 21 carloads of mill ore. There are 15 sets of lessees working on the property.

Joe Dandy—James H. Peabody, lessee on this mine on Raven Hill, shipped in August 800 tons of ore, most of which came from the 550 level.

Elkton—The August output was 3000 tons of a bullion value of about $50,000.

Mary McKinney—The output for August was 40 carloads, most of which came from the ninth level where the shoot has been developed for 600 ft. in length. The company is paying dividends regularly.

C. K. & N.—From this mine, on Beacon Hill, the output for August was 25 carloads.

Idaho

Bonner County

Idaho Continental—Construction work was begun recently on the new mill of this company, near Porthill.

Idaho County

Mill-site grading is under way on the property of Hazlett & Trader, in the Dixie district.

Snowstorm—Besides considerable surface prospecting work, a tunnel has been driven for 60 ft. on the vein, on this group of quartz claims, near the Center Star, on the south fork of Clearwater River. Leslie Belor is owner.

Center Star—In the face of the tunnel the vein is as wide as the excavation. The tunnel is 500 ft. long and the face is 300 ft. below the surface. Messrs. Murphy, Brown and Tiedman are the owners.

Crooked River Placer Mines Co.—This company, owning placer claims on Crooked River, and the south fork of Clearwater River, will soon begin hydraulicking. A small force of men has been employed in repairing the ditch since last May.

Penn-Dixie—The mill is about ready to be placed in commission. The equipment includes a 4-stamp mill, 30-hp. boiler and engine, two concentrators and cyanide equipment. Provision has been made for the installation of six more stamps. S. R. Gayton, Dixie, is manager.

Majestic—At these mines, near Dixie, machine drills are being used in driving tunnels, the rate of progress being about 21 ft. per week.

Oversight—Development work has resulted in the discovery of rich ore on this property, owned by Robinson & Cox.

Michigan

Copper

Calumet & Hecla—Shaft No. 18, the most northernly shaft on the Osceola lode, is developing good ground; drifts have been extended from the second and sixth levels to the Centennial boundary line and stoping has been done.

Indiana—This company continues sinking its shaft at the rate of about 60 ft. per month; the shaft is about 1075 ft. deep, the objective point being the felsite formation that was revealed in the drill cores at a depth of about 1400 feet.

New Arcadian—This company has moved a complete surface equipment from the old workings to the site of the new shaft and everything is in readiness for sinking. The shaft is about 100 ft. deep.

Lake—Lateral openings are being extended at all the levels on the main lode below the fifth and on the so called east lode, which is about 150 ft. from the main lode at a place between the third and eighth levels. Shipments of about 400 tons are being made to the mill.

Wolverine—Production so far has surpassed that of last month and barring some unforseen delays, that of September will surpass that of August in all respects. The management gives the conservative life of the property at from 15 to 20 years more, and the property has the record of being the cheapest producer on the Lake.

Ojibway—Sinking is being done at No. 1 shaft at a depth of about 2050 ft., but no laterals have been started below the 17th level. Shaft No. 2 is bottomed at the 1900-ft. level. At No. 2 shaft the only work underway is a crosscut being driven from the 16th level, and which will reach the lode within a few days. At No. 1 shaft the drifts on the 16th and 17th levels are developing good ground.

Iron

Republic Iron & Steel Co.—Diamond drilling is still in progress at the Sherwood property north of Iron River held under option by this company; Cole and McDonald are doing the work.

Chatham—Excavation has been begun for a new change house close to the old building; there will be a main portion 70x34 ft. with two wings one 28x12 ft. and one 26x15 ft., and will have 300 lockers for a proposed force of 150 men, one locker for underground clothes and one for street clothes, for each man. It will be a frame structure with galvanized-iron sheeting. The old change house has accommodations for 60 men. Shipments are being made from the stockpile; 50,000 tons will have been shipped from the pile by the end of the season.

Davidson—At shaft No. 1 a new 400-ft. trestle has been finished. The new change house is nearing completion.

Chicagon Lake—In this district of the Iron River field, an option has been taken on the northwest quarter of Sec. 35, 43-34, by men of Ely, Minn. Hane brothers and Edward Sjoquist own the mineral right. On the northeast quarter of the same section, ore formation was proved several years ago at the Gleason exploration. The nearest operating mine is the Chicagon one mile north.

Caspian—A new, modern office building is being completed at this mine in the Palatka district.

Rogers—At this Rogers-Brown mine in the Iron River district, all the new steel and brick buildings except the change-house are completed and the machinery is being installed.

American—The building for the new concentrating plant is being completed. Operations are being delayed by failure of the machinery to arrive on specified time.

Minnesota

MESABI RANGE

Ore is now being shipped from a new state mine in Sec. 17, 58-19, in the Buhl district. The mine is a small one. Drifting from the shaft is in progress under the direction of A. B. Coates.

Ore shipments from Two Harbors continue heavy, the shipments for the year to date being; April, 32,245 tons; May, 1,117,689 tons; June, 1,431,206; July, 1,600,091; August, 1,578,220; a total of 5,759,451 tons. The shipments for the same period during 1911 were 3,687,608 tons, which shows that thus far this season's shipments have been almost double those of last year.

Euclid—The ore remaining in this mine, which was closed down on account of iron-ore prices several months ago, will be cleaned up and shipped.

Scranton—The output from this state mine will be between 250,000 and 300,000 tons for the 1912 season. This is the first year that the mine has been on the list of shippers.

VERMILION RANGE

Consolidated Vermilion Extension Mining Co.—The mine of this company is now producing a fine quality of iron ore. The shaft is practically free from water, only 250 gal. per min. being required of the pump. The blocking out of ore is progressing rapidly and the company expects that by spring the railway will have finished a 4-mile spur into the property. The plant is well supplied with modern machinery and as the ore is of the same quality as that at Ely, mining will be comparatively easy as compared to the Soudan mine, which is now being operated on a comparatively small scale.

Missouri

JOPLIN DISTRICT

Thomas H. Walker has struck rich ore at a depth of 178 ft. on a 40-acre lease in the northern part of Webb City. A mill will be built as soon as a shaft can be sunk.

Granby Mining & Smelting Co.—Cuttings of lead ore are being found at a depth of 137 ft. in the drill holes being put down by this company to the southeast of Duenweg.

Betsey Jane—This mill of 150-tons capacity at Thoms Station will be given a trial run in the near future. Work underground has been suspended pending the erection of a hoister derrick.

Sheridan-Adams Royalty Syndicate—This syndicate has acquired title to a 330-acre tract known as the Snapp land. This land is leased on a royalty basis, the producers being the Cherokee Mining Company, the Little Minister, Foster, and Ortt & Coats. Other leases are being developed and will soon be producing.

Eldorado—This lease southwest of Joplin is being equipped with hand jigs. The jigging is being done by contract for $4 per ton of concentrates.

Montana

BUTTE DISTRICT

Alex Scott—During August about 7000 tons of ore was shipped to the East Butte smeltery. The mine has been closed for a short time for the purpose of replacing the cylinders on the hoisting engine, and after this is completed the output will be increased. Development work is being done on the 600-ft. level. Mining in recent months has been confined to the 1600- and 1700-ft. levels, the ore on the 1800-ft. level being held in reserve.

Butte & Superior—Recent changes made in the mill have caused numerous shutdowns, and an intermittent output of concentrates. The working of the mill is fast being perfected however, and it is expected that by the end of September half of the mill will be running smoothly, and within the next few months it will be in condition to treat more than 1000 tons of ore per day. Various experiments toward the further perfection of minor details of the oil-flotation process are still being made, and the Peterson electric smelting process is being used on certain ores. It is not probable that this method will be used to a great extent, at least in the near future, as the present process is proving to be as satisfactory as can be expected. In regard to the Butte-Milwaukee claims, in which the company has a controlling interest and other adjoining property on which it holds options, amounting in all to approximately 300 acres, the intention is to thoroughly develop the entire section.

Butte Northern—Recently, while driving a tunnel along the vein on its property north of the Butte & Bacorn mine, this company cut a vein of commercial ore at a depth of 60 ft. A new compressor and more adequate machinery may be installed for the exploration of this orebody.

LINCOLN COUNTY

Snowshoe—This property, near Libby, which went into the hands of a receiver some time ago, has been opened again by receiver William Jennison, who has placed Robert C. Davis, of Butte, in charge. A shaft had been sunk to the 500-ft. level and stoping done on the 300-, and 400-ft. levels; also a tunnel had been driven a short distance into the property. Mr. Davis has reopened the stope on the 300- and 400-ft. levels and cut a station on the 500-ft. level, preliminary to development work at that depth. The old concentrator has been repaired, and about 125 tons of ore is now being concentrated daily.

Nevada

Comstock Lode

Mexican—Alterations to the mill have been completed and it is now running full time. Last week, 393 tons of ore was treated of a gross head sample value of $10,000, the apparent extraction being 94%. The ore recovery from the mine for the week was 308 tons of a gross assay value of $8100.

Union Consolidated—A special report on mine conditions was made to the directors of the company last week by the superintendent, Whitman Symmes, in which he advocates the opening, as soon as possible, of two new levels on the 2650- and 2800-ft. levels. It is proposed to sink the joint Sierra Nevada and Union winze, now down to the 2676-ft. level, to the 2800-ft. level, for it is believed that the opportunity is greater to uncover orebodies at greater depth than above the 2500 level. Brief reference is made to the geological features of the Mexican orebody and their relation to the Union Consolidated's possibilities in the way of ore discoveries.

Ward Shaft—A meeting of the United Comstock Pumping Association was held last week, at which time it was voted to proffer the use of the shaft and its present equipment to the Gold Hill mines, the latter to pay the operating costs. The north end and middle group of mines desire to direct their support to the pumping installations and operations now taking place at the C. & C. shaft.

Comstock-Phoenix—Another shipment of high-grade ore stoped from the 400 level was made to a California smeltery last week. This is the second shipment of the month.

Crown Point—Operations have been resumed on the 1400-ft. level and stoping of low-grade ore is underway. An incline winze has been started from the sill floor of No. 1 stope.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Sept. 7, are as follows:

Mines	Week	Year to Date
Tonopah Mining	2,900	119,719
Tonopah Belmont	3,365	82,307
Montana-Tonopah	1,072	37,164
Tonopah Extension	1,055	35,688
West End	853	26,307
Midway		420
MacNamara	458	12,760
North Star	.....	130
Mizpah Extension	.....	40
Jim Butler	300	1,000
Totals	10,003	315,535
Estimated value	$250,075	......

An important transaction has just been closed by the sale of the Little Tonopah group of 23 patented claims for the sum of $250,000 to John G. Kirchen and Key Pitman, of Tonopah, and Frank A. Keith and Seeley W. Mudd, of Los Angeles. It is understood that the property will be divided and two companies formed to develop the ground on which a shaft has been sunk to a depth of 600 feet.

New Mexico

Socorro County

Socorro Mines—Contract to break ore has been let on a portion of the Consolidated mine, on the Queen vein; the ore will be treated in the Socorro mill. The crusher at the mill is being moved to the shaft and the ore will be transported to bins by belt conveyor, eliminating the elevated tramway. Development faces in the lower levels are being advanced in good ore and a large body has been opened up above 200 level east.

Deadwood Mines—The mill ran continuously in August, treating 1700 tons of ore. A large amount of development was done.

Oaks Co.—During August, 461 tons of ore of an average value of $17 per ton was shipped to the mills from the development of the Pacific and Johnson mines.

Deep Down—Lessees are sinking the shaft in good-grade ore.

Mogollon Gold & Copper Co.—Thirty men are employed at the Little Charlie mine, the ore being sent to the Deadwood custom mill.

Utah

Juab County

Tintic shipments for the week ended Sept. 6 amounted to 227 cars, which is four cars behind the record of 231 made the second week in August.

Victoria Consolidated—This company is considering new power equipment, and it is likely that the machinery will be installed at an early date.

Colorado—Prospecting at depth from the Crown Point has not shown any results, and this company is now looking for the Beck Tunnel orebody within Colorado lines. Shipments of about 80 tons weekly are being made from the stopes between the 200- and 300-ft. levels, and a tunnel is being driven in the northern part of the property to cut the vein near the surface under prominent outcroppings.

Iron Blossom—This company is said to be considering building a concentrating plant to handle low-grade ores. Experiments on the ore have been made.

Piute County

Bully Boy & Webster—The new mill is treating up to 40 tons daily. The amount treated is somewhat restricted at present, owing in part to low water. A good saving is reported on some of the ore, but part of it will require further treatment by cyaniding, and it is stated that a plant for this work will be in operation in the near future.

Salt Lake County

Ohio Copper—It is stated that out of the 1,260,000 shares all but 80,000 have been turned in with the first half of the $1 assessment. The third unit of the mill is now being tried out.

Utah Apex—Two directors of this company, Bradley and Horne, died during this month, and a reorganization of the board is soon to take place.

Summit County

Park City shipments for the week ended Sept. 7 amounted to 3,251,840 lb. During August 7020 tons of ore was shipped, including beside the usual shippers, the Grasselli company, Ontario lease, the McKenzie, Briggs, Anderson, and Lowrie leases, the Little Bell, and Barry-Coxe.

Tooele County

Bullion Coalition Mines—The main drain tunnel is being extended. This level gives about 1800 ft. on the dip of some of the mineral bearing fissures. Oreshoots have been opened for 125 ft. on the strike, and the ore is five or six feet wide in places. The best ore carries from $20 to $25 in lead, silver, and gold. Work is being done on company account on the 600-ft. level, and by several sets of lessees above this ground. Shipments are being made.

Utah County

Among the properties worked throughout the summer in American Fork cañon are the Miller Hill, Blue Rock or Pacific, Mary Ellen, Globe, Dutchman and Yankee. Of these the Dutchman, Miller Hill, and Pacific are making shipments of silver-lead ore. The Pacific is jigging some of its second-class dumps, and is shipping concentrates, beside the regular straight shipping ore.

Union Chief—As soon as this company in the Santaquin district can secure more teams for ore hauling, shipments will be increased.

Washington

Ferry County

Imperator-Quilp—This company recently re-leased the Quilp mine, and has taken over another property in the same vicinity. It is the intention to start operations at once.

International Gold Mining Co.—A contract has been let by this Orient company for sinking a shaft on the Big Bend claim.

International—A shaft is being sunk to the 125-ft. level at this mine, and other improvements are contemplated. Walter Bryant, Orient, has charge of the work.

San Poil—The ore from this property in the Republic district is now being treated entirely in its own cyanide mill, the first cleanup recently yielding about $5000 in gold and silver.

Michigan Mining & Milling Co.—An electric power plant will be installed at the Gwynn mine of this company, at Orient.

Beecher—This mine, near Orient, which has been closed for several years on account of litigation, will, it is reported, be reopened.

Wisconsin

PLATTVILLE DISTRICT

Wisconsin Zinc Co.—This company has leased the Funk farm of 196 acres just north of the city limits. Some development was done on the property five years ago by the Columbia Lead & Zinc Co.

Sunrise—The lease and mining equipment have been purchased by the Mineral Point Zinc Co. The property is three miles north of Rewey on the Rundell farm and has been a steady producer for the last 10 years.

Scrabble Creek—The top of the main pitch was reached at the depth of 140 ft., carrying a solid sheet of lead and zinc ore 16 in. thick. The property adjoins the Cleveland mine at Hazel Green and is operated by the Vinegar Hill Zinc Co. A 100-ton mill will be built at once.

Wyoming

ALBANY COUNTY

Platinum Mining & Milling Co.—Shipments of high-grade gold-copper-platinum-palladium ore are now being made from the Rambler mine operated by this company. A concentration mill of 50 tons daily capacity is being built to treat the low-grade ore. A new shoot of high-grade ore was recently opened, from which the present shipments are being made.

Commercial Gold Mining Co.—This property, one mile west of Centennial, is being developed by a tunnel which is now 500 ft. long, and from which 200 ft. of crosscut has been driven. This property was formerly known as the Old Centennial. The vein was lost at a fault and the work now being done is to find the faulted portion. The equipment consists of an 8-hp. gasoline engine, pneum-electric drill, dynamo, electric lights, etc. Bernard Holtum is general manager, and while but a few men are now employed, the company expects to increase its working force during this month.

Wyoming Mineral Development Co.—This company, capitalized at $300,000, has a 60-day option on the Victoria and Free Gold groups of claim. Free-milling gold ore is said to outcrop for a long distance over the two groups of claims. W. G. Emerson, formerly of Grand Encampment, is promoting the company.

Canada

BRITISH COLUMBIA

Granby Consolidated—During August, 109,105 tons of ore was shipped from the mines in 29 working days, a daily average of 3760 tons. Development work consisted of 632 ft. raising, 378 ft. drifting, 6 ft. sinking, and 1337 ft. of diamond drilling. At the smeltery 2082 tons of foreign and 109,355 tons of company ore was treated.

ONTARIO

Canadian Ta'c & Silica Co.—This company, of which H. Hungerford, of Chicago, is president, which owns a talc mine and mill at Eldorado, Ont., has purchased a talc property near Madoc, from J. H. Curley and may erect a mill.

Bewick-Moreing—This syndicate, though it has withdrawn from the Porcupine camp, has no intention of abandoning the Canadian field. It is organizing a system for the investigation of new mining districts with a view to investment and will remove the Canadian office, from Montreal to Toronto.

ONTARIO-CABALT

Shipments of ore and concentrates, in tons, from Cobalt for the month of August were, according to Arthur A. Cole, mining engineer for the Timiskaming & Northern Ontario Ry.:

Beaver	63 82
Buffalo	92 10
Casey Cobalt	
City of Cobalt	75 49
Cobalt Lake	121 50
Cobalt Townsite	216 65
Chamb.-Ferland	32 00
Conagas	207 94
Crown Reserve	47 49
Drummond	
Hudson Bay	62 80
Kerr Lake	105 78
La Rose	342.37
Lost and Found	
McKinley-[illegible]	168 52
Nipissing	228 61
O'Brien	
Penn.-Canadian	29 69
Provincial	
Right of Way	30 61
Timiskaming	62 85
Trethewey	70 35
Wettlaufer	
Colonial	21.55
Totals	1980 12

La Rose—An open cut is being made and the noted "silver sidewalk" of the Lawson property is being removed. This vein showing about two feet of high-grade ore has been well stoped out.

Cobalt-Townsite—The royalties payable by this company to the Timiskaming & Northern Ontario Ry. commission have been reduced from 25% of the gross earnings to 15% of the net earnings.

Miller Lake-O'Brien—Good discoveries have recently been made at this mine in the Montreal River district. A winze sunk 45 ft. below the 250-ft. level is in good ore all the way. This level has been opened up for 250 ft. with good ore in both faces, and a cross-vein has been developed for 150 ft. The mine has this year shipped two carloads of high-grade ore, nothing of a lower quality than 4000-oz. ore being sent out.

ONTARIO—PORCUPINE

Plenaurum—The crosscut connecting the shafts on opposite sides of Pearl Lake will be finished shortly. When completed, the veins cut under the lake will be opened.

Krist—A promising vein has been uncovered on the surface.

Dane Copper Co.—A shipment of 60 tons of high-grade copper ore has been made to the smeltery at Chrome, N. J.

Mexico

MEXICO

El Oro Mining & Railway Co.—During August the mill was in operation 30 days, treating 20,280 tons of ore, and 15,300 tons of tailings, from which $167,320 was recovered as bullion. The working expenses were $94,610 and the expenditures on development $22,650, a total of $117,260. The railway profit was $7830, making the total profit $61,890. The expenditures on permanent mine improvements amounted to $2810.

SAN LUIS POTOSI

Tiro General—The standard-gage track of the Central de Potosi R.R. is now in operation between Charcas and the mine, and daily shipments of 300 to 400 tons of ore are being made. S. F. Shaw is superintendent.

SONORA

Four C Co.—A six-compartment shaft has been started at the Capote property. It will be used for the development of a large shoot of ore recently struck. Ore bins are being built to take care of the output of the new shaft.

Calumet & Sonora—The work of raising the main working shaft from the 525 to the 400-ft. level has been completed. The property is shipping an average of 300 tons of zinc and copper concentrate and about 50 tons of lead concentrate per month.

Cananea-Boston—This company has started a new 1½-compartment shaft. It is being sunk at the intersection of the Democratia and Norton veins. The old shaft had to be abandoned on account of the flow of water. It is not expected that such a flow will be encountered in the new shaft.

Democratia—Work has been resumed at this property and it is probable that the old smeltery will be blown in. There is one furnace at the plant with a daily capacity of 125 tons.

Montezuma-Arizpe—This company, operating a mine about 10 miles from Cananea, is now operating its 10-stamp mill and is shipping concentrate to the smeltery.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Sept. 18—Coal trade in the West is active and strong almost everywhere, with prices firm and advancing. The same condition prevails in the seaboard bituminous trade, which is in better shape than for a long time past, both as to demand and prices.

The West Virginia coal operators have declined the offer of the governor of the state to arbitrate the differences with the miners. The operators are determined to prevent the organization of the state by the United Mine Workers, if possible.

The shadow on the coal market is the probable shortage of cars. Complaints are already being made of car scarcity and slow movement of coal.

Anthracite trade continues very active and the companies are rushing work at the collieries to keep up with their orders.

Coal passing through Sault Ste. Marie Canals season to Sept. 1, short tons:

	1911	1912	Changes
Anthracite........ .	1,226,515	926,926	D. 299,589
Bituminous	8,116,034	8,063,094	D. 52,940
Total..........	9,342,549	8,990,020	D. 352,529

The anthracite trade has not yet caught up with that of last year. The bituminous shipments are also a little below.

Austrian Coal—Coal production of Austria, half-year ended June 30, metric tons:

	1911	1912	Changes
Coal	7,217,717	7,718,574	I. 500,857
Brown coal	12,593,732	12,747,064	I. 153,332
Total mined .	19,811,449	20,465,638	I. 654,189
Coke made	1,026,242	1,115,571	I. 89,329
Briquettes made.	173,395	199,181	I. 25,786

Of the briquettes reported this year, 116,138 tons were made from brown coal or lignite.

IRON TRADE REVIEW

New York, Sept. 18—The iron and steel markets are this week practically a repetition of several weeks past. Specifications on contracts continue heavy enough to keep all the mills busy, and new orders are not lacking. Advances in prices seem to be suspended for the time being, except in pig iron.

The finished-steel market has not shown the increase in activity which usually comes with September. Conditions are, if anything, quieter than in July and August, but the showing is not entirely unfavorable, for those months were abnormally active. There is reason to conclude, however, that the steel industry is not necessarily marked for an unending increase in prices and activity. While the pressure for early deliveries is greater, if anything, the tendency to buy for farther forward delivery does not increase. There is really very little buying for the new year. Formal announcement was made during the past week by the Republic Iron & Steel Co. that its price on merchant steel bars for first quarter is 1.35c., its price having been 1.30c. for this year; and it is understood that other mills, while they have not made formal announcements, have assumed the same attitude. There is, however, very little buying for that delivery.

The pig-iron market has been strong, with a general disposition among furnaces to advance prices on all new business. Foundry iron has been in demand; basic is also taken, with many new inquiries; while quite a business in bessemer iron has gone to the furnaces. Advances of 25 or 50c. per ton have been frequent. Southern iron has had the call on foundry business.

Mills using billets and blooms are finding trouble in getting their crude steel. Production is not up to the requirements, and mills are behind in deliveries to a serious extent.

Alabama Iron Rates—The Interstate Commerce Commission will about Oct. 28 hear the complaint of Southern iron manufacturers, who ask a lower freight rate on iron and kindred products to the Ohio gateway points. The matter was to have been taken up this week but William Wimbish, attorney for the iron manufacturers, is ill and for this and other reasons a postponement was taken. Consumers and others in the Middle West join with the Southern iron manufacturers in making the complaint and are pushing the matter. With a reduction in freight rates to the Ohio river gateways, it is claimed the manufacturers in the South would be able to dispose of large quantities of iron, the competition of Northern and Western manufacturers notwithstanding. Five of the pig-iron manufacturers of the Central West and North put in an intervention in the case and will assist the railroads in opposing the request of the Southern furnaces. The intervention puts forth the claim that the Southern furnace companies have their ores, limestone and coke right at hand, while the furnace companies complaining have to haul their ores long distances, their cost of production being greater than that of the Southern furnaces.

Baltimore

Sept. 16—Exports for the week included 637,800 lb. iron pipe to Antwerp; 100,300 lb. galvanized pipe and 35,068 lb. galvanized sheets to Hamburg. Imports included 711 tons ferromanganese from Liverpool; 250 tons manganese ore from Rotterdam; 5550 tons manganese ore from Poti, Russia; 3436 tons pyrites from Huelva, Spain; 11,450 tons iron ore from Cuba.

Birmingham

Sept. 16—Selling freely and on an advancing market, the Southern pig-iron manufacturers acknowledge a strong market. There is need for all the iron that can be produced and the output will be increased just as soon as furnaces can be gotten into shape. Many sales of iron have been made on a basis of $13 per ton, No. 2 foundry, while some business has been transacted at $13.50 per ton, No. 2 foundry. It is believed that before the end of the month $14 will be reached. By the end of the year the prediction is made that $15 will be the price. Some of the companies in this section, including the largest, are behind in deliveries and consumers have been asking other iron manufacturers to help out. Some foreign business has again attracted attention and an estimate is made that in the last few weeks no less than 15,000 tons of iron were sold for export by Southern manufacturers, most of it to go to Italy. Inquiries are in hand for iron to be delivered on during the first half of next year. Coal cars are being used for deliveries of pig iron. The Sloss-Sheffield Steel & Iron Co. will have its furnace near Sheffield ready by the end of the month and within two weeks from that date the North Birmingham furnace, now under repairs, will be in readiness for operation. The Tennessee Co. by the end of the year will have another furnace at Ensley ready for operation.

The demand for steel products is also strong and there is a steady operation of the Tennessee Co. plants at Ensley and Bessemer and the Southern Iron & Steel Co.'s plant at Gadsden.

The Bessemer rolling mill is busy on steel shapes and angles.

Charcoal iron is in fairly good demand, while scrap is also needed. The foundries and machine shops, with labor troubles still on, are doing as nicely as could be expected.

Chicago

Sept. 17—Pig iron has been active in the last week and bids fair to continue in large demand for at least another seven days. Some of the larger users have been buying for first quarter and first half, in lots ranging up to 5000 tons each. The aggregate for the week is between 40,000 and 50,000 tons, a large record for this market.

Prices have advanced, No. 2 foundry now being held at $16.50@17 for Northern, at furnace, which means $17@17.50 delivered, and $13, Birmingham, or $17.35, Chicago, for Southern. The latter price is the minimum; some interests ask $13.50 on next year's deliveries and one is holding out for $14, Birmingham. Charcoal iron has also advanced, now selling at $17.75, Chicago.

The buying seems to be due to the general belief of melters that the upward tendency in the market is a lasting one, and that they can no longer rely on their policy of buying often in small lots. It fulfills the expectations of the furnace agents who for many weeks have been refusing to sell pig iron for 1913 delivery in any quantity, except at higher prices than have obtained for last-quarter deliveries. There is still some business done in last-quarter supplies, but this consists mostly of small lots, and prices on such lots run 25 or 50c. lower than for the first quarter or first half.

In nearly all lines, finished material continues to be in greater demand than supply, despite advancing prices. Railroad supplies and structural material are sought beyond the capacity of the mills for early delivery and the producers are yet reluctant to bind themselves for 1913 deliveries. Bars are in very large demand, both iron and steel; plates and sheets are strong.

Cleveland

Sept. 16—Some delay in ore shipments was caused last week by a strike of the laborers on the Allouez docks. This will reduce September shipments.

Pig Iron—Demand is good and prices are firm. The number of furnaces in a position to blow in is limited by the supplies of ore and coke. Quotations, Cleveland delivery, are $15.65@15.80 for bessemer; $15 for No. 2 foundry.

Finished Material—Demand continues active in nearly all lines. Mills are still hanging back on 1913 contracts. Bars have, however, been sold for first-quarter delivery. For most material for next year higher prices are asked than buyers want to pay.

Philadelphia

Sept. 18—The demand for pig iron has declined materially and inquiries for first-quarter delivery are not resulting in orders, owing to the strong prices asked and the indifference of makers as to business. A good deal of correspondence is in progress between prospective buyers and makers, relative to future dealings, but very little actual business can be reported during the week. Iron is held higher than a week ago and basic especially, is quoted at figures which are discouraging to business. Fortunately, most of the larger consumers are fairly well supplied by contract and can afford to remain out of the market for some little time. A number of foundry interests in the East would place orders at once if prices suited, but they are in a position to delay contracting for at least a month. The cast-iron pipe makers are out of the market, having work ahead pretty well covered by pig-iron contracts, most of them being placed with Southern iron makers. No. 2 X foundry is quoted at $16.75 as an outside figure; forge $16; basic $16.50, and low phosphorus $21.50 per ton.

Steel Billets—Openhearth billets are quoted at $25.90, forging billets $30 as a bottom price, with transactions for early delivery $2 higher.

Bars—Bar iron has slightly advanced and 1.45@1.47½c. is a bottom price with an upward tendency for early delivery. The mills are crowded to the limit for the present.

Sheets—Sheets have advanced in selling prices within a week and premium quotations are the rule.

Pipes and Tubes—The only business done this week has been for what is regarded as early delivery and at premium quotations in tubes. Merchant pipe is also strong and active.

Plates—Orders for steel plate have been unusually large, though most of the business has been in small lots ranging in delivery from one month from date to as late as next April. Inquiries for small lots are steadily increasing.

Structural Material—The week's business has fallen much below the average. The tone of the market is strong and premium prices are the rule with nominal quotations at 1.60c. Eastern makers are unable to accommodate Western buyers who have overtaxed Western mills.

Scrap—The scrap market has been quiet, owing to the diminution of stocks and the difficulty dealers are experiencing in obtaining material on standing orders.

Pittsburgh

Sept. 17—The local iron and steel market shows no material change from last week. Pig iron continues its progress toward higher prices, with moderate buying. Finished-steel prices show a stiffening here and there, but in general are unchanged. The rearrangement made by the National Tube Co. under date of Sept. 10 in merchant steel pipe and boiler tubes has been adopted by the independent producers. The mills are operating at slightly better advantage than in August, the weather being favorable, and all the available capacity being employed. Full production of steel for the balance of the year is practically assured.

Pig Iron—On light sales bessemer pig-iron has advanced 50c. to $15.50, Valley. Today two or three lots were sold at this figure, aggregating 500 tons or more, while firm bids for large tonnages at $15 have been promptly refused. Basic iron has not moved correspondingly. While the furnaces are quoting $14.50@14.75, Valley, there are no authenticated cases of regular sales at above $14. Sales aggregating 10,000 tons were made by one interest at the reported price of $14.50, furnace, but the furnace is outside the Valleys, and has a freight advantage of 50c. to certain consuming points. A sale of 3000 tons was made at $14.35, Valley, but this was for next year's delivery. It is reported that the Pittsburgh Steel Co. has bought about 40,000 tons of basic iron to be made at Josephine furnace and shipped over the balance of this year, at about $14, furnace, or a trifle less. Inquiry for foundry iron for next year has increased. On all grades the furnaces are asking somewhat more for next year's delivery than for the balance of this year. There are six idle merchant furnaces in the two valleys, and they are all watching the market closely, with the idea of getting into blast if slightly higher prices can be secured, and if they could sell freely at 25 or 50 cents above present market prices it is probable that most of these furnaces would immediately prepare to get into operation. We quote for this year's delivery: Bessemer, $15.50; basic, $14@14.50; malleable, $14.25@14.50; No. 2 foundry, $14.25@14.50; gray forge, $13.75@14, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The ferromanganese market has been fairly firm since the $3 advance of Sept. 9 to $56.50, Baltimore, but occasionally this price could be shaded a trifle on a small prompt lot. Consumers are believed to be fairly well covered for the next few months. We quote the market at $56.50 for contract and at $56@60 for prompt, f.o.b. Baltimore, freight to Pittsburgh being $1.95.

Steel—The scarcity of unfinished steel is still more pronounced, and fancy prices are frequently paid for early deliveries, although, of course, these do not exactly represent the market. The highest price paid on any sizable lot of unfinished steel is represented in the transaction of 1000 tons of small billets, which went at $27, delivered to consumer's mill, Pittsburgh district. The general position of the market is represented by prices quoted a week ago, though frequently higher prices must be paid to get material for early delivery: Bessemer billets, $23@23.50; bessemer sheet bars, $23.50@24;

openhearth billets, $24@24.50; openhearth sheet bars, $24.50@25; rods $25.50@26, f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—The market is strong at last week's advance, which amounted to $2 a ton in black sheets and $3 a ton in galvanized. The advance, as noted in last report, was started by the independent mills, but it is now understood that the leading interest is adhering to the advanced figures also. The mills are sold up practically for the balance of this year, on contract, and most of them have specifications on books for from five to ten weeks' of full operation. Blue annealed sheets are scarce and while no general advance has occurred some mills are quoting a $2 advance as their minimum. We quote: Black sheets, 28 gage, 2.15c.; galvanized, 28 gage, 3.30c.; blue annealed, 10 gage, 1.50@1.60c.; painted corrugated, 28 gage, 2.30@2.35c.; galvanized corrugated, 3.35c. for 28 gage.

St. Louis

Sept. 16—Prices on pig iron have stiffened up considerably during the week. Buying has been quite active. Southern No. 2 foundry at $12.50, Birmingham, is hard to locate—most of the producers are holding out for $13, Birmingham, or $16.75, St. Louis, and are asking a premium of 50c. per ton over these prices for second-quarter delivery. Northern iron is quiet, though prices have advanced, No. 2 being quoted at around $16.50, St. Louis.

Foundry coke is bringing about $5.40, **St. Louis.**

Iron Ore Trade

A block of Cuban ore, 35,000 tons from El Cuero mine in the Daiquiri district, is reported sold to an Eastern iron company for 1913 delivery.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie Canals in July was 10,781,304 short tons, being 34,145 tons more than in June. For the season up to Aug. 1 the total freight was, in short tons:

	1911	1912	Changes
East-bound.. ..	15,299,750	23,266,029	I. 7,966,273
West-bound.....	7,639,761	7,366,045	D. 273,716
Total...	22,939,511	30,632,074	I. 7,692,563

The number of vessel passages this year was 10,020, showing an average cargo of 3057 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal........	6,838,023	6,486,454	D. 351,569
Iron ore ..	13,412,646	20,248,973	I. 6,836,327
Pig and mfd. iron.	196,615	296,648	I. 100,033
Copper ...	55,860	46,938	D. 8,922
Building stone .	3,142	2,282	D. 860
Salt, bbl ..	303,043	362,286	I. 59,243

Iron ore was 66% of the total freight, and coal 21.1% this year.

Metal Markets

New York, Sept. 18—The metal markets have been fairly active and strong. Speculation in tin is again active in London.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
July 1912..	$ 7,263,624	$ 3,747,869	Exp. $3,515,755
" 1911..	2,178,088	2,594,653	Imp. 416,565
Year 1912..	40,660,460	29,012,211	Exp. 11,648,249
" 1911..	15,429,650	36,367,679	Imp. 20,938,029
Silver			
July 1912..	6,591,054	3,449,716	Exp. 3,141,338
" 1911..	5,275,008	3,920,794	Exp. 1,354,214
Year 1912..	40,260,276	28,713,965	Exp. 11,546,311
" 1911..	39,718,211	25,881,395	Exp. 13,836,816

Exports from the port of New York, week ended Sept. 14: Gold, $120,000; silver, $1,152,358, chiefly to London. Imports: Gold, $460,015; silver, $70,833, from the West Indies, Mexico and South America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. There was some gold taken for Turkey, some for Germany, and on Sept. 16 there was £750,000 taken for shipment to New York. More is expected to follow.

Iridium—Current price of iridium is $63@64 per oz., New York.

Platinum—Notwithstanding reports of an uncertain position, quotations hold steady, both here and abroad, and no change is reported. Dealers here ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

Silver—The price of silver has been well maintained. The impression prevails, that the India government will need more silver before it is through the present purchase movement.

SILVER AND STERLING EXCHANGE

September	12	13	14	16	17	18
New York....	62¾	62½	63	63	63¼	63¼
London. .	28$\frac{13}{16}$	28	29$\frac{1}{16}$	29$\frac{1}{16}$	29$\frac{3}{16}$	29$\frac{3}{16}$
Sterling Ex.	4.8570	4.8545	4.8565	4.8570	4.8575	4.8575

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 5, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India ...	£5,404,000	£6,418,700	I. £1,014,700
China	949,700	933,500	D. 16,200
Total	£6,353,700	£7,352,200	I. £998,500

Messrs. Samuel Montagu & Co. write from London, Sept. 5: "The Indian currency returns received on Sept. 3, reports a rise in the total of silver coin of 47 lakhs, and a fall in the total of gold of 10 lakhs. It is stated that the reserve holds 2 crores of silver in transit. The amount of silver required at the present price to provide a crore of rupees is about £450,000. The amount of silver bullion under coinage is described as 37½ lakhs compared with 7½ lakhs last week.

Copper, Tin, Lead and Zinc

NEW YORK

	Copper		Tin	Lead		Zinc	
September	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
12	17 @17¾	17.50 17.55	48¾	5.10	4.95 @5.00	7.40 @7.50	7.25 @7.35
13	17⅝ @17¾	17.45 17.50	49¼	5.10	4.95 @5.00	7.45 @7.50	7.30 @7.35
14	17⅝ @17¾	17.45 17.50	49⅝	5.10	4.95 @5.00	7.45 @7.50	7.30 @7.35
16	17⅝ @17¾	17.45 17.50	49⅝	5.10	4.95 @5.00	7.45 @7.55	7.30 @7.40
17	17⅝ @17¾	17.45 17.50	48½	5.10	4.95 @5.00	7.45 @7.55	7.35 @7.40
18	17⅝ @17¾	17.45 17.50	48¾	5.10	4.95 @5.00	7.45 @7.55	7.35 @7.45

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
12	78¼	79¼	84	223¾	220¾	22½	27
13	78$\frac{11}{16}$	79$\frac{3}{16}$	84½	224½	222	22½	27
14							
16	78$\frac{5}{16}$	79¼	84	226½	223½	22¾	27
17	78¼	79⅛	83¾	222	218¾	22¾	27
18	78$\frac{5}{16}$	78⅞	83½	224¼	221	22½	27¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper—The market has been relatively inactive, there being but little demand either from domestic consumers or from foreign. The abstention of the European buyers is creating some nervousness, it being feared that they overbought a little while ago to a greater extent than was estimated; also that possibly the European consumption may be falling off. However, sellers here have not yet shown any anxiety to dispose of their supplies, although several have a good deal of copper both for near-by and later deliveries that they would like to sell. Their attitude for the moment is to hold aloof and await developments. Several lots of electrolytic copper were sold during the week at 17.45c., cash, New York. If the pegged price of 17¾c., delivered, usual terms, is realized, it is for deliveries to Western points figured up to New York basis or for deliveries to points to which the freight is higher than the average. Business in Lake copper has been slack and the market for this kind is largely nominal. At the close Lake copper is quoted 17⅝@17¾c.; electrolytic in cakes, wirebars or ingots 17.45@17.50c., while casting copper is quoted nominally at 17.30@17.40c. as an average for the week.

The average price of electrolytic copper for the first half of September was 17.527 cents.

The London market has fluctuated within narrow limits, spot holding around £78 5s., and three months around £79 2s. 6d. At the close spot is quoted £78 6s. 3d., three months £78 7s. 6d. per ton.

Coppers sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6353 long tons. Our special correspondent gives the exports from Baltimore at 1407 tons for the week.

Constant increase in ocean-freight rates affects materially the net return on sales of copper to Europe.

According to telegraphic dispatches today, the miners of Bingham Cañon, Utah, upward of 4000 in number, have voted to strike for an increase in pay, especially to abolish, or reduce, the differential between the wages paid to men engaged in open work and those engaged in underground work.

Visible stocks of copper in Europe, Sept. 15, are reported as follows: Great Britain, 29,890; France, 8330; Rotterdam, 500; Hamburg, 3600; afloat from Chile, 2050; afloat from Australia, 5100; total, 49,470 long tons, or 110,812,800 lb. This is a decrease of 865 tons from the Aug. 31 report.

Tin—Early in our week, the market continued to display great strength and advanced from day to day, reaching almost 50c. on Sept. 16. The following day the London market declined about £4 10s., which was the first pronounced reaction after a continuous rise of almost £30 in about eight weeks, and the price here reacted to 48½ cents.

The statistical position of the article is a very strong one indeed, and it is believed that the market is likely to hold, if not go higher. At the close tin is quoted 48¾c. for September delivery.

The London market, on Sept. 12, closed at £223 5s. for spot and £220 5s. for three months. On Sept. 13 it advanced to £224 10s. and £222, for spot and three months, respectively. On Sept. 16 it went still higher, to £226 10s. for spot and £223 10s. for three months. During that day spot actually touched £227 10s., an unprecedentedly high figure. On Sept. 17, spot re-acted to £222, and three months to £218 15s., closing on Sept. 18 at £224 5s. for spot and £221 for three months.

Lead—The market is firm and a good business is doing at 5.10c., New York, and about 4.95@5c., St. Louis. Consumption is excellent, stocks are small and the article is in a very strong position.

The foreign market remains very firm and lead for near-by shipment is scarce. At the close Spanish lead is quoted £22 10s. and English lead 2s. 6d. higher.

Spelter—Consumption continues excellent, and there has been a fair business at advancing prices. However, the market has now reached a point at which foreign spelter can be imported at a profit. Importations have already taken place and further quantities are reported to be on the way. This has had the effect of bringing the Eastern market below the parity of St. Louis, and at the close St. Louis is quoted 7.35@7.45c.; New York, 7.45@7.55 cents.

The foreign market is very firm at £27 for good ordinaries and £27 5s. for specials.

Base price of zinc sheets was advanced 15c. on Sept. 12, and is now $8.90 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7⅜@7½c. per lb., New York.

Other Metals

Aluminum—Business is good and the market is firm. Quotations are 24¾@25c. for No. 1 ingots, New York.

Antimony—The market is again strong and active, and a good business has been done. Prices have advanced all around. Cookson's is quoted at 8¾c. per lb., and Hallett's at 8¼@8½c.; while 8⅛@8⅜c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

The International Nickel Co. has organized by the election of the same officers and directors who served on the old International Nickel Co., with the exception of William A. Bostwick, who was elected second vice-president in place of Capt. J. R. Delamar, resigned.

German Metal Trade

Imports and exports of metals other than iron and steel in the German Empire, six months ended June 30, were, in metric tons:

	Imports	Exports	Excess	
Copper	118,618	45,088	Imp.	73,530
Copper, 1911	98,826	40,546	Imp.	58,280
Tin	8,169	4,721	Imp.	3,448
Tin, 1911	6,779	5,033	Imp.	1,746
Lead	40,136	24,606	Imp.	15,530
Lead, 1911	43,287	21,556	Imp.	21,731
Zinc	24,261	57,472	Exp.	33,211
Zinc, 1911	25,580	63,584	Exp.	38,004
Nickel	911	1,328	Exp.	417
Nickel, 1911	1,673	1,083	Imp.	590
Aluminum	7,503	2,431	Imp.	5,072
Aluminum, '11	4,396	1,470	Imp.	2,926
Minor metals	827	8,399	Exp.	7,572
Minor, 1911	886	6,708	Exp.	5,822

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the three months were, in metric tons:

Ores:	Imports	Exports	Excess	
Gold ore	117	1	Imp.	116
Gold ore, 1911	104	1	Imp.	103
Silver ore	801	....	Imp.	801
Silver ore, '11	1,466	....	Imp.	1,466
Copper ore	12,669	10,935	Imp.	1,734
Copper ore, '11	9,805	11,118	Imp.	1,313
Tin ore	7,650	....	Imp.	7,650
Tin ore, 1911	8,608	....	Imp.	8,608
Lead ore	68,421	1,797	Imp.	66,624
Lead ore, 1911	58,427	1,851	Imp.	56,576
Zinc ore	122,459	19,206	Imp.	103,253
Zinc ore, 1911	121,076	26,252	Imp.	94,824
Nickel ore	10,249	....	Imp.	10,249
Nickel ore, '11	6,502	....	Imp.	6,502
Miscellaneous	14,413	3,091	Imp.	11,322
Miscellan's, '11	3,740	489	Imp.	3,251
Chrome ore	10,838	328	Imp.	10,510
Chrome ore, '11	4,301	546	Imp.	3,755
Pyrites	465,694	23,182	Imp.	442,512
Pyrites, 1911	376,655	4,243	Imp.	372,412

Miscellaneous includes ores of tungsten, molybdenum and other rare metals.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 14—The base price paid this week for 60% zinc ore ranged from $56 to $60. The base price paid for 80% lead ore was $63 per ton.

SHIPMENTS, WEEK ENDED SEPT. 14

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,217,810	....	716,200
Mineral Point	655,400	....	....
Platteville	563,460	54,440	66,000
Shullsburg	404,000	....	....
Highland	349,900	....	....
Hazel Green	250,000	....	....
Harker	179,430	....	....
Galena	151,200	....	....
Cuba City	69,520	....	....
Total	3,840,720	54,440	782,200
Year to date	144,920,870	5,991,860	24,889,730

Shipped during week to separating plants, 1,852,590 lb. zinc ore.

Joplin, Mo., Sept. 14—For this week's delivery the change in price is small from last week's settlement prices, but week-end offerings for next week's delivery advanced to $65, on a base per ton of 60% zinc ranging from $58 to $62. Zinc silicate sold at $30@31 per ton of 40% zinc. The average price, all grades of zinc, is $56.12. Lead sold up to $62, on a base of $60 per ton of 80% metal content. All prices are now based upon the metal content, dry weight, basis 80% metal, succeeding the old method of buying on a flat rate and docking for moisture and impurities. The average price, all grades of lead, is $59.14 per ton.

SHIPMENTS, WEEK ENDED SEPT. 14

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,448,450	. .	1,288,190	$193,925
Joplin	2,889,400	. ...	311,530	93,085
Duenweg	972,450	. ...	96,760	30,616
Alba-Neck....	977,290	. .	35,400	30,380
Oronogo . .	608,620	.	316,550	24,780
Miami. .	283,400	......	155,790	12,320
Galena.	297,700	. .	54,100	10,250
Cave Springs.	307,440			8,915
Jackson ..	83,430		180,450	7,745
Spurgeon	8,470	210,580	116,180	7,295
Carl Junction	190,440		18,480	6,450
Carthage ..	130,000	36,480	.	4,446
Wentworth...	131,020	46,970		4,371
Granby	......	199,320	27,260	4,300
Sarcoxie.	85,000		.	2,380
Aurora	.	124,290	.	2,235
Totals......	12,413,110	617,540	2,630,690	$443,493
37 weeks	388,146,940	23,702,110	66,603,090	$12,4[illegible]2,128

Blende val. the week, $354,916; 37 weeks, $10,[illegible],085
Calamine the week, 10,764; 37 weeks, 30[illegible],416
Lead value, the week, 77,813; 37 weeks, 1,86[illegible],427

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January...	$41 85	$44 90	$40 55	$43.54	$55 68	$58.92
February..	40 21	45 75	39 16	43 31	54 46	52.39
March. ...	39 85	51 56	38.45	49.25	54.57	54.64
April.......	38 88	52.00	37 47	50 36	56 37	54 18
May	38 25	55.30	36 79	53.27	55 21	52.45
June.........	40 50	55 88	38 18	54 38	56 49	55.01
July........	40 75	58 85	38 36	56 59	58 81	58 83
August....	42 50	55 13	41 28	53.27	60 74	57 04
September	42 63	.	41 29	.	59 33	.....
October....	42 38	..	40 86	.	54.72	.....
November.	45.40		43 27		57 19	.....
December	44.13	..	40 76	..	62 03	.....
Year.	$41.45		$39 90		$56.76	.....

Note—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Sept. 18—The general market is in good condition and fairly active.

Arsenic—The market is strong and rather excited. Spot supplies are very scarce and nothing can be had under $4.75@5 per 100 lb. German producers have cabled an asking price of $6 per 100 lb. A large American producer claims that the ores now treated are lower in arsenic than formerly, and that for some time past the main production has been from accumulated stocks of flue dust, which are now nearly exhausted.

Copper Sulphate—Business is fair. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is good and prices remain firm. Quotations are 2.52½c. per lb. for spot and September nitrate; 2.57½c. per lb. for October-January deliveries.

Phosphate Rock—The Interstate Commerce Commission, on Sept. 10, suspended until Jan. 11, proposed increases in the rates on phosphate rock in bags or barrels from Franklin and other producing points in Tennessee, to Baltimore, Philadelphia, New York and Boston. The increases average over $1 a ton.

Mining Stocks

New York, Sept. 18—On Sept. 12 there was a little more activity on the Exchange, though speculation is still limited by high rates for money. The Curb was dull and irregular, with only small trading in mining stocks.

Sept. 13 business on the Exchange was light and irregular, but prices were firmer at the close. On the Curb there was some dealing in coppers, but few price changes. Other mining stocks were dull.

Sept. 15 the Exchange was dull. On the Curb also there was little interest and light trading. The high rates for money still depress speculation.

Sept. 16 prices on the Exchange were firmer, on light business. The Curb was more active. Coppers were easier on fair trading, and other mining stocks generally firm.

Sept. 17 and 18 the Exchange was rather broader and more active, but irregular. Copper stocks were more active and were firm on the Curb, while other mining stocks showed increased sales and slightly better prices.

Boston, Sept. 17—Wolverine, by all odds, has been the feature of the local market the past week. It made a low price at $75.25, from which it has recovered to $81.50. This, notwithstanding the fact that the regular semi-annual dividend of $5 was declared about a week ago. Rumors of worked-out ground have been responsible for a good part of the selling. A report that Wolverine, Mayflower and Old Colony would be consolidated received no credence.

The mining-share market, after a period of dullness and weakness, again shows signs of regaining life, particularly the Cole-Ryan stocks. Calumet & Arizona has recovered $1.25 from the recent low to $80.50, and North Butte is up over $1 to $34.75. Hancock came in strong today with a $2 advance to $26.50, which is $2.75 from the recent low. Sales of Ahmeek are recorded at $350. The directors have declared a quarterly dividend of $6, payable Oct. 10. This company started with a $2 payment last fall and has increased its rate $1 each successive quarter.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments.	4,134,569	2,224,441	1,242,836
Anaconda	22,750,000	23,000,000	25,250,000
Arizona, Ltd.	[illegible]	3,200,000	3,260,000
Copper Queen	7,622,730	7,708,147	8,040,424
Calumet & Ariz. ..	4,160,000	4,748,000	4,514,000
Chino. ..	1,474,979	2,945,000	3,437,309
Detroit.... . ..	[illegible]	2,194,090	1,882,289
East Butte ...	..	......	1,410,500
Mammoth .. .	....	. .	....
Mason Valley.... ..	1,438,580	1,500,000	....
Nevada Con.	5,913,832	6,084,274	. . . .
Ohio ...	[illegible]	617,500	. . .
Old Dominion ..	2,130,000	... ..	2,620,000
Ray	3,004,195	2,985,965	2,888,095
Shannon . .	1,270,000	1,446,000	1,400,000
South Utah ..	162,335	142,555	224,855
United Verde* .	2,500,000	2,500,000	2,500,000
Utah Copper Co.	8,772,742	10,602,000	11,248,992
Lake Superior* ..	15,600,000	19,500,000	21,000,000
Non-rep. mines*...	8,300,000	8,970,000	8,970,000
Total production	..		
Imports, bars, etc..	24,262,292		.
Total blister.....	....		
Imp. in ore & matte	8,404,936		.
Total American..	....		
Miami† ..	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	[illegible]	1,026,006	
Granby	1,888,400	1,802,753	
Mexican Cos.:			
Boleo† . ..	1,851,920	2,386,480	.
Cananea ...	4,310,000	4,000,000	4,044,000
Moctezuma	3,176,819	3,094,016	3,229,839
Other Foreign:			
Cape Cop., S. Africa			
Kyshtim, Russia...	....	1,325,000	
Spassky, Russia...	[illegible]	[illegible]	
Famatina, Argen..	....		
Tilt Cove, Newf'd		.	
Exports from Chile ...	[illegible]	[illegible]	8,512,000
Australia	8,176,000	8,288,000	8,064,000
Arrivals in Europe‡	12,667,200	14,114,240	20,200,320

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.
‡ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VIII 1911. .	125,493,667	59,955,304	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI .	111,876,601	68,039,776	67,049,279
XII ..	122,896,697	65,988,474	79,238,716
Year .	1,431,938,338	709,611,605	754,902,233
I, 1912.........	119,337,753	62,343,901	80,167,904
II	[illegible]	56,228,368	63,148,096
III .	[illegible]	67,187,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII ..	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150

VISIBLE STOCKS

	United States	Europe	Total
IX, 1911........	133,441,501	191,228,800	324,670,301
X .	140,894,856	191,945,600	332,840,456
XI ..	134,997,642	176,825,600	311,823,242
XII .	111,785,188	164,281,600	276,066,788
I 1912 .	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III .	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V ..	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII .	[illegible]	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX .	46,701,374	113,568,000	160,269,374

Trading on the Curb has been of generous proportions. Alaska Gold has been the feature, although the price has settled to $8.62½. Smokey Development has come in for attention, advancing from under $2 to $3.50 per share.

Assessments

Company	Delinq	Sale	Amt
Andes, Nev	Sept. 26	Oct. 17	$ 05
Black Bear, Ida	Sept. 26	Oct. 26	0 01
Cedar Talisman, Utah	Sept. 14	Oct. 3	0 005
Columbus Extension, Utah	Sept. 30	Oct. 23	0 02½
Dalmatia Ida	Aug. 24	Sept. 21	0 002
Eagle Mt . Ida	Sept. 23	Oct. 23	0.005
Empire Ida	Sept. 23	Oct 23	0 002
Great Eastern, Ida	Sept. 28	Oct. 28	0 002½
Hale & Norcross, Nev.	Oct. 3	Oct. 24	0.05
Hilarity, Ida	Sept 5	Oct. 5	0.002
Little Butte, Ida	Sept. 21	Oct. 21	0.001
Mineral Hill Nev	Aug. 5	Oct. 5	0.01
New Hope, Ida	Sept. 3	Oct. 3	0.002
Ohio Copper, Utah	Aug. 28	......	0.50
Reindeer, Ida	Sept. 7	Oct. 5	0 003
Savage, Nev	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev.	Oct. 4	Oct 25	0 02
Sierra-Nevada, Nev	Sept. 25	Oct. 16	0.05
Snowshoe Ida	Sept. 30	Oct 30	0.005
Temple, Ida	Sept. 30	Oct. 31	0 002
Twin Star Ida	Aug 31	Sept 28	0 02
Wasatch, Utah	Sept. 27	Oct. 16	0 01

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	52.375	53 795	56 260	24 154	24 865	25 887
February	51 534	52 222	59 043	23 794	24 081	27 190
March	51.454	52.745	58.375	23 690	24 324	26.875
April	53 221	53 325	59 207	24 483	24 595	27.284
May	53 870	53.308	60 880	24 797	24 583	28 038
June	53 462	53 043	61 290	24 651	24 486	28 215
July	54 150	52 630	60 654	25 034	24 286	27.919
August	52 912	52.171	61 606	24 428	24 082	28.375
September	53.295	52.440	..	24 567	24 209	
October	55.490	53 340	..	25.596	24.594	
November	55.635	55 719		25.680	25.649	..
December	54.428	54 905	..	25.160	25.349	
Year	53 486	53.304	......	24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York Electrolytic 1911	New York Electrolytic 1912	New York Lake 1911	New York Lake 1912	London, Standard 1911	London, Standard 1912
January	12 295	14.094	12.680	14.337	55.600	62 760
February	12 256	14.084	12.611	14.329	54.974	62 893
March	12.139	14 698	12 447	14.868	54 704	65.884
April	12 019	15 741	12.275	15.930	54.034	70.294
May	11 989	16 031	12.214	16 245	54.313	72 352
June	12 385	17 234	12 611	17 443	56 365	78.259
July	12.463	17.190	12.720	17.353	56 673	76.636
August	12 405	17 498	12.634	17.644	56 266	78 670
September	12.201		12 508		55 253	
October	12 189		12 370		55.170	
November	12 616		12 769		57 253	
December	13 552		13 768		62 068	
Year	12.376		12.634		55 973	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	44 519
February	41 614	42 962	August	43 319	45 857
March	40 157	42.577	September	39 755	
April	42 185	43 923	October	41 185	
May	43 115	46 053	November	43 125	
June	44 606	45 815	December	44 635	
			Av. Year	42 281	..

Prices are in cents per pound

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	4 483	4.435	4 334	4.327	13 009	15 619
February	4 440	4.026	4 266	3 946	13 043	15 738
March	4 394	4.073	4 238	4 046	13 122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4 373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13 260	17 588
July	4 499	4 720	4 397	4 603	13 530	18 544
August	4 500	4 569	4 406	4 452	14 260	19 679
September	4 485	.	4 356	....	14 744	.
October	4 265		4 139	....	15 332	. .
November	4 298	....	4.181	......	15 821	
December	4.450	..	4 332	.....	15.648	.
Year	4.420	..	4 286	.....	13.970	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton

SPELTER

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	5 452	6.442	5 302	6.292	23.887	26 642
February	5 518	6.499	5 368	6 349	23 276	26 661
March	5 563	6.626	5 413	6.476	23 016	26.048
April	5 399	6.633	5 249	6 483	23 743	25 644
May	5 348	6.679	5.198	6 529	24 375	25 790
June	5 520	6.877	5 370	6 727	24 612	25 763
July	5 695	7.116	5 545	6 966	25.006	26 174
August	5 953	7.028	5 803	6 878	26 801	26 443
September	5 869	.	5 719		27 750	.
October	6.102	..	5.951	..	27 256	
November	6 380	.. .	6.223		26.795	
December	6.301	......	6.151	.	26.849	
Year	5 758	. . .	5.608	..	25.281	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No 2 Foundry 1911	No 2 Foundry 1912
January	$15 90	$15.12	$14.40	$13.32	$14 75	$14.00
February	15 90	15.03	14 50	13.28	14 81	14.01
March	15 90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13.90	15 00	14 15
May	15 90	15.14	14 30	13.90	14 72	14.12
June	15 90	15 15	14 06	14 11	14 56	14.22
July	15 90	15.15	14 03	14 38	14 53	14 38
August	15 90	15 43	14 00	14 90	14 47	14 85
September	15 90	......	13 57	.....	14 40	. ..
October	15.43	......	13.44		14 34	
November	14 92	..	13 30	....	14 25	.
December	15.15	. ....	13.10	.....	13.90	. . .
Year	$15 72		$13 94	.....	$14.49	... .

STOCK QUOTATIONS

COLO. SPRINGS Sept. 17 Name of Comp.	Bid.
Acacia	.04¾
Cripple Cr'k Con.	.02½
C K & N	18¾
Doctor Jack Pot.	.66¼
Elkton Con	.65¼
El Paso	1.14½
Findlay	.06
Gold Dollar	1.17½
Gold Sovereign	.02¼
Isabella	22¼
Jack Pot	.06¼
Jennie Sample	.07
Lexington	‡01
Moon Anchor	‡07
Old Gold	04
Mary McKinney.	71
Pharmacist.	.01
Portland	97
Vindicator.	85
Work	.01

SALT LAKE Sept. 17 Name of Comp	Bid
Beck Tunnel	08
Black Jack	08
Cedar Talisman	01
Colorado Mining.	.15½
Columbus Con	.02½
Crown Point	02¼
Daly-Judge	‡5 75
Grand Central	62
Iron Blossom	1 22½
Little Bell	‡ 30
Lower Mammoth.	07¼
Mason Valley	11.00
May Day	16¼
Nevada Hills	1 90
New York	‡ 03
Prince Con	1 65
Silver King Coal'n	2.85
Sioux Con	.04½
Uncle Sam.	.14
Yankee	‡ 11

TORONTO Sept. 17

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 50	Hollinger	12 25
Hudson Bay	‡65 00	Imperial	02
Temiskaming	40	Pearl Lake	10
Wettlaufer-Lor.	44	Porcu. Gold	21
Apex	02	Porcu. Tisdale	‡ 01
Central	‡5 56	Preston E D	01
Crown Chartered	05	Rea	25
Doble	‡ [illegible]	Standard.	‡ 005
Dome Exten	09	Swastika	05
Foley O'Brien.	.13	West Dome	.05

SAN FRANCISCO Sept. 17

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	05	Belmont	9.50
Belcher	.30	Jim Butler	70
Best & Belcher	04	MacNamara	.22
Caledonia	1.01	Midway	.55
Challenge Con	.07	Mont.-Tonopah	2.22½
Chollar	.04	North Star	.22
Confidence	.50	West End Con.	1.62½
Con. Virginia	41	Atlanta	.20
Crown Point	.30	Booth	.06
Gould & Curry	02	C.O.D. Con	.10
Hale & Norcross	07	Comb. Frac	.13
Mexican	2 85	Jumbo Extension	.33
Occidental	50	Pitts.-Silver Peak	.96
Ophir	.67	Silver Pick	.10
Overman	.60	St. Ives	.30
Potosi	.02	Tramp Con	‡ 04
Savage	03	Argonaut	‡2.50
Sierra Nevada	.09	Bunker Hill	‡4 50
Union Con	62	Central Eureka	30
Yellow Jacket	30	So. Eureka	‡2 90

N. Y EXCH Sept. 17 Name of Comp	Clg.
Amalgamated	88
Am. Agri. Chem	58⅜
Am.Sm.&Ref.,com	86
Am.Sm. & Ref., pf.	108⅛
Am.Sm. Sec., pf. B	87⅞
Anaconda	46¼
Batopilas Min	1¼
BethlehemSteelpf	73
Chino	44⅝
Comstock Tunnel	‡ 10½
Federal M. & S., pf.	48
Goldfield Con	2⅞
GreatNor.,ore. ctf.	46¼
Guggen. Exp.	58¼
Homestake.	96½
Inspiration Con	18⅛
Miami Copper	29⅛
Nat'nalLead,com	59½
National Lead, pf.	108
Nev. Consol	22½
Pittsburg Coal, pf.	96
Ray Con	22⅞
RepublicI&S,com.	29
Republic I & S, pf	90
SlossSheffi'd,com.	56¼
Sloss Sheffield, pf.	‡100
Tennessee Copper	43½
Utah Copper	66
U. S. Steel, com	74½
U. S. Steel. pf.	113¼
Va. Car. Chem.	46

N. Y. CURB Sept. 17 Name of Comp.	Clg.
Barnes King.	‡ 88
Beaver Con	45
Braden Copper	7⅛
B. C. Copper	5¼
Buffalo Mines	1.35
Caledonia	40
Con. Ariz. Sm	11/16
Davis-Daly	2⅜
Diam'field-Daisy	8
Ely Con	27
Florence	82
Giroux	5½
Gold Hill Con.	5/16
Greene Cananea	9¼
Greenwater	05
Internat S. & R.	‡124
Kerr Lake	2 9/16
Keystone	2
La Rose	2⅝
McKinley-Dar-Sa.	2
Min Co of A. new	3
Motherlode Gold	‡15/16
Nev Utah M. & S.	‡ 01
Nipissing Mines	8⅜
Ohio Copper	1 9/16
Pacific Sm. & M	¼
South Live Oak	2
South Utah M. & S	9/16
Standard Oil (Old)	1110
Stand'd Oil of N.J	410
Stand'd Oil Subs.	‡685
Stewart	1 7/16
Tonopah.	7 1/16
Tonopah Ex	2 5/16
Tri-Bullion	11/16
Tularosa	⅞
Union Mines	‡ 9/16
United Cop., pfd.	10
Yukon Gold	3⅝

LONDON Sept. 18 Name of Com.	Clg.
Camp Bird	£1 8s 3d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 17 9
Mexico Mines	7 10 0
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 9 0

BOSTON EXCH. Sept. 17 Name of Comp.	Clg.
Adventure	7¾
Ahmeek	345
Algomah	4¼
Allouez	45½
Am. Zinc	31
Ariz. Com., ctfs.	4¾
Bonanza	‡ 40
Boston & Corbin	6¾
Butte & Balak	3 9/16
Calumet & Ariz	80½
Calumet & Hecla.	540
Centennial	19
Cliff	5
Copper Range	58¼
Daly West	4
East Butte	14
Franklin	9¾
Granby	57
Hancock	26½
Hedley Gold	20
Helvetia	‡1
Indiana	15⅝
Island Cr'k, com.	55
Island Cr'k, pfd.	88¾
Isle Royale	34¼
Keweenaw	1
Lake	36
La Salle	5½
Mass	7½
Michigan.	2¼
Mohawk	67¼
New Arcadian	3½
New Idria Quick.	7⅝
North Butte	34¾
North Lake	5
Ojibway	3¾
Old Dominion	60¼
Osceola	113
Quincy	87¼
Shannon	15¾
Shattuck-Ariz.	22
Superior	45¼
Superior & Bost.	‡1⅞
Tamarack	40
Trinity	5½
Tuolumne	2¼
U. S. Smelting	47
U. S. Smelt'g, pf.	51
Utah Apex	2¼
Utah Con	11
Victoria	3
Winona	4½
Wolverine.	81
Wyandot	1⅞

BOSTON CURB Sept. 17 Name of Comp.	Last
Bingham Mines	5¾
Boston Ely	1
Boswyocolo	02
Butte Central	7
Cactus	10
Calaveras	2¾
Chief Cons	1¼
Corbin	.48
Cortez	95
Crown Reserve	3¼
First Nat. Cop.	2
Majestic	.49
Mazatan	‡½
Moneta Porc.	‡ 05
Nevada-Douglas.	3⅜
New Baltic	2¼
Oneco	1 3/16
Raven Copper	26
Rhode Island Coal	12
San Antonio	‡3
S W Miami	4⅞
South Lake	8
Trethewey	.30
United Verde Ext.	.47
Vulture	‡5

‡Last quotation

The Engineering and Mining Journal

Vol. 94. SEPTEMBER 28, 1912 No. 13

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres Rob't McKean, Secy
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C
Unter den Linden 71—Berlin, N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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American Institute of Mining Engineers

Members of the Institute received on the same day last week circulars from two parties, requesting proxies for use in the meeting on Oct. 7. We shall refer to these as the Corning party and the Eilers party, adopting the names of gentlemen to whom the proxies are to be made out, merely for convenience in this article, without implying leadership or especial responsibility in either case. The Corning party proposes to kill the pending amendments to the constitution. The Eilers party does not propose to carry them, but wants to keep them alive until the next annual meeting.

Among the pending amendments are those to change the name of the Institute, and to classify its membership. Neither of these has ever aroused much interest. In fact, there has been a general indifference about them. This being so, there is no good reason to keep them alive, and no doubt the best thing is to vote them down and be done with them.

The only pending amendment of consequence is that authorizing increase of dues to $15. The Eilers party does not propose to carry this, but prefers to keep it alive for resort if necessary. The Corning party proposes to kill it and to substitute one authorizing an increase of dues for the specific purpose of liquidating the land indebtedness of the Institute and only for such time as will be necessary to do that. In our opinion this will be the more rational and satisfactory procedure. Anyway, there is so little difference between the two parties on this point that an agreement ought to have been reached in a 10-min. conference, saving all the trouble of circularizing and conducting warfare in which a victory by either side will be equivalent to "The Dutch have taken Holland."

The Eilers party has introduced a new issue in calling for a proper recognition of the services of Dr. Raymond. It seems to us unfortunate that such a personal issue has been introduced. It is based obviously upon the idea that the report of the committee of five was designed to discredit the former management of the Institute, especially Dr. Raymond. We do not think that there was such an intention. The purpose of the committee of five was to give the membership information about its affairs, that ought to have been given by their council and board of directors, which had failed to do so. In fact, the committee of five did not find out anything to the discredit of anybody, except such carelessness or stolidity as an investigating committee might find in the affairs of any of us. The committee called attention to numerous things that might be done in a better and more economical way. The board of directors had previously discovered many of these things on its own account and was already in the course of correcting them; and, moreover, took up promptly the suggestions of the committee.

Unless the Eilers party reads into the report what is not there and contests what it supposes to be the spirit rather than the printed word, there is no reason that we can see in rushing to the defense of Dr. Raymond, who has not been attacked. However, the committee of five did make a suggestion that Dr. Raymond's honorarium as retired secretary might be discontinued as a measure of economy, a suggestion that we have previously characterized as indecent, and we are glad that his friends are giving the membership an opportunity to express themselves about this and reaffirm the recognition of the debt that the Institute owes to him.

The insurgent movement in the Institute crystallized on the matter of increasing the annual dues, but was based on the feeling that the Institute did not do for its members what it could and ought. It appears now that the dues need not be raised, except perhaps temporarily for the liquidation of the land indebtedness, which ought to be done as a matter of honor, and insofar the insurgent movement has been justified, but as for developing any constructive program to satisfy the cravings that rallied so many members to their banners, the insurgent leaders have done nothing at all. Neither of the parties that is now asking proxies has any great issue, nor on the face of things is there any great difference between them; so wherefore all the trouble?

Yet the Institute never more needed the loyal and thoughtful attention of its members and the consideration of constructive measures. Its affairs have not been run in the best way and the spirit of its membership has waned. This has been fully realized and things to rejuvenate the organization have been done, but rather than to details should attention now be given to some broad principles of reform, among which are establishment of unity of interest among professional men, the concentration of the administration of the organization in a single body, and the popularizing of the organization by giving its members more to do about what is after all their own affair.

The Scarcity of Labor

From many quarters of this country come reports of scarcity of labor. These may be explained by the requirements of the expansion in industry that has lately been experienced, by the requirements of harvesting the bountiful crops of this year, and by the exodus to Europe of many men during the lean times following the crisis of 1907, who have not yet returned to this country.

The scarcity of labor is one of the elements in the economic puzzles of the present time. In many places sufficient men are not to be had, and wages have been advanced to attract them. In many places wages have been constantly advancing, with never any reduction, but the cost of living advances as rapidly. In other places, like Lawrence, Mass., there seems to be an oversupply of labor, low wages, and deplorable conditions generally.

If we import a further supply of labor from Europe to work in our mines, mills and factories, to build our railways, etc., in the face of our halting agricultural development, what will be the effect upon the price of food and the cost of living generally? The economic situation of the present time is confused and but imperfectly understood, and the feeling that there is something wrong somewhere is perhaps the explanation of the hesitancy in the stock markets of the world.

The Metal Markets

We have lately witnessed developments in the markets for all of the important metals that if suggested a year ago would have been received with incredulity. Who would have ventured to say during the gloomy days of September and October, 1911, that within a year we should be exporting manufactures of iron and steel, not to dump a surplus supply but because better prices could be realized abroad than at home? Who dreamed that in the face of an enormous increase in copper production there would be an advance of 5c. per lb. in the price for that metal? Would not all experts have pronounced as fantastic any prediction that America would import round lots of spelter, duty paid, and would be on the verge of exporting domestic lead to Europe? Yet all of these things have happened.

In general, the strange developments have been economically legitimate. We cannot be so confident about the situation in copper for the reason that the increased production has manifestly been delayed from the market in arbitrary ways, and we fear that the statistics upon which we have been accustomed to rely do not disclose the real situation, but there can be no doubt as to the soundness of the advances both in iron and in lead.

Nor can there be any doubt as to the real position of spelter, which we mention separately, because this has become really acute. In America new ore supplies have failed to be developed as expeditiously as expected, and smelting capacity has been strained by the gradual failure of natural gas in Kansas and Oklahoma, which seems to be going on more rapidly than new capacity can be provided in the coal fields of Illinois. Even in the case of new capacity that is available, there is more or less difficulty in utilizing it fully, owing to the scarcity of labor. These conditions have brought about an advance in the price for spelter, such as has not been witnessed in many years, and finally made it possible for dealers to import substantial tonnages of foreign spelter and pay the duty of 1⅜c. per lb. These importations were made by houses who foresaw the culminating advance in the American market, purchased supplies in Europe a while back, put them afloat and had them ready for delivery here at the proper time, an operation which has been profitable, as it has turned out.

At the moment European spelter cannot be bought for profitable delivery in this country, because previous American buying, coupled with large buying at home, has advanced the European market and diminished the difference between the prices at London and New York.

The importation of spelter that has already been made has temporarily influenced not only our price but also our conditions of marketing. Aside from the spelter that is used in the brass industry in Connecticut and elsewhere, the bulk of the ordinary spelter is consumed by the galvanizers at Pittsburgh, Wheeling and in the Ohio valley, and being supplied chiefly by smelters situated to the west of St. Louis, the natural basing point for the spelter market has been St. Louis, the price at New York being the St. Louis price plus the freight of 15c. per 100 lb. The introduction of foreign spelter makes New York a basic market for the supply of Connecticut and other nearby points, but, of course, foreign spelter cannot be delivered profitably at Pittsburgh and vicinity in competition with Western spelter until the disparity between the American and European markets becomes greater than it has yet been this year.

The high prices for tin which have now prevailed for some time have stimulated production in all the larger producing countries, and have drawn out larger exports from the Yunnan province in China. They have not, however, developed any important new sources of supply. The yield from Nigeria, from which much was expected, remains small. Tin discoveries are reported from time to time in different countries, but few or none of them seem to reach the point of actual production, and we continue to rely on the old-time producers for our supplies of this metal.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Acetylene Lamps

The JOURNAL of Aug. 31, under "Correspondence and Discussion," contains a brief communication on acetylene lamps, by F. M. Lothrop, of Houghton, Mich., as follows: "That the prejudice held by a number of engineers against the use of acetylene lamps underground, is a matter of imagination, was clearly demonstrated to me recently when a prominent member of the profession, forced by circumstances to use an acetylene lamp, became its ardent advocate. . . . . There can be no question but that the acetylene lamp has many advantages over other forms of underground lighting previously in use, and that for general purposes it is far superior to such devices as the old-fashioned candle and the newer 'sunshine' lamp." There is one line of underground work, however, in which I, personally, prefer the much-maligned candle, and that is, instrument work of any kind in mine surveying. I believe that many other engineers also hold the same opinion, and that a number of them will be found in the Michigan copper country. For almost any other sort of work, and especially for inspection work of any kind, a casual trip, etc., the acetylene lamp is a wonderful advantage. It may be that the "prominent member of the profession" was converted through just such a circumstance.

For an instrument man, the chief objection to the acetylene lamp in its awkward shape and bulk. Because of this it is impossible to work with such a lamp on one's hat. Many surveyors will doubtless recall the nervous shocks they have suffered, when, after accomplishing a difficult set-up, they have carefully approached the eyepiece of the transit, only to have the lamp bump against the telescope with sufficient force to necessitate releveling. Whereupon, the first impulse is to attempt to manipulate things with the lamp in the hand. Neither does this work, as with one of these lamps in the hand, there is nothing left to adjust the level screws with. After no little practice under such circumstances, I have found the best results to be obtained by working with an ordinary candle, minus a candlestick. True, the grease drops around promiscuously, but it is easily removed and it is perfectly possible to keep it off the notes.

I do not wish it to be understood that I am advocating the abandonment of the acetylene lamp, nor even the barring of its use by surveyors. Quite the opposite, for there should be at least one such lamp in every surveying crew. I know of nothing better for hunting up old survey points, examining roof conditions, timbers, etc., but for use in the hands of a transitman, my own experience has been that it is an unmitigated nuisance. For this purpose, and perhaps for this purpose alone, give me the time-honored candle. SURVEYOR.

Calumet, Mich., Sept. 19, 1912.

Practical Accuracy

The editorial, "Practical Accuracy," in the JOURNAL of Aug. 24, 1912, seems to indicate that the processes of assaying are, in many cases, medievally imperfect. The fault would seem to lie with the costs, not with assay methods. To run down 10 or 15 assay tons of tailings in a big Battersea or French clay crucible is absurdly easy, both in principle and practice, until the bills for fluxes, crucibles and fuel begin to come in, after which most superintendents are more than anxious to have an assay run on ⅓ or ½ a.t., and to forego the delights of reports down to 0.001 oz. Perhaps the editorial means that the assayers should devise some cheap assay. Perhaps so, but I think here is a case in which one cannot have an omlet without breaking eggs, and that it is simply up to the superintendent to choose between expensive accuracy or inexpensive approximation, and that the assayer can deliver the goods, even with all his medieval imperfections.

JAMES G. HORTON.

Colorado Springs, Aug. 28, 1912.

Food Supplies for Miners

The recent articles on food supplies have been both interesting and valuable and I want to offer another contribution, plagiarized from Uncle Sam's Army Regulations, General Order No. 60, which seems to me to throw considerable light on the dark and grievous subject of providing miners with food. Nobody realizes better than those who have struggled with the problem of a mine boarding house that a miner has to be fed much differently than if he were under enlistment, but the fact remains that the army ration is not only sufficient to keep the men perfectly fit but is ample also to support the graceful *embonpoint* of the sergeant-major.

The time is at hand when many camps in our Northwest must be provisioned for the winter and I know of no better basis for the scientific handling of this difficult problem than the U. S. Army ration.

A scrutiny of the figures recently published on this subject in the JOURNAL reveals the fact that in the prime necessaries, flour, potatoes, beef, coffee, sugar and butter, in only two instances are the mining-camp consumptions of items below the army ration and in the other instances they range from 30 to 800% higher. Certainly a chance for scientific study in the latter cases. The following table is made up from the figures published and is stated in ounces per man per day:

COMPARISON OF RATIONS

	Army Ration	Cobalt[1]	Candelaria[2]	Alaska[3]	Idaho[4]
Flour	18	14	16	23	19
Potatoes	20	28	48	28	27
Beef	20	28	24	22	28
Coffee	1.12			1.6	2.1
Sugar	3.2		8	6.8	6
Butter	0.5	3	4	3.4	2.2

[1] Eng. and Min. Journ. p. 837, Apr. 27,1912.
[2] Ibid. p. 1022. May 25, 1912.
[3] Ibid. p. 1259. June 29, 1912.
[4] Ibid. p. 197. Aug. 3, 1912.

Hessyl[5] states that a close record over 18 months showed that six to seven pounds of food supplies were consumed per man per day and by estimating certain amounts omitted from the Cobalt data above, the consumption there would be greater than this. Shockley[2] gives the average consumption per man per day at Candelaria as between six and seven pounds. The Army ration amounts to 4⅓ lb., and one writer says that a man cannot eat more than 3½ lb. per day. Using either of these latter figures the conclusion is obvious either that the miners in the above mentioned cases ought all to have had the gout or the cooks ought to have been fired. It is waste and not appetite in the boarding house which makes it generally a trying proposition to the one in charge of the property. Of course, the cook is about the hardest man on the payroll to be handled, but too often the superintendent has less idea about food supplies than any other part of his job; hence the increased vexation.

In Army parlance. A ration is the allowance for the subsistence of one person for one day. The garrison ration is intended for troops, whenever practicable, in time of peace, also in time of war.

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[5] Ibid. p. 971. May 18, 1912.

GARRISON RATION

Component articles and quantities.		Substitutive articles and quantities.	
Beef, fresh	20 oz	Mutton, fresh	20 oz
		Bacon *a*	12 oz.
		Canned meat, when impracticable to furnish fresh meat	16 oz
		Hash, corned beef, when impracticable to furnish fresh meat.	16 oz
		Fish, dried.......	14 oz.
		Fish, pickled..	18 oz
		Fish, canned......	16 oz.
		Turkey, dressed, drawn, on Thanksgiving Day and Christmas, when practicable........	16 oz.
Flour	18 oz	Soft bread.........	18 oz.
		Hard bread, to be issued only when the interests of the Government so require.	16 oz.
		Cornmeal	20 oz
Baking powder	0.08 oz		
Beans	2.4 oz	Rice............. ...	1.6 oz.
		Hominy	1.6 oz.
Potatoes *b*	20 oz.	Potatoes, canned....	15 oz.
		Onions, in lieu of an equal quantity of potatoes, but not exceeding 20% of total issue.	
		Tomatoes, canned, in lieu of an equal quantity of potatoes, but not exceeding 20% of total issue.	
		Other fresh vegetables (not canned) when they can be obtained in a wholesome condition, in lieu of an equal quantity of potatoes, not exceeding 30% of total issue	
Prunes	1.28 oz	Apples, dried or evaporated............	1.28 oz.
		Peaches, dried or evaporated	1.28 oz.
		Jam, in lieu of an equal quantity of prunes, but not exceeding 50% of total issue.	
Coffee, roasted and ground.	1.12 oz	Coffee, roasted, not ground...........	1.12 oz.
		Coffee, green	1.4 oz.
		Tea, black or green...	0.32 oz.
Sugar	3.2 oz.		
Milk, evaporated, unsweetened	0.5 oz.		
Vinegar	0.16 gill	Pickles, cucumber, in lieu of an equal quantity of vinegar, but not exceeding 50% of total issue	
Salt....	0.64 oz.		
Pepper, black.......	0.04 oz.		
Cinnamon.	0.014oz.	Cloves	0.014oz.
		Ginger.............	0.014oz.
		Nutmeg	0.014oz
Lard	0.64 oz.		
Butter....	0.5 oz.	Oleomargarine..	0.5 oz.
Sirup	0.32 gill		
Flavoring extract, lemon...	0.014oz	Vanilla	0.014oz

a In Alaska, 16 oz. bacon, or, when desired, 16 oz. salt pork, or 22 oz. salt beef.

b In Alaska the allowance of fresh vegetables will be 24 oz. instead of 20 oz. or canned potatoes, 18 oz. instead of 15 oz.

Note.—Food for troops traveling on U. S. Army transports will be prepared from the articles of subsistence stores which compose the ration for troops in garrison, varied by the substitution of other articles of authorized subsistence stores, the total cost of the food consumed not to exceed 24 cts. per man per day, except on Thanksgiving Day and Christmas, when not to exceed 39 cts. is authorized.

PERCY E. BARBOUR.

Uwarra, N. C., Sept. 21, 1912.

The Iodide Copper Assay

In the JOURNAL of Aug. 31, 1912, Arthur J. G. Smout, in his discussion of my previous remarks on the iodide copper assay, published in the JOURNAL of July 13, seems to have partially misunderstood me. This method is familiar to everyone, but perhaps I was not sufficiently explicit and I will try to make a little clearer what I meant in my last letter when I said the method must be correctly handled.

Mr. Smout says that for complete precipitation of copper with aluminum the solution must be free from hydrochloric and nitric acids. This is true but it is also true that these acids can be removed by fuming with sulphuric acid. Perhaps traces of chlorine may be found in the sulphuric acid after fuming, but if it is fumed hard in the free flame of a bunsen burner, or its equivalent, these acids will never be found in sufficient amount to have any effect on the precipitation of the copper.

He also doubts that copper can be completely precipitated with aluminum. From the opinions of many eminent authorities and from my own experience I believe that copper can be perfectly precipitated with aluminum. It is true that the precipitated copper is readily oxidized, on the sides of the beaker, etc., and will then go back into solution so that solutions tested will at times show copper, but this is a re-solution and not copper which has failed to be precipitated. This is easily overcome by washing the sides of the beaker with dilute hydrogen-sulphide water when it is removed from the hot plate. This not only precipitates any copper which has been redissolved but also prevents any further oxidation. If this addition of hydrogen-sulphide water causes a heavy cloud of sulphides to form which would render filtration difficult, the beaker is put back on the hot plate and the solution boiled for a few minutes longer. The solution will rapidly clear up and further addition of hydrogen-sulphide water will give no precipitation of sulphides. The copper can then be rapidly filtered off and must be washed with hydrogen-sulphide water.

While it is true that copper is precipitated more slowly from solutions containing arsenic, antimony, organic matter, etc., these substances do not offer any serious difficulty and if handled in the above described way a perfect, rapid and complete separation of the copper will result. There is no danger of the sulphuric acid becoming concentrated, for the time of the determination is not great enough for much concentration, but if it should become so it is a simple matter to dilute it.,

I was not aware of the fact that hydrogen sulphide is ever passed after the precipitation with aluminum as most of the chemists of my acquaintance in this country use the method somewhat as I have described it.

It seems to me the superiority of this method over the precipitation of copper as a sulphide lies in the fact that the resulting copper is almost all metallic, which is much more readily disolved by nitric acid, and also it eliminates the formation of free sulphur, which might readily occlude copper.

Far from only being accurate to 0.1 or 0.2%, as Mr. Smout says, this method is readily accurate to 0.02 or 0.03% and that accuracy is not in any way limited by the chemistry of the method but wholly by the inability of the chemist to titrate any closer when starting with a sample sufficiently small to be conveniently handled.

These statements I have made are not the result of a few experiments carried on for the purpose of presenting a new method but are the outcome of many hundreds of determinations, umpire, control, etc., covering a number of years, many of them made in duplicate, triplicate, etc., and also in collaboration with other chemists. I have developed nothing new in this method but have had perfect satisfaction with it and my reason for entering this discussion was my desire to present this method, handled in this way, to those who might care to use it. The credit, perhaps not for the fundamental principles, but certainly for the perfection of manipulation of this method, is due to A. H. Low, of Denver.

In closing I wish to say again that this method as above partially described is quick, accurate and reliable in every way and is one of the best methods we have at the present day for the determination of copper.

R. L. HALLETT.

Brooklyn, N. Y., Sept. 14, 1912.

Caving System in Chisholm District—II

In the second instalment of my article on the caving system in use in the Chisholm district of Minnesota, published in the JOURNAL of Sept. 14, I notice that the numbers referring to the illustrations have been changed so that in the text the figure numbers do not agree with those of the diagrams, and I doubt if the article will be readily understood.

In the first column, the reference to Fig. 2 should read "as shown in the plan, Fig. 1." The letters *A* and *B* mentioned on p. 511, do not appear on Fig. 3 and the references to the latter in the last two paragraphs should have been to Fig. 5. It might have added further to the clarity of the article to insert a reference to Fig. 2 in the sentence, "The drift is then breasted up, and the room blasted down," in the first paragraph of the next page.

L. D. DAVENPORT.

Mesaba, Minn., Sept. 16, 1912.

The Leuschner Flotation Process

Some further details of a combination gas and oil flotation process for separating metallic sulphides from a non-metallic gangue. Oil consumption low and directly proportional to sulphide content, and no attempt to recover the oil is made.

The Leuschner flotation process has already been commented on in the JOURNAL, p. 924, May 11, 1912. Additional details are given below, taken from *Glückauf*, Mar. 9, 1912. The process is a combination oil and gas-flotation process, the gas being generated by carbonates, which are added if they do not already exist in the ore. The method is only to be regarded as a complete substitute for magnetic- or wet-concentration methods on comparatively rich ores containing only one sulphide.

Details of the Friedrichssegen practice have been given, while below in table I, are presented some results of tests made in the laboratory showing the possibilities of the process. In table II, results of larger tests or mill-runs in lots of 10 to 15 tons are recorded.

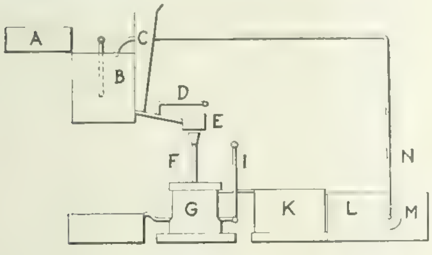


FIG. 1

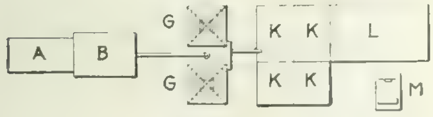


FIG. 2

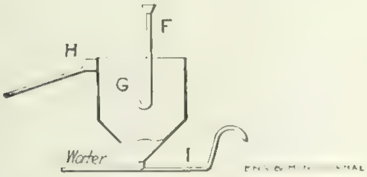


FIG. 3

LEUSCHNER APPARATUS

The course of concentration by this flotation process is simple; the apparatus is small and simple. Figs. 1 to 3 show the arrangement of a plant which has been built for the Ludwigseck mine near Salchendorf, Neunkirchen County, Westphalia, and put into operation in the summer of 1911. The ore consists of galena and sphalerite associated with siderite; the vein matter is quartz and the country is graywacke. The galena is recovered by jigging, the zinky middlings are subjected to the flotation process.

The tank *B* (Figs. 1 and 2) contains the separating liquor which is prepared by running enough sulphuric acid from tank *A* into water heated by steam to 140° to 175° F., to produce a density of 1° to 2° Bé. The classified middlings are charged through a gutter *C* upon an inclined launder under the outlet of *B*. Near the outlet there is the oil feed pipe *D*. In the launder the separating liquor, the ore and the oil unite to a pulp and are run on the distributor *E*, a plain wooden box lined with sheet lead and having two openings at the bottom for distributing the pulp in the flotation tanks. If the ore is clayey or loamy or is apt to clot, a simple stirring device may be placed between the distributor and the outlet of tank *B*. The ores of Ludwigseck do not require any stirring. From the distributor the pulp runs through two lead pipes into the flotation tank *G*. These lead pipes are funnel-like at the top and bent upward at their lower ends to cause the pulp to run uniformly into the flotation tanks, and are placed so that the pulp will strike the center of the tanks.

TABLE I

Kind of Ore	Prevailing gangue	Origin	Worked for	Metal contents in Ore %	Metal contents in Concentrate %	Metal contents in Tailing %	Yield %
Copper pyrites	siderite, quartz	Siegerland	Cu	4.8 Cu	20.4 Cu	traces of Cu	97.7
Copper pyrites	diabase, quartz	Sauerland	Cu	7.2 Cu	21.8 Cu	tr. Cu	96.9
Galena and blende...	barite, calcite	Harz	Pb, Zn	15.6 Pb 4.5 Zn	45.2 Pb 12.8 Zn	tr. Pb tr. Zn	97.0
Copper pyrites	hematite, calcite	Dill dist.	Cu	15.3 Cu	27.8 Cu	tr. Cu	99.0
Copper pyrites	siderite	Siegerland	Cu	5.1 Cu	24.9 Cu		97.6
Galena and sphalerite.	siderite	Siegerland	Pb, Zn	5.2 Pb 9.1 Zn	17.5 Pb 34.2 Zn	0.4 Pb 0.2 Zn	91.0 98.2
Galena and sphalerite.	siderite	Siegerland	Pb, Zn	9.4 Pb 13.6 Zn	32.0 Pb 31.0 Zn	0.5 Pb 17 Zn	96.0 93.4
Boulangerite.........	hornblende	Westerwald	Pb, Sb	24.3 Pb 6.9 Sb	34.2 Pb 9.8 Sb	0.9 Pb tr. Sb	98.4
Boulangerite.	hornblende	Westerwald	Pb, Sb	9.8 Pb 3.8 Sb	27.4 Pb 9.3 Sb	0.4 Pb tr. Sb	97.1
Blende	siderite	Siegerland	Zn	11.0 Zn	43.2 Zn	1.8 Zn	84.0
Blende	siderite	Siegerland	Zn	9.4 Zn	37.5 Zn	1.3 Zn	89.8
Blende	eruptive rock	Norway	Zn	9.2 Zn	30.8 Zn	1.0 Zn	90.0
Blende	siderite	Siegerland	Zn	12.5 Zn	41.6 Zn	1.5 Zn	90.0
Copper pyrites......	siderite	Siegerland	Cu	4.16 Cu	23.4 Cu	0.2 Cu	95.6
Peacock ore.........	calcite	Africa	Cu	2.6 Cu	67.1 Cu	1.28 Cu	92.7
Blende	eruptive rock	Norway	Zn	29.2 Zn	58.5 Zn	1.2 Zn	98.5
Blende	eruptive rock	Norway	Zn	26.2 Zn	53.4 Zn	1.5 Zn	96.0
Copper pyrite	siderite	Siegerland	Cu	6.9 Cu	17.88 Cu	0.24 Cu	83.3
Boulangerite	hornblende	Westerwald	Pb, Sb	15.0 Pb 7.1 Sb	26.6 Pb 12.4 Sb	0.08 Pb 0.4 Sb	91.4

TABLE II

Kind of Ore	Prevailing gangue	Origin	Worked for	Metal contents in Parcel of Ore %	Metal contents in Concentrate %	Metal contents in Tailing %	Yield %
Copper pyrites	siderite, quartz	Siegerland	Cu	1.3 Cu	14.8 Cu	0.08 Cu	81.3
Galena, sphalerite	barite, calcite	Harz	Pb, Zn	10.5 Pb 5.1 Zn	28.7 Pb 15.0 Zn	1.8 Pb 0.2 Zn	89.0
Galena, sphalerite.....	hornblende	Thuringia	Pb, Zn	0.8 Pb 2.9 Zn	8.4 Pb 24.7 Zn	tr. Pb 0.8 Zn	83.0
Galena, sphalerite	siderite	Siegerland	Pb, Zn	1.6 Pb 8.3 Zn	6.9 Pb 30.0 Zn	0.7 Pb 0.2 Zn	81.0
Copper pyrites.......	siderite, quartz	Siegerland	Cu	1.12 Cu	11.64 Cu	0.06 Cu	98.0
Copper pyrites.......	siderite, quartz	Siegerland	Cu	2.62 Cu	18.3 Cu	0.34 Cu	84.0
Copper pyrites	siderite, quartz	Siegerland	Cu	2.52 Cu	19.8 Cu	0.24 Cu	82.33

DETAILS OF OPERATION.

A unit contains two such apparatus fed by a common distributor. The flotation tank is a square wooden box made of 2-in. plank and lined with sheet lead. It is 5 ft. high by 4 ft. 3 in. square, and runs out at the bottom into an inverted truncated pyramid (Fig. 3). In this apparatus the separation of the sulphides from their barren concomitants takes place. On the way from the feed gutter to the flotation tank oil and pulp have had sufficient time to become intimately mixed. The bubbles of carbon dioxide set free by the sulphuric acid from the siderite inclose the oiled particles of sulphide, causing them to rise to the surface and float there. By a continuous access of new pulp the separating liquor rises over the edge of the flotation tank and enters the overflow launder *H* which surrounds the former, carrying the floating ore particles with it. The barren matter sinks in the flotation tank to the pointed bottom and is sluiced out through the pipe *I* by means of a continuous jet of fresh water under pressure. The flotation product, or concentrate, is run with the separating liquor into several settling tanks *K*, where it subsides, while the separating liquor runs into the storage tank *L*, from which it is pumped back by a pump *M* through the pipe *N* into the supply tank *B*, to recommence its circuit. The concentrate is shoveled out at convenient intervals, washed with water, drained and is then ready for the reduction works.

The tanks required for the flotation process are all made of wood and lined with sheet lead wherever there is any contact with the separating liquor. The centrifugal pump used for raising the liquor is made of hard lead. Power is only needed for driving the pump and the cleaning trommel; it amounts to 2 or 3 hp. per unit of the plant. Glover acid of 60° Bé. is used on account of its cheapness. The concentration of the separating liquor is as already stated, from 1° to 2° Bé., but depends upon the solubility of the carbonates and may be lower or higher. The consumption of sulphuric acid also varies and amounts to 40 to 60 kg. of Glover acid per ton of feed according to present experience at the Friedrichssegen dressing works.

Waste oils are used which can be had in large quantities. Their weight and viscosity are determining factors for their applicability. These properties are again dependent upon the condition of the ores to be concentrated. The consumption of oil is uniform if the ore is uniform. The more sulphide particles to be coated with oil the larger will be the consumption of oil. Hence it rises and falls with the metal content of the material. At Friedrichssegen where ore with 10 to 15% zinc is treated, the oil consumption amounts to 4 to 6 kg. per ton of ore. The recovery of the oil, which in other flotation processes is an important item, is not found necessary at Friedrichssegen on account of the small consumption. The oil adhering to the *schlichs* does not interfere with the subsequent reduction process.

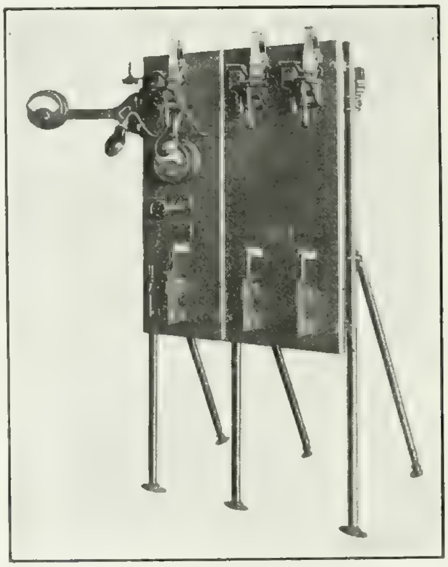
The heat required in the flotation process is at Ludwigseck generated by conducting live steam into the separating liquor, but exhaust steam or other substitutes for creating heat may be used. The steam is solely used for keeping the separating liquor at a fixed temperature. As the separating liquor is in constant circulation the loss of heat which is caused by the contact of the bath with the ore and the tanks has to be made up by fresh steam. The expense for furnishing heat is small; at Friedrichssegen it amounts from 7 to 17c. per ton of ore. The labor requirements of the process are also moderate; one unit (of 10 to 15 tons) requires the attendance of three men. If several units are operated in conjunction two will do.

The cost of moving materials, operating the plant, providing for power and counting in wear and tear amounts to from $0.96 to $1.42 per ton of ore at Friedrichssegen. The operating costs depend, however, on local conditions and the metal content of the ore. Rich ores require more separating liquor and the capacity of the tanks decreases. On the other hand there is a larger output of concentrate. With poor ores the expenses are less.

From the description of the Ludwigseck plant it may be inferred that its construction is inexpensive. Its cost may be assumed at from $1250 to $1500 per unit of 15 tons in 10 hours.

Switchboards for Small Mining Plants

The equipment necessary for the control and distribution of electrical energy for small mining plants is simple, comparatively inexpensive, and in general, similar to that used in street railway systems using direct generators for power. Since one side of the system is grounded, the switching protecting the measuring apparatus is reduced to a minimum, it being necessary to take care of the generator and feeder circuits of a single polarity only.



Switchboard for Small Mining Plants

However, to obtain safe and satisfactory service, there are a few features which are essential. The equipment should be of sturdy construction and good workmanship, and the panel supports should be insulated from ground to lessen the chance of short circuits. The circuit breakers in the generator circuits should be connected between the negative brushes and the series field to protect the machines from grounds, either internal or between the machine and the panel. The switching equipment should be such that when machines are run in multiple, the series field of the incoming machine may be connected in multiple with those of the running machines and the voltage adjusted before closing the main switches, as this arrangement insures the correct polarity of the incoming machine and the least disturbance in paralleling.

Often, too, in small mining plants, a separate source of power is not always available for operating the station and switchboard lamps. This may be taken care of by a lighting switch and fuses on each generator panel, using lamps of the same voltage as the generators or of lower voltage and connecting them in series. The lighting circuits should be connected between the circuit breaker and the machine and not at the bus, so that the station can be lighted from any machine before the power is thrown on the line and also to prevent the station from being thrown in darkness should the breakers on all machines open. To meet these requirements the General Electric Co. is marketing a new line of 250-275-volt and 550-575-volt small mining-plant switchboards, illustrated in the accompanying engraving.

Novelty in Openhearth Practice

According to a paper written by N. S. MacCollum, of the Phœnixville Iron Works, Phœnixville, Penn., for the Congress of Applied Chemistry, openhearth furnaces have for some time been limited in their output by the rate of tapping. Working a larger charge is entirely feasible, but to cast a great body of metal into small ladles means usually that the first of the metal is cast too hot, and the last, too cold. If bigger ladles are used, the ladle skulls are costly to handle.

The problem was solved by Mr. MacCollum by means of a bifurcated spout, which permitted tapping into two ladles at once. By means of this, he has increased the charge in a nominally 50-ton furnace to 100 and even 125 tons.

[The use of multiple spouts is by no means new in copper practice. It has been used for ingots since copper was tapped instead of ladled, and for wire bars since 1902. The problem was the same, to increase the capacity of the furnace by increasing the speed of tapping. Editor.]

Mineral Production of Peru for 1910

The Peruvian Government reports the following mineral production for 1910: Gold, 708 kg.; silver, 252,565 kg.; mercury, 350 kg.; copper, 27,347 metric tons; lead, 1866; antimony, 49; vanadium ore, 3130; bismuth, 24; tungsten ore, 12; borax, 2351; salt, 17,594; coal, 307,320; petroleum, 167,712 tons.

American Institute of Mining Engineers

The following circulars, requesting proxies for the October meeting, are being sent to the members of the American Institute of Mining Engineers by the signatories.

New York, Sept. 10, 1912.

Dear Sir:

In February last we addressed a circular to the members asking for proxies to postpone action on the proposed amendments to the constitution and to have a committee appointed to study and report on the affairs of the Institute so that the members might be able to vote intelligently on these propositions. The responses were most satisfactory, over a thousand proxies having been received.

The committee was appointed and was purposely composed of men of very divergent views. Three were among the signers of the circular and two had been members of the board of directors of the Institute for many years. With a committee so constituted the report was necessarily a compromise and did not fully express the views of any one of its members. We hope, however, that it was full and explicit enough to serve the purpose for which the committee was appointed.

The proxies received were also used at that meeting in furthering the election of Messrs. George C. Stone, Charles F. Rand and E. B. Kirby to the directorate of the Institute. They were not voted at all in the matter of the secretaryship of the Institute. This was intended to indicate a suspension of judgment. Mr. Kirby was elected to the board in order to give the very large western membership at least some representation on that body.

At the adjournment of the annual meeting to be held Oct. 7, 1912, some decision should be reached in regard to the amendments proposed last year and probably action will be required on other matters referred to in the report of the Committee of Five. We therefore ask for new proxies to enable us to act on these questions as we do not feel that the old ones, although of sufficient general scope, should be used as they were really granted for a definite purpose that has been accomplished.

We agree with the opinion expressed in the report of the Committee of Five, that the present financial deficit may be met by the reductions which are possible in the expenditures of the Institute. It will, however, take some time to secure this, and it is necessary to provide now for the possibility that the reduction may not be sufficient for the purpose. Therefore:

We propose to offer an amendment to the constitution in the following sense; giving the board of directors the right to increase the annual dues, not to exceed $5 per year, for such length of time as may be necessary to pay off the land fund. The increase to be used solely for that purpose and the dues to recede automatically to the present basis of $10 per year as soon as the object is attained.

It is our opinion: That all of the amendments to the constitution proposed last year should be rejected. That the meeting should be again adjourned to the date of the Cleveland meeting of the Institute. This is to allow of full discussion of any matters appertaining to amendments of constitution and by-laws brought up Oct. 7, before final action at the next annual meeting in February, 1913.

The present constitution precludes action on any amendments which have not been proposed in their final contents at a previous annual meeting.

We inclose a blank proxy, which, to be valid, must be signed, dated and witnessed. On the same sheet are blanks for noting how you wish the proxy to be voted. If no instructions are given we will vote in accordance with the opinions expressed above; and, if any unexpected questions come up at the meeting we will vote the proxies in accordance with the decision of the majority of the signers of this circular who are present at the meeting as we did on February last.

Lewis G. Rowand,
James R. Finlay,
George C. Stone,
John H. Allen,
J. Parke Channing,
J. A. Van Mater,
Robert Peele,
Edmund B. Kirby,
Richard H. Vail,
H. M. Chance,
C. R. Corning,
F. L. Garrison.

New York, Sept. 19, 1912.

Dear Sir:

At the last annual meeting of the Institute, in February, 1912, a Committee of Five was appointed to investigate all the affairs and operations of the Institute, to see whether an increase in the dues could be avoided, and to report to the board of directors, making such suggestions as they might deem best for the welfare of the Institute. This committee made an exhaustive examination and its report has been distributed to our members. As was shown in the report, the management of the Institute has been striving for some years to reduce expenses and increase efficiency. The suggestions of the committee, even those that seem to be unadvisable or impracticable, are being carefully considered by competent committees of board and council.

There are certain matters which will come before the adjourned business meeting on Oct. 7, 1912, to which careful, dispassionate consideration should be given.

(1) The report of the Committee of Five should be accepted and, with its accompanying papers, correspondence, accounts, reports, etc., be filed in the archives of the Institute, the committee be discharged with thanks, and the Institute be left to the management of its duly constituted authorities, the council and the board of directors.

(2) On the question of increasing the dues, even temporarily, the report of the Committee of Five does not justify a final conclusion.

We believe that our fellow members would neither wish to have the dues unnecessarily increased, nor on the other hand, see the means of the Institute restricted, or its work crippled. We have before us the important matter of paying off the balance of the land debt, and the plans of judiciously aiding the local sections and the professional divisions, on which we count so much to help the growth and widen the beneficial influence of the Institute.

We urge the postponement of action on this question, and also on the other constitutional amendments suggested last year, until the next annual meeting in February, 1913, when we shall have further light from this year's budget. By that time, present uncertainties will be cleared up as to routine finances, voluntary contributions to the land fund, and the amount of new resources coming from the somewhat rapid increase in membership.

(3) We believe that it is not a necessary preliminary to progress and to a solution of the new problems to attempt to throw discredit upon the past management of the Institute, or to belittle the debt of gratitude which the Institute owes to Dr. R. W. Raymond, who served it for so many years with distinction and rare devotion and self sacrifice, and who more than any other man brought it to its high place among the technical societies of the world.

(4) We believe that the membership at large should be given an opportunity to express its indorsement of the action of the board of directors and of the council when they recognized Doctor Raymond's lifelong services and devotion by unanimously electing him an honorary member, and to act affirmatively on the recommendation of the Committee of Five to make possible the conferring upon Doctor Raymond of the title of secretary emeritus.

(5) We believe that the membership at large should be given an opportunity thus to approve of and ratify the action of the board of directors when they took steps to secure for the future his aid in that part of the editorial work of the Institute which he is so eminently qualified to perform.

(6) We believe that the Institute should extend to Doctor Raymond, now that he has retired from the active direction of its affairs, suitable facilities for carrying out such work, with a proper annual stipend along the general lines as arranged by the board at the time of his retirement from active participation in the affairs of the Institute 18 months ago.

If these suggestions appeal to you, we ask you to sign, have witnessed in writing, and return before the date fixed for the adjourned meeting, October 7, and as soon as you can conveniently do so, the inclosed proxy, to be voted at the adjourned annual business meeting of the Institute, in support of the general policy outlined in the above.

You are entitled to sign this proxy whether you have previously signed another or not. A later proxy supersedes an earlier one.

If you desire to consider more fully the financial situation, the inclosed analysis by a past president of the Institute may be of interest to you.

H. S. Chamberlain,
Ellsworth Daggett,
Henry S. Drinker,
Arthur S. Dwight,
Anton Eilers,
Karl Eilers,
B. F. Fackenthal, Jr.,
John Fritz,
James Gayley,
C. W. Goodale,
William H. Howard,
Alexander C. Humphreys,
Robert W. Hunt,
John H. Janeway, Jr.
William Kelly,
Charles Kirchhoff,
Wheaton B. Kunhardt,
George F. Kunz,
Benjamin B. Lawrence,
Edward P. Mathewson,
Willet G. Miller,
R. V. Norris,
Eben E. Olcott,
James J. Ormsbee,
Walter T. Page,
D. M. Riordan,
Thomas Robins,
F. W. C. Schniewind,
E. G. Spilsbury,
Leonard Waldo,
Warren A. Wilbur,
William H. Wiley.

FINANCIAL ANALYSIS 1912

An analysis of the "Comparative Statement of Receipts and Disbursements for the six years 1906 to 1911, inclusive," appended to the report of the committee of five (see pages 26, 27 and 28), may be useful, to show what the position, financially, of the Institute is now, and will be for the next few years, assuming that it continued at the same rate of normal receipts and expenditures.

The net loss shown by the accountant's statement, taking credit for interest received, amounted to $12,696.72. During that period the Institute paid in rents and assessments:

RENT AND ENGINEERING BUILDING ASSESSMENTS

1906 (rent 99 John St.)	$2,500
1907 assessment for operating building	10,250
1908 assessment for operating building	6,700
1909 assessment for operating building	6,000
1910 assessment for operating building	4,500
1911 assessment for operating building	4,500
Total	$34,450

At the present rate of assessment of $4500 per year (under which the United Engineering Society is accumulating a fair surplus), the outlays would have been for the same period of six years $27,000, so that the next period of six years should show a saving in that respect of $7450.

The total payments for the interest on the Institute's share of the Engineering Building land mortgage for the six years aggregated $30,462.99, as shown in an accompanying table.

At the present time the Institute is paying interest on $68,000 net, or $2720 per annum. Had the generous gifts of friends of the Institute to the land fund been received at the beginning of the period under review, instead of flowing in at a later date, then there would have been a saving in interest of $14,142.99, viz., $30,462.99 less $16,320 (six years' interest at the present rate).

PAYMENTS FOR INTEREST ON MORTGAGE

1906	$9,133.33
1907	5,200.00
1908	5,200.00
1909	4,276.00
1910	3,520.00
1911	3,133.00
Total	$30,462.99

In order to fairly judge of the ability of the Institute to meet its costs in the future, based on the normal expenditures of the last six years, there must be eliminated the two sums mentioned: $7450 representing extraordinary building assessments, and $14,142.99 in interest payments, which it need no longer face.

The two sums amount to $21,592.99, so that deducting abnormal outlays now no longer a possible burden, the apparent net loss of $12,696.72 is transformed, so far as the normal conditions of receipts and expenditures are concerned, into a surplus of $8896.27. This surplus would have enabled the Institute to place to capital account the greater part of the sums received for life memberships, which aggregated $10,500 somewhat irregularly distributed over the six years under review.

Under present conditions the Institute is not facing an annual deficit in its operating expenses. With an income based on $10 dues, and normal receipts and expenditures on the scale of those of the period of 1906 to 1911, both inclusive, the Institute will be able not alone to carry on its work as well as heretofore—maintain the standard and volume of its publications—pay the regular annual assessment of $4500 per annum for its share in the cost of operating the United Engineering Building—pay the interest on the present mortgage debt—and place to capital account hereafter the receipts from life memberships.

In 1907 the Institute had pledged itself under the founders' agreement to pay $180,000 as its share of the land mortgage, which amount has now been reduced to $68,000, and no payment will be due on this balance of $68,000 until 1915. It is believed that through revenue received from the natural increase of membership as well as through further contributions to the land fund from friends of the Institute, this debt will be fully met.

It should be appreciated that such a settlement will give the Institute an unencumbered one-third interest in a property worth $1,659,320, in which our equity today is not less than $480,000.

CHARLES KIRCHHOFF,

New York, Sept. 14, 1912.

Jade is mined chiefly in Burma, says U. S. Consul Anderson at Hong Kong, though most of it is marketed from China.

Steam Hammer Drills

By P. B. McDonald*

A contractor in Duluth, while recently excavating a trench 18 in. wide and 4 ft. deep in tough trap rock, found that he was losing money. He had eight drill crews of three men each, who drilled 18 in. per crew per day, or a total of 12 ft. per day. The contractor went to a mining-machinery man to talk it over. Obviously some small "plug" drills were needed. The job did not warrant buying an air compressor, and up to that time plug drills could not be operated by steam, as the valve mechanism expanded with heat and stuck. Beside, the small tortuous ports produced "wire-drawing" of the steam to which compressor air, being quicker, was not subject.

Fortunately a new plug drill had just been put on the market which could be operated by steam, due to the advantages of the recently improved "Butterfly" valve. The contractor bought two of these drills and a 3-hp. portable boiler. For the remainder of the job two men, using the plug drills, drilled 6 ft. per man per day, or a total of 12 ft. per day; the other 22 men were dispensed with. The foreman having little to do, attended to the boiler, occasionally throwing in a chunk of coal. The fuel cost was less than $1 per day. The deepest holes drilled during this work were 4 ft., but this was easily done, and 6-ft. holes could have been put down readily. Thus the drills proved to be the solution of what might have been a difficult problem.

TRENCHING WITH STEAM PLUG DRILL

Another use of plug drills which is receiving attention, is for secondary work, such as blockholing large masses which have been blasted by means of holes drilled with heavy reciprocating drills.

---

*Mining engineer, Negaunee, Mich.

Under the old method, reciprocating machines on tripods were used to put in holes spaced closely enough to break the rock into small fragments, as hand drilling of chunks was slow work. Now it is possible to space the holes put in with the reciprocating drills so as to break large masses and slabs, which can then be broken up readily by plug drills. By this change of policy in breaking rock, higher efficiency can often be obtained.

On the Mesabi range, plug drills are now used in connection with steam-shovel work to break up boulders, hard pan, frozen ground or rock. The steam for operating can be obtained from the steam-shovel boiler. This method is rapidly superseding the old custom of hand drilling in pit work.

The butterfly-valve mechanism is shown in the accompanying drawing. When the valve has flapped to one side as in Fig. 1, the air supply is connected with the back end of the cylinder and the exhaust with the front end. When it has turned to the other end, the conditions are reversed. It is evident that the structure of this valve is better adapted for use with steam than are spool and tappet valves, which are likely to stick and which are fed through narrow posts. The Butterfly drills used in the above work are the product of the Ingersoll-Rand Co., 11 Broadway, New York.

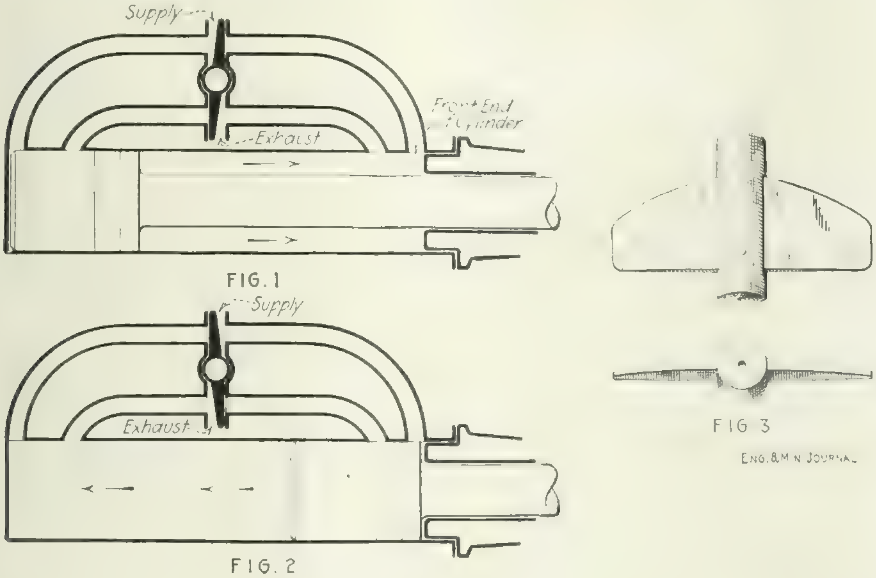


FIG. 1

FIG. 2

FIG 3

ENG. & M'N JOURNAL

BUTTERFLY VALVE

Ontario Mineral Output

The report for the Ontario Bureau of Mines for the six months ended June 30, 1912, for the mineral production of the province is as follows: Silver, 14,258,403 oz.; pig iron, 283,926 tons; nickel, 10,179 tons; copper, 5170 tons; cobalt, cobalt and nickel oxides, crude cobaltiferous material, 854,324 lb.; gold, 11,854 oz.; iron ore, 12,342 tons; lead ore, 17 tons. The items are arranged in order of decreasing value.

The gold is chiefly that from the Dome mine. Cobalt district shows a slight falling off in output of silver, but there is a much greater recovery of byproducts. Nickel, copper and pig iron all touch high-water mark in this period.

Rand Mining Notes

JOHANNESBURG CORRESPONDENCE

In the deepest levels of the Village Deep, on the Central Rand, the main-reef series after flattening to under 30°, is now dipping 40° and giving good assays. It is cheaper to mine on the steeper dip, as less shoveling is required in the stopes, but the highest rock temperature at which it is possible to mine will be reached sooner. At 7000 ft. vertical, a rock temperature of 97½° is expected. Roof pressures will likely prove the deciding factor in limiting mining in depth.

AIR-BLAST TROUBLES AT CINDERELLA

In the Cinderella Consolidated at a depth of about 4000 ft. vertical, much trouble is being caused by so called "air blasts." Last month a nominal profit of only £1000 was declared, owing to five stopes of the mine being rendered unworkable for the time by collapses of roof. In this mine about 1000 tons of sand are being sent down for filling. At first attempts were made to send the sand down wet in pipes, but owing to wear of pipes and the great cost of pumping 4000 ft., this method was abandoned. The sand is now sent down dry through a wooden chute about 12 in. square. Jets of compressed air are used at bends to assist. The trouble seems to be that stopes cannot well be filled as worked, and that the effects of pressure act suddenly and unexpectedly. The system of mining may, however, ultimately be modified to deal with the conditions.

Another very deep mine, the Simmer Deep, is in a precarious condition, owing to the low grade of ore met with. Last quarter 135 stamps, followed by tube mills, crushed 143,360 tons, against 90,734 tons developed. The ore yielded only 4¼ dwt. gold per ton. Working costs were 16s. 7d. per ton and profit only 1s. 2d. per ton, or £8400. Interest on debentures, etc., absorbed £13,819, and capital expenditure, including inclined-shaft sinking, cost another £10,359. A fire destroyed the joint crusher station of the Knights Deep and Simmer East mines. Another station was in course of erection and only one week's delay was caused. The Knights Deep mine is an example of how cheaply ore can be mined and treated when the reefs are large, where 30% of the ore can be mined from the foot and hanging walls of old stopes and where development is nearly completed. At this mine 270 stamps and six tube mills crushed 60,000 tons per month at a cost of 11s. 2d. per ton, 2d. per ton representing development costs. The ore mined is of about 17s. per ton grade.

The Voorspoed diamond mine made a working profit of £21,800 for 1911-1912; of this, £19,800 was written off for depreciation. The yield decreased to 14.1 carats per 100 loads.

Southern Aluminum Co. Buys Equipment

The Southern Aluminum Co. is reported to have placed an order for $400,000 worth of electrical machinery with the General Electric Co. According to press dispatches, the equipment purchased consists of seven 5000-kw. and two 2500-kw., 250-volt, alternating-current generators, with all necessary switchboard and control apparatus, and the contract is probably the largest single one ever given in the South for electrical machinery.

The company purchased from the old Whitney company the unfinished electrical development and 3000 acres of land at Whitney. The dam of the power plant has been finished and work is now progressing on the power house, while work is also being started on the aluminum works proper and 500 concrete cottages of different designs for the employees of the company. The aluminum works proper will consist of nine furnace rooms, 60x500 ft., and an electrode factory of like size. Plans are being made for the development of a second plant to furnish 35,000 hp. later. Bauxite will be secured from Georgia and the Middle West.

Palladium Production

In 1911, according to the U. S. Geological Survey, 2390 oz. of palladium were produced, 300 oz. from crude foreign and domestic sands and the rest from the refining of copper ores and copper bullion. In 1911, 1218 oz. of palladium were imported, the value assigned being $56,307. Palladium is chiefly used for certain alloys in dental work; also in the manufacture of astronomical instruments and watches and for soldering platinum metals. The demand is said to be greater than the supply.

Labor Strike at Bingham

All the laborers at the mine of the Utah Copper Co., and most of the other properties in Bingham Cañon, went out on strike Sept. 18, because of the refusal of the mine owners to advance wages 50c. per shift and officially recognize the union. The men went out, it is said, in spite of the efforts of President Charles H. Moyer, of the Western Federation of Miners, to have work continue until an attempt at settlement without a strike could be made.

Most of the strikers, who number about 5000, are foreigners, Croatians, Greeks, Austrians and Italians predominating. They have organized themselves under crude military discipline, and are said to be ready to offer armed resistance to the entrance of strikebreakers into the region. Rifle pits have been dug on the mountain slope opposite the Utah Copper property, and a few days ago a party of deputy sheriffs was fired upon.

Sheriff Sharp informed Governor Spry that he was unable to cope with the situation with his force of deputies, whereupon the governor visited Bingham with the intention of supressing disorder by calling out the militia. Since his visit the strikers have been less violent. The Utah Copper Co. increased wages 25c. per day about Sept. 1, at the instance of the miners. This lead was followed by the other mines, but the men were not satisfied with this advance of half what they had demanded, and they resented the company's refusal to recognize the union.

Survey Work in Alaska

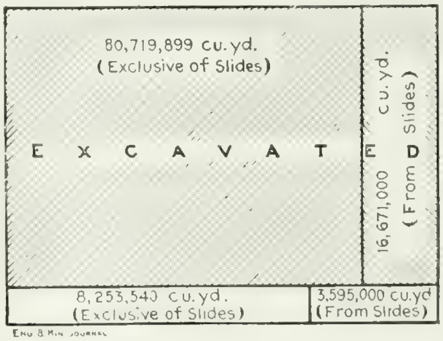
The scope of the field work of the U. S Geological Survey in Alaska during 1912 has been announced to include a study of the gypsum and marble deposits in the southeastern part of the territory, and detailed surveys of the west end of the Chitina copper belt, as well as of the copper-bearing region adjacent to Galena and Landlocked Bays. The volcanic eruption that took place in the Alaskan peninsula in June caused the deposition of much material on the northern part of Kodiak Island and created much hardship among the settlers. This field is being jointly investigated by the Geological Survey and the National Geographic Society.

The study of the gold districts at Ruby Creek and Iditarod is to be continued as will the investigation of the water supply available for placer mining in the Yukon-Tanana region. A geologist of the Survey corps is accompanying the parties which are surveying the international boundary north of the Porcupine River. It is expected that during 1912 the Survey will be carried through to the Arctic Coast and thus completed.

The delay in passing the appropriation bill has made it impossible to carry out all the field plans for Alaska that had been formulated for 1912, but the funds that became available by emergency appropriation made it possible to dispatch several of the smaller parties for a full season's work, and others started for Alaska as promptly as the appropriation permitted.

Progress of the Panama Canal

According to revised estimates of the Panama Canal Commission, Oct. 15, 1913, is the tentative date set for the passage of the first vessel through the canal. Colonel Goethals, in charge of the construction, reports that the canal will be completed below the estimated cost of $400,000,000. The total amount of excavation work involved in the canal is about 242,134,000 cu.yd., of which 90% has been completed up to Sept. 15. At the present rate of progress the digging should be completed before Sept. 15, 1913. The Gatun dam, locks and spillways show stages of completion varying from 75 to 90%. The concrete work of the Pedro Miguel locks is nearly 95% completed and that of the Miraflores locks over 92 per cent.



Total Estimated Excavation at Culebra Cut, July 1, 1912. The Unshaded Portion Is Yet to Be Excavated

The accompanying diagram, drawn from data given in the *Canal Record* of Sept. 4, 1912, shows graphically the total estimated excavation at Culebra Cut inclusive of slides and also the total estimated excavation on account of slides as compared with the total original excavation in the canal prism in the cut; also it shows the estimate of total excavation remaining on July 1, 1912, giving separately the amount of excavation remaining on that date, due to slides.

The work of decreasing the pressure, where breaks and slides might be expected, by excavation with steam shovels, has continued uninterruptedly since January, 1911. The records show that while the lightening of weight has been beneficial, it has not wholly stopped the moving and heaving. Most of the so called slides were, properly speaking, breaks in the bank due to the inability of an underlying layer of rock to support the enormous pressure of the ground above it. This weight crushes the underlying material, forces it laterally, and causes it to heave in the bottom of the cut. Observations show that the material has heaved to a height of 30 ft. The material involved is not clay as commonly supposed, but argillaceous sandstone. The total area involved in slides, up to June 30, 1912, is 208 acres.

Mc Dermott Underground Steam Shovel

Negaunee Correspondence

A demonstration was recently given at the Sheridan mine stockpile at Iron River, Mich., of the new underground steam shovel invented by Capt. Harry McDermott. The machine is of compact build for use in drifts underground or in tunnels, for loading muck into tram cars.

A lively interest is manifested by operators on the Menominee Range, where the economical mining of the low-grade deposits is always a problem. It is pointed out that with the present practice of shoveling broken rock into tram cars by hand, the labor cost is nearly as high for this item as the labor for drilling and blasting; that is, in approximate figures, it takes two men per shift to drill and blast a cut, and it requires two men shoveling for a shift to take away the broken rock. While constant improvements are being made in rock drilling, the method of getting the material into the cars has changed but little since mining began.

The underground steam shovel will be manufactured by the McDermott Machinery & Foundry Co. of Iron River, of which H. McDermott is president, C. T. Hampton, secretary, and Charles E. Lawrence, treasurer. A royalty will be paid to the McDermott Mechanical Co., which owns the patent. A model of the shovel was exhibited at a meeting of the Lake Superior Mining Institute several years ago, and it was desired to exhibit a full size machine at the meeting just ended, but delay in the manufacture prevented this.

Mineral Production of New Zealand

The mineral production of New Zealand for 1911 was, according to the government report, as follows: Gold, 455,266 oz.; coal, 2,068,073 tons; kauri gum, 7587 tons; silver, 1,311,043 oz.; all other minerals, £22,200. Of the last figure, it is understood that over one-half was due to scheelite exports. Outside of the kauri-gum diggers it is estimated 7400 persons were employed in metalliferous mines and 4290 in coal mines during the year.

Details of Practical Mining

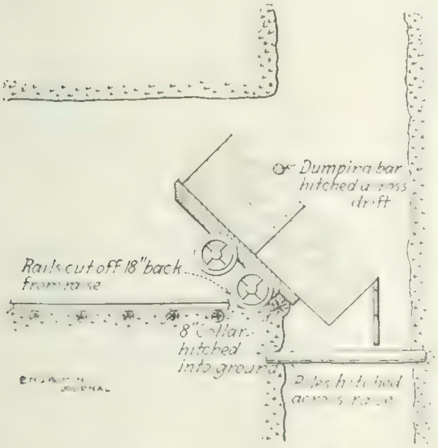
Accounts of Useful Ways of Doing Many Things in the Day's Work

A Sublevel Car Dump

By L. D. Davenport*

Various kinds of tipples for end-dump cars have been tried in the Chisholm, Minn., mines at different times. Most of these required frequent repairing, and trouble was caused by fine ore getting under the rockers. Cars hinged so that they would dump without the wheels leaving the track were also used at one time. One of the objections to these cars was the inconvenience in taking them from one level to another. At present all sublevel cars are made with the boxes fastened directly to the trucks. These cars are of 25 and 41 cu.ft. capacity with 14-in. wheels running loose on the axles.

Usually each gang dumps into a separate raise. The accompanying sketch shows a typical car dump. The rails are cut off 18 in. back from the raise and a collar-piece of round timber is hitched into the ground at the edge of the raise. A dumping bar is placed 4 ft. 6 in. above this collar and parallel to it. The loaded car comes down the track and just before reaching the dump the miner throws the lever which unfastens the car door, the front wheels drop about 4½ in., the front end of the truck strikes the collar-piece and the car dumps at an angle of about 45°. The dumping bar prevents any chance of the car going into the raise. This bar is sometimes made of a short piece of rail. Poles or short pieces of rail are hitched across the raise to prevent anyone from falling through. These poles are placed low enough to allow plenty of room for the car door to swing open.


Dumping bar hitched across drift
Rails cut off 18" back from raise
8" Collar hitched into ground
Poles hitched across raise

Sublevel Car Dump

After the car has dumped, one or two miners grasp the handle at the rear end and with one pull the rear wheels come down on the track, the front wheels are lifted clear of the ground and as the car moves back at the same time, the front wheels also come down on the rail. This dumping arrangement for end-dump cars is simple, safe, easily made and requires little repairing.

A Blasting Bulletin Board

The accompanying form shows the blasting bulletin board used at the shaft stations of the St. Louis Smelting & Refining Co. in the Flat River district of Missouri. As the men go off shift, they mark the holes just fired in the proper place on the record on the bulletin. The driller is designated by name as well as by the number of his machine. Thus a driller on the next shift knows by the number of the machine, if he does not know the name of the man using his machine on the other shift, the number and kind of holes that were blasted in his working place on the preceding shift.

BLASTING BULLETIN BOARD

Shift Boss				Shift Boss.....				
Holes Fired						Holes Fired		
Breast	Stope	Lifter	Name of Driller	Number of Drill	Name of Driller	Breast	Stope	Lifter

Special Instructions

It is the duty of the drillers and backhands to study this bulletin carefully before going to work and upon arriving at their respective places of work to make a thorough search for missed holes.

All missed holes must be fired before drilling is started.

The method of designating the holes will differ according to the method of breaking ore. In the Flat River district the ore in a stope is broken by carrying a top breast or heading along the top of the orebody. This is kept somewhat ahead of the running stope. The holes drilled in the heading breast or in the breast of a drift are called breast holes; the running stope below the breast is broken by benching it off from the top down, by a series of steeply pitching water-holes. These are called stope holes. When the stope has been benched down until only a thickness of ore is left at the bottom, such as can be broken by flat holes in the bottom, such holes are drilled, as they leave a better floor for the shovelers to work upon than if the vertical benching be continued clear to the bottom of the stope. These flat holes are the lifters. In other mines some other denomination of the holes might have to be adopted.

The object in giving the names of the holes is that by such a system the men can take care against drilling into missed holes. When so many men are blasting in the mine it is impossible to count the holes and determine those of each man. Even when it is impossible for each miner to stop in a place where he can tell from the reports whether his are the holes exploding, it is well to make each driller chalk under such a bulletin board the kind of holes that he has fired and the number. It makes the work of the driller safer, and less time is lost by the miner on the next shift in looking over the breast to make sure that there are no cut-offs or missed holes. This is especially the case where holes are tamped, for tamping often, especially when it is about the same color as the ore, makes it difficult to find a cut-off hole.

The miners appreciate the fact that the keeping of the bulletin is only an attempt on the part of the company to safeguard them, and they gladly use it. Such a board should be placed at each level station where the men can mark the holes while waiting for the cage. The bulletin board and a simple system of designating the holes makes the work easy. There is no drawing of the round as has been suggested for development-work headings, or anything else to do that any miner of sufficient intelligence to run a machine cannot do. At the bottom of the bulletin is left enough blank space for any remarks that it may from time to time be desirable to make.

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*Engineer, Oliver Mining Co., Mesaba, Minn.

Troubles with Mine Telephones

By Sidney F. Walker*

The principal trouble involved in the use of electrical apparatus in metalliferous mines, arises from the fact that they generally carry an extraordinary quantity of water. Electric motors and generators, though the latter are not often used underground, have a much better chance of continuing to work than electric signals and telephones, because the wires employed in their construction are so much larger, that water does not easily attack them.

The great evil to be feared in connection with motors underground in metalliferous mines is the destruction of the insulation; evidently from the experience in the Rand mines, which were flooded during the war, it is possible to guard against that by suitable construction. In the manufacture of electrical apparatus care is now taken to abstract all moisture and air, from the insulating materials employed, and to impregnate them thoroughly with insulating varnish. If the varnish is properly applied, and is thoroughly baked after application, insulation troubles in metalliferous mines are minimized.

With telephones and electric signals the chief difficulty is in the corrosion of the connections, and the screws employed to make connections with leading wires, etc. In telephones, the induction coils are necessarily wound with fine wires, say No. 30 standard wire gage and smaller. The smallest drop of water upon the screw, under which the end of one of the wires from an induction coil is screwed, will cause the connection to be destroyed in a short time. In modern telephonic apparatus, the difficulty is overcome by carrying a larger wire for connecting purposes inside the body of the spool upon which the induction coil is wound and hermetically sealing up the whole thing, in something the same manner as with armature coils and field magnets of dynamos. The same danger arises with the wires forming the coils of electric bells used in signals; and it is to be overcome to a certain extent in the same manner.

The telephone has a number of connections inside the case, which contains the transmitter, switches, and now usually the receiver. If these connecting wires are small, they will easily be parted. In modern telephonic apparatus intended for mining work, all the connecting wires are made of No. 16 gage wire or larger. The trouble is not cured by using strips of brass or copper, because these expose larger surfaces to the electrochemical action which goes on whenever water is deposited upon them. The best results are obtained by solid wires of ordinary section, exposing as small surface as possible for a given strength. The larger wires give a better chance of the connections not being broken, in case water is deposited upon them.

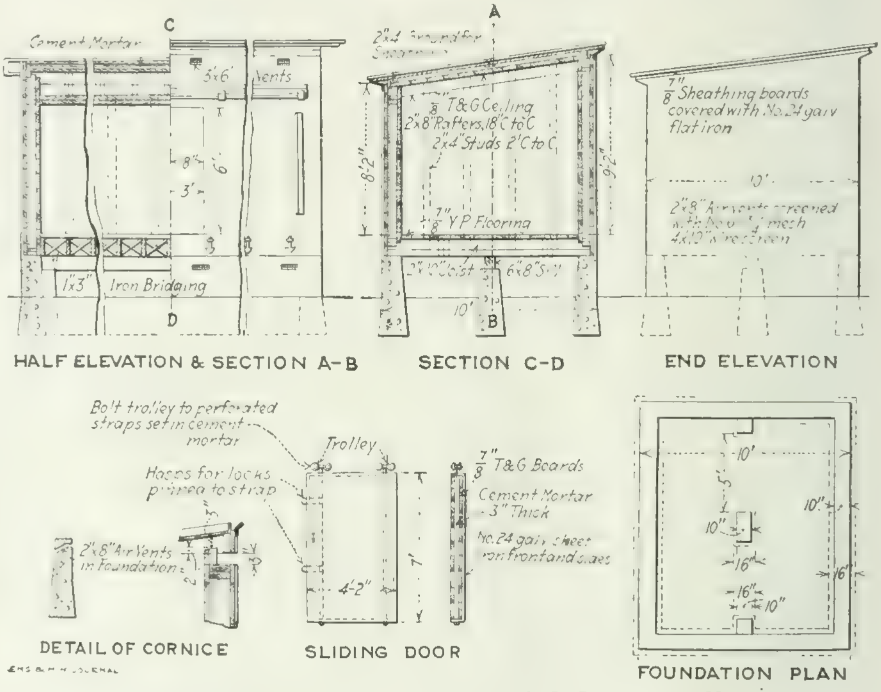
Further protection is afforded by inclosing everything within a metallic case, consisting of a single casting and a cover plate, plate, the joint between the body of the case and the cover being formed by wide flanges, carefully machined. Careful machining and a wide flange, are the two secrets for success in this matter. I have found that when moisture is present in the atmosphere where an electrical apparatus is fixed, it is difficult to keep it out. Water vapor will find its way through the smallest aperture between the cover and the telephone box, or the opening made when a signal button is pressed.

In modern telephonic apparatus, the telephone receivers are fixed on the inside of the containing box, the ear receivers being only acoustic tubes. Great care should be taken to make the joint between the receiver and the box perfectly water-tight. I have found that wherever possible, it is wise to have the connecting screws for the leading wires on the outside of the containing box so they can be seen and quickly cleaned. The terminal screws should be made large, so as to present plenty of surface, and the wires employed for connections between the bells, pushes, etc., should be as large as possible, to withstand fof a longer time the effect of electrochemical action due to the presence of moisture.

The method described by L. H. Eddy,[1] by which a 4-cp. lamp was inclosed inside the telephone box, strikes me as a good one; but where heat is applied in that manner, there should be provision for ventilation to carry off the moisture; otherwise there will be danger of the moisture merely being removed from one part of the apparatus to another.

Powder Magazine and Thaw House

After an investigation of the methods of storing and handling explosives, the U. S. Bureau of Mines decided that cement-mortar construction was best for magazines and thaw houses for explosives. The magazine and the thaw house, shown in the accompanying engravings were built by the Bureau of Mines and are described in *Technical Paper* 18, by Clarence Hall and Spencer P. Howell.



Powder Magazine Recommended by U. S. Bureau of Mines

The cement-mortar magazine has a capacity of 20,000 to 30,000 lb. of explosives and was built at a cost of $400. The outside dimensions are 10x14 ft. The salient features of the magazine are the cement-mortar walls, sliding door and roof. The cement mortar is 6 in. thick in all walls and 3 in. thick in the roof and the door. The door is secured by two substantial locks. No metal of any kind is exposed on the inside of the magazine. The ventilators above the floor are arranged to prevent the entrance of bullets or firebrands.

The means provided for ventilation were found to be adequate, therefore the storage conditions are favorable for keeping the explosives from deteriorating. The cement-mortar construction is effective in resisting the penetration of rifle bullets, and because of its friable nature offers an additional advantage for the reasons that, in the event of an explosion in or near the magazine, large masses of material will not be projected over the surrounding country. The galvanized-iron covering is fire-resisting; it also serves as an excellent medium for protection against lightning, as the four corners of the building are properly grounded with metal rods. The concrete of the foundation consists of one part cement, three parts sand and five parts gravel. The cement mortar in the walls, door and roof consists of one part cement to six parts coarse sand.

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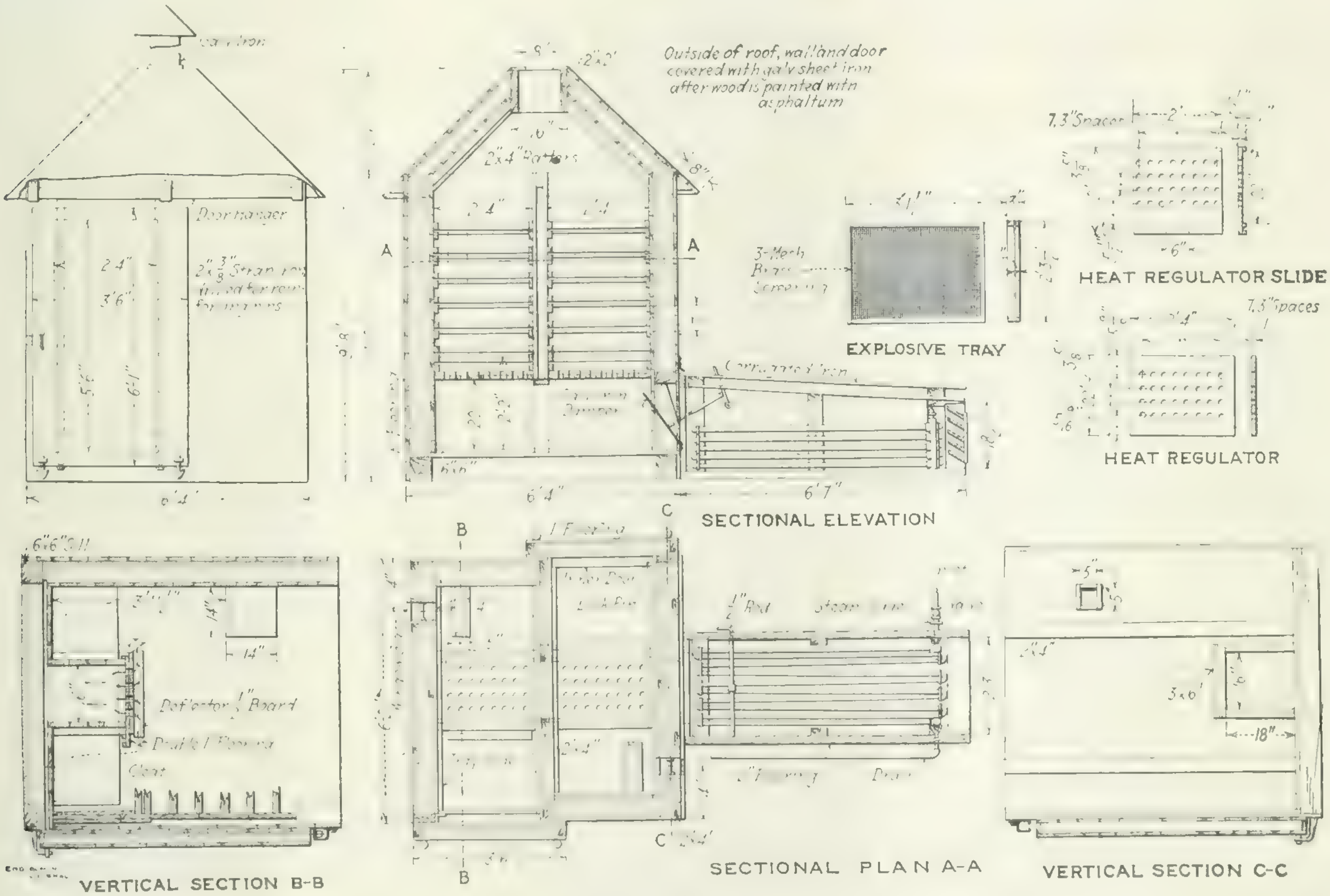
*Bloom[illegible] Bath, Eng.

[1] Eng. and Min. Journ., June 8, 1912.

The cement-mortar thaw house built by the Bureau of Mines for thawing large quantities of explosives has a capacity of 500 lb. and cost complete $200. Entrance is difficult and is unnecessary, for the trays can be entirely removed without anyone entering the house; all parts of the house are accessible for cleaning; the explosives can be distributed in thin layers in the trays; the thermometers are easily read from without.



Bureau of Mines Thaw House of Cement-mortar Construction

The thaw house also offers the following advantages in regard to temperature: No high temperature from artificial sources of heat obtains in the vicinity of the thaw house; the low-pressure steam, hot-water, or electric coils are not in the thaw house proper but in a separate compartment at its side, and hence particles of explosives cannot come in contact with them; the explosives are not subjected to the evil effects of free steam or water; the temperature is surely and easily controlled with little attention; the entrance of cool air or the escape of heat from the thaw house is reduced to a minimum; the stack makes possible the positive circulation of heated air.

The operation of the thaw house is as follows: The position of the heating box with reference to the explosives compartments, the slanting roof of the heating box, and the stack make a natural draft easy. The cold air from without is drawn through the air regulator, over the hot coils, through the damper opening, into the air conduit. Thence it is passed upward through the holes in the compartment regulators and through them only. The air is then deflected to each side of each compartment by means of deflector boards, one of which is directly above each compartment regulator. As the trays in each compartment are staggered, the air is deflected backward and forward as it rises, until it finally escapes through the stack.

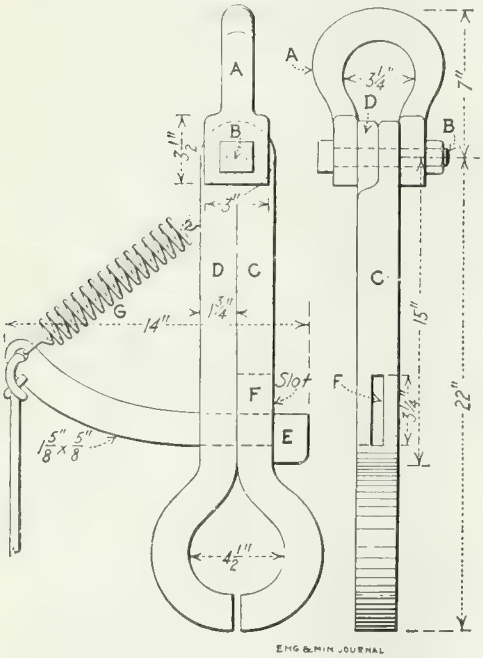
The air regulator consists of five adjustable ¾-in. louver boards, spaced 3 in. apart. This regulator is used only to control the quantity of air passing over the coils. If the outside air is very cold the quantity of air is reduced by partly closing the louver boards, in order that the air entering the explosive compartments may be heated to the proper temperature. On the other hand, when the outside temperature is comparatively high, say 32° F., the louver boards are left completely open, or nearly so, in order that the air entering the explosives compartments may not become too warm for the safe thawing of explosives. A damper is included in the construction as a precautionary device for instantly cutting off the heating box from the air conduit and the explosives compartments.

Each compartment regulator consists of two 1-in. boards, the upper one stationary, the lower one sliding. Each board has thirty-two 1½-in. holes, the holes in the movable board coinciding with those in the upper board. Each explosives compartment may then be supplied with equal quantities of air by partly closing the holes of the regulator for that compartment. Either compartment may be completely isolated from the incoming warm air by closing its air regulator, and hence one compartment may be used without the necessity of heating the other compartment, or the compartments may be used alternately. The steam coils consist of 50 lengths of 1-in. pipe, each 5 ft. 2 in. long.

The galvanized-iron covering of the thaw house is grounded in the same manner as for the powder magazine, thus affording protection against lightning.

Releasing Hook for Cage Testing

Usually, when testing the safety catches on skips or cages, the hoisting cable is attached to the cage by a hemp rope, which is cut when the cage is in the desired position. The inspection department of the Cleveland Cliffs Iron Co., in the Lake Superior region, tests all safety dogs once each month. A releasing hook is used instead of the hemp rope and has proved more satisfactory. The accompanying drawing shows the details of the hook, which is strong enough for a five-ton skip of the Kimberley type. The trigger *E* is pinned to the arm *D* and operates in the slot *F* cut in the arm *C*. The trigger catches on the lower back edge of this slot. The pin *B* of the clevis *A*, which fastens the cage to the shackle of the hoisting cable, is removed and the clevis attached to the releasing hook. The hook is now linked into the drawbar of the skip or cage whose safety dogs are to be tested. When the cage has reached the proper position the rope attached to the trigger is pulled, allowing the arms *D* and *C* to separate and the cage to fall.



CLEVELAND-CLIFFS RELEASING HOOK

At the Cliff shaft of the Cleveland Cliffs Co., the safety-dog testing is done at the bottom of the shaft where actual working conditions as to slippery guides are more nearly duplicated than at the surface. This practice is open to objection, however, if the bottom guides are not worn as much as those higher up.

The danger due to the dogs cutting up the guides is better tolerated at the bottom of the shaft than at the surface. Should the dogs of a heavy skip refuse to work and allow it to fall on the stage at the collar of the shaft, damage might be done to the shaft timbers; this danger is obviated by the use of the bottom of the shaft for testing purposes.

Drift Round in Flat Sediments

In the JOURNAL of Sept. 7, 1912, various methods of drifting in the lead district of southeastern Missouri were described. In speaking of the center V-shaped cut used by the Desloge Consolidated Lead Co., making a drift 11 ft. wide and 6½ ft. high, it is stated that this drift cannot be driven as fast as the smaller one, 6½ ft. high and 8 ft. wide; we are informed by Superintendent F. V. Desloge, that this is incorrect. Two one-man machines, working in the large drift, drill 18 holes to the round, making about 100 ft. of hole. A round will square up 5 ft. of advance per shift and the average speed is about 90 to 100 ft. per month of 25 working days. About 50 lb. of dynamite is used to break the round; this is at the rate of 10 lb. per ft. of drift driven. About 25 to 30 tons of rock are broken per round per shift. At the Desloge mine the only extra expense in driving the large drift is the handling of the extra rock, and when working in ore or lean rock, this pays for the extra work.

In making typographical corrections in the article in the JOURNAL of Sept. 7, referring to small drifts, mentioned above, the second and the twentieth lines on p. 442 were misplaced. The sentences in which they appear should have read as follows: "A one-man machine will drill about 40 ft. of hole per shift in average ground, taking out the time required in setting up and loading and blasting." The other sentence should have read: "About 20 lb. of dynamite per foot is used in such a drift and about 12 to 18 tons are broken by a round." Mr. Desloge places the dynamite consumption at his mine at "about 18 lb." per foot of advance in these drifts. In connection with these figures it will be well to bear in mind that only 35% dynamite is used.

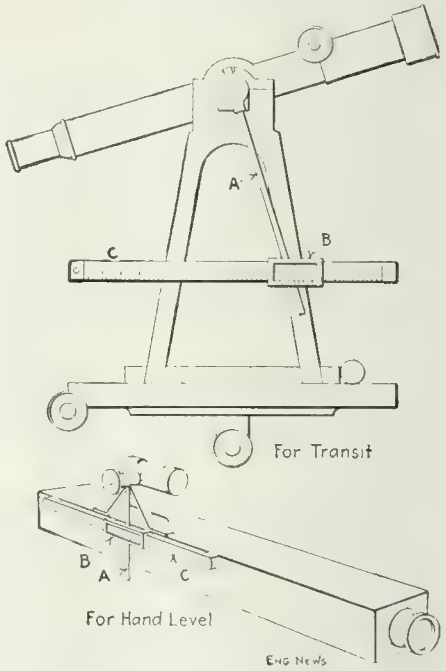
Illuminating the Cross Hairs in Mine Surveying

In discussing practical problems in mine surveying with several engineers, says George M. Brown (*Coal Age*, Sept. 14, 1912), I find that many of them are still using sheets of white paper torn from note books, etc., to reflect the light upon the plumb bob in taking "sights" below ground. This method requires the illumination of the cross hairs in the instrument.

I find that a small piece of tracing cloth about 6x9 in., held 2 in. behind the plumb bob or string and illuminated from behind, will show good results in sighting up to 300 ft. (depending on power of telescope), and no illumination of cross hairs is necessary. They will stand out clear upon the illuminated tracing cloth. The cloth will easily last one or two days.

Grade-Reading Attachment for Transits and Levels

The transit attachment illustrated in the accompanying sketch was patented by F. W. Austin, Hartford, Iowa, in 1909, states *Engineering News*. It was designed for the purpose of giving a direct reading of rates of grade by means of the inclination of the telescope. In this design, a rod *A* is attached to the telescope trunnion and extending below it passes through a sleeve on the back of a vernier *B*, causing this to slide along a fixed horizontal scale *C* as the telescope is oscillated on its bearings. The scale is attached to the standards supporting the trunnion bearings. The device is shown in the patent as applicable also to a hand level. In this case (which also is shown in the cut) the scale is attached to the side of the telescope, with space enough between them to permit the radial movement of the rod, the upper end of which is attached to the trunnion of the spirit level; the radial movement on the rod, as this level is tilted, shifts the sliding vernier along the scale. The vernier is graduated in feet and decimals of a foot.



TRANSIT AND HAND-LEVEL FITTED WITH GRADE-READING ATTACHMENT

Headframe Rolled Aside to Permit Shaft Repairs

At the Maas mine, one of the Cleveland Cliffs Iron Co. properties on the Michigan iron ranges, the headframe was removed by the Foundation Co., in order to gain freer access to the shaft while replacing the wooden lining with concrete. The steel headframe was mounted upon rollers and moved bodily to one side of the collar until the concrete work had been finished.

Details of Metallurgical Practice

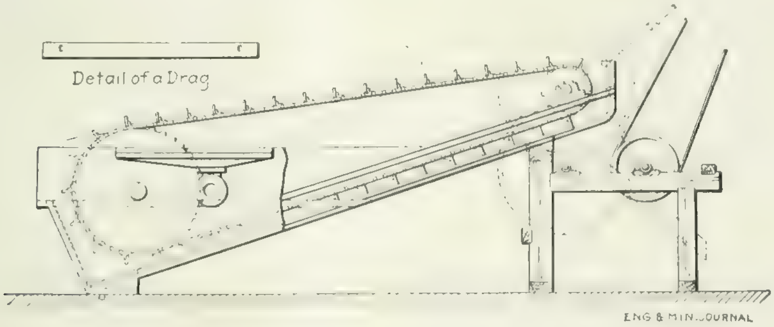
Records of Experience in Ore Dressing, Cyaniding and Smelting

Esperanza-Federal Classifier

By Frederick MacCoy*

The Esperanza-Federal classifier, which is the joint invention of H. A. Guess, manager of the Federal Lead Co., Flat River, Mo., and Charles Hoyle, manager of the Esperanza Mining Co., of El Oro, Mex., is used in the El Oro district for separating the slime from the sand before tube milling. At Esperanza two batteries of these classifiers are used. The upper battery takes the stamp-mill product and separates the flocculent slime from the quartz sand, and sends the sand to the tube-mill plant for regrinding, and the slime to the upper Pachucas. The lower battery is working on the tailings dump which was built up in the days before the tube-mill plant was installed. This tailings dump contains a greater proportion of sand, as much of the original slime has been washed away.

The essential features of the classifier, to quote the description of same on which U. S. pat. 565,801 was based, are: "The combination of a settling box having an inclined bottom extending above the overflow level, an extended overflow pan in said box spaced from the ends thereof and presenting an overflow edge, a conveyor in said box encircling the overflow pan in a vertical plane and comprising an endless series of transverse scrapers extending across said box and adapted to engage the bottom, said series extending along said bottom to above the liquid level."



Drag Classifier Used in El Oro District Mexico

As will be seen by the illustration, the sand and slime enter the classifier through the feed launder; the lighter slime overflowing into the slime-discharge pan and from there out through the slime-discharge pipe. The sand, being heavier, settles to the bottom of the box, where it is caught by the scrapers and elevated above the overflow level and discharged over the top of the inclined bed of the classifier.

Various ratios of classification are possible, by altering the speed of the drag chain, spacing of the drags, inclination of the classifier, varying height of overflow slime pan, sprinkling of the sand as it is elevated above the overflow, etc.

Various materials have been used at Esperanza for the scraper bars, such as slotted trommel plates, solid iron bars and angle irons, but the most satisfactory material has been found to be ordinary wooden slats, as they keep ground down to conformity to the bottom, and are inexpensive to replace when worn out. The metal bars develop a tendency to arch somewhat from continued use, and thereafter do not engage the bottom as well as do the wooden bars.

At the mill of the Mexico Mines of El Oro, Ltd., the classifier is made use of as a combined classifier and oversize return on the tube mills. A classifier is placed alongside each tube mill and receives the combined discharge from the stamp batteries and the tube mills. The slime is cut out, and the oversize from both sources is elevated by the drags to a point high enough above the feed end of the tube mill to flow in by gravity.

TESTS OF CLASSIFIER AT ESPERANZA MILL

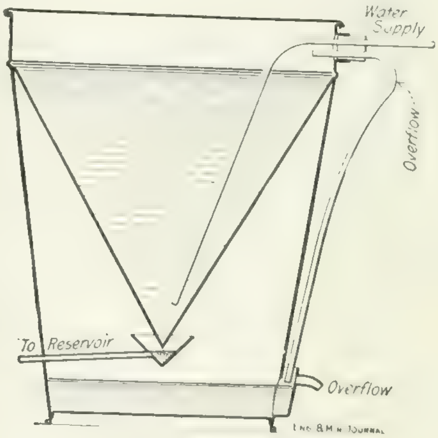
Test Number	1	2	3
Tons treated	11,056	4653	17,035
Number of classifiers....	3	2	2
Screen Test on Feed	%	%	%
+ 40 mesh	7.4	5.3	1.9
+ 60 mesh	9.8	10.1	8.5
+ 80 mesh...	8.3	10.0	9.2
+100 mesh...........	1.4	1.9	1.2
+150 mesh...........	21.4	23.0	23.9
+200 mesh.	1.6	0.8	0.4
—200 mesh .	50.1	48.9	54.9
Screen Test on Sand Product			
+ 40 mesh.	15.1	15.3	9.1
+ 60 mesh...........	20.2	24.2	25.2
+ 80 mesh	15.9	18.4	20.6
+100 mesh..	2.6	2.8	2.4
+150 mesh	31.3	30.0	32.4
+200 mesh...........	1.9	0.7	0.4
—200 mesh...........	13.0	8.6	9.9
Screen Test of Slime Product			
+100 mesh.	0.5	0.8	0.9
+150 mesh	5.7	6.9	8.8
+200 mesh. ..	1.0	0.5	0.4
—200 mesh...........	92.8	91.8	89.9

The classifier has been installed in all of the mills in the El Oro district, with slight variations in dimensions, etc., from the original as built at Esperanza. As indicative of the work which the classifier does, a resumé of tests under working conditions is given in the accompanying table. Samples were taken every 30 minutes.

Water Still

By E. W. Buskett*

An ingenious still is that in the Merrill assay office, Joplin, Mo. It possesses such qualities of cheapness and efficiency that it should be of interest to all assayers and chemists.



Bucket Condenser

It consists of an ordinary galvanized bucket, a condensing cone and connections and supporting brackets. The bucket cost 25c., the cone and tinners work $1.50 and the brackets 25c.

The cone is made of tinned copper, the tin being on the outside of the cone. The connections of water and overflow are of glass and pass through a cork or rubber stopper. The water tube is brought down near the point of the cone while the overflow is curved into the bottom of the bucket as shown. Here is an automatic overflow that keeps the water always at the required depth in the bucket. At the point of the cone is a smaller cone provided with a copper tube which leads the water from the still to a carboy or other receptacle. The water is evaporated, condenses on the tinned outer surface of the large cone, is caught by the small cone, and is carried off to the reservoir.

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*Chief engineer, Esperanza Mining Co., El Oro, Mex.

*Metallurgical engineer, Joplin, Mo.

Air Granulated Slag

A method of granulating blast-furnace slag by means of an air-blast was described in a paper recently read before the Verein Deutscher Eisenhüttenleute, by G. Jantzen, manager of the Buderus Iron Works, where the installation has been in successful operation for over a year, with an output of 100 tons per day, says *Engineer*, Aug. 30, 1912. The slag is delivered from the furnace through a spout into a revolving iron drum about 6 ft. in diameter by 45 ft. long. As it enters the drum the molten slag is met by a blast of compressed air, delivered through a suitable nozzle. This jet of air sprays the slag and flings it against the sides of the revolving drum, the wall of which is kept cool by a flow of water delivered over its outer surface. Owing to the rotation of the drum a fresh and cooled surface is continuously exposed to the shower of particles flung against it by the jet. Stationary scrapers are provided within the drum, which prevent the formation of lumps. The slag is ultimately delivered from the discharge end of the drum as a granulated sand, containing no large masses. As it falls it is received in the boot of an elevator and transported automatically into a storage bin, whence it is transported to the cement works. A chimney is provided at the delivery end of the drum, and carries off all fumes. For cement-making the slag sand thus formed has proved fully equal to water-granulated slag. The latter, however, contains a large percentage of water, which must be got rid of before the slag can be utilized for the production of cement. The air-granulated slag is dry when delivered, and is, moreover, much denser than the water-granulated variety, weighing about 2½ times as much, bulk for bulk. The material is also said to be suitable for use as sand in cases where it cannot be used for cement.

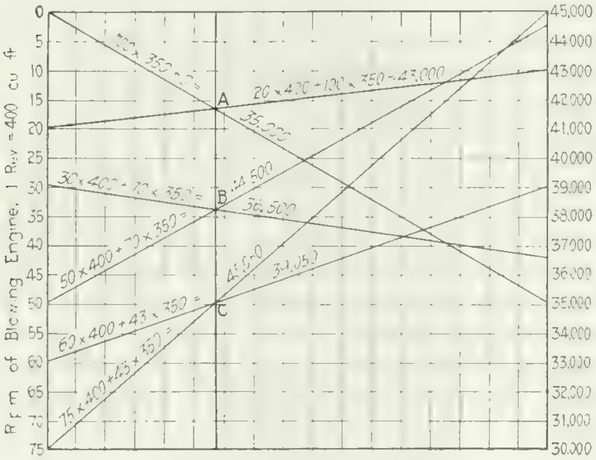


FIG. 1. METHOD OF LOCATING POINTS ON CHART

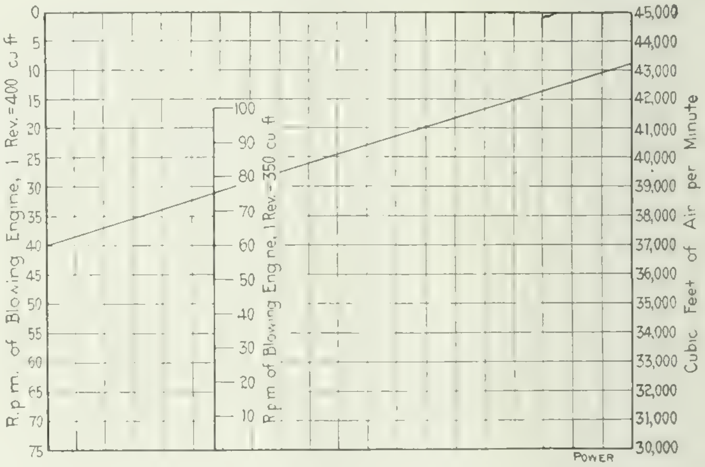


FIG. 2. FINISHED CHART, SHOWING VOLUME OF AIR PUMPED

Chart for Determining Blowing Engine Speed

It often happens, states J. C. Watson in *Power*, that in blast-furnace work the air for the furnaces is supplied by two blowing engines of different sizes. As it is necessary for satisfactory operation to supply a definite amount of air to each furnace, this involves a calculation of the speed at which the engines should run to deliver the required amount.

A convenient way of determining these speeds without any calculation is by the use of a chart similar to the one shown herewith in Fig. 2. This chart is constructed as follows: Suppose that the blast furnace to be supplied uses not less than 30,000 nor more than 45,000 cu.ft. of free air per minute, and that the air is supplied by two blowing engines, one having a maximum speed of 75 r.p.m. and delivering 400 cu.ft. of free air per revolution, the other having a maximum speed of 100 r.p.m. and delivering 350 cu.ft. of free air per revolution.

Take a sheet of cross-section paper as shown in Fig. 1; divide the left side into 75 equal parts, with the zero at the top to represent the maximum, 75 r.p.m. of the 400-cu.ft. blowing engine. At the right side of the sheet choose another vertical line, and starting with the minimum number of cubic feet of air required per minute at the bottom of the sheet, divide this line into such a number of equal parts that the maximum number of cubic feet of air per minute will be shown on the sheet. It is immaterial whether this comes at the top line of the sheet or not; convenience in making the divisions will determine.

All that remains to be done to complete the chart is to determine the location of the line representing the 350-cu.ft. engine and the size of its divisions. In the present case the 400-cu.ft. engine, making 75 r.p.m., will pump 30,000 cu.ft. of air per minute, so the zero speed of the 350-cu.ft. engine lies somewhere on the line connecting these two points.

Now, if the 350-cu.ft. engine runs at 100 r.p.m., it pumps 35,000 cu.ft. of air per minute. So, if the zero point on the 400-cu.ft. engine line is connected with the 35,000 point on the volume line, it will be known that the point representing 100 r.p.m. of the 350-cu.ft. engine line lies somewhere on this connecting line. Likewise, if the 400-cu.ft. engine is running at 20 r.p.m., it blows 8000 cu.ft. of air per minute, and if this is added to the 35,000 cu.ft. blown by the 350-cu.ft. engine at 100 r.p.m., there is a total of 43,000 cu.ft. of air per minute blown by the two engines.

If, now, 20 is connected on the 400-cu.ft. engine line with 43,000 on the volume line, another line is located on which the point representing 100 r.p.m of the 350-cu.ft. engine must lie. The intersection of *A*, Fig. 1, of the two lines determines the exact location of this point. The point of zero revolutions lies directly under this 100-revolutions point, so all that remains is to draw this line and divide it into 100 equal parts.

It is better, however, to locate a few more points, as *B* and *C*, in order to check the accuracy of the work. The completed chart is shown on Fig. 2.

Suppose that 43,250 cu.ft. of air per minute is required by the furnace, and that it is desired to run the 400-cu.ft. engine at 40 r.p.m.; then connect these two points with a straight-edge, as in Fig. 2, and it will be found that it crosses the 350-cu.ft. engine line at 75. This means that in order to attain the required result, this engine must be run at 75 revolutions per minute.

A shallow sheet-iron pan filled with sand, and placed on the blacksmith's forge, will be found a valuable asset to an improvised chemical laboratory, when convenient fuels are not available. Care must be exercised in blowing the forge not to get the sand bath too hot in spots.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Iron Mining on the Menominee Range

The old Menominee iron range is situated in the southern part of Dickerson County, Mich., and extends from the Menominee River, the dividing line between Michigan and Wisconsin, east about 20 miles and almost parallel to the Wisconsin state line. To the end of 1910 the active mines had produced 41,568,439 tons of ore and had exposed above their bottom levels 9,177,348 tons of ore. Mr. Finlay, in appraising the mines of this district in 1911, added additional tonnage sufficient to bring the expected future output of the district up to 18,233,000 tons. The principal mines of the district are: the Cyclops, Norway, East Vulcan, West Vulcan, Curry and Brier Hill mines of the Penn Iron Co. These mines extend along the iron formation for about three miles and contain at least 21% of the ore estimated for the district. The Chapin mine of the Oliver Iron Mining Co. is the largest mine and is estimated to have 9,000,000 tons of ore in reserve or almost 50% of the entire tonnage credited to the district. Other mines ranking in the order named are: the Loretto of the Loretto Iron Co., Aragon of the Oliver Iron Mining Co., the Pewabic of the Pewabic Co., and the Millie belonging to the Dessau Mining Co. The earnings for five years as shown in Mr. Finlay's report for nine companies operating at a profit were $7,885,624, while two companies lost $69,365. Basing the average value of the ore for the district at 100%, the cost of producing and delivering it at Cleveland, Ohio, for a five-year period, 1906-1910 was as follows: Mining 33%, exploration and development 2.64%; construction, shafts, machinery, etc., 2.97%; general expenses; including administration, etc., 2.83%; royalties, 7%; taxes, 2.34%; rail-freight, 11%; lake-freight, 15.40% and commissions, 0.02%; a total cost equal to 77.2% of the value of the ore.

Nitrate Production

According to Diaz-Ossa (*Bull.* Soc. Ind. du Nord de la France, 1912, p. 359), the production of 100 kg. of nitrate of soda requires 80 to 150 liters of water, and 25 kg. of coal. To produce 5000 tons (metric) of nitrate of soda per month from 20 to 25% *caliche*, about 32,000 cu.ft. of dissolving tanks are required, and about 214,000 cu.ft. of crystallizing tanks. Such a plant costs about $500,000. The cost of production of nitrate, in sacks, f.o.b. Chilean ports, is about 0.9c. per lb., of which labor is about 19%, coal 11, other materials 6, general expenses 3, depreciation 9, transport and commissions, export duty 41 per cent.

Unit Costs, Erie Consolidated

At the Erie Consolidated mines, Gaston, Calif., according to data furnished by S. H. Brockunier, general manager, the unit costs are as given herewith: The mine is operated through a tunnel and 25% of the ore is extracted from stull stopes, and 75% by the shrinkage system. Square setting was formerly carried on, but was found to be too expensive for the grade of ore mined. The vein rock mined consists of quartz and quartz-impregnated slate and the walls are of slate. Laborers are Americans, Italians and Austrians; on an average, 26 men are employed underground per day, including the shift boss and foremen. In the stopes 17 men are employed, eight breaking ore, seven tramming and two timbering; in development four men were employed in advancing and three in mucking and tramming. The daily output from the mine is about 145 tons of rock, 100 tons of which is ore and 45 tons waste. Approximately 80% of the ore and 55.5% of the waste mined comes from stopes and the remainder from development work. The development work consists of about 200 ft. of drifts, 200 ft. of raises and 600 cu.ft. of station pockets per month. According to these figures, four tons of waste are mined for every 10 tons of ore produced and 5.59 tons of rock or 3.85 tons of ore are secured per day per man employed underground. In stoping one ton of waste is mined for every 3.2 tons of ore produced, 6.18 tons of ore and waste are secured per day per man, or 4.7 tons per man engaged in breaking ore, tramming and timbering. Based upon the men breaking ore, 10 tons are secured per man per day and for men tramming the rate is 11.4 tons. One man is employed in timbering in stopes for every 40 tons of ore broken per day or for every 52.5 tons of rock taken out. The consumption of dynamite in stoping ranges from 0.66 to 0.9 lb. per ton of ore broken, and in development about four pounds per foot of advance.

Little timber is used since square setting was discontinued, about ⅝ linear feet of round stulls being used per ton of ore in stoping and ½ ft. per foot of advance in development. Ore chutes cost about $30 each in place, or 5c. per ton of ore. No electric lights are used in the mine and candle consumption is reported as three per man per 8-hr. shift. It requires approximately one-half hour for men going on shift to get to working faces. Power is furnished by Pelton water wheels working under 330-ft. head of water obtained from the North Bloomfield ditch at a cost of 10c. per miner's inch, or $3 per 24 hr. for compressor operations. No pumping or hoisting power is required. The average consumption of air in drilling is 360,000 cu.ft. per day, operating two piston and three hammer drills. The piston drills are C-110 2¼-in. and B-9 2½-in. Ingersoll-Sergeant drills. In drifts it usually requires 1½ hr. to muck back and ½ hr. to set up machine, two set-ups are made per shift and drilling rate is 55 ft. of holes in an 8-hr. shift. The oil consumption per machine is ½ pint per shift. In stopes 8-C, Waugh drills are used and the rate of drilling ranges from 36 to 54 ft. per shift. Two men are employed at sharpening drills by hand and sharpen on an average of 40 per day; the actual time required is 4 hr., if drills are in good condition. Air blast is furnished by a hand-operated fan; charcoal is used for fuel and it requires an average of 1½ bu. for drills.

In drifting through slate and quartz stringers, a 5x7-ft. drift advances on an average of 4 ft. per shift, labor consisting of one driller, one trammer and one shoveler, with drilling time approximately 5 hr. This is equivalent to 5.84 cu.ft. per man-hour. In running a 5x7-ft. raise through the same kind of ground, one man will advance about 6 ft. per shift of 8 hr., drilling on an average of 5 ft. per shift, and using 4.4 lb. of dynamite per foot of raise.

A trammer shoveling from a rock bottom and loading a 1¼-ton car will average 10 cars in 8 hr., tramming 1000 ft., which is equal to 1.6 tons per man-hour. Two men loading and tramming the same distance will average 15 cars, which is equal to 1.17 tons per man-hour. This would indicate that the efficiency of one man under these conditions is almost 36.8% greater than two men performing the same work. In a 100-ft. tram one man will average 14 cars of one ton each in 8 hr., or 1.75 tons per man-hour. Loading from a chute and tramming a 1¼-ton car 1500 ft., one man averages 20 cars in 8 hr., which is equal to 3.12 tons per man-hour. The average length of tram for the mine is 1000 ft., and the average consumption of lubricating oil for tramming is about 8 gal. per car per month. Wooden-body cars last from six to eight months and car wheels from four to six months; up to date the iron-body cars in use in the mine have been operated for two years.

Panama Canal Construction

The following costs were taken from a statement of construction expenditures on the Panama Canal to June 30, 1912. The figures include administrative and general expenses but not general items or expenditures for sanitation, hospitals or civil administration. On the Atlantic division the cost for excavating (prism) 31,054,558 cu.yd. averaged about 27.2c. per yd., made up as follows: 2,181,998 cu.yd. of dry excavations at 66.67c.; hydraulic excavation, 29,605 cu.yd. at 39.42c. and 28,842,955 cu.yd. of dredging at an average cost of 24.12c. per cu.yd. On the Gatun spillway, dry excavation has averaged 70.99c. per cu.yd., preparations for foundations $2.187, masonry $7.85 and back filling 54c. per cu.yd. The Gatun dam cost to June 30 was $7,668,405, consisting of 38,425 cu.yd. of dredging excavations at an average cost of 52.16c. per yd.; 10,061,800 cu.yd. of dry filling at 44.57c., 10,514,247 cu.yd. of hydraulic filling at 29.95c. and 40,411 cu.yd. of paving at 36.42c. per yd. On the Gatun locks 4,555,395 cu.yd. of dry excavation has cost 67.6c. per yd., 1,372,451 cu.yd. of dredging 27.75c. and excavating, preparing for foundations $2 per yd. Dry filling around south approach wall cost 53.42c. per cu.yd., compared with 15.82c. for hydraulic filling.

On the Central division the cost of dry excavating (prism) averaged 80.84c. per cu.yd.; clearing canal line without excavation averaged $62.02 per acre and masonry $6.50 per yd. for 1271 cu.yd. On the Pacific division, dry excavation (prism) has averaged 80.6c. per cu.yd. compared with 24.18c. for dredging and 59.77c. for hydraulic excavating. A general average of excavating (prism) shows that 97,886,097 cu.yd. of dry excavation averaged 80.5c. per yd.; 1,127,878 cu.yd. of hydraulic work, 59.4c. and 61,314,214 cu.yd. of dredging averaged 24.2c. per cu.yd. of material.

A statement of the detailed cost per cubic yard for the quarter ended June 30, 1912, shows a comparison between dry and hydraulic filling on the Gatun dam as follows:

DRY FILL

Cubic yards	707,083
Clearing site	$0.0001
Excavation	0.0945
Tracks	0.0903
Trestles	0.0002
Transportation	0.0763
Filling	0.0582
Maintenance of equipment	0.0523
Plant arbitrary	0.0710
Division Expense	0.0217
Total division cost	$0.4646
Administrative and gen. expense	0.0354
Total Cost	$0.5000

HYDRAULIC FILL

Cubic yards	559,610
Clearing site	$0.0001
Clearing for dredge	0.0071
Dredging	0.1052
Relay pumps	0.0151
Pipe lines	0.0125
Wood flumes	0.0729
Power	0.0014
Small boats	0.0033
Maintenance of equipment	0.0549
Plant arbitrary	0.0850
Division expense	0.0084
Total division cost	$0.3659
Administrative and gen. expense	0.0170
Total cost	$0.3829

An article on steam-shovel work published in the *Canal Record* of Aug. 7 states that the best record made in the Central division was that of shovel No. 207, working 26 days in the Culebra district, which excavated 58,412 cu.yd. of earth, which is equivalent to about 2250 cu.yd. per day.

Labor Output at the Republic Iron & Steel Co.

The Republic Iron & Steel Co. according to its annual report for year ended June 30, 1912, operates 19 iron mines. They are divided into two groups, viz: The Northern group consisting of the Cambria No. 1, Cambria No. 2, and Lillie mines at Negaunee, Mich.; Sherwood mine, Iron River, Mich.; the Franklin, Victoria; and Onondaga mines, Virginia, Minn.; Pettit, Mariska and Schley mines, Gilbert, Minn.; Willis mine, McKinley, Minn.; Monica mine, Pewabic, Minn.; Bray mine, Keewatin, Minn.; and the Kinney mine, Kinney, Minn. The Southern group consists of the Alfred group, four slopes; Raimund group, three slopes; and the Houston, Tannehill, and Spaulding mines all at Birmingham, Ala. During the year 1371 men were employed in the iron mines and the production of iron ore amounted to 1,722,495 tons, equal to 1250 tons per year per man. As published in a previous article in this department, the tonnage secured per man in 1911 was 1049 tons; 1910, 999 tons; 1909, 999 tons; 1908, 850 tons and in 1907, 611 tons of ore.

In the coke department which includes the coal mines, 619 men were employed at the mines and coke ovens of the Northern division and 1188 in the Southern division, making a total of 1807 men. The total production of coke was 861,761 net tons, an increase of 137,902 tons over 1911. The output per man per year was 476 tons, compared with 397 tons in 1911, 388 tons in 1910, 383 tons in 1909, 311 tons in 1908 and 306 tons in 1907. The Northern division of coal and coke properties includes the Republic mine and 400 coke ovens at Republic, Penn.; the Atcheson mine and 138 ovens at Gans, Penn.; and the Martin mine and 246 ovens at Martin, Penn. The Southern division consists of the Warner mine and 100 coke ovens, the Thomas mine and 910 ovens, and the Sayreton and Thompson mines, all situated near Birmingham, Ala. The total capacity of the Southern division is 606,000 tons of coke per annum and the total of both divisions, 1,154,800 tons.

The total production of all products by the Republic Iron & Steel Co. and labor employed for the last three years is as follows:

	1912	1911	1910
Iron ore	1,722,495	1,861,185	2,050,224
Coke	861,761	723,859	670,018
Limestone	53,064	88,239	115,473
Pig iron	1,007,849	850,863	793,962
Bessemer steel ingots	655,673	597,991	681,884
Openhearth steel ingots	307,815	6,939	.
Finished and semi-finished products	979,617	684,553	827,515
Total tonnage handled	5,588,274	4,813,629	5,139,076
Average number of men	11,723	11,588	12,066
Ave. tons handled per man	475	415	427

The total amount expended for labor during the year ended June 30, 1912, was $8,798,160, in 1911 $8,273,630, and in 1910, $8,652,102. The average earnings per man were about $750 per year in 1912, $710 in 1911 and $718 in 1910. The current rates are the highest that have been maintained within a decade and represent advances ranging from 25 to 30 per cent.

New Goch Gold Mines

The 1911 annual report of the New Goch Gold Mines, Ltd., Transvaal, South Africa, states that 480,714 tons of ore were mined and 3679 tons added from the dumps, making 484,393 tons sorted, from which 138,131 tons or 28.52% were discarded as waste. The mill crushed 346,862 tons with 120 stamps in 337.9 days, which is equivalent to 8.55 tons per stamp per day. The cyanide department treated 347,340 tons of sand and slime consisting of 227,220 tons of sand and 120,120 tons of slime, from which 40.67% of all the gold recovered was obtained. The working cost was $4.06 per ton, made up of $2.36 for mining; 26c. for sorting, crushing and transportation; 41c. for milling; 32c. for cyaniding; 29c. for general mine expenses; 15c. for head-office expenses; 17c. for development and 10c. for permanent work. The value of the yield was $5.85, which indicates a working profit of $1.79 per ton milled.

It is estimated, says *Coal Age*, that every 8 to 12 tons of coal mined in this country requires one chamber prop. The cost of the props is from 10 to 20c. each, thus making the timber cost 1 to 2c. per ton mined.

Launching a Steel Dredge Hull

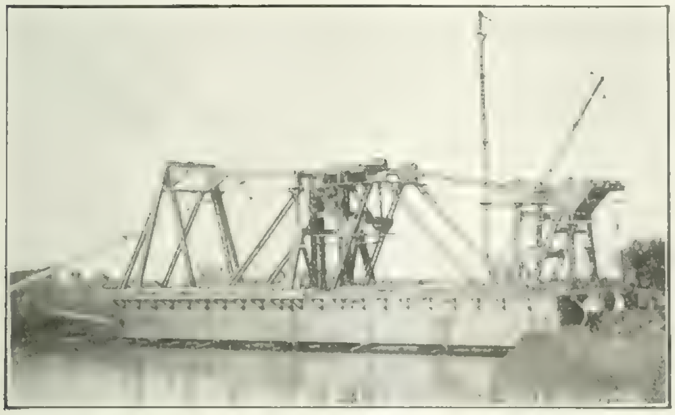
By Lewis H. Eddy

The hull of the reconstructed Natoma No. 8 was assembled and subsequently launched sidewise into the dredging pond, thus departing from the usual method of floating the hull in the pit in which it is built. It was not considered economical to reconstruct this dredge in the old pit, which was 50 ft. deep and full of water.

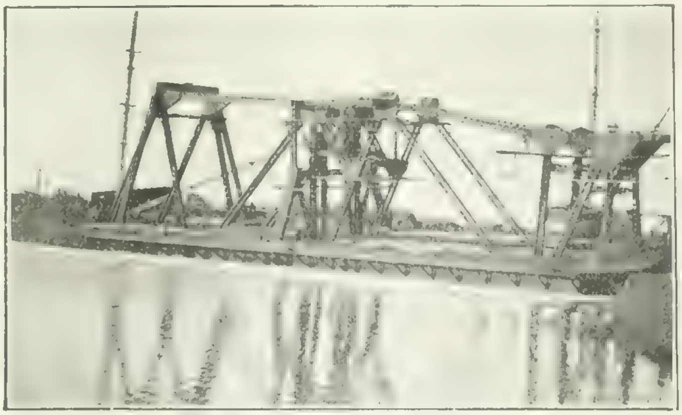
The new steel hull of the 15-cu.ft. Natoma No. 8 dredge of the Natomas Consolidated of California was launched on Aug. 13, in the Natoma field of the American River district. The launching of large dredge hulls is not common practice in dredge construction in California. The usual method is to float the hull in the pit in which it is built by turning in the water at the proper time.

A Reconstructed Dredge

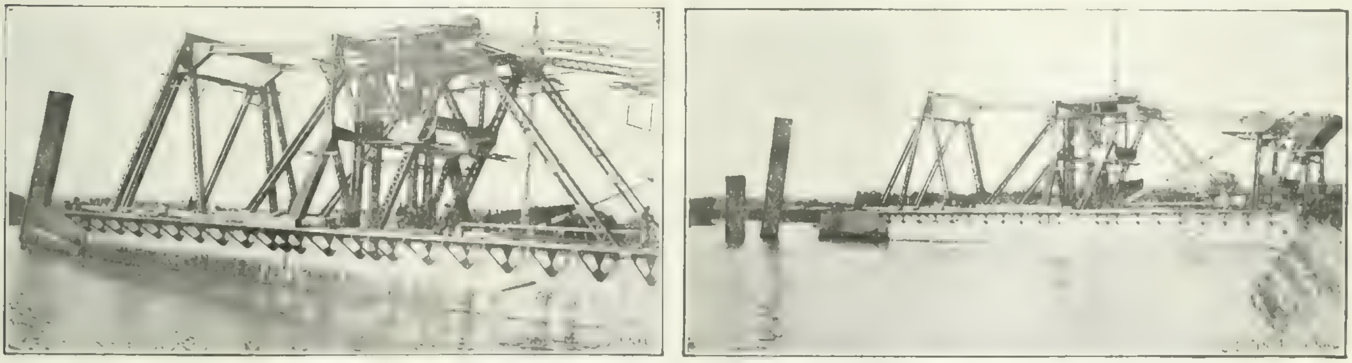
No. 8 dredge is being reconstructed. The original boat was built in 1910 and destroyed by fire in October, 1911. The recovery of the machinery was completed in February, 1912. Reconstruction was begun in June, 1912. A portion of the recovered machinery is being placed in the new boat. The pond in which the dredge had operated is 50 ft. deep, an impracticable depth for economic construction. So it was necessary to assemble the new hull in a sub-pit on shore at the edge of the flotation pond and to place it in the water by the method of sidewise launching.



The Reconstructed Natoma No. 8 on the Ways



Entering the Water Sidewise



The Rebound After Launching and the Hull Straightened in the Pond

The hull is 150 ft. long, 56 ft. wide and 10 ft. deep. When launched the main trusswork of the superstructure and the foundation of one winch were completed, and the planking and calking of the deck about 50% completed. The total weight of the structure when it went into the water was about 600 tons. The total gross weight of the completed dredge will be about 1200 tons. This dredge and No. 10 dredge in the same field, which was nearing completion at the time of the launching of No. 8, are the first all-steel dredges to be constructed for placer mining in California. They are of the same design and capacity; but No. 10 is new in every part and No. 8 will be equipped with some parts recovered from the original boat.

Both hulls are built entirely of steel except that the decks, roofs and doors are of wood, and the siding of the housings is built of wood enveloped by two sheets of iron, making a fireproof siding. They were set up in the shop yards in Michigan, then knocked down and shipped in parts. The machinery and all parts other than the hulls were built by the Yuba Construction Co. at the Marysville shops, and the dredge construction completed by that company.

Auxiliary Construction Pit Used

The pit, in which No. 8 dredge was set up and the hull and part of the superstructure completed in the field, was excavated in the bank of the flotation pond, about 160 ft. long and about 60 ft. wide. The trestle and cribbing on which the bottom of the hull was laid, port side to the water, stood 10 ft. higher than the digging water line on the water side and 5 ft. higher than the water line on the land side. The ways were placed 8 ft. apart, on a grade of 1 in. to 1 ft., on the bottom of the pit. The lowering of the boat to the ways was begun on Aug. 6 and on Aug. 12 it was resting on the ways ready for the launching. The water in the flotation pond rose to a height sufficient to receive the boat on the afternoon of Aug. 13. The pit was not flooded, the water reaching only to and under the lower edge of the hull.

The boat was tripped loose and went

into the water sidewise at 6 p.m. The launching was direct and even, without the slightest jarring, straining or twisting, and without causing a "kick-back" of any of the ways. It floated about 200 ft. toward the center of the pond before being hauled to by men ashore with hawsers attached to bow and stern. A bulwark of heavy planks was lashed to the port pontoon for the protection of the hull from contact with the steel spuds of the original dredge which had been left in the position they occupied at the time of the fire. But the hull was hauled to before it had reached the spuds. The spuds will be picked up and placed on the new dredge, as they were not damaged by the fire.

Boat Placed on Ways

There were 8 ways, each about 80 ft. long, composed of skids and caps. The skids were each constructed of two sticks, 14x12 in., 40 ft. long, spliced with 1½-in. wooden pins. The caps were made of 2 pieces, 14x8 in., 40 ft. long, with 12x4-in. planks 40 ft. long bolted to the sides. The two lengths of caps were bolted together end to end, making a total exact length of 80 ft., while the skids were a little shorter, allowing for the splice. The caps of six of the ways were bolted to the skids at the land end. The caps of the two other ways, one toward the bow the other toward the stern, were each held in position by a tripping device attached by wire rope or cable to a deadman placed on shore outside of the pit. Seven sticks 8x8 in., 6 ft. long, were placed one each between two ways to act as buffers to prevent extraordinary twisting or sidewise displacement of the ways as the hull moved into the water. These were placed within 10 ft. of the ends of the ways at the water side of the pit. But there was no displacement of the ways.

So far as the eye could detect the skids remained in the same position after the hull had gone into the water as when first laid. The skids were greased with ordinary soap grease. The caps of the ways were lashed to the hull at both the port and starboard sides with ropes or wire cables, so that they were carried into the pond and afterward recovered. These ropes were of sufficient length to allow the caps to float clear of the bottom of the hull. To facilitate the movement of the hull when ready for the launching, in case it might be necessary, three sets of jackscrews were placed between the upper bank of the pit and the starboard side of the hull. There were four jacks in each set fore and aft and two jacks in the set at the amidship point. It was found necessary to jack the hull a distance of about four inches after the tripping devices had been loosened.

Trippers and Jacks Used

About an hour before the launching the cables attaching the trippers to the deadmen were drawn taut by taking up the slack with derrick cables; and within the hour the caps of the six unattached ways were sawed off at the land end, releasing the caps from attachment to the skids, so that when ready for launching the hull while resting firmly on all the ways was held in place only by the two ways to which the trippers were attached. One man was stationed at each tripper and at a signal drove off the clamp by striking with a heavy iron bar, releasing the upper arm of the tripper. The caps of the two ways were thus simultaneously released. The men stationed at the jacks, when it was found the hull did not move instantly, were signalled to turn the screws.

The hull then moved slowly and steadily into the water, immediately righting on an even keel and floated rapidly toward the center of the pond. The entire performance was accomplished with precision and complete regularity, with the single exception that the men who manned the hawsers at the bow end did not haul to as rapidly as the men at the stern end; but when they did get busy they were more active than was necessary; this caused no damaging disturbance of the floating hull, which was made fast immediately. The boiler makers were sent directly into the hold to stop any leaks. These were found to be few and of no serious nature.

The ways and tripping devices were designed by L. D. Hopfield, assistant superintendent of the Natomas Consolidated, who has also general supervision of the construction work in this field. The details of construction and of the launching were under the direction of L. L. La Petit, superintendent of construction of No. 8 dredge, for the Yuba Construction Company.

Mineral Development of North Borneo

Several years ago the British North Borneo Government made a concession to an exploration company for the sole right of exploring the territory of the State—31,000 square miles—and the possession of all minerals of every kind discovered. Consul Orlando H. Baker reports (*Daily Consular and Trade Reports,* Aug. 7, 1912) that a vast amount of money and labor have been expended, but nothing of value has been found, though there is hope expressed that valuable copper deposits have been discovered at Karang. The efforts of the company to find oil were unsuccessful, but under the encouragement of the government and better conditions, research is to be again commenced.

The report for 1911 states that the concession comprising the entire petroleum rights of British North Borneo has been extended until 1920. The British North Borneo Government has granted the syndicate a 999-year oil-mining lease over 440 sq.mi. of territory on the Kilas Peninsula, west coast of Borneo, the rental being 25c. per annum and no royalty on production. Drilling operations were carried on in this territory until July, 1911, when they had to be abandoned, owing to a breakage of casing at the bottom of the well, after a depth of 1058 ft. had been reached. Before commencing further drilling, the directors decided to obtain additional expert advice upon the selection of the site of the proposed new well.

Meantime a concession had been obtained for the prospecting rights over 220 sq.mi. of territory in the state of Brunei, adjacent to Miri oil field, Sarawak, belonging to the Shell Transport & Trading Co. J. F. Falkowicz, an experienced oil-field expert, reports that although this territory is undoubtedly oil bearing, the broken nature of the formation indicates that the oil-bearing anticlines will yield only a limited production of petroleum. He therefore recommends that the further development of this territory be deferred until the output from the Kilas Peninsula can be dealt with to greater advantage.

It has been decided to proceed at once with the vigorous development of the Brunei territory and it has, therefore, become necessary to consider the means of further capital. The arrangements for effecting this will be to sell the whole of the assets and undertaking of the present syndicate to a new syndicate to be called the British Borneo Petroleum Syndicate, Ltd., having a capital of £120,000.

Artificial Graphite

The manufacture of artificial graphite, according to a bulletin of the U. S. Geological Survey, is conducted by means of the electric furnace, an anthracite coal carrying small amounts of evenly distributed impurities being the material from which the ordinary grades are made.

For obtaining the purest grades of graphite, petroleum coke is substituted for anthracite. The process for the manufacture of graphite was patented in 1896 and its commercial development has been so rapid that at present the output of artificial graphite in the United States is greater than the whole domestic production of natural crystalline graphite.

An alloy used for counterfeiting the Austrian florin was composed of: Al, 53.5%; Sb, 46.4%; Pb, As, Fe, a trace each. *Nature* comments that it is unusual for silver-counterfeiting alloys not to contain lead as their chief constituent.

Lead Salts in Cyanide Treatment

By J. E. Clennell*

A study of the action of lead compounds on cyanide solutions as improving extraction and eliminating cyanicides. Lead seems to be especially active in precipitating sulphur before it does harm, but too much lead is as bad as none.

The addition of lead acetate in the cyanide treatment of ores containing silver sulphide has been practiced for several years. The theory of this procedure appears to be as follows. Silver sulphide is soluble in cyanide solutions, with the formation, at least momentarily, of a soluble alkaline sulphide:

$$(a)\quad Ag_2S + 4\,NaCN = 2\,NaAg(CN)_2 + Na_2S$$

In presence of a lead salt, this alkaline sulphide is immediately removed with precipitation of lead sulphide:

$$(b)\quad PbR_2 + Na_2S = PbS + 2\,NaR,$$

R being any acid radical combined with lead.

Soluble Sulphides Not Stable in Cyanide Solution

Soluble sulphides can seldom, if ever, be detected in the solution, and it is probable that, even without the addition of lead salts, they are rapidly destroyed, either by conversion into thiocyanates,

$$(c)\quad Na_2S + NaCN + H_2O + O = NaCNS + 2\,NaOH$$

or by the precipitation as zinc sulphide

$$(d)\quad Na_2S + Na_2Zn(CN)_4 = ZnS + 4\,NaCN$$

As, however, silver is precipitable from cyanide solutions by alkaline sulphides, and zinc sulphide is slightly soluble in cyanide, reactions (a) and (d) are, to some extent, reversible, and a state of equilibrium will be reached unless the soluble sulphide is removed by some such reaction as (b). Lead sulphide being more insoluble in cyanide than either silver or zinc sulphide, the addition of a lead salt disturbs this equilibrium, and allows a further quantity of silver sulphide to dissolve.

When the process is carried out in conjunction with aëration, as is usually the case, it is probable that the lead sulphide formed by reaction (b) is quickly oxidized to sulphate:

$$(e)\quad PbS + 2\,O_2 = PbSO_4$$

and is thrown out in the residues in this form.

Any lead remaining in the solution as a soluble compound would be precipitated during the subsequent treatment of the solution with zinc shavings or zinc dust, and even before zinc precipitation it is generally found that only a small proportion of the lead introduced as acetate or otherwise, remains in the solution.

Comparative Results with Various Lead Compounds

At first sight it might be supposed that only a soluble salt of lead could be effective for the purpose described. Experience shows, however, that almost any lead compound, soluble or insoluble, acts in the same way, the efficiency being determined in most cases entirely by the proportion of lead in the compound, and being quite independent of the nature of the acid radical. Even native galena, when finely powdered, was found to give the same action.

The only noteworthy exception to this rule was observed in the case of lead tartrate. Comparative tests made with quantities of lead acetate and tartrate containing equal amounts of lead showed a reduced extraction of silver in the case of lead tartrate, lower in fact than that obtained with solution to which no lead compound was added.

In a typical case, the following extractions were obtained. The tests were made with ordinary plant solution containing the usual impurities, and a sample of Mexican silver ore, containing silver chiefly as sulphide, and ground so that over 99% passes a 200-mesh screen. The other conditions of the test were similar in each case.

INFLUENCE OF LEAD COMPOUNDS ON EXTRACTION

Lead Salt Added	Amt. Added per ton of Ore Kg	Silver Extraction		
		Maximum %	Minimum %	Mean %
None		87.2	85.4	86.4
Acetate	2.5	89.9	88.9	89.4
Oxide (litharge)	1.71			88.5
Peroxide (PbO₂)	1.84			88.5
Nitrate	2.55			88.8
Carbonate	2.05	89.2	88.8	89.1
Sulphate	2.33			87.5
Sulphide (native galena)	1.84	89.1	88	88.5
Tartrate	2.73	84.1	83.3	83.7
Sodium Plumbate	2.73			87.3

The amounts of the various compounds in this series of tests were so chosen that the charges should contain approximately equal amounts of lead per ton of ore.

The bad effect of lead tartrate may, perhaps, be ascribed to some reducing action due to the acid radical. The rather indifferent result given by sodium plumbate may possibly be connected with the fact that in this compound the lead forms part of the acid radical. With regard to lead sulphate, which also gives a poor result, a test made with solution prepared from fresh cyanide and lime instead of mill solution, gave as good a result as lead acetate.

Effect of Varying Amount of Lead Salt

The amount of lead compound which must be added to produce the most beneficial effect is by no means a matter of indifference. Tests made with litharge and lead acetate showed that for each of these compounds, when added to a particular ore, there is a certain proportion which assists the extraction of silver to a greater degree than any other. Any increase of the lead salt beyond this point is injurious, the extraction being progressively diminished by increasing amounts of lead until it is lower than that obtained without any lead compound.

INFLUENCE OF VARYING AMOUNTS OF LEAD

SERIES A

With Lead Acetate			With Litharge	
Added per Ton of Ore Kg	C. P. Acetate Silver Extraction %	Commercial acetate Silver Extraction %	(Commercial) added per ton of Ore Kg	Silver Extraction %
nil	98.5	89.5	nil	89.5
1	90.7	91.6	0.8	91.7
2	91*	92.7*	1.6	90.5
2.5	90.5	91.8	2.4*	92.2*
3	89.8	90.6	3.2	87.7
			4	85.9

SERIES B

With Lead Acetate (C. P.)		With Litharge	
Added per Ton of Ore Kg	Silver Extraction %	Added per Ton of Ore Kg.	Silver Extraction %
nil	89.3	nil	89.3
0.4	91.4	0.4	91.9
		0.8*	93.6*
1.2*	92.3*	1.2	91.8
2	91.5	2	90.2
2.5	91.6	2.5	89.6
3	91.4	3	90.1

SERIES C

With Lead Acetate (C. P.)		With Litharge	
Added per Ton of Ore Kg	Silver Extraction %	Added per Ton of Ore Kg	Silver Extraction %
nil	84.6	nil	84.6
0.5	83.6	0.5	85.8
1	87.4	1*	88.0*
1.5*	88.1*	1.5	86.8
2	85.5	2	85.6
2.5	85.5	2.5	84.3
3	84.2	3	81.9

*Most favorable proportion of lead salt

The above bottle tests were made with mill solutions. In all tests in the same series, the ore, solution and all conditions of treatment were alike. The charge used was 250 grams ore and 500 c.c. solution, agitated for 72 hours. The solution was made up to about 4% KCN and 1% CaO before treatment.

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*Cyanide chemist, Cia. Minera El Barreno y Anexas, San Luis Potosi, Mexico

LEAD SALTS AND HYPOSULPHITES
SERIES A

Without Lead Acetate*		With Lead Acetate* (2.5 kg. per ton of ore)	
Hypo. added per Ton of Ore Kg.	Silver Extraction %	Silver Extraction %	Improved Extraction due to Acetate %
nil	89.8	92.8	3.0
2	89.6	91.7	2.1
4	89.1	92.1	3.0
8	89.1	91.6	2.5
20	89.2	89.2	nil

*Fresh solution used in all tests.

SERIES B

Without Lead Acetate			With Lead Acetate (2.5 kg per ton)		
Hypo. added per ton of Ore Kg	Silver Fresh Solution %	Extraction Mill Solution %	Hypo added per ton of Ore Kg	Silver Fresh Solution %	Extraction Mill Solution %
nil	93.3	89.8	nil	94.6	90.1
2	93.9	89.0	2	94.6	90.1
4	93.0	89.4	4	94.3	88.4
8	93.6	89.0	8	94.2	88.1
20	93.0	88.0	20	93.3	87.1

INFLUENCE OF LEAD COMPOUNDS ON REDUCING AGENTS AND CYANICIDES

The addition of lead acetate was found to be beneficial in presence of various substances which ordinarily diminish the silver extraction.

EFFECT OF LEAD ON COPPER SALTS
SERIES A (Fresh Solution)

Without Lead Acetate		With Lead Acetate		
Cu SO$_4$.5H$_2$O Added per Ton of Ore Kg.	Silver Extraction %	CuSO$_4$.5H$_2$O Added per Ton of Ore Kg.	Silver Extraction %	Increased Silver Extraction %
nil	93.3	nil	95.1	1.8
2	94	2	96.7	2.7
4	91.5	4	93.6	2.1
6	72.8	6	81.7	8.9
8	19.4	8	27.4	8.0

SERIES B (Fresh Solution)

Cu SO$_4$.5H$_2$O Added per Ton of Ore Kg.	KCNS Added per Ton of Ore Kg	Silver Extraction		Increased Silver Extraction %
		Without Lead Acetate %	With Lead Acetate %	
nil	nil	94.9	95.9	1.0
2	1.6	95.5	95.9	0.4
4	3.2	93.3	94.6	1.3
6	4.8	71.3	85.6	11.3
8	6.4	23.4	46.1	22.7

SERIES C (Mill Solution)

Cu SO$_4$.5H$_2$O Added per Ton of Ore Kg	Silver Extraction		Increased Silver Extraction %
	Without Lead Acetate Kg.	With Lead Acetate Kg.	
nil	89.1	91.4	2.3
1	84.7	87.9	3.2
2	77.7	84.7	7.0
3	71.3	83.1	11.8
4	66.2	81.5	15.3
6	50.8	71.6	20.8

In these tests it is seen that the addition of hyposulphite diminishes the extraction of silver to a slight extent, but in all cases, except the last three, the extraction is better in presence of lead acetate than in the corresponding test without. With mill solution the addition of lead acetate in presence of hyposulphite seems to be injurious.

These tests show the marked deleterious effect of copper on the silver extraction, but in all cases the extraction is better in presence of lead acetate than in the corresponding test without.

SOLUBILITY OF LEAD ACETATE AND LITHARGE IN WORKING CYANIDE SOLUTIONS

The following tests were made to determine what amount of lead actually goes into solution when lead acetate or litharge is added to the mill solution.

On adding acetate, a white precipitate, presumably basic cyanide of lead, occurs, which at first dissolves in the excess of solution, but when the acetate is added in the proportion used in these tests, a permanent precipitate remains. In each case the mixture was agitated over night, filtered, and the undissolved residue weighed:

Substance added	Weight taken, grams	Lead contents grams	Volume of mill solution c.c.	Weight undissolved grams	Lead found in solution grams	Per Cent. of Lead Dissolved
(1) Litharge (commercial)...	1	0.928	500	0.750	0.1075	11.6
(2) Lead acetate c.p..........	1	0.637	500	0.347	0.0965	15.1
(3) Lead acetate commercial...	1	0.637	500	0.290	0.0835	13.1

A considerable consumption of cyanide and also some consumption of alkali occurred in this test during agitation with lead compounds, as appears from the following titrations:

	KCN %	CaO %	Consumed per ton of solution	
			KCN Kg.	CaO Kg.
Original strength after agitation	0.31	0.09		
With litharge	0.21	0.05	1.00	0.40
With c.p. lead acetate.	0.22	0.072	0.90	0.18
With commercial lead acetate............	0.21	0.065	1.00	0.25

The consumption of cyanide is approximately 0.5 kg. for every kilogram of lead salt added.

EFFECT OF EXCESS OF LEAD IN THE ORE

Not only, as pointed out above, is there a limit to the amount of lead compound which can be added with beneficial results in the treatment of a given ore, but in some cases the ore itself may contain enough lead to exert a harmful effect on the treatment. Before using acetate or other lead compound on a working scale, tests should always be made to ascertain whether the addition of such compounds is beneficial or otherwise. Native carbonate of lead is soluble to an appreciable extent in cyanide solutions, and the lead thus introduced into the stock solution may cause trouble by the consumption of cyanide and by precipitating on zinc, giving rise to a base bullion which is troublesome to smelt and expensive to refine.

REMOVAL OF LEAD FROM SOLUTIONS

Cyanide solutions exert a "selective action" between lead and silver compounds; that is to say, by using a weaker solution it is generally possible to dissolve more silver in proportion to lead, and so to reduce the amount of base metal carried by the solution without materially diminishing the silver extraction. It is, however, possible to precipitate the lead from the solutions with tolerable completeness and at no great cost by adding an excess of an alkaline carbonate or bicarbonate. These reagents precipitate practically the whole of the lead and calcium from the solution, leaving it in good condition for further use, and without precipitating any of the gold or silver.

When sodium bicarbonate is used there is some loss of alkali and an apparent loss of cyanide. The latter is probably only due to the effect of diminished alkalinity on the silver-nitrate titration of free cyanide in presence of zinc, as the cyanide strength is restored when the alkalinity is brought to the original figure. The loss of alkalinity seems to be due to the reaction:

$$NaHCO_3 + Ca(OH)_2 = CaCO_3 + H_2O + NaOH$$

in which two equivalents of calcium hydrate are exchanged for one equivalent of sodium hydrate.

It is desirable to remove the precipitated carbonates by filtration or decantation, so as to avoid the possibility of the lead redissolving on continued contact with the solution.

ACCUMULATION OF FOREIGN SALTS IN THE SOLUTION

Under ordinary circumstances, as already pointed out, the lead added in the form of acetate or otherwise shows no tendency to accumulate in the solution, as it is rapidly converted into some insoluble compound. But it must be remembered that the acid radical with which it is combined is not, as a rule, precipitated. In the case of lead acetate, for example, the acetic acid remains in solution in the form of sodium or potassium acetate, and the question arises whether these compounds may not eventually accumulate to such an extent as to produce injurious effects.

A certain portion of such soluble salts is, of course, constantly discharged in the form of barren solution in the moisture of the residues, and occasionally in solution run directly to waste, but where the final washes are made with water there is a possibility that the amount of foreign salts daily introduced may exceed the amount discharged.

Experiments made by direct addition of potassium acetate showed that it had practically no effect on the silver extraction, injurious or otherwise. An examination of the mill solution, however, revealed the presence of other organic compounds, which may, perhaps, result from the gradual decomposition of the acetic-acid radical. These tests showed the existence of a substance, probably the formic-acid radical, which has a powerful reducing action on silver nitrate. When a quantity of the mill solution, in which the protective alkali has been exactly neutralized by addition of the required amount of $\frac{N}{10}$ acid, is mixed with an excess of silver nitrate, the precipitate obtained is brownish, owing to the admixture of metallic silver thrown down by this reducing action. If the precipitate be filtered and washed, first with cold distilled water and afterward with 10% nitric acid, the latter dissolves the precipitated silver. By collecting the acid filtrate apart and titrating with thiocyanate, the amount of reduced silver may be determined. If the alkali in the mill solution is not neutralized as above, there is, of course, in any case a precipitation of silver oxide or hydroxide.

Formates may likewise be produced by hydrolysis of the cyanide itself, especially in warm alkaline solutions, by the reaction:

$$NaCN + 2\,H_2O = HCOONa + NH_3$$

but where an excess of oxygen is present, it seems at any rate not unlikely that their presence may be partly due to the breaking up of the radical CH_3COO—

$$2\,CH_3COONa + 4\,O = 2\,HCOONa + 2\,HCOOH$$

Sodium formate would act injuriously on the solution, owing to the ease with which it undergoes further oxidation:

$$HCOONa + Ca(OH)_2 + O = CaCO_3 + NaOH + H_2O.$$

In the case of litharge, although no acid radical is introduced, there may be impurities in the commercial article which in time would accumulate in the solution and might have injurious effects.

ESTIMATION OF LEAD IN SOLUTIONS

A rapid method of estimating lead in cyanide solutions is desirable in cases where lead acetate or other lead compounds are used in the treatment, or where the ore contains lead minerals liable to be attacked by cyanide.

The electrolytic method of analysis appears to give satisfactory results where small quantities have to be determined, but where the necessary apparatus is not available, I would suggest the following, modified from a method given by A. H. Low ("Technical Methods of Ore Analysis," 3d. Ed., p. 313. Appendix).

To 1.0 liter of the solution add sufficient sodium carbonate to precipitate completely the lead and calcium in the solution. Agitate thoroughly and allow to settle clear. Filter and wash with cold water. Dissolve the precipitate from the filter paper with a sufficient amount, say 50 c.c., of boiling 20% acetic acid. Add 5 c.c. of a 1% potassium-chromate solution, or sufficient to precipitate the lead, leaving an excess of chromate in solution. Boil five minutes, filter and wash with boiling dilute acetic acid. Wash the precipitate back into the flask in which the chromate precipitation was made, add 10 c.c. of 25% sulphuric acid. Boil thoroughly. Cool to room temperature. Add 5 c.c. acetic acid and a crystal or two of potassium iodide and titrate the liberated iodine with $\frac{N}{10}$ thiosulphate, adding starch at the finish.

The thiosulphate should be standardized on pure lead foil, dissolved in nitric acid, evaporated to dryness, redissolved in acetic acid and treated with potassium chromate, etc., exactly as described.

Cortez Associated Mines

The Cortez Associated Mines has issued a report of the operations of the company since its organization in January, 1910. The report states the condition of properties up to July 1, 1912.

The properties of this company are situated in the northern part of the State of Hidalgo, Mexico, in the districts of Jacala, Zimapan and Ixmiquilpan, and consisted originally of 2307 acres, which have now been increased by purchase and denouncement to 4150 acres. The headquarters from which operations are directed is at Jacala, 72 m. north from Sayula, the nearest railroad station.

The properties of the company are said to include copper deposits in contact zones and silver-lead and zinc ores as replacements in limestone, all the ores carrying silver and some gold. The amount of new work performed up to July 1 of this year in drifts, tunnels, cross-cuts and shafts amounted to 17,327 ft., not including 1446 ft. of core drilling. The main tunnel, the Cortez, is 1652 ft. long.

The Pachuca-Zimapan Railroad, which will be of great service to the company, is about 25% completed and work is continuing slowly on it. The company has a staff of engineers at work surveying a railroad line through the mountain section of the Moctezuma Valley with the idea of eventually making it part of a system which will reach the port of Tampico, about 130 miles distant.

The company's work has not been interrupted by the revolutionary troubles. The general offices of the company are at 53 State St., Boston. William Y. Rice is president and Olof Wenstrom, consulting engineer and general manager.

Platinum and Its Uses

The mineral called platinum is really a natural alloy of platinum, iridium, rhodium, palladium, and often osmium, with varying amounts of iron, copper, and gold, according to the U. S. Geological Survey. It is usually found as small nuggets, scales, and rounded or irregular grains; its color is steel-gray. The specific gravity of the crude platinum varies from 14 to 19. The percentage of the metal varies also within wide limits usually from 70 to 85%. In the United States, platinum is almost wholly produced in California and Oregon. The Rambler mine in Wyoming, also produces some platinum, there is a production from gold refining by the U. S. Mint, and one of the Eastern metal refineries is turning out a small amount.

Owing to its high melting point and great resistance to acids, platinum is extensively used for laboratory utensils. Platinum salts are employed in chemical analysis. In the manufacture of sulphuric acid the metal has been used in making large concentration kettles, but of late gold and glass have been substituted for it. In photography, dentistry, and electric installation much platinum is used.

Of late the manufacture of jewelry has consumed large quantities of it. It is extensively used for chains and for the setting of diamonds, as it is more resistant than silver and harder than gold; diamonds set in platinum appear larger than in any other kind of setting.

Owing to the high price demanded for platinum during the last two years, a great demand for a substitute has arisen. At one time much platinum was used in the manufacture of incandescent lamps and of sparking points, but it can be replaced by tungsten. Platinum triangles, used extensively in laboratories, have recently been replaced by similar appliances made of an alloy of nickel and chromium, but the use of this substitute is not recommended by the American Chemical Society's Committee on platinum ware.

The present extensive use of platinum in the manufacture of jewelry is unfortunate, since other metals can be there substituted for it, and this fad is undoubtedly one of the principal causes of the great increase in the price of platinum.

Notes on Spain's Lead Mining Industry

By E. Mackay Heriot*

Spain for its size is the largest lead producer in the world, though as a country it takes second place, the United States coming first. On account of the present high prices of the metal a growing activity is noticeable in Peninsular leading-mining camps, the chief of which is La Carolina, with an output of 10,000 tons of concentrate per month.

High Export Tax

The government levies an export tax of 10 *pesetas*[1] per ton on all lead ore shipped. By this means practically the whole output of the mines is smelted in the country. Yet even after this preventive measure competition is still possible. Lead ore is shipped to Belgium, and not long ago a continental firm applied to me for ore.

There are six smelters in the south of Spain; three at Linares, one at Peñaroya and two in the Cartagena district, Peñaroya being by far the largest. These works have formed a ring, and thus obviate unnecessary competition in the buying of ores, the latter being distributed according to agreement.

The value of Linares ore (75% Pb and about 180 grams Ag per ton) with lead at £19 may be taken as being 308 *pesetas*. Under ordinary circumstances the working cost in the chief mining centers is about 100 to 115 *pesetas* per ton of concentrate, which leaves a good profit. The government duty is 3% of the ore sold, and every influence is being used to reduce this to 2 per cent.

The practical way to calculate the ore underground is by taking one centimeter of solid ore as being equal to 50 kg. per square meter. To explain I will take a block of ore 100 m. long by 30 m. high, and estimated at 5 cm. solid ore. Thus we have $100 \times 30 = 3000$ sq.m. @ $5 \times 50 = 250$ kg. per sq.m. Hence, $\frac{3000 \times 250}{1000} = 750$ metric tons of ore. This has been found to answer well in practice.

Hand Dressing Used Because Cheap

It is a remarkable fact that both in the Linares and La Carolina districts no large outlay for the plant is necessary as far as ore concentration is concerned, because hand dressing is about half as costly as mechanical dressing. The ores are exceedingly clean, wages are low and the men expert at their work. A miner in the south of Spain gets 3.50 *pesetas* per day, a surface worker 2.50, and a dresser from 2 to 3.50 *pesetas*, thus hand labor can be profitably employed.

Many Spanish lead mines are worked on the *"saca genero"* principle. A certain portion of a mine is given to a tributer at, say, 20 to 28%. Although this system is ruinous for many properties, even large companies have employed it. Taken on the whole, Spanish lead mines have not been worked economically. One reason for this has been that a large number of the companies have been formed locally with insufficient funds.

If we except French, there is little foreign capital in this industry. While the British shareholders prefer to look for tin and gold in the furthermost parts of the earth, the French are taking advantage of the promising outlook in these districts nearer home.

Many Prospects but Few Mines

Spain has still riches in lead and zinc as yet untouched for want of communications, and the La Carolina district, although covered with claims by people of small capital, has in spite of its great output, as yet few mines at work, although there are plenty of good looking prospects.

The word prospect reminds me that when examining such properties as an engineer often has to, it has been my wish to compare notes with other men from other districts, but such data were not easy to obtain. In Spain practically all workable silver-lead lodes must be considered by the magnitude of the old workings, because the Romans, with few exceptions, found everything worth exploiting. In the "filling" ore samples can be obtained. I have found that the silver content of these ores varies as the percentage of lead, thus an ore with 35% lead would assay 1000 grams silver per ton, while a 70% lead ore would carry 2000 grams per ton.

In the case of Roman workings one is never certain whether the mine has been worked out or not. In one mine I know of the old workings go down over 200 m. As regards other lead-ore outcrops in Spain, in some districts one encounters rich ores at surface, which do not continue in depth whereas in others it is just the contrary. In La Carolina rich lodes have been discovered by sinking on "cross" lodes containing ore.

In some of the great lodes of La Carolina the profitable orebody does not begin before 50- to 100-m. depth, whereas in Linares the ore in most lodes can be worked profitably near surface.

From the above it will be seen that a general rule cannot be laid down as regards the value of a prospect, each case must be examined in relation to working mines in the same locality, if there be such. It would be interesting to obtain more details pertaining to this question from other lead-mining camps.

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[1] One peseta = 19.3c. or 9½d.

Gold in La Sal Mountains

A reconnaissance of the northern La Sal Mountains in Grand County, Utah, was made by James M. Hill for the U. S. Geological Survey in June, 1911. In the vicinity of Basin and Mesa, both gold-quartz prospects and placers have been worked, but the entire output would probably not exceed $5000, the placers being the chief source of production.

The La Sal Mountains are in the Colorado Plateau region, which is characterized by long mesas cut by deep cañons with steep cliffs. Above this comparatively level plateau, which has a general elevation of 8000 ft., the northern group of mountains rises abruptly at Mount Waas to a height of 12,586 ft. The quartz prospects in this region are few in number and the value of the ore is low even at the surface, where many gold-bearing deposits in other districts are enriched. The veins, so far as they could be seen by Mr. Hill, are small and contain much barren quartz. The high charges for transportation to the railroad at Cisco, ranging from $12 to $15 for outbound and $25 per ton for inbound freight, are an additional handicap.

The placers of Wilson Mesa are apparently of small extent. They contain only a small quantity of gravel, and all the gold in it cannot be saved by sluicing, because some of it is carried in boulders, which require crushing. They include so much barren material that it would hardly seem advisable to install expensive crushing and amalgamating machinery unless it were found practical to sort the ore from the waste by hand. Besides these unfavorable conditions only a small and uncertain supply of water is available for placer operations. The placers contain, however, some free gold that might be procured at a profit if the deposits are worked in a small way.

Magnesite in 1911

The only state that produces magnesite in this country is California, where much the larger part of the production comes from the Tule River deposits, says the U. S. Geological Survey. In addition the deposit near Winchester, in Riverside County, and those near Sanger, on Kings River, Fresno County, were producers. The total output was 9375 tons, while imports amounted to 122,075 tons of calcined, and 12,974 tons of crude magnesite.

A new mine was opened at Iowa Hill, Placer County, but none of the product was shipped. A deposit was also developed at Bissell station, near Mohave, Kern County, which is unique among magnesite deposits of the United States, as it is clearly sedimentary, whereas all the other California magnesites are associated with, and derived from, altered basic, intrusive rocks.

Surface Improvements at Ajax Mine

By S. A. Worcester*

At the Ajax mine, Victor, Colo., hoisting cages were formerly used and the ore was trammed from cage to ore house or dump. Two-ton self-dumping skips are now employed and a 2-ton electric car distributes the ore and waste. The ore-house reject is hoisted in a 3-ton skip and dumped on a sorting grizzly. A 4-ton electric car conveys the ore from mine bins to the mill. A cableway with a 1-ton drag bucket conveys the rock from the old mine dump to ore bins.

The improvements at the ore- and waste-handling plant of the Ajax mine, Victor, Colo., include changing the hoisting cages formerly used to self-dumping skips of two tons capacity; changing the tramming of mine cars from the cage to the ore house or waste dump, employing four or five men per shift, to the use of a two-ton electric-motor car operated by one man and having a much larger capacity than the former arrangement; also the following installation: A cableway, with a one-ton drag bucket, operated by a three-drum hoist, for reclaiming the mine dump; a large grizzly sorting table on which the bucket deposits the low-grade dump material for a rough re-sorting; a 100-ton milling-ore bin and a 60-ton waste bin beneath the grizzly; a three-ton skip for hoisting "ore-house waste," or waste from the sorting tables and dumping it on the re-sorting grizzly table mentioned, and for taking re-sorted waste from the 60-ton bin mentioned and dumping it into the two-ton motor car which takes it to the waste dump; a row of four 60-ton bins for receiving ore which goes from mine to mill without sorting; and a four-ton electric-motor car for carrying ore from these four bins and from the 100-ton cableway bin to the mill.

Two-ton Mine Skips Adopted

The capacity of the mine skips was fixed at two tons for the reason that the mine is operated mainly by a number of lessees whose ores must be kept separate in comparatively small lots. It frequently happens that five or six successive skip loads must go to as many different bins, for different lessees. Among the features of this skip may be noted the convenient arrangement for removing the skip box, the cast-iron boxes on which it swings having hinged caps held by cotter pins and easily swung open. The skip hanger is first hooked into the eye at the bottom edge of the skip body with the weight resting in the hanger. The box caps are then opened and the skip box, with its weight resting on the rollers in the dumping guides and suspended from the hanger, is swung clear of the skip frame. By placing a removable floor on the cross-bars the frame may be converted into a cage for handling men and timbers, shaft repairs, etc.

The guide shoes are simple flat plates and are easily renewed when worn. The ⅜-in. skip bottom is reinforced by a ½-in. steel liner. The safety appliances are of a simple and positive character. The dogs are so shaped as to be prevented absolutely from rotating beyond the proper arc of 90°, the projecting end of the dog encountering the steel frame and preventing further movement. Dogs of eccentric shape, held by chain connections have been known to turn over, breaking the chains, and allowing the cage or skip to fall to the bottom of the shaft. The helical safety springs are in a protected position, yet can be easily removed, replaced and adjusted in case of accidental damage. I know from many experiences that the springs furnished by the majority of mining-machinery builders for occasional skips and cages are unreliable, and I use this spring frequently in my designs, knowing that it has been tested before leaving the factory and is reliable and that it can be easily and cheaply renewed at any agency of the International Harvester Co. It has an initial tension of 400 lb., and is a compact and powerful spring.

Skips Dump Into Larry

The slanting oil holes in the roller pins have the merit of being easily cleaned, catching little dirt and not losing oil except through the bearing. The dumping guides are made with two different radii, so as to begin the tilting movement of the skip gently and without undue strains. The upper guide is long so that the skip can be hoisted several feet above the usual dumping position without overturning. The two skips discharge their loads into a substantial steel hopper which directs the ore to the two-ton car beneath. The bottom slopes of the hopper are of ¾-in. steel plate stiffened by 4x4-in. angles and show no distortion from the continued impact of heavy rocks. The two-ton side-dump ore car was originally driven by a three-phase induction motor at 440 volts, using the overhead trolleys shown, but for various reasons this was later changed to a 7½-hp. direct-current motor at 110 volts, the current being carried by the track rails and a light third rail to which connection is made by a sliding shoe, the arrangement being similar to that used with the four-ton car which is shown in detail.

Since this two-ton car is not required to operate on a grade exceeding 1%, it handles the load easily at a travel of about 800 ft. per minute. It not only handles all ore and waste from the mine, but also rehandles the material from the waste skip before mentioned, taking it a distance of perhaps 600 ft. to the dump. The mouth of one of the row of ten crude-ore bins into which the car discharges the ore to be sorted, is shown on the general plan, above the grizzly, which is the almost invariable feature of ore handling in this district. One of these mouths is placed at the head of each of the ten grizzlies, to direct the ore properly from the motor car, the opening of which is much wider than the grizzly.

A circular dial about 12 in. in diameter is fixed below the top cross-bar of each of the mine skips and has a pointer which is held by friction at any desired one of the 20 or so numbers at the edge of the dial. The skip tender sets the pointer at the number indicating the place to which the load is to be taken and the motorman discharges the load at the place indicated, keeping careful tally of all loads sent to each number.

Shipping and Milling Ore and Waste Produced

In the ore house the coarse ore passes over the grizzlies with about 2-in. spaces and drops into crude-ore bins. Whatever passes the grizzlies drops to screens having about 1-in. openings and the rejections from screens also drop into the crude ore which discharges through lever gates to sorting tables, where the shipping ore is thrown into bins beneath, while the low-grade ore, carrying perhaps $3 per ton in gold, including coarse rock, is scraped into mine cars holding about 1800 lb. Before the improvements were made these cars were trammed by hand a distance of 500 to 600 ft., most of the way out of doors and in all weather, over a bad track. Frequently cars were tipped over the sliding dump and had to be hauled back by horses.

With the new arrangement the cars are trammed a distance varying from 6 ft. from the nearest table to 110 ft. from the farthest, to the east end of the steam-heated ore house, where they are dumped into the chute which loads the waste skip. In the latter this low-grade rock is hoisted and dumped, through the movable spout, on the grizzly sorting table.

This table is made of 60-lb. rails held bottom up, and has 4-in. spaces. All materials passing through drops to the 100-ton cableway bin. The coarse rock is rapidly sorted, all that shows sufficient value being thrown into the cable-

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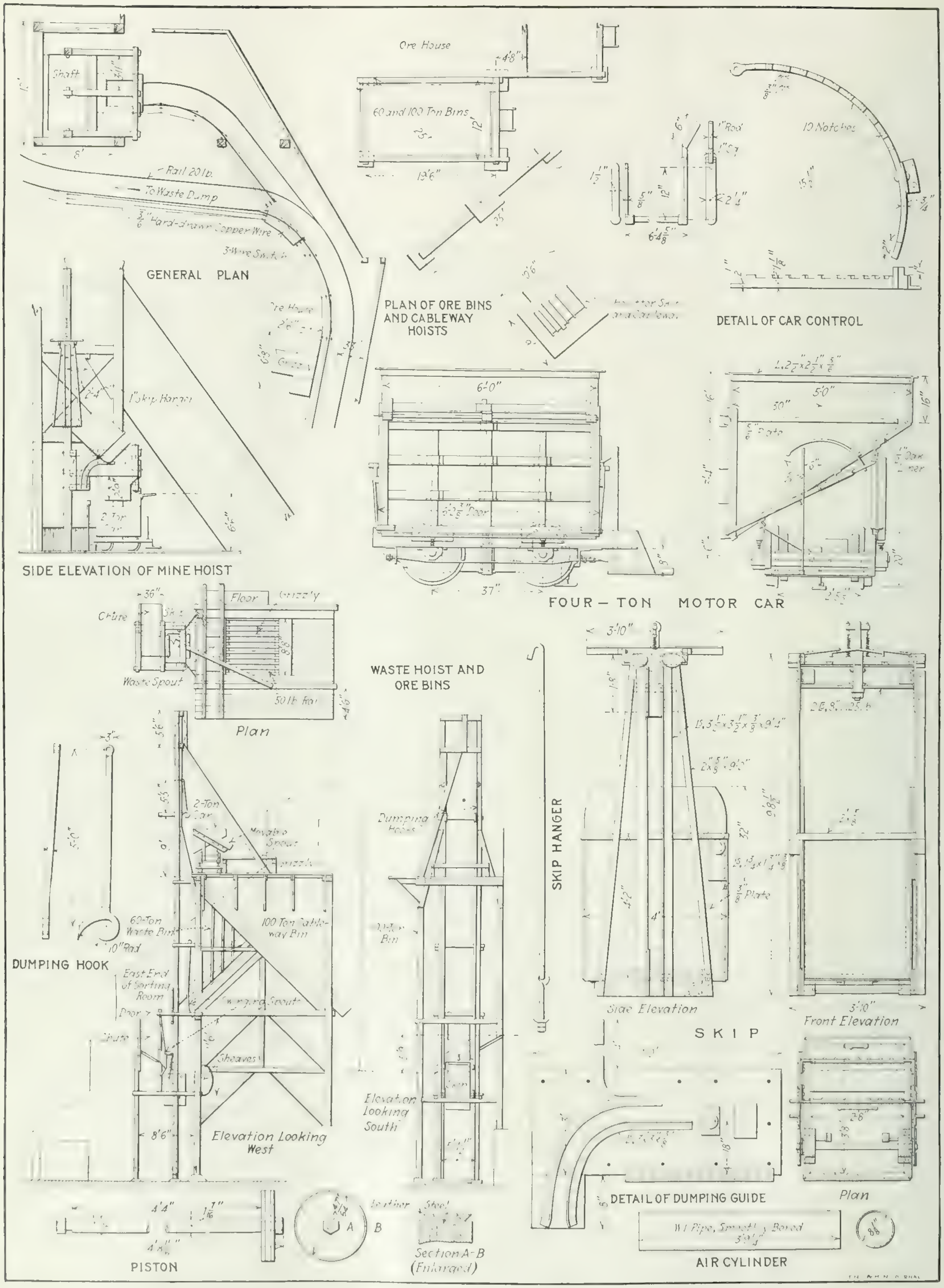
*Mechanical engineer, Victor, Colo.



Details of New Surface Equipment at Ajax Mine, Victor, Colo.

way bin through an opening in the floor at the north end of the grizzly, while the barren rock is raked or thrown over the opposite end into a vertical spout passing through the floor of the 100-ton bin and into the 60-ton waste bin below.

Motor-driven Car for Waste

From this bin the waste rock issues through an air-operated gate to the skip which hoists it and dumps it into the two-ton motor car. The movable spout is run out of the way and the car set in position to receive the skip load, which it then takes to the waste dump. The skip is dumped by means of the peculiar hooks shown, which engage the dumping rollers, first pushing until the skip is partly overturned, then pulling so as to prevent the box from becoming inverted. Stop blocks on the gallows frame prevent the skip from rising too far and being inverted. These hooks are used instead of the usual dumping guides because the guides would project so much further as to interfere with the cableway bucket. The main gallows-frame brace is also placed at one side to clear the bucket and grizzly.

The hoist for operating the cableway is placed on a concrete foundation and has three drums with friction clutches and brakes. One drum, not shown, smaller and in front of the two shown, is used for hoisting the waste skip. The engineer's levers are placed at the grizzly floor, on top of the cableway bin and connected to the hoist by wires, using an arrangement somewhat similar to that of the railway block signal and switch mechanism. This gives the engineer a view of the working of the cableway at all times and the skip discharges within a few feet of his station. The skip hoisting rope passes horizontally from the hoist to a sheave in the framing of the cableway bin and then almost vertically to the sheave at the top of the gallows frame. The chute leading from the ore house to this skip holds about three cars, or one skip load of rock, and is closed by a lever gate.

Swinging spouts which are thrown over the skip by a cam on the skip frame when the skip is at the loading positions at the chute and at the opposite bin gate above, prevent spilling when loading the skip. Lever connections, having rollers which engage the cams, throw the spouts out so as to project about 4 in. over the skip. The ends of the rods from which the spouts are hung engage the edge of the skip when it is hoisted, this movement being assisted by gravity, and swing the spouts clear. The movement of the skip for this short hoist of about 45 ft. is comparatively slow and the spouts are swung in and out as the skip passes, without any damage being done.

The bottoms of all bins are lined with ¼-in. steel plate and the air-actuated gates for the 100-ton cableway bin, the 60-ton waste bin and the four 60-ton mine bins are made of ¾-in. steel plate and have substantial steel guides. They are raised and lowered by 8-in. air cylinders which are shown in detail. They are controlled by brass four-way cocks with levers having each two ropes hanging within convenient reach. The five ore bins mentioned deliver to the four-ton side-dump motor ore car, which is shown in detail.

The car is of all steel and iron construction and well built for severe duty. It is propelled by two 5-hp. General Electric direct-current motors at 110 volts, which are geared with a single reduction, to the two axles. The car ascends without difficulty the 4½% grade to the sampling plant with a load exceeding four tons. Among the features of this car may be noted the babbitted half-boxes for the axles, which are easily removed and repaired. These boxes are held endwise by the grease cup, and are easily removed by unscrewing the cup and jacking up the frame slightly. Two extra half-boxes are kept as spares. The electric contact shoe has its shank guided by the wooden blocks which also insulate it; it rests or slides on the light-iron third-rail conductor. The brake is similar to the one on the two-ton car and is a simple lever arrangement with ample power for arresting the heaviest load in a short distance, with one hand. Wear of the brake shoes is compensated and adjustment maintained easily by setscrews in the brake beams and jam nuts on the rods. The car bottom, of ⅜-in. steel, is reinforced by a ¾-in. steel lining which shows no perceptible damage from the impact of the heaviest rocks.

Unique Car-door Control

The door control used with these cars is, to the best of my knowledge, original, and has some special merits. When commencing the design of the two-ton car I observed that in dumping mine cars over grizzlies great care was exercised in order to prevent the dumping from being too rapid, it being important to accomplish as perfect screening as possible. I had also observed that at other mines where the doors of side-dump motor cars are held by ordinary latches and the entire load released at once, a great portion of the finer material which should pass grizzlies and screens is carried over with the rush of ore.

The lever which controls the doors of these Ajax cars is jointed in such manner that the handle can be made to engage the notched quadrant when the door is opened any desired distance, thereby preventing positively any further opening until the handle is disengaged. The door may be opened wide quickly to permit a large rock to escape, then partly closed quickly and held at reduced opening while finer rock passes out slowly. The door is held positively shut against the heaviest load by allowing the controlling lever to drop to its normal position, slightly below the center line of the latch rod.

Doors not having this feature have to be held open with hand or foot while the fines run out, but this one lever performs all such functions effectively and easily. It is a convenience in discharging the four-ton car into the hopper of the gyratory crusher at the mill, where it is desired to see any wood which discharges and to pick it out. The general planning for the improvements described was done in collaboration with E. A. Colburn, Jr., general manager of the Ajax properties at Victor, while I worked out the details and surpervised the work of installation.

The Miner's Phthisis Compensation Act

Johannesburg Correspondence

The Miner's Phthisis Compensation Act has been passed by the Union Parliament, and it is the most important piece of industrial legislation yet passed in South Africa. It will be remembered that a commission was appointed which found that a large percentage of the underground workers on the Witwatersrand were suffering from this disease, which, though most common among rock drillers, was also likely to be contracted by all underground employees, the risk increased with the period of underground service.

All evidence has gone to show that it is not alone the dust produced by drilling upper holes that is dangerous; but also the dust circulated in the mines by blasting and by shoveling broken rock. This has indeed been recognized for some years and the government mining regulations have contained clauses adequate to deal with the matter had they been enforced. In the past, owing to the reluctance of the mining companies to spend money in providing proper underground water services and to the objection of the men to using jets or sprays when drilling, and to the slackness of the government in enforcing its own regulations, nothing effectual has, until recently, been done to check the disease.

Provision for Existing and Future Cases

The report of the commission and the legislation in Parliament have come as an unpleasant shock to the mining houses. The Act divided all cases of miners' phthisis into two sections. For existing cases in respect of which application will be made during the first two years after the bill comes into force a special compensation fund has been constituted. For cases that will arise after the expiration of those two years an insurance fund has been constituted. The government from its revenues from the Bewaarplaatsen will contribute £100,000 toward the compensation fund and the mines are to bear the whole of the remaining costs, which is estimated at from £1,000,000 to £1,500,000. As one clause in the Act makes the liability to pay compensation extend to the dependents of any deceased miner who can prove that his death was due to miners' phthisis, the liability may even exceed these figures. The money will be collected every three months from the mines in proportion to the total number of underground employees employed during that term. The insurance fund which deals with new cases is to be formed by contributions from the mines and from the employees underground. For the first two years after the bill becomes law the mines are to pay a contribution equal to 5% of the wages of underground employees every month, from which one-half is deducted from the earnings of the employees. After the second year the mines pay 5% and the employees 2½ per cent.

No Compulsory Inspection

There is to be no compulsory inspection of the employees to ascertain who are suffering and no restraint on anyone who is affected continuing work. All new employees on making application for a blasting certificate must be examined by a medical man and must show there is no weakness of the lungs. When cases that are not seriously affected apply for compensation they receive £8 per month for a year and are not allowed to resume under ground work. Severe cases receive £8 per month for life or a grant not exceeding £400, and dependents may receive such payments as the Board who control the fund may decide. Some of the mines will be badly hit by this law and will have to spread the compensation payments over a number of years or reduce dividends.

Actual Precautions Instituted

The most interesting question is, however, have the mining houses really decided to stamp out this disease and can they compel the miner to take precautions? I have lately been making private inquiries as to the real state of affairs. Several of the largest of the groups have, I am certain, at last awakened to the seriousness of the matter, and on many mines water pipes are laid to all working faces and managers have orders to dismiss any underground official found slack in enforcing the prevention of dust.

Even on these mines, the miners still in many cases refuse to suffer from wet clothes caused by using jets and sprays, and make only a pretense of doing so while officials are present. However, the use of some form of James water blast and the wetting of broken ore in stopes will undoubtedly reduce the danger greatly. At other mines the eight-hour law is being ignored where development work is being done, and despite the presence of government inspectors adequate water services are not yet installed. Before the eight-hour day law was passed a developer on many mines was expected, working with two machines in a drive, to drill and blast a round of 13 or 14 five- to six-foot holes in a shift; and this is being done in certain mines today by neglecting to make any inquiries as to when the developer ceases work. At other mines the law is strictly enforced and the shift bosses are not allowed to leave the shaft head until every miner has replaced his check given him before going below. No doubt in future the law will be better enforced in these particulars and all mines will be brought into line.

Result of Measures at Simmer Deep

What can be done by a moderate expenditure of capital and a little care and attention to detail is shown in the case of the Simmer Deep mine. This mine is being worked by inclines from three vertical shafts, the central shaft being used almost wholly for ventilation purposes. At the surface of this shaft in 1911, there was installed a Sirocco fan capable of moving 350,000 cu.ft. of air per min. against a five-inch head of water. In the down-cast shaft the air is moistened by sprays from water rings and the air current is split at the various levels into about five courses along the working levels. The working faces are ventilated by stopping all unused box holes in the pillar along the top of the drives.

The dust in the mine comes from three sources, (1) dust from drilling, (2) dust from blasting, (3) dust from shoveling broken rock. Jets and sprays are provided at all drilling machines with water in pipes from an underground tank holding 24 hours' supply drawn partly from mine water and partly from water sent underground. At the end of the pipes in all development faces, water sprays are turned on just before blasting on the day shift and left on until turned off at night by the stope watering gang. These sprays are made by using a high water pressure with a No. 28 Roni acetylene burner, and two are found sufficient to make a screen of water spray through which all smoke and dust from blasting must pass. Broken rock in stopes is wet by a special gang which work at night and sprays are in use at loading stations in the shaft. What these measures have done to improve the health conditions of the mine and to make work more efficient is shown by the following figures.

With natural ventilation 105,700 cu.ft. of air circulated in the mine and at present the fan circulates 200,000 cu.ft. per min. The effect of this is shown at the twenty-third level now being developed, where the wet-bulb reading has dropped from 83° to 78°, and the dry-bulb from 84½° to 80°, and this at a spot several hundred feet below where the downward current reaches.

The lowest working stope on the twenty-first level at a vertical depth of 3939 ft. has had the wet-bulb reading reduced from 80° to 71°, and the dry-bulb reading from 82° to 74°, and the average of the mine from about 80° to 74°. As the efficiency of labor falls off greatly after the wet bulb reading reaches 80°, the gain in efficiency is obvious.

In 1907 the amount of CO_2 in the ends of drives was 0.57%, with a dangerous proportion of CO. It is now 0.15%, and in the upcast 0.17%. In 1911 the grams of dust per cubic meter were 0.28, 0.13, 0.10, in various places, in 1912 the grams per cubic meter were 0.021, 0.039, 0.014, or a reduction of 77 per cent.

Victoria 1911 Mineral Output

The mineral production of Victoria for the year ended Dec. 31, 1911, was: Gold, 542,074 oz. gross or 504,000 fine oz.; coal, 653,864 tons; copper ore, 1116 tons, from which was produced 36 tons of copper, 653 oz. of silver, 55 oz. of gold, and 184 oz. of platinum; antimony concentrate, 743 tons; tin, 33 tons; wolfram ore, 17 tons; gypsum, 591; infusorial earth, 400 tons; magnesite, 166 tons; kaolin, 371 tons; silver, 18,494 oz.; manganese ore, 8 tons; silver-lead ore, 1098 tons.

Alluvial workings furnished 172,330 oz. of gold, quartz mining 371,370 oz. Of the alluvial gold, dredging yielded 78,535 oz., and sluicing by gravity, 3059 oz. The average yield of the 95 dredging companies was 1.9 grains of gold per cu.yd. treated. The government of Victoria runs nine testing batteries for the benefit of prospectors; the total loss incurred on these during the year was £3036. In addition, 15 batteries were erected by the government, but are run by local trusts, without expense to the government.

There are two quartz mines in Bendigo over 4000 ft. deep, vertical: Victoria Reef Quartz, 4614 ft.; New Chum Railway, 4318 feet.

French Metal Smelting Industry, 1910

The output of the French metal smelting industry (*Min. Journ.*, July 27, 1912, abstr. from *Statistique de l'industrie minérale en France et en Algeria*) in 1909 and 1910 was as follows:

Metal	1909 Kg	1910 Kg
Gold (fine) . .	136	133
Platinum	5	3
Silver (fine)	63,671	52,957
	Tons	Tons
Lead .	26,927	20,226
Zinc. .	19,956	52,598
Copper	7 923	12,933
Nickel	1,600	2,100
Aluminum	6,092	6,425
Antimony	5,441	4,640
Manganese	. .	1,360

Operation of Argentina Tramway

By C. A. Tupper[*]

The government 22-mile aerial tram, between Chilecito and Upulungos, is operated during the day only. Each morning, after the line is reported clear, light loads are started at low speed from the main upper station. Both load and speed are gradually increased to normal; the normal rate is 8.5 ft. per sec., the interval between carriers being 45 sec. or about 375 ft. The operation is largely automatic. The tram carries ore principally, but is equipped to convey miscellaneous supplies, water, mail and passengers. The line is inspected daily.

In the building and operation of the 22-mile Chilecito to Upulungos aërial tramway, for opening up the Famatina mining district, elevated over two miles above the plain, the government of Argentina has set a noteworthy example to the rest of the world. The construction of the tramway and the methods used in its erection have been already described. Of further interest, however, is the fact that this line is conducted merely as a part of the existing railway system, of which it was originally designed to be an extension in the form of a cog road.

CHIEF FREIGHT IS ORE

The freight handled on the tramway consists of ore, principally copper, sent down from the mines at a maximum rate of 40 tons hourly; but material and supplies of various kinds, including mining tools and machinery, are sent up as needed, according to a regular schedule. Ordinarily the line is operated only during daylight, as the low temperature at these high altitudes and the frequency of unfavorable weather conditions for the greater part of the year impose hardships on the attendants at night; but increasing traffic will in time render a 20-hr. schedule necessary.

Thorough control is maintained over the traffic. Before the tramway is put in operation in the morning, which takes place from above all of the stations have to report to an official dispatcher that the track is clear. As soon as this is understood, a light load, at speed much under normal, is loosed at the main station on the upper level, known as Bello Plan; then the ore buckets follow one another with gradually increasing weights and acceleration, until the line is loaded to its capacity, and the velocity of travel has attained the designed proportions.

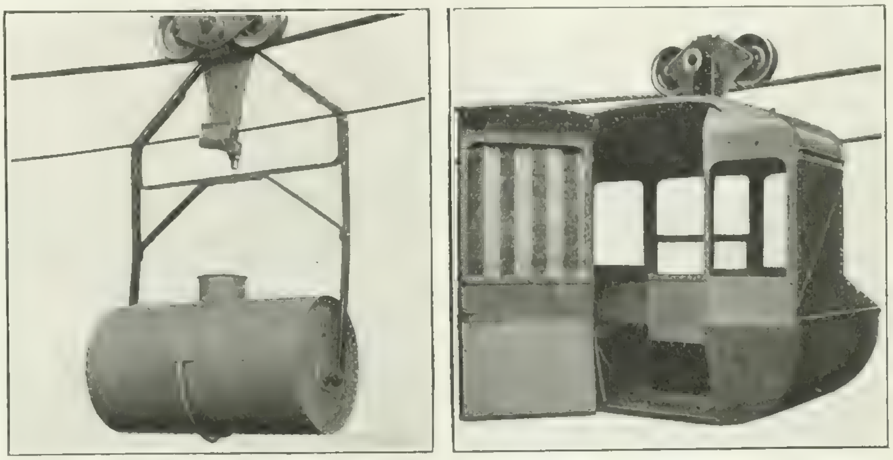
Owing to the steep grades and long spans, it is desirable to obtain the requisite capacity with a minimum number of carriers in transit; therefore, it was decided to employ a speed of about 8.5 ft. per second, making the time intervals 45 seconds and the spacing of the carriers 375 ft. apart. When the tramway is fully loaded, the down operation proceeds practically of itself, except for the starting of the carriers, and at the lower terminal the loads are automatically weighed, recorded and discharged to bins. The automatic scale and the counter are shown in the accompanying halftones. All special conveyances are also side-tracked at the lowest station, Chilecito, except the water tanks, which are always returned empty to an intermediate point where there is a good spring of water at which they can be refilled. Passenger cars are usually held in readiness at each station.

The stations are so designed and equipped as to make the operation of the tramway as nearly automatic as practicable, so that little labor is required. At the eight intermediate stations the wheels of the carriers pass over rails from one track cable to the next and are self-coupled again to the traction cable, after automatically uncoupling and traversing the intervening space by their momentum. The station attendant's duties are to see that nothing goes wrong. When necessary, a light push is given to insure no delay in the passage.

Carriers which are intended for unloading at an intermediate station can be shunted to overhead rails of a double-head pattern, made especially for this purpose, by means of which they can be taken to the point of discharge, and thence to the opposite side, where they are attached to the traction cable and sent out over the line empty or reloaded as the case may be. At the points where the carriers enter or depart from a station, the shunt rails terminate in what are known as "terminal shoes," a special form of saddle so designed that the transition of the carriers to and from the cables is without shock or jar. These shoes are provided with hinged steel hoods.

Arriving at the bottom and discharging, the ore buckets are loaded with material for above, or started up again empty, with as little delay as possible. Care is taken to balance the traffic both ways to the fullest extent permitted by conditions, so as to derive the advantage of the excess energy generated by the down loads for pulling others up and also to minimize the power required for braking, which is exerted by small high-speed automatic-engine plants at several of the stations.

An independent telephone line, strung on poles running alongside the tramway, enables the entire system to be kept in communication. The station attendants are thus notified of any supplies or other material intended for their use; and the receptacles, which bear large numbers on their ends, can be readily detected as they approach. Most of the stations have side tracks on to which carriers can be switched, as above described; but for two that are perched on the sides of steep declivities where there is little room, material is sent up at times when loads are far apart, so that they can be taken out and the carriers allowed to proceed. All buckets or other receptacles drawn out and emptied are put back with their carriages on the up line, so that rolling stock always makes the complete round trip and is available in each instance for reloading at either end. Only a limited number of special carriers, such as those shown in the accompanying halftones, are, however, kept in transit, the remainder being held at Chilecito or returned there when not needed. Water casks are taken care of at the mountain station, where there is a filling plant.



WATER CASK AND PASSENGER CARRIER ON ARGENTINA TRAMWAY

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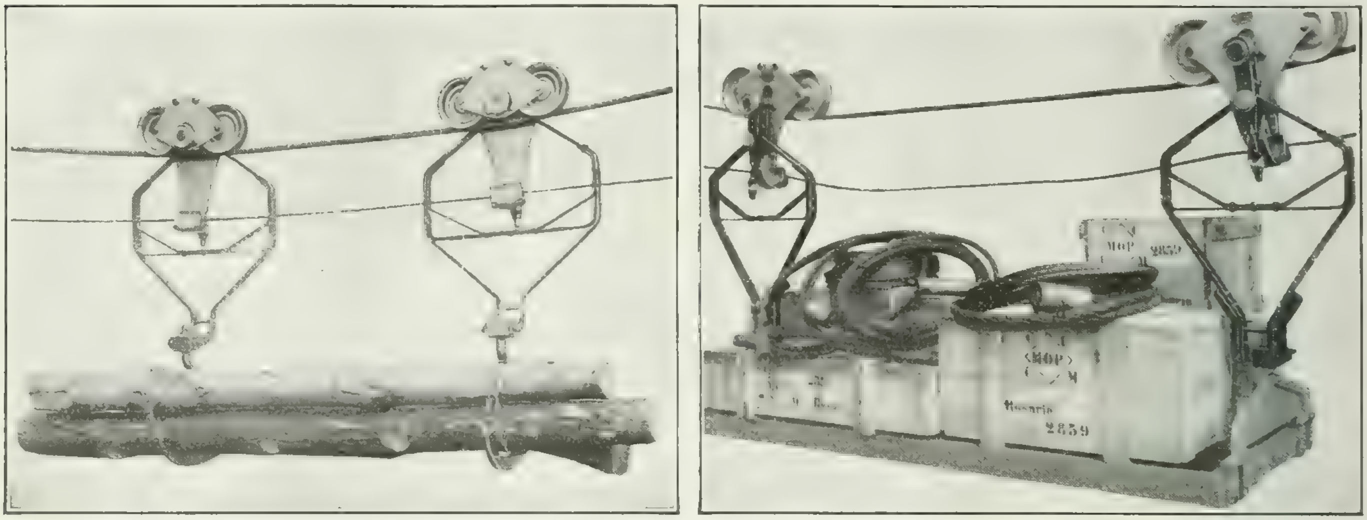
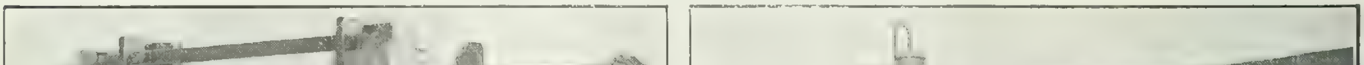
[*] Consulting engineer, 389 Thirty-first Ave., Milwaukee, Wis.

The line is also used to a large extent for passenger traffic and mail. An accompanying halftone shows one of the four-seated passenger conveyances used, which is built of steel, with glass windows, and contains a water tank and other conveniences. By means of a special brake the velocity can be reduced, and the round trip usually takes about four hours.



Mine Timber and Merchandise Carriers on the Argentina Tramway



Automatic Scale and Automatic Load Recorder on Argentina Tramway

About 700 Carriers Used

For the entire traffic of the system, as at present constructed, upwards of 700 carriers are used in transporting freight, passengers and mail. The carriage consists of two steel side plates, between which are mounted two cast wheels, fitted with phosphor-bronze pins, so designed that as the upper surfaces become worn, they can be turned around underside up. The hanger pins are made of machinery steel. The grip is so designed that the weight of the carrier acts as the gripping force, which varies with the inclination of the cable. This construction possesses the advantage of being independent of any nice adjustment of the jaws, so that the grip automatically accommodates itself to irregularities in the wear of the traction rope.

The mechanism operating the jaws is entirely inclosed within the main casting and is impervious to rain and snow, which makes it possible to operate the tramway under the severe weather conditions above referred to. A slipping of the grip upon steep inclines on the long spans, when the cable is covered with ice, had to be especially guarded against, as the running wild of a single carrier would have serious consequences. Moreover, should a carrier run off the cable, it must instantly detach itself from the traction rope automatically, which would take place with the type described.

The tramway is under the control of officials of the Argentina state railways, headed by a traffic manager; and a mechanical superintendent has charge of the maintenance of way and the rolling stock. At each station quarters are provided for a station master, a telegraph operator and assistant, three carrier and line attendants and usually an engineer and fireman. Each station has, furthermore, its own line inspectors and repair men, who may also be partially those employed at an adjacent station. It is obligatory to go over the entire stretch carefully every day.

In Chilecito there is a large store house and repair shop, with machine tools, iron fabricating equipment, etc.; a similar plant at the upper terminal, and tools for light metal work, line kits, portable telephone outfits, etc., at each intermediate station.

Cables Automatically Oiled

The lubrication of the track cables is automatically effected by a traveling oiler. The oil or special compound used is carried in a cylindrical tank, to which is attached a small rotary pump, driven from the carriage wheels by a belt and gears, that forces the lubricant up through a small pipe to the cable at a point just under the middle of the carriage, with a spraying effect. There is also a special device for coating the traction cable. This consists of a U-shaped receptacle containing the mixture used, which is suspended near one of the terminal guide sheaves. The rope passes over a small roller, which slushes it in the same manner as a ring oiler of a bearing, and brushes set just beyond in the receptacle wipe off the drip.

The enterprise of the Argentina government in building and providing for the systematic operation of this tramway, was marred at the outset by too great economy in providing various details; for, on the theory that the traffic would be light for some time, cables were ordered sufficient for a burden of no more than 10 tons hourly during a 10-hr. day, and only a limited number of carriers was purchased. The Famatina Development Corporation, Ltd., however, proceeded to build two smelting plants between Chilecito and the mountains, at Santa Florina, capable of treating 400 tons of copper daily, and the line could not be pushed in carrying capacity beyond 15 tons hourly.

In attempting to do more the light cables in service broke and the tramway was idle for a long period because no spares had been provided. This necessitated shutting down the smeltery. Since then, however, the damage has been repaired and heavier cables were ordered last year, although without consulting the tramway builders as to their construction and dimensions. The number of carriers has also been increased and a requisition for 250 additional was recently placed by the Argentina government, so that conditions now approach those for which the line was originally designed, as described in this and previous articles. The supports, station framework, power equipment, etc., were fortunately calculated and supplied in the beginning for the hourly capacity of 40 tons required.

The railway from Buenos Aires, which runs through Rosario and northwest in three divisions to Tucuman, with an extension beyond, has a number of spur lines to the foot of the Andes, including the one from Cordoba to Chilecito. Beyond these there are rich deposits of ore in the mountains, but the barrier heretofore interposed has prevented their development on anything like an extensive scale. The construction of the Chilecito to Upulungos tramway is, therefore, of much importance, as showing a way to get at the riches of the Andes.

The Parkes Process in the United States*

The original Parkes process as practiced in England consisted in stirring into silver-bearing lead melted in a kettle from 1 to 2% of zinc, cooling, liquating the zinc scum in an iron retort, distilling the rich residual alloy in fireclay retorts to regain the zinc, and refining the desilverized lead at a low heat in a shallow cast-iron pan which formed the hearth of a reverberatory. If the lead was too impure it was first softened in a similar reverberatory.

The Balbach process liquated the softened bullion in a reverberatory with a cast-iron inclined hearth, the liquated metal flowed into a kettle containing the required zinc, with which it was thoroughly stirred, and was then cast into bars. These bars were then transferred to a second furnace, where they were heated to the melting point of lead, a desilverized lead flowing away, leaving the rich alloy behind. This was distilled in graphite retorts, the zinc condensed, and the lead cupelled. Thus the Balbach process as patented in 1864 had some of the features of the Parkes process of 1851, and about 1872 was so modified as to resemble it still more closely.

The commercial failure of the original Parkes process was due to the cracking of the cast-iron pans, and the failure of the fireclay retorts. By the use of firebrick furnaces and graphite retorts, the Parkes process was made an unqualified success.

The American works are all built with terrace construction, the softening furnace is on the highest level, the desilverizing kettle on the next, the refinery furnace below this, and last the casting floor.

Softening Furnace

The reverberatory softening furnace was early built with a riveted sheet-iron pan carrying an inverted arch of firebrick to act as the hearth. To counteract the corrosive oxides at the slag line, water cooling in various forms was resorted to. A 2½- or 3-in. water pipe was placed along the lead line next to the pan, or the sides and ends of the hearth were provided with water jackets, or the riveted pan was made double to act itself as a jacket. This last was eventually abandoned as increasing fuel consumption, while the use of magnesite bricks along the lead line further allowed dispensing with water cooling. In some furnaces there is now no watercooling except under the skimming door.

The size of the furnace has gradually been increased from 10 tons up to 90 tons, which is the limit with hand charging. But by means of an endless belt which drops the pigs into a chute through a hole in the roof the 210- to 240-ton furnace at Omaha has been made possible The time of refining is about the same in a large as a small furnace, and labor, fuel and repairs are less.

The important points in softening are to melt at a low heat and to remove the copper dross; then increase the heat and skim off the arsenic and antimony dross. In some works litharge free from copper is used to assist in oxidizing the arsenic. If the bullion is skimmed as it is poured into the ore-smelting-furnace molds, there is practically no copper dross to be removed. After softening the charge is flowed through a launder into the softening kettles.

Desilverizing Apparatus

The first desilverizing kettles had a capacity of about 10 tons and were tapped through a spout in the bottom. Later a siphon was used, and now a motor-driven centrifugal pump is used for emptying the kettles.

Formerly the silver crusts were liquated on an inclined cast-iron hearth, or in a kettle with or without a spout. These methods have been superseded by the Howard silver-crust press. The earlier methods of stirring in the zinc, by hand or steam, have been superseded by a propellor blade stirring device, driven either by engine or motor.

In early days the zinc was added in three doses, stirring in each addition, and cooling and skimming until a ring of chilled lead formed around the kettle. Only the first crust was liquated, the second and third were used on the next charge. Some works took off four crusts, the first, the gold crust, taking off the gold and a little silver. The time for desilverizing was 15 to 20 hours. With the use of the Howard propellor stirrer the time has been reduced to about 10 hours.

The elimination of the zinc retained by the lead, 0.6%, is done by oxidation at a high heat in a reverberatory, or in a kettle by passing dry steam through the lead heated to redness. The refining furnace is similar in construction and size to the softening furnace. After the zinky oxides have been skimmed, the heat is raised and air admitted to remove the last of the antimony, or the removal of the antimony is accomplished by steaming without raising the heat.

The graphite retort was used as early as 1867 by Balbach. It was mounted in an inclined position in a coke furnace. A Fabre du Faur, in 1870, swung the furnace on trunnions, the present method. From a capacity of 250 lb., the retort charges have gradually increased to 1200 to 1400 pounds.

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*Abstract of a paper by E. F. Eurich, of New York, read before the International Congress of Applied Chemistry.

In the United States, cupellation has always been effected in the cupel furnace, the size of which has gradually increased from one to six tons. The use of boneash soon gave way to portland cement, portland cement and ground firebrick or limestone, limestone and fireclay, or magnesite. At present, dolomite and fireclay is most used. The test bottom may be either stationary or tilting, and may be water cooled.

It was formerly the custom to cast the rich lead from the zinc retorts and feed these bars into the cupelling furnace but now the charge is poured into a pot, and thence, still molten, into the test bottom.

Concentration with Woodbury Classifier and Jigs

By Edward T. Wright*

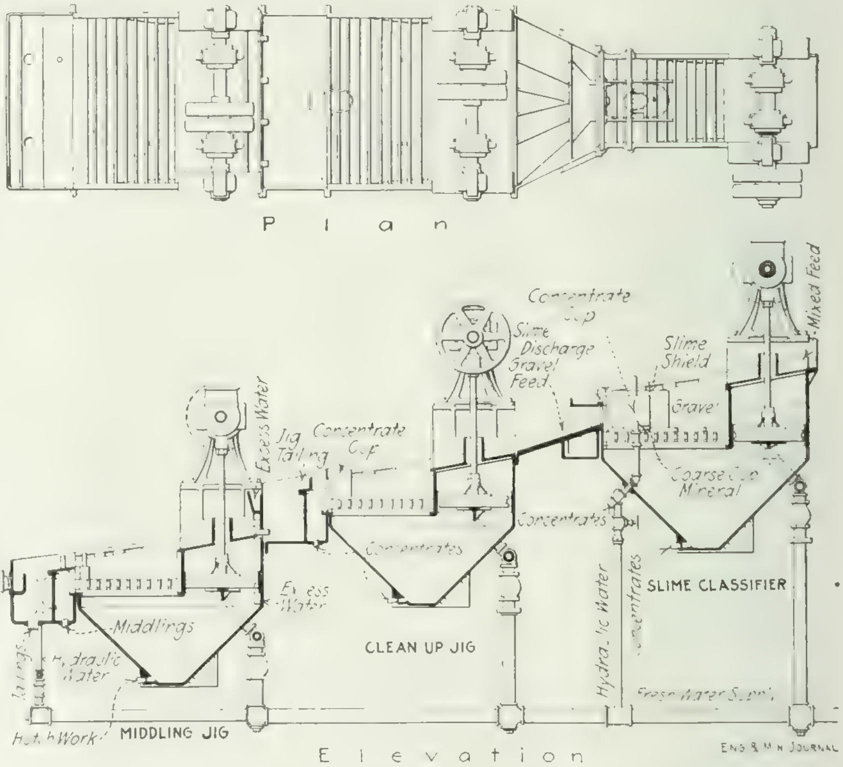
The Woodbury system of concentration, which is extensively used for preliminary work in the mills of the Lake Superior copper country, is designed to effect a separation of free "mineral" and middlings from a mixed or unsized feed. It is a type of plunger jig so arranged that the feed flowing on it parallels the currents of water caused by the plunger impulse. The unclassified pulp from the steam stamps (not coarser than ⅜ in.) is delivered at the head of the unit to the first compartment, the slime classifier.

This classifying jig has a plunger compartment at its head. The plunger is actuated by means of eccentrics which are given a differential motion resulting in a quick downward and slow upward motion of the plunger. The feed as it is delivered flows over a sieve of suitable mesh, which is supported on sieve bars. The plunger, of course, imparts to the water a differential pulsation up through the sieve. The pulp flowing over the sieve is thus lifted sharply and is allowed to settle through the water. This results in a stratification, heavy minerals going to the bottom followed by middlings, sands and slimes.

There are four discharges from the classifier: (1) Slimes approximately 60 mesh and finer; (2) sand, usually retreated on jigs following; (3) coarse cup concentrates; (4) fine or hutch concentrates.

The slime-classifying device consists of a large brass shield adjustable vertically and so set that the pulp on the sieve seals it against the entrance of slimes. This suspended matter is carried around the shield, over the tailboard and away for future treatment, as shown in the accompanying drawing. By regulation of the height of the tailboard, the mesh of the slime discharged can be roughly governed.

The pulp moving on the sieve bed is drawn along inside the shield toward an opening or slot a little lower than the slime discharge. This slot is controlled by a gate and may be regulated to suit the quantity of feed to be treated. The height of this opening, of course, regulates the depth of sieve bed. Another brass shield inside the large slime shield forms a cup for drawing off the coarse concentrates; this cup extends down into the bed of concentrates and discharges them through a pipe, as seen in the drawing. From the hutch plugs of the classifier are drawn the clean fine concentrates which have been jigged through the sieve bed into the hutch. The nominal capacity of the 24-in. slime classifier is given as 250 tons per 24 hr. and that of the 48-in. machine at 500 tons per 24 hours.



Unit of Two Woodbury Jigs and a Slime Classifier

The slime-classifying jig is followed in the Lake Superior copper country by one or more compartments of Woodbury jigs to complete the separation of concentrates, middlings and tailings. This jig is constructed with a plunger compartment at its head of the same general type as the slime classifier. The feed flows on the jig over the plunger compartment. The discharge of concentrates is accomplished by means of a brass cup similar in operation to the one on the classifier. The discharge from the cup is adjustable; its height controls the depth of concentrate bed on the sieve and this controls the quality of the hutch product.

The middling jigs are equipped with a hydraulic middling discharge. An angle-iron shield is fastened across the tail of the jig and extends down into the middling stratum which seals it against the entrance of tailings. From under this shield openings placed at 6-in. intervals lead to a hydraulic compartment, where a fresh-water supply regulates the quantity and quality of middlings discharged through the openings into this compartment and out through plugs in the bottom. This hydraulic device gives a uniform discharge and discharges true middlings by holding back light mineral and tailings, with the hydraulic pressure.

The tailings from one jig pass over the angle-iron shield and hydraulic compartment into the "water lessener" of the next succeeding machine in the series. This is a small dewatering trough diverting the excess water of the feed into the hutch of the succeeding jig. The nominal capacity of the 48-in. jig is given at from 250 to 500 tons per 24 hours. From 1000 to 1500 gal. of water are used on these units per ton of ore treated.

The material discharged from the hutches of the classifier and first jig is usually clean mineral, which is included in the general concentrates. The hutch product of the middling jigs is an enriched sand which is usually treated on tables. The tailings from the last jig are usually wasted. The Woodbury classifiers and jigs are now manufactured by the Power & Mining Machinery Co., of Cudahy, Wisconsin.

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*Engineer, Power & Mining Machinery Co., Cudahy, Wis.

Mining and Metallurgical Patents

A Classified List of New Inventions

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by "The Engineering and Mining Journal" upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COPPER

ALLOY—Improved Alloy of Copper and Zinc. A. Schmid, Zurich, Switzerland. (Brit. No. 27,829 of 1911.)

LEACHING—Improvements in the Treatment of Copper Liquors. J. H. Thwaites, Peterborough, Eng. (Brit. No. 26,320 of 1911.)

REFINING—Process of Refining Copper. Walter S. Rockey and Hilliary Eldridge, New York, N. Y., assignors to Metallurgical Research Co. (U. S. No. 1,037,538; Sept. 3, 1912.)

GOLD AND SILVER

AMALGAMATION—Separator and Collector for Metals; Samuel L. Boggs, Pittsburgh, Penn. (U. S. No. 1,037,114; Aug. 27, 1912.)

CYANIDING—Ore-Treating Apparatus. Alexander John Arbuckle, Johannesburg, Transvaal, assignor of one-half to Anglo French Exploration Co., Ltd., London, England. (U. S. No. 1,036,535; Aug. 27, 1912.)

CYANIDING—Precipitating Apparatus for Cyanide Solutions. Daniel Bosqui, Monahan, Wash., assignor to Merrill Metallurgical Co. (U. S. No. 1,035,941; Aug. 20, 1912.)

CYANIDING—Process of and Apparatus for Atomizing Metals, Etc. James Millar Neil, Toronto, Ont. (U. S. No. 1,036,689; Aug. 27, 1912.)

GOLD-SAVING AND AMALGAMATING MACHINE. Robert Beyrle, Los Angeles, Cal. (U. S. No. 1,037,195; Sept. 3, 1912.)

GOLD-WASHING MACHINE. James M. Carter, Pendleton, Ore. (U. S. No. 1,037,434; Sept. 3, 1912.)

MINING SLUICE. Pierre Bouery, Weaverville, Cal. (U. S. No. 1,036,430; Aug. 20, 1912.)

STAMP MILL. William B. Straub, Oakland, Calif., assignor of one-half to John J. Knight, Alameda, Calif. (U. S. No. 1,038,019; Sept. 10, 1912.)

IRON AND STEEL

ALLOY MANUFACTURE. Robert B. Carnahan, Jr., Middletown, Ohio, assignor to The International Metal Products Company, Newark, N. J. (U. S. No. 1,035,948; Aug. 20, 1912.)

BLAST FURNACE. Arthur J. Moxham, Wilmington, Del. (U. S. No. 1,036,137; Aug. 20, 1912.)

BLAST FURNACE CONSTRUCTION. James Scott, Pittsburgh, Penn. (U. S. No. 1,036,350; Aug. 20, 1912.)

BLAST-FURNACES—Cleaning Device for Water-Cooled-Wall Furnaces. George J. Rennie, Aspinwall, Penn. (U. S. No. 1,035,050; Aug. 6, 1912.)

FLUE-DUST—Process for Briquetting Flue-Dust and the Article of Manufacture Produced Thereby. Robert Gubner, Elizabeth, N. J. (U. S. No. 1,038,370; Sept. 10, 1912.)

FURNACE-CHARGING MECHANISM. James B. Ladd, Philadelphia, Penn., assignor to Ladd & Baker. (U. S. No. 1,036,272; Aug. 20, 1912.)

GAS-WASHING PLANT. Homer D. Williams and William Ahlen, Duquesne, Penn. (U. S. No. 1,037,095; Aug. 27, 1912.)

HARDENING—Case-Hardening Compound. Patrick W. Brennan, Philadelphia, and Michael Meehan, Williamstown, Penn. (U. S. No. 1,036,435; Aug. 20, 1912.)

INGOT MOLD. John Power, Pueblo, Colo. (U. S. No. 1,036,333; Aug. 20, 1912.)

MANUFACTURE—Process [illegible] Steel. Fred B. Lamb, Bettendorf, Iowa, assignor of one-fourth to Albert B. Frenier, Davenport, Iowa. (U. S. No. 1,036,198; Aug. 20, 1912.)

METALLURGICAL FURNACE OF THE OPEN-HEARTH TYPE. Fred B. Lamb, Bettendorf, Iowa, assignor of one-fourth to Albert B. Frenier, Davenport, Iowa. (U. S. Nos. 1,036,499, and 1,036,500; Aug. 20, 1912.)

OPEN-HEARTH FURNACES—Process and Apparatus for Removing the Slags from Ingot Iron and Ingot Steel in Open-hearth Furnaces. K. Stobrawa, Gleiwitz, Germany. (Brit. No. 17,434 of 1911.)

REFINING—Improvements in Refining Molten Pig Iron for Steel Making and Other Purposes. T. Twynam, Redcar, Eng. (Brit. No. 18,406 of 1911.)

REGENERATIVE FURNACES—Improvements in Regenerative Furnaces. Knox Pressed & Welded Steel Co., Niles, Ohio. (Brit. No. 8883 of 1912.)

REGENERATIVE FURNACES—Improvements in Regenerative Reverberatory Furnaces. J. Maerz, Breslau, Germany. (Brit. No. 19,536 of 1911.)

REGENERATIVE REVERSING FURNACE. Luther L. Knox, Avalon, Penn., assignor to Keystone Furnace Construction Co., Pittsburgh, Penn. (U. S. No. 1,038,154; Sept. 10, 1912.)

TREATED IRON ORE. Edward F. Goltra, St. Louis, Mo. (U. S. No. 1,035,960; Aug. 20, 1912.)

TREATMENT OF MOLTEN STEEL. Joseph W. Richards, South Bethlehem, Penn. (U. S. No. 1,037,536; Sept. 3, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINA—Process of Producing Alumina. David H. Childs, Alfred, N. Y. (U. S. No. 1,036,454; Aug. 20, 1912.)

ALUMINUM—Process of Producing Aluminum Fluoride. David H. Childs, Alfred, N. Y. (U. S. No. 1,036,453; Aug. 20, 1912.)

ALUMINUM SOLDER. Charles R. Erkens, New York, N. Y., assignor to Simplex Aluminum Solder Co., Inc., New York, N. Y. (U. S. No. 1,033,565; July 23, 1912.)

BORON—Reduction of Boron Compounds. Frank J. Tone, Niagara Falls, N. Y. (U. S. No. 1,035,919; Aug. 20, 1912.)

TIN—Improvements in or Relating to the Treatment of Tin, Tin-Containing Materials and Other Products. Elektrochemische Fabrik Kempen-Rhein, Dr. Brandenberg; Weyland, Kemper-Rhein, Germany. (Brit. No. 21,447 of 1911.)

TIN—Improvements in Tin Oxidizing Furnaces. K. von Olszewski, Dresden, Germany. (Brit. No. 23,267 of 1911.)

ZINC—Heater for Zinc-Reducing Furnaces. Carl Roitzheim, Cologne, Germany. (U. S. No. 1,038,205, Sept. 10, 1912.)

MINING—GENERAL

BLASTING IMPLEMENT. Nicholas Ruschel and John F. Bodey, Federal, Penn. (U. S. No. 1,036,343; Aug. 20, 1912.)

CAR-DUMPING MECHANISM. Herbert S. Salmon, Bessemer, Ala. (U. S. No. 1,036,910; Aug. 27, 1912.)

DRILL—Rock Drill. William L. Brookings, Telluride, Colo. (U. S. No. 1,036,180; Aug. 20, 1912.)

DRILLING—Improvements in Re-boring Rock Drills Cylinders and the Like. J. Davidson and R. J. Richards, Johannesburg, Transvaal. (Brit. No. 19,181 of 1911.)

DUMP-CAR LOCK. Roy E. Cartzdafner, Columbus, Ohio, assignor to Kilbourne & Jacobs Manufacturing Co., Columbus, Ohio. (U. S. No. 1,034,418; Aug. 6, 1912.)

EXCAVATOR. Morton G. Bunnell, Chicago, Ill., assignor to Frederick C. Austin, Chicago, Ill. (U. S. No. 1,037,429; Sept. 3, 1912.)

MINE DOOR. Zenas N. Cox, Denver, Colo. (U. S. No. 1,034,693; Aug. 6, 1912.)

MINER'S LAMP. Edward C. Manglin, Colorado Springs, Colo. (U. S. No. 1,037,918; Sept. 10, 1912.)

ORE HANDLING—Improvements in Apparatus for Handling Ore. Brown Hoisting Machinery Co., Cleveland, O. (Brit. No. 19,676 of 1911.)

ROCK-DRILL BIT. Abijah S. Meguire, Chicago, Ill. (U. S. No. 1,036,673; Aug. 27, 1912.)

SHAFTS—An Improved Method of Forming Shafts for Mines and the Like. F. S. Ruckett, London, Eng. (Brit. No. 25,617 of 1911.)

ORE DRESSING—GENERAL

CLASSIFICATION—Apparatus for the Separation of Ores. Henry Dallemagne, Clichy la Garnee, France, assignor to Compagnie d'Entreprises de Lavage de Minerais, Paris, France. (U. S. No. 1,035,864; Aug. 20, 1912.)

CONCENTRATOR—Ore Concentrator. George M. Gross, Chicago, Ill. (U. S. No. 1,035,874; Aug. 20, 1912.)

CONCENTRATORS—Method of Feeding Endless-Belt Ore Concentrators and Apparatus Therefor. Frank S. Card, Denver, Colo., assignor to Ritter & Ritter, Washington, D. C. (U. S. No. 1,033,302, July 23, 1912.)

CONCENTRATORS—Protective Covering for Concentrator Tables and Method of Applying the Same. Everest A. Baylis, Madera, Mexico. (U. S. No. 1,037,579, Sept. 3, 1912.)

CRUSHING—Roll for Crushing Machines. William A. Box, Denver, Colo. (U. S. No. 1,036,067; Aug. 20, 1912.)

DRY ORE CONCENTRATOR. Alfred H. Kidney, Orange, N. J., assignor to International Concentrator Co., New York, N. Y. (U. S. No. 1,036,260; Aug. 20, 1912.)

MAGNETIC SEPARATOR. Georg Ullrich, Broken Hill, N. S. W., Australia. (U. S. No. 1,037,563; Sept. 3, 1912.)

PULVERIZER. Edward H. Frickey, St. Louis, Mo., assignor to Williams Patent Crusher & Pulverizer Co., St. Louis, Mo. (U. S. No. 1,037,232; Sept. 3, 1912.)

SLIME CONCENTRATOR. Wilton E Darrow, Sutter Creek, Cal. (U. S. No. 1,035,165; Aug. 13, 1912.)

WASHING—Improved Apparatus for Washing Coal, Ores of the Precious Metals and Other Ores and Minerals. J. Dodds, Glasgow, Scotland. (Brit. No. 24,406 of 1911.)

METALLURGY—GENERAL

CALCINING FURNACES — Improvement in Gaseous or Pulverulent Fuel Fittings for Calcining Furnaces. Gebhard Bierhals, Berlin, Germany. (Brit. No. 2503 of 1912.)

CONVERTER VALVE. Prime Edward Gannon, Jerome, Ariz. (U. S. No. 1,034,995; Aug. 6, 1912.)

ELECTRIC INDUCTION FURNACE. Albert E. Greene, Chicago, Ill., Assignor to American Electric Smelting & Engineering Co., St. Louis, Mo. (U. S. No. 1,036,996; Aug. 27, 1912.)

MELTING FURNACE. William Joseph Holzapfel, Eddystone, Penn. (U. S. No. 1,037,768, Sept. 3, 1912.)

ORE TREATMENT—Process of Treating Ores. Wilhelm Gunther, Cassel, Germany. (U. S. No. 1,032,400; July 16, 1912.)

RETORT SETTING—Method of Constructing a Retort-Setting. George W. Parker, St. Louis, Mo. (U. S. No. 1,037,516; Sept. 3, 1912.)

ROASTING—Securing Rabble-Arms of Roasting-Furnaces. Utley Wedge, Ardmore, Penn., assignor to Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,037,091; Aug. 27, 1912.)

SCRAP METAL—Scrap-Compressing Machine. John Dunn, Streator, Ill., assignor to Vulcan Detinning Co., New York, N. Y. (U. S. No. 1,033,089; July 23, 1912.)

SCRAP TREATMENT—Receiving-Box for Metal-Scrap-Compressing Machines. John Dunn, Streator, Ill., assignor to Vulcan Detinning Co., New York, N. Y. (U. S. No. 1,033,091; July 23, 1912.)

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Henry F. Lefevre left New York, Sept. 21, for Panama.

John M. Callow, of Salt Lake City, was in New York this week.

Kirby Thomas, of New York, is making some mine examinations in Ontario.

W. A. Carlyle, of London, England, has been in Mexico on professional business.

Robert Hay Anderson has returned to New York from Europe, and has gone to Mexico.

J. Gordon Hardy, of El Paso, Texas, is now at Clifton, High Craigmore, Bute, Scotland.

J. I. Hoffman, of Johnson & Hoffman, London, England, is in Servia on professional business.

Charles S. Price, president of the Cambria Steel Co., has resigned on account of continued ill health.

M. G. Talcott, consulting engineer of the General Assets, Ltd., has been appointed manager of the Dome Lake mine at Porcupine.

G. C. Bateman has been examining claims for the Canadian Mining and Exploration Co., in Turnbull Township, near Porcupine, Ontario.

C. K. Colvin, of Denver, Colo., is at Forbestown, Calif., on a professional visit to the Gold Bank-Golden Queen and other mines in the district.

William G. Nickerson, of Boston, has been chosen president of the Kerr Lake Mining Co., in the Cobalt district, to succeed Julius Lewisohn, resigned.

A. L. Sweetser, of Denver, Colo., is at San Juancito, Honduras, on professional business, and expects to remain in Central America for several months.

Robert S. Lewis, of Stanford University in California, has been appointed associate professor of mining in the University of Utah at Salt Lake City.

Leighton Stewart, recently at the Mina Tiro General, Charcas, San Luis Potosi, is now at Minas Tecolotes y Anexas of the American Smelters' Securities Co., at Santa Barbara, Chihuahua, Mexico.

J. F. McKenzie, formerly general manager of the Dome Lake mine, Porcupine, Ont., which is owned by the General Assets, Ltd., of Toronto, has gone to the Superior Talc Co., Moretown, Vermont.

Alfred E. Kornfeld, until recently vice-president and manager of the Engineering News Publishing Co., returned from a four-months' trip in Europe, on Sept. 6. He has taken an office at 41 Park Row, New York.

The General Engineering Co., Salt Lake City, Utah, announces the addition of Karl Bernson to the engineering staff. Mr. Bernson will act in the capacity of constructing engineer, taking active charge of all construction.

Warren E. Hall, Atlanta, Ga., and formerly division engineer in the Porto Rico irrigation service, has been appointed district engineer of the U. S. Geological Survey in charge of stream measurements and investigation of water resources in the southeastern states.

Maxcy R. Hall, for the last 10 years district engineer of the U. S. Geological Survey, in charge of stream measurements and investigations of water resources in the southeastern states, has resigned and is now a member of the firm of Hall Brothers, civil and mining engineers, Atlanta, Georgia.

C. Morton Ayres for 11 years chief engineer of the Central Iron & Coal Co., and more recently engineer and superintendent of the Central Foundry Co., at Holt, Ala., has resigned to enter private practice as a member of the firm of Finnell, Ayres & Parsons, consulting civil and mining engineers, with offices at Tuscaloosa, Alabama.

Edward Dedolph has disposed of his patent rights for four European countries on his process for making zinc oxide out of low-grade zinc ore to the Metallurgische Gesellschaft of Frankfurt-am-Main, which is going to exploit it. Mr. Dedolph is at present at McGill University, Montreal, where he is engaged in research work on electric zinc smelting in behalf of the Canadian government.

C. Vey Holman, formerly state geologist of Maine, who lately finished revising for the U. S. Geological Survey a list of the economically important mineral deposits of Maine, and has still more recently been collaborating with Arthur S. Watts, of the Bureau of Mines, in an investigation of the feldspar deposits of Maine, is now professionally engaged in an examination of the crystalline lime deposits of Sussex and Warren Counties, New Jersey.

OBITUARY

James Preston died at Titusville, Penn., Sept. 12. He was one of the best known oil operators in the Pennsylvania district.

Dr. H. F. Wiebe, of Charlottenburg, Germany, a prominent scientist and official representative of the Kaiser to the Eighth International Congress of Applied Chemistry, died Sept. 17 from heart trouble at the Hotel Netherland, New York, where he had been staying since the close of the congress. He had planned to sail for home on Sept. 25. Doctor Wiebe was born in Hamburg, Germany, in 1852, and was educated at the Academy and Gymnasium at Hamburg, the Technical High School, at Charlottenburg, and the University of Berlin. He won royal favor through his scientific experiments. He was the author of many books and papers on scientific subjects, and was a member of a number of scientific societies. At the Congress of Applied Chemistry he presented a paper on "The Highest Efficiency Point of the Abel-Pensky Apparatus, Compared with the Pensky Flash-point Tester," before the section on fuels and asphalt.

Societies and Technical Schools

Association of Official Agricultural Chemists — This association held its twenty-ninth annual meeting at the Raleigh Hotel, Washington, D. C., Sept. 16 to 18, 1912. Of interest to smeltery men is the adoption of official methods for lead-arsenate analysis. The work on potash and basic-slag phosphorus will be carried on for at least another year before a final report is made.

Old Freibergers in America—An enjoyable and enthusiastic meeting of old students of the Freiberg Bergakademie was held at the Hofbrau Haus, New York, Sept. 13. At this meeting it was decided to arrange for a dinner in New York near the Christmas Holidays and at that time to form a permanent organization. Among those present at the first meeting were Dr. F. Heberlein, of Frankfort, and R. Hofmann, professor of Metallurgy at the Clausthal School of Mines, Clausthal, Germany. Both of these gentlemen are well known not only as old Freibergers but in the metallurgical world also. The organizers are having some trouble in getting correct addresses as mining and metallurgical men are a wandering crowd. All old Freibergers are therefore asked to send in their names and addresses, with others they may know of, to C. L. Bryden, 1015 Myrtle Street, Scranton, Penn., so that a notice of the next meeting can be mailed to them.

Coöperative Safety Congress—At the first annual convention, at Milwaukee, Wis., Sept. 30-Oct. 5, to be held under the auspices of the Association of Iron and Steel Electrical Engineers, the following are among the papers to be given: "Advantages to be Derived from the organization of a Coöperative Safety Society," by L. W. Chaney; "Safety as Standardized by the Interstate Commerce Commission," by C. C. McCord; "Safety Measures in the Mining Districts of Western Pennsylvania, Ohio, and West Virginia," by H. M. Wilson; "Accidents Attributable to the Carelessness of Employees and how Best to Prevent Them," by A. H. Boyd, Jr.; "What Labor Organizations are doing to Encourage their Men to be More Careful to Guard against Accidents," by Mr. Boone. An exhibition of all kinds of safety devices will be held in connection with the Congress. Further particulars may be obtained from L. R. Palmer, 5852 Douglas Ave. East End, Pittsburgh.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Sept. 19—The total value of minerals and metals produced in California in 1911, and reported by Charles G. Yale, statistician of the U. S. Geological Survey, was $25,174,677, a decrease from 1910 of $1,845,728, resulting chiefly from the closing of two of the large smelteries. There was a slight increase in gold production, but the decrease from normal production was so much greater that the increase in total gold had no appreciable effect on the aggregate of all minerals. The decrease from normal was also due chiefly to the closing of the smelteries. The same condition applies chiefly to the decrease in the production of silver and lead, and wholly to the decrease in copper production. The closing of the smelteries was responsible for a loss in aggregate production of gold, copper, silver and lead of approximately $3,250,000, and directly attributable to the agitation and complaints of the farmers of the state and the U. S. Forest Reserve. Taking into consideration the production of zinc and the increase in gold from the deep mines, and of gold and silver from the placers and gold from the dredges, an aggregate of $395,763, and the losses in smeltery production, the total production of all minerals in the state for the year 1911 under normal conditions would have been approximately $28,000,000, or an increase over 1910 of about $1,800,000, instead of a decrease of an approximately like amount. The only actual decrease under such normal conditions would have been in the production of the drift and sluice placers. So it is plain that there was no diminution in the productive capacity of the mines, but rather an advancement. Production was reported from 1181 properties; 596 were deep mines, 585 were placers, an increase of 81 deep and 21 placers over 1910. The placer operations included 65 dredges, operated by 34 companies or individuals, 141 drift and 169 hydraulic plants and 210 ground-sluicing placers. The total included 522 gold mines, 11 silver mines, 31 silver-lead mines and 30 copper mines. The total mine production of gold in 1911 was $19,738,908 from the following sources: Gold mills, $9,709,319; placers, $8,986,527; smelteries, $641,495; old and new tailings, $401,555. The increase in gold production over 1910 was $23,468. The total silver production was 1,270,445 fine ounces, valued at $673,336, a decrease of 569,640 oz., or $320,310. The copper mines produced 36,316,136 lb. of copper, valued at $4,539,517, a decrease of 12,384,620 lb., or $1,645,479. Lead decreased from 2,870,977 lb. in 1910 to 1,398,111 lb. in 1911, a decrease in value of $63,468. The zinc production increased from zero to 2,807,035 lb., valued at $160,001. The deep mines produced 2,944,188 tons of ore, an increase of 246,303 tons over 1910. The ore extraction included 2,443,274 tons of gold and silver ores, 494,281 tons of copper ores, 2008 tons of lead ores, 4625 tons of zinc ores. The total average value of ores yielding gold and silver in 1911 was $4.54 per ton, a decrease of 61c. per ton from 1910. The total average value of all ores treated and sold in 1911 was $5.49, against $6.71 in 1910. The average value per ton of ores from which the gold was recovered as bullion in the mills was $3.59. The gold and silver mills treated 2,156,950 tons of ore; the smelteries 538,214 tons, yielding copper, gold, silver, lead and zinc. The dredges produced 38.84% of the gold production of the state in 1911, increasing the total $116,207 over 1910. The aggregate production of the dredges in the state from 1899 to 1911, inclusive, was $47,985,236, an average of $3,691,171 per year, and increasing from about $200,000 in 1899 to nearly $8,000,000 in 1911.

Denver

Sept. 21—The suit of Garwood & Garwood *vs.* the Colorado & Southern, Burlington, and Union Pacific railroads to obtain lower rates on coal from the northern coal fields is set for hearing Oct. 1. This case is correlated with the Consumers' League case against the same railroads for lower rates, to be tried in the Denver County district court, Oct. 1. In a hearing of the Consumers' case, the railway commission reduced the rates on coal haulage 25 to 30% and the railroads brought action.

The action of the Federal Government against the American Smelting & Refining Co. and the Exploration Co., Ltd., of London, to set aside patents issued on eight pieces of valuable coal land was heard before the United States circuit court of appeals yesterday. The corporations demurred on the ground that the statute of limitations makes court action null and void. The patents were issued late in 1902, and six years, it is said, exceeds the statute of limitations. The court took the case under advisement. If the government wins, it believes it will recover lands worth $3,000,000 and the importance of the decision in this case, in the opinion of Prosecutor Townsend, lies in the fact that if the court decides to establish the equitable rule as to recovery of land patents, the Southern Pacific R.R. will have to give up oil lands worth $400,000,000 in southern California. It will change the aspect of all future coal and other land prosecutions and give the government a big advantage. The government, through B. D. Townsend, special assistant to the attorney general of the United States, seeks to have established a rule which will permit the government to recover lands obtained by fraud, long before the statute of limitations has begun to run under the present statute. The government wants the rule laid down that those who take lands by fraud cannot invoke the equity statute if they have concealed the frauds in order to permit the statute of limitations to run against the fraudulent entries.

Butte

Sept. 18—At the Montana state fair, to be held at Helena, five mine-rescue teams will compete for four days in first-aid methods. They will come from Butte, Red Lodge, Roundup, Washoe and Roslyn, Wash. A government team of professionals will be on the ground to judge the events, but will take no part.

John D. Ryan, president of the Amalgamated Copper Co., arrived at Great Falls, Sept. 15, accompanied by Thomas F. Cole, of Duluth, and remained for two days, looking after his business interests, leaving for Butte, and Anaconda, Sept. 17. A consultation was held between Mr. Ryan and Henry A. Herrick, of Manchester, N. H., consulting engineer, concerning the proposed dam at the falls, after which the announcement was made that a crew of men would be put to work in about a week to determine the character of bedrock by making borings. Construction will be started next spring after the high waters, and plans for the dam will be prepared during the winter. Several claims in the Butte district have recently been acquired, and Messrs. Cole and Ryan will spend several days in Butte, during which time they will decide upon the advisability of beginning development work.

Salt Lake City

Sept. 19—Zinc ores can now be shipped to the Kansas smelteries over the Denver & Rio Grande for $7.30 per ton, the new rate, which affords a reduction of $2.20 per ton, having gone into effect Sept. 16.

Negotiations are under way between the Utah Copper Co. and the new management of the Telluride Power Co. for a large increase in electrical power, looking to the Telluride Power Co. to supply all the power for the Utah Copper works. At present operations are being carried on by electric power, partly supplied by the Telluride company and partly by the steam plant at Magna. Under the new arrangement, the steam plant would be closed down, the machinery being left to stand for some time for use in case of an emergency. The Bingham & Garfield R.R. has been so constructed that it can be readily electrified, and, if it is found practicable, the steam shovels, especially those used in taking out the ore where the levels are more permanent than those in the overburden, will eventually be run by electricity. Steam-shovel builders are making experiments with electric power.

Announcement has been made that the monthly meetings of the Utah Society of Engineers, suspended during the summer, will be resumed. Talks on the following subjects will be given: At the first meeting, Sept. 20; "Weir Measurement of Water," by R. R. Lyman, of the University of Utah. At the first meeting in October; "Street Paving in Salt Lake City," by D. H. Blossom, city engineer, and John Dudor, assistant city engineer; at the second meeting in October; "Hydro-Electric Power Resources Tributary to Salt Lake City," by H. D. Randall, of the General Electric Co.; "Factors Determining Cost of Hydro-Electric Service," by Markham Cheever, of the Telluride Power Co.; "Continuity of Hydro-Electric Power Service," by Leonard Wilson, consulting engineer; "An Example of Modern Steam Relay Station," by C. A. Cohn, of the Utah Light & Railway Co., and "An Example of Modern Transmission Practice," by G. W. Riter, of the Utah Light & Railway Co. At the fourth meeting, in December, the subject will be, "The Principal Metal Mining Districts of Utah, Geology, Statistics and Future." The details have not yet been arranged.

Negaunee, Mich.

Sept. 20—The Calumet & Hecla Mining Co., Oliver Iron Mining Co., Cleveland-Cliffs Iron Co., and Jones & Laughlin Ore Co. have announced that they will come under the provisions of the new Compensation Law which went into effect in Michigan on Sept. 1. The Cleveland-Cliffs Iron Co. has worked out a complete scheme for the administration of the law, and has notified the state insurance commissioner that it will pay all benefits from its own treasury.

The Cleveland-Cliffs Iron Co. is preparing a textbook and arranging courses for its night school for employees. About 150 men came out at first, but the attendance has dropped down to half that number. One of the reasons why the men are interested is that it is known that the company has undeveloped mines in the Gwinn district, at North Lake and Iron River, which will require shift bosses and mining captains.

Spokane, Wash.

Sept. 20—Delegates and visitors to the American Mining Congress, to be held at Spokane, Nov. 25 to 30, will be taken to the Cœur d'Alene and Slocan districts, Saturday, Nov. 30. Spokane mining men are arranging these trips as a part of the entertainment, which also will include on Friday evening, Nov. 29, a visit to the Spokane state armory, where the settings will show a typical pioneer mining camp. Dr. Joseph A. Holmes, director of the Bureau of Mines, will give two illustrated lectures, one devoted to coal mining, and the other to an outline of his plan for metallurgical work in the West, for which Congress has appropriated $50,000.

Wallace, Ida.

Sept. 18—An engineer has been sent to Pottsville, about 10 miles east of Wallace, to survey all the available land suitable for agricultural purposes in, and near that place, extending as far east as the Silver Cliff mine. This land has already been covered by applications to the land office. The land is poor for agricultural purposes, as it is mostly coarse glacial till. Several groups of mining claims have already been located on this ground, but no patents can be obtained, owing to the strict regulation of the forestry department. The land is in forest reserve. Much development work has been done on the ground and more was planned. All future development and prospecting will be abandoned as far as the original locators are concerned, and all work which they have done will be a total loss. The vein of the Silver Cliff has been traced through this ground and the outcrops of several other veins are known. A quantity of ore has been taken from the Silver Cliff vein, east of the proposed agricultural locations.

Porcupine

Sept. 20—The board for conciliation between the mine managers and miners of the Pearl Lake district, which has been in session for a week, adjourned Sept. 17. The mine managers have submitted evidence regarding the wage scale and hours of work, and the matter will be further taken up and settled in Toronto, Sept. 24. Indications seem to point to the matter being decided against the union as there were practically no grounds for calling the board. The Pearl Lake mines simply reduced the scale of wages to conform to the scale at the Dome and Hollinger mines. This scale is higher than that in effect at the Cobalt mines. There is some talk among the men, of a strike, but the managers have intimated that if this strike takes place, a further reduction of 25 to 50c. per day will be made. The mines involved are the McEnaney, McIntyre, Vipond, Pearl Lake, Plenaurum and Jupiter.

Toronto

Sept. 20—A case of widespread interest to investors in Canadian companies comes up for hearing before the Canadian supreme court in October, arising out of an action brought by the Canadian Pacific Ry. against the Ottawa Fire Insurance Co. It involves the question of the right of provincial governments to license or limit the operation of federally incorporated companies, and the right of a company holding only a provincial charter to extend its operations beyond the province by which it is incorporated. The Canadian government and most of the provinces will be represented at the hearing.

Chihuahua

Sept. 14—Mining throughout the state is being resumed as rapidly as safe conditions are assured and suitable mine labor can be obtained. On account of the daily wage of two pesos offered both by the federal and rebel armies, many of the better-class miners have enlisted and it is a hard task for operators to secure adequate and first-class Mexican miners. Coke and other fuel is being brought in as fast as the inadequate railroad service will permit, so that the smelting and mining plants may not be handicapped.

Among late mine transfers is that of the La Fé copper property, in the eastern part of the state reached via the Orient Ry., to James Artwin and associates, who have already begun active work, both in production and development.

The Compañia Minera de Naica, S. A., the largest operating company in the Naica lead-silver district south of Chihuahua, has resumed shipments and is to operate at normal capacity as fast as desirable Mexican miners can be obtained. J. Bovio is again in charge.

The Yoquivo and Concheño mining companies in the western part of the state are taking in supplies of all kinds preparatory to re-starting the cyanide plants about Oct. 1. The work of rebuilding and enlarging the milling plant of the Palmarejo Goldfields, Ltd., in the vicinity of Chinipas is also reported under way. The Batopilas Mining Co. is operating at partial capacity. The Sierra company at Ocampo has announced no operative plans. The Republica mill re-started but was forced to close down again.

The Mining News

The Current History of Mining

Alabama

Reports submitted to the clerk of the United States court at Birmingham by the trustees in charge of the operations of the Southern Iron & Steel Co. and the Alabama Consolidated Coal & Iron Co., show that the Alabama Consolidated has one blast furnace in operation together with coal and ore mines sufficient to furnish raw material; while the Southern company has one furnace in blast, together with mines and coke ovens and a steel plant, producing steel wire. Efforts are being made to relieve the companies from the legal situation.

Sloss-Sheffield—The iron-ore mines at Sloss, a short distance from Birmingham, met with some trouble this month when water broke into the slope again. An underground stream a few years ago broke through into the mines and for several months disturbed the operations. Recently there was slight seepage and this gave some trouble. It is announced that the new trouble has been conquered and the usual output will be maintained.

Alaska

Belmore Brown, of Tacoma, and others have taken an option on a group of placer claims, on Quartz Creek, near Seward, and plan to install machinery next season.

It is reported that an English-French syndicate has purchased the Wonder and Ault groups, and other placers at Nome. According to present plans, two steel dredges will be sent to Nome in the spring and should be ready for operation by next autumn.

Princeton Mining & Milling Co.—This company, operating a mine near Dolomi, on Prince of Wales Island, is erecting a 10-stamp mill with slow-speed chilean mill, which is expected to be ready for operation early in October. Last summer an additional 100-hp. boiler was installed, also an 8-drill air compressor to replace the smaller compressor which will be put in operation on another property. B. A. Eardley is general manager.

Victory Mining Co.—It is reported that Patrick Heaney and associates, who have a bond on this property, will make the first payment Oct. 1. The property is on Seal Bay, Gravina Island. The present development consists of a crosscut tunnel 2000 ft. long, in which seven veins have been cut. The greatest depth reached on the ore was 600 ft. The ore contains copper and gold in commercial quantities and a little silver.

Rush & Brown—A third oreshoot has been uncovered on the surface. It is about 100 ft. from the working shaft, and appears to be parallel to and to have the same dip and characteristics as the sulphide shoot, which is now being worked. It is not yet known whether or not it will prove of commercial importance. Development is proceeding on the second level of the sulphide shoot, and a winze will be sunk on the ore from this level. Regular shipments are made to Tacoma. U. S. Rush is manager.

Arizona

GILA COUNTY

Old Dominion—Preparations are being made to move the old buildings near the main shaft to make room for the new crushing plant, sampling mill, ore bins, conveyor houses, etc. Excavation for the crushing plant has been started. A skip-pocket is being cut at the 14th level preparatory to replacing cages with skips for hoisting ore and similar pockets will be cut at the 8th, 12th and 16th levels. This work must be done and the change made in the method of hoisting without delaying or interfering with the hoisting of ore and therefore proceeds slowly, so that it will probably be eight months before the change is effected. About 1200 men are employed.

Gibson—This mine, nine miles west of Miami, is increasing its production and shipments for this month are expected to amount to five or six cars of about 16% copper ore as compared with four cars in August. The ore is all coming from the fourth level on the Pasquale vein, where five or six stopes are being worked and where some new oreshoots were recently opened. Drifting southward continues on the fifth level and a raise is being driven to the fourth, but no important oreshoots have been opened on this level, although the vein is mineralized and prospects are considered favorable, for cutting ore in both the drift and the raise. Three 8-horse teams are engaged in hauling the ore to Miami whence it is shipped by rail to the Old Dominion smeltery at Globe. About 35 men are employed. Tip Henderson is superintendent.

Savage Group—Patrick Savage, owner of this group of nine claims near the Gibson mine, has leased it to W. A. Thompson, P. S. Carr and D. Prescott, who have started work on the property. The claims are traversed by several veins in schist similar to the formation at the Gibson, and the ground is opened by several tunnels and prospect shafts.

MARICOPA COUNTY

A new company is preparing to sink a well for oil northeast of Agua Caliente. Colonel W. F. Cody is also having a well drilled.

Kay Copper Co.—This company is hauling ore from its mine, 50 miles north of Phœnix, to Glendale, 42 miles from the mine, by mule team. Glendale is on the Sante Fé railroad and Tisdale & Lewis have a contract for hauling 1000 tons of ore.

Harris Copper Co.—This company owns an extension of the Kay vein and a tunnel is being driven to cut the vein about 500 ft. south of the Kay company's shaft.

Buffalo-Arizona Consolidated—This company, operating a mine near Morristown, will install a 100-hp. gasoline engine.

Red Rover—This company, north of Phœnix, has been shipping regularly at the rate of four carloads per month.

YAVAPAI COUNTY

Pocahontas-Copper Queen Mining Co.—Work is to be resumed and a new hoist and milling machinery will be installed at this mine, near Mayer.

California

ALAMEDA COUNTY

Cedar Mountain—It is reported that the Pacific Coast Steel Co. has secured a lease on the magnesite claims from the McLaughlin estate, and that a calcining furnace will be installed at the mine. The product will be used for furnace lining. The property is near Livermore. Magnesite has been mined at Red Mountain in the same vicinity, and shipped to San Francisco paper mills.

AMADOR COUNTY

Hardenburg—It is reported that good milling ore has been found in the west drift from the 1000-ft. level in this mine, at the south end of the Mother Lode. The new west drift should strike the main orebody at about 200 ft. from the vertical shaft, now being used instead of the old inclined shaft. R. M. Kelsey, of Jackson, superintendent.

Kennedy—Repairs to the shaft and to the water tanks at the various levels are being made preparatory to deepening the shaft to 3700 ft. Webb Smith, of Jackson, is superintendent.

Little Illinois Gold Mining Co.—The capital stock has been increased from $350,000 to $700.000. A portion of the stock will be sold to obtain money for development. The property is at Drytown, north of the Fremont mine. J. W. Buchanan is president and manager.

South Jackson—The new vertical shaft was deepened 112 ft. in August. Driving will be started at the 500-ft. level, which will probably be reached by December.

Central Eureka—Thirty stamps are dropping. An electric air compressor will be installed. It is reported that a shoot of good ore has been disclosed in the 2800-ft. level. J. A. Davis, of Sutter Creek, is superintendent.

Calaveras County

Granetti—New machinery for working this gravel mine, at Douglas Flat, will be installed; 12 men are employed.

Christensen—Pay gravel is reported in this mine, on Stockton Hill, near the town of Mokelumne Hill. The shaft, which was sunk in the early fifties, is 180 ft. deep. The mine has been idle since then, and is being reopened by C. G. Nuner, of Mokelumne Hill.

Boire—The cleanup after 12 days' run at this gravel mine, at Railroad Flat, yielded $2000. The mine is equipped with a Huntington mill. Boire brothers are owners.

Ferraris Mining & Milling Co.—Articles of incorporation have been filed and $10,800 has been subscribed. The property is at Albany Flat, near Angels Camp. Stockton is the principal place of business. The directors are John G. Ferraris, of Angels. Richard P. Ricci, Samuel Sattui, Bernard Levy and Gordon A. Stewart, of Stockton.

Humboldt County

A new gold discovery has been made near the mouth of Three Creeks, near the town of Blue Lake, by N. C. Halliday and others. The croppings indicate that there are two veins which are believed to extend from Horse Mountain. The discovery is not in the vicinity of the War Eagle, which caused excitement several years ago, and which did not make good, but gave Three Creeks district a bad name.

Happy Tom Mining Co.—Articles of incorporation have been filed and capital stock placed at $100,000, for the purpose of mining in the northern part of the county. Principal place of business is Arcata. The directors are Lewis Orcutt, Charles M. Preston, Thomas B. Riley, Jr., and W. W. Reese, of Arcata, each subscribing to $1000 of the stock.

Colorado

Lake County-Leadville

Winthrop Gold Mining Co.—This company has on the cars in the Colorado & Southern yards, a 100-hp. boiler, 180-hp. steam hoist, a four-drill compressor and four machine drills. The railroad company will put in a spur at once and then this machinery will be shipped and installed at the Copper Belle shaft and the portal of the Crescent tunnel. The properties will be worked steadily through the winter.

Dunkin—A boiler and small hoist have been erected at Dunkin No. 1 shaft on Fryer Hill by W. S. Jones who is mining some fair-grade iron ore.

Robert E. Lee—The lessees are getting out a good tonnage of iron ore which is increasing in silver content and yields a fair profit.

Adelaide—A small tonnage of ore is being shipped from this mine by Peck and Schert, lessees. It is operated through the Yak Tunnel.

Long & Derry—In this mine the lessees have a vein of silver-lead ore three feet wide and their shipments, it is said, net them $100 per ton.

Louisville—About 75 tons of medium-grade zinc ore is being shipped daily through the Yak tunnel by Hannifen & Reynolds, and from their Penn lease on Breece Hill 50 tons daily of good-grade iron ore.

Mineral County-Creede District

Creede Mining Co.—A new shoot of gold-lead ore was recently opened in the White Star lode. The Humphreys 300-ton mill, owned by the company, is treating 4000 tons per month, mainly from the new development. S. B. Collins, manager.

Triune Co.—This company is treating about 100 tons of ore per day in the Amethyst mill and is shipping the concentrates.

San Juan District

The ore shipments from Telluride in August were 96 carloads of concentrates as against 88 cars, some of which was crude ore, for the same period last year.

In the carnotite mines there is increasing activity. The Swindler group in Long Park has been purchased by Thomas F. V. Curran, president of the General Vanadium Co. and two carloads of high-grade ore were loaded at Placerville. O. B. Willmarth is buying carnotite in the Disappointment Creek country; he has shipped five carloads from the Long Park district since March.

Teller County—Cripple Creek

A customs cyanide mill is to be erected in the Cripple Creek district and a company has been organized by Howard Shultz and others, of Denver, with a capitalization of $500,000, the object being to carry on a general milling and mining business.

Strong Gold Mining Co.—The Jolly Tar vein in the town of Victor, and adjoining the Strong vein, is owned by this company. Three carloads per day of rich gold ore are being shipped to the smeltery from a rich strike; it is said to be 16 ft. wide and all pay ore, but in the center, there is a streak 8 in. wide that carries 20 oz. gold per ton.

Idaho

Cœur d'Alene District

Hypotheek—A strike of rich lead-carbonate ore has been made at this mine at Kingston. The ore was encountered in a crosscut from the 520-ft. level. The ore cut was 12½ ft. wide, 3½ ft. assaying 2% lead, 3½ ft. 23½% and 5½ ft. 35½%. The mine has been in operation for many years and all the work has been done on a vein carrying some copper. The second vein in which the strike was made, was known to exist, but no work had been done on it until the crosscut opened the lead ore.

Duluth—This company will start work at once on its seven claims in Cañon Creek. The surface showing and the location warrants a careful development of the property.

Liston Mining Co.—Individual control of this property, east of the Bunker Hill & Sullivan, has been secured by Mathew Baumgartner, of Spokane, by purchase of 174,000 shares from Mr. and Mrs. Patrick Crowley, of Osborn, Idaho. Mr. Baumgartner immediately issued orders for resumption of operations, which were halted to repair the compressor and to overhaul the plant. A new ventilating system is being installed and part of the lower tunnel is being retimbered. Mr. Baumgartner reports encountering in the lower tunnel an iron-lead carbonate of better grade than that exposed in the upper tunnel.

Michigan

Copper

Old Colony—Drill hole No. 17 has encountered an amygdaloid formation carrying copper at a depth of about 1175 ft. The formations passed through in sinking this drill have tallied with the results obtained in holes 16 and 17 of the Mayflower drilling.

Osceola Consolidated—Operations are to be resumed at the No. 5 shaft of the old workings, Oct. 1. Production has gradually increased at No. 6 and there are now 16 drilling machines in operation in that shaft.

Adventure—The crosscut from No. 5 shaft has encountered the eastern sandstone formation at a distance of about 1075 ft. from the shaft. The No. 4 lode is nearly 70 ft. wide at the point of intersection with the crosscut and drifting is revealing considerable mass and heavy copper. The formation lies in close to the sandstone.

Hancock—Shaft No. 2 is down about 3925 ft., the objective point being a depth of about 4000 ft. It is planned to crosscut from the 4000-ft. level into the footwall of the Pewabic lode and then to sink two winzes to work at depth. Electric hoists will be installed and the ore will be transported through the crosscut to the No. 2 shaft for hoisting. The crosscut at the 34th level continues in trap carrying copper in commercial quantities.

IRON

Palms—Operations for development have been started at this Gogebic Range property on which nothing has been done for several years. A new shaft will be sunk. The mine is just southeast of Bessemer, and between the Tilden and Anvil mines; it is owned by the Newport Mining Co.

Presque Isle Iron Co.—Machinery is being purchased by this new corporation for developing the Copp's property on Sec. 21, 47-43, at the eastern end of the Gogebic Range. Diamond drilling has been in progress for some time and a body of commercial ore has been discovered. R. J. Whiteside, W. G. La Rue and W. H. Cole, of Duluth, control the company.

Cascade Mining Co.—The site has been cleared for the 4-compartment shaft. The sinking of which will start soon. A diamond-drill hole has been drilled in the diorite dike at the shaft site, and a 2-in. core obtained showing the rock in which the shaft will be sunk. About 20 ft. of surface is anticipated; that part of the shaft in surface soil will be concreted. The work is being done from the rock surface up. It is planned to dig directly to bedrock even though a wide excavation has to be made. About 25 men are employed, under the direction of Capt. Thomas Nicholas. Diamond drilling in the ore formation is still in progress by the Longyear company, under direction of L. D. Cooper.

Minnesota

CUYUNA RANGE

Iron Mountain—There are 14 drill holes down on this ground, all in iron ore, the greater part of which is rich in manganese.

MESABI RANGE

Shenango—This opencut mine, after being out of commission for a year, has resumed shipping. At present two steam shovels are in operation and 300 cars of ore per day are being shipped.

Leonard—This pit mine, in the Chisholm district, recently broke the loading record when one shovel loaded 180 cars in a 10-hr. shift, each car holding 45 tons. The nearest approach to this record on the Mesabi was made at the Coleraine, when 160 cars were loaded.

VERMILION RANGE

A crew of men is at work on 63-9, exploring for ore. This property was formerly owned by Willis Cleveland, who has charge of the opening work.

Consolidated Vermilion Extension Mining Co.—The shaft is now practically free from water and the ore is rapidly being blocked out. A railway spur will be laid to the mine by spring.

Montana

BUTTE DISTRICT

Anaconda—The quarterly dividend was increased from 50 to 75c. per share at a meeting of the directors, Sept. 24. The change makes the dividend rate 12% instead of 8% on the $25 par stock.

Bullwhacker—Experts have long been working to determine the most efficient method of treating this ore, which is low-grade carbonate and silicate containing about 3% copper. Patrick Clark, president of the company, is preparing to install an experimental 5-ton leaching plant. It is understood that the machinery has been ordered and work on construction of the buildings will begin in a week or two.

Pilot—A new hoist has been installed and sinking has been resumed. The shaft is 1325 ft. deep and the work will be continued to the 1800-ft. level, where a station will be cut and crosscutting started. The shaft will then be continued to the 2000-ft. level, where a station will be cut and development work begun. The company is amply financed to continue the work necessary to place the mine on a producing basis.

BROADWATER COUNTY

Butte & Radersburg—According to an announcement made by the directors, operations will again be started at the property in the Radersburg district, after a shutdown of about two months. A promising vein, carrying gold, was opened on the 200-ft. level a short time before the shutdown, and drifting will be resumed on this vein.

FERGUS COUNTY

New Year—Chicago men purchased this mine and mill at New Year some time ago, and are operating both steadily.

Gold Acres—A. S. Wright, who has for some time been negotiating with New York men for the sale of this property adjoining the New Year, has left for New York to complete the transaction. Ore is blocked out in this mine, and the prospective purchasers are considering plans for the erection of a complete cyanide plant.

Nevada

COMSTOCK LODE

C. & C. Shaft—The new vertical centrifugal pump has been connected up at the 2500-ft. level, and is now doing regular service pumping hot water from the sump to the 2310 station pumps. From that place, the water is relayed to the Riedler pumps on the 2000-ft. level, and from there to the Sutro tunnel drain at the 1600 level. The No. 2 hydraulic elevator has been removed, and will be replaced by No. 2 vertical, after which No. 1 hydraulic will be taken out, giving two centrifugals in the sump. The hydraulics were installed in 1899, and have run continuously since, pumping out the north-end mines from the 1600 to the 2500. In this territory thus recovered, several millions in bullion have been extracted. The new pumping system will recover ground below the 2500-, and the 2900-ft. level will be the first objective point in order to prospect the new Mexican ore-shoot at that depth.

Mexican—A new development of interest was made on the 2500-ft. level when, 250 ft. in the north drift, a winze was sunk for 14 ft. in the vein. The quartz exposed is irregular and the ore spotty. Sampling shows that the best ore is on the hanging wall, and 21 tons taken out averaged $17 for the entire width Further work gives encouraging prospects, and the vein will be followed down at this place. The winze is more than 200 ft. south of the stope on this level, from which a large quantity of high-grade ore has been extracted. A shipment of bullion from the mill will be made soon. The financial statement of the company shows a cash balance in the treasury of $50,000.

Ophir—The new cyanide plant is rapidly nearing completion, the following equipment being in place: Dorr classifier, Dorr thickener tank, stock tank, wash and sump tanks. Concrete foundations have been put in for the Butters' filter and for the heating plant.

LANDER COUNTY

Nevada Mining Co.—This company recently began operations at Battle Mountain, and installed an 8x10-in. Sullivan compressor, driven by a Fairbanks-Morse gasoline engine.

LINCOLN COUNTY—PIOCHE DISTRICT

Prince Consolidated Mining & Smelting Co.—The control of this property has passed from the control of the Godbe family to that of George Wingfield and associates. Several near-by mines and claims are under option to the same men. It is proposed to do much prospecting with a diamond drill, the aim being to produce 400 tons per day. A favorable contract has already been closed with smelters. A shrinkage system and back-stoping methods will be followed to break

1200 tons of ore per day in order to be able to ship 400 tons of shipping ore. A. Y. Smith is manager.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Sept. 14, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,350	123,069
Tonopah Belmont	3,110	85,417
Montana-Tonopah	1,034	38,108
Tonopah Extension	1,071	36,759
West End	835	27,142
Midway		120
MacNamara	465	13,225
North Star	40	170
Mizpah Extension		40
Jim Butler	300	1,300
Totals	10,205	325,740
Estimated value	$255,125	

For the month of August the Montana Tonopah, West End and Tonopah Extension mines exceeded all previous monthly records of production of ore and bullion and net profits earned.

Jim Butler—In this mine, the Fraction vein, which faulted on the third level, has been struck in a crosscut on the 600-ft. level. It carries very good ore. The property is shipping from the upper levels 300 tons weekly to the old Belmont mill.

Tonopah Merger—The drift on the 970-ft. level now shows four feet of good ore and shipments will be commenced as soon as possible.

North Star—This mine will shortly commence shipments from the ore recently opened on the 850-ft. level. The south drift on the 1250-ft. level has entered a large shoot of quartz containing good ore.

Tonopah-Belmont—The mill is treating an average of 500 tons of ore daily, averaging over $20 per ton. The company recently shipped 8120 lb. of silver bars in one week. The mill is recovering more than 96% of the gold and silver.

New Mexico

SOCORRO COUNTY

Ernestine Mining Co.—Reconstruction work on a 10-stamp battery has been finished and the plant is now operating with 30 stamps.

Oaks Co.—From developments on the Pacific, Johnson and Susie claims, 128 tons of ore was recently shipped to the custom mills. The grade ranges from $14 to $25 per ton.

Precious Metals Co.—The tunnel, now more than 700 ft. long, is in good ore, and it is planned to increase the force to three shifts per day.

Deep Down—The shaft continues to yield a good grade of ore, which is being treated at Socorro Mines' mill.

Treasure Mining & Reduction Co.—Grading for new ore bins at the mines is in progress.

South Dakota

LAWRENCE COUNTY

Victoria—The mill has been started, and 100 tons per day is being dry crushed and cyanided. The plant will be worked up to 200 tons capacity as fast as practicable. The first few days' operations have been satisfactory. O. N. Brown, of Cyanide, is manager.

New Reliance—Operations have been resumed at this mill under the management of F. C. Bowman. Minor changes have been made in the plant. The mill is equipped with 30 stamps, and a good leaching plant.

Trojan—The mill is treating 180 tons per day with the first unit in operation. Everything is being put in shape for winter, and the capacity will probably not be increased soon. This is a close corporation, and results of operations are not made public. H. S. Vincent, of Deadwood, is manager.

Minnesota—Stockholders have paid off judgments amounting to a little more than $20,000, which clears up the title to the property. Funds for development are now being raised, and work will be undertaken in the shaft within a few weeks. The shaft is 200 ft. deep, and in a northerly drift from this level some good ore has been developed in quartzite. E. Major, of Maitland, is manager.

Bismarck—General Manager Hitchings is authority for the statement that this plant will be in operation within 60 days. It will start with a capacity of 300 tons per day. It adjoins the Wasp No. 2 and the same process for handling ores, viz., dry, coarse crushing and cyanidation, will be used.

Golden Gate—E. J. Hoover has secured this property and has a crew at work cleaning out the old shaft preparatory to undertaking thorough development of the quartzite ores. The property has been shut down for 12 years, but previous to that time was a producer of what would today be rated as high-grade mill ore. Large quantities of medium-grade ore were untouched in former operations, and should pay a profit today.

North Homestake—Lateral work has been discontinued on the 600-ft. level, and within 30 days work will be commenced on the 300-ft. level. A drift will be run northerly to intersect the quartzite, which is pitching in that direction, and where oreshoots are known to exist.

Golden Reward—Good progress is being made in the erection of the Wedge roaster that this company is putting in at the Astoria mine. The plant will start with a capacity of 75 tons per day. Fuel oil will be secured from Casper, Wyo. The company's cyanide plant, at Deadwood, is operating steadily at full capacity, and richer ore is being sent to the smelteries at Denver and Omaha.

Wasp No. 2—The steam shovel used for stripping is being pushed to full capacity, as every effort is being made to uncover enough ore to keep the mill busy all winter and shut down the shovel during the bad months; 10 to 14 ft. of overburden is being moved at the present time. The company recently installed a Donaldson tilting furnace, made by the Denver Fire Clay Co. for melting precipitates. Wyoming fuel is used with good results. Coke furnaces were formerly used.

Texas

BURNET COUNTY

Thomas & Barringer are developing a quartz property five miles from Burnet; twelve men are employed.

Utah

JUAB COUNTY

Tintic shipments for the week ended Sept. 13 amounted to 169 cars. The lowered output is due to the Knight companies having discontinued the mining of low-grade ores, pending arrangements for the storing of such ores for the proposed new mill.

Colorado—The quarterly dividend was passed at a directors' meeting, held Sept. 16. The earnings for the period amounted to about $9000, and there is $70,000 in the treasury.

Gold Chain—This company has declared its second dividend of 2c. per share.

Iron Blossom—The low-grade ore is being saved for the proposed mill. There is $270,000 in the treasury, and it is thought that earnings will be sufficient to keep up dividends during the period of mill construction, which will be about six months.

Lower Mammoth—Copper ore is being mined on the 1800-ft. level, and zinc ore is exposed on the 1500-, 1700- and 1800-ft. levels.

Swansea—Ten cars of ore were shipped the week ended Sept. 13, the ore coming from the 940- and 850-ft. levels. The new electric compressor is in operation.

East Tintic Development—Shipments of zinc ore will begin soon.

Chief Consolidated—The output for the week ended Sept. 13 was 23 cars. Development is being done on 1000-, 1400- and 1600-ft. levels chiefly.

Black Jack—During the year ended Sept. 1, 1912, there were produced 1468 tons of iron ore and 771 tons of lead-silver and siliceous ores from leases, and 35 tons of silver-lead ore on company account, the whole netting the company $1952.

SALT LAKE COUNTY

Ohio Copper—A record of over 3100 tons in 24 hr. was made recently at the mill.

South Hecla—A report has been issued covering operations for the eight months from Jan. 1, to Sept. 10, 1912. The total indebtedness is $10,700, and 75,000 shares of treasury stock have been offered the stockholders at 25c. per share, 12½c. to be paid by Oct. 5, and the remainder by Dec. 5, with a view to financing the company.

Cardiff—Preparations for winter work are being made. As soon as the shipping season is over, work on the upper levels will be discontinued, and operations confined to the lower tunnel, which is approaching the contact.

Montana-Bingham—Timbering has been necessary for 65 ft. near the face of this company's 1300-ft. tunnel. The soft ground shows considerable mineralization.

Michigan—Utah Consolidated—The stock of this company has recently been listed on the Boston Curb. Shipments are being made though they are somewhat restricted, owing to a shortage of ore teams. The towers on the tramway, which has recently been overhauled, are all in place, and the cables are being restrung. The tram is 4½ miles long. The output at present amounts to 20 tons of shipping ore daily.

Alta Consolidated—Sinking is being done in sulphide ore below the main level. Shipments are being continued.

Columbus Extension—Ore has been opened on the lower tunnel level in what is thought to be the Toledo fissure.

SUMMIT COUNTY

Park City shipments for the week ended Sept. 14 amounted to 2,619,740 pounds.

New York Bonanza—The gross indebtedness at the end of the year ended Sept. 10, 1912, was $4589, which, less $600 worth of ore on hand, treasury stock, and bills receivable, gave $3334 as the total of liabilities over assets.

Daly—A strike is reported in a raise from the 800-ft. level. This is said to be a new shoot in hitherto unprospected ground.

Ontario—It is expected that the mill, which is to be operated by the Mines Development Co. will be started in a few days. The capacity is to be 75 tons.

TOOELE COUNTY

Bullion Mines Coalition—Monthly shipments of 1200 tons are being made from this Stockton property, half of the output coming from lessees; 100 men employed.

Ophir Mill—Regular shipments are being made over the new branch line to the Salt Lake route. The work of enlarging the mill from a capacity of 150 tons to 300 tons in progressing, and it is expected that operations will begin in about two months. An electric line is being built from South Willow Cañon to the camp, a distance of 25 miles.

Cliff—Steady shipments are being made by an aërial tramway one mile long to the new branch road from St. John to Ophir.

Lion Hill—The Chloride Point ground is being developed, and ore, some of which is of shipping grade, is being mined 200 ft. from the surface. Development is being done in other parts of the property.

UTAH COUNTY

Union Chief—September shipments from this property in the Santaquin district, so far amount to three cars of ore of good grade.

Eva—Nineteen men are mining from 10 to 12 tons of ore daily in this mine in the Santaquin district. Four cars were shipped during August. The ore is sent out over a new 2700-ft. tramway.

Virginia

Old Dominion Pyrite Co.—This company, capitalized for $150,000, will develop 100 acres of mineral property, at Mineral, Louisa County, about one mile east of the Arminius mine. A two-compartment shaft is being sunk in a lense of pyrite, which appears to be 60 ft. wide and to extend to within 5 ft. of the surface. William C. McIntire, of Washington, D. C., is president, and B. F. Hand, of Mineral, is manager.

Washington

FERRY COUNTY

Some good strikes have recently been made on Contention Hill, near Orient, and many prospectors are in the hills.

Republic Mines Corporation—This company, in the Republic district, earned $42,737 for the stockholders during the fiscal year ended May 31, 1912, according to the report of General Manager J. L. Harper. The receipts were $226,651, while the disbursements, including every item of expense incident to operating the properties, were $183,914, leaving a surplus of $42,737. The ore shipments for the year totaled 524 cars, containing 20,646 tons, valued at $382,118. The treatment charges were $105,674, and the freight was $48,477, returning to the company $227,967. The total extraction for the year, including 10,529 tons waste, was 31,175 tons, mined at a cost of $183,914, making the ton cost $5.98. The percentage of extraction was shown to be 66.2% and the cost of the ore milled and shipped to the smeltery was $3.27 per ton.

Jim Blaine—Glen A. Collins, Republic, general manager of this mine, is making preparations for extensive operations in the near future.

Republic Mines Corporation—Plans are being drawn for rebuilding the assay office of this company at Republic.

Blacktail—The company owning this mine, in the Republic district, is considering the installation of a cyanide mill.

North Washington Power & Reduction Co.—The rearrangement of the crushing department of this cyanide plant, at Republic, has resulted in doubling the capacity, making it possible to treat 125 to 160 tons per day.

KITTITAS COUNTY

Star Copper—This property, better known as the Skookum Copper, is being examined by Louis Garbrech, of Los Angeles, with the view of a thorough prospecting of the property with diamond drills.

STEVENS COUNTY

Lead & Zinc Co.—J. Jenson, of this company, at Metaline Falls, announces that a concentration mill will be built.

Mineral Farm Co.—Two cars of gold ore were shipped recently. Development work will be continued. Louis Jaquish, Meyers Falls, is manager.

Jack Waite—This company is having plans drawn for a concentrating plant, to be erected on the property at Waits. Fritz Marchante has charge of the work.

Inland Lead Co.—This company has been organized by C. S. Clute and others, of Spokane, and has taken over a claim near Metaline. Work is to be started at once.

WHITMAN COUNTY

Mizpah—Some fine gray-copper ore has been encountered in the 400-ft. tunnel of this property, and a trial shipment will be made. This mine is in the Hoodoo district, near Palouse.

Wisconsin

FLORENCE COUNTY

Florence Iron Co.—This company is preparing to sink a shaft to develop an orebody found by diamond drilling near Commonwealth. It is expected that large shipments may be made next season.

PLATTEVILLE DISTRICT

A local company has been organized to prospect the M. I. Schroeder land, four miles south of Platteville.

Baxter—This mine, at Cuba City, has been reopened under the management of J. H. Billingsley; the mine has been a producer and dividend payer.

Merry Christmas—The Mineral Point Zinc Co. has reopened this mine, at Mineral Point; the property was purchased a short time ago.

Senator—The Joplin Separator Co. has renewed the leases and will reopen this mine at Rewey.

Cranhall—In the last 30 days the Field Mining Co. produced and sold $60,000 worth of ore from this new property at New Diggings; the raw zinc concentrates assay from 50 to 58% zinc. The mine is owned by Robert W. Hunt & Co., of Chicago, Ill.

Frontier—This company has installed a crosshead pumping equipment at the Hird shaft and is prospecting the Grotkin and Sedgewick leases.

Wyoming

CARBON COUNTY

Fram—Class, Stewart & Smelser are shipping a car of high-grade gold ore from this property on the Snowy Range.

FREMONT COUNTY

Mary Ellen Mining Co.—A bunk house and office building are being built. The company purchased the old Helen G. mill at Lewiston, and will move it to the Mary Ellen mine. J. N. Smith is manager.

Miners' Delight—It is reported that this and the Carissa mine are to be examined. These two are the largest mines in the Atlantic district.

Beck Mining Co.—The cyanide addition to this mill is rapidly nearing completion. It is expected that the stamps will be dropping again in a fortnight.

X. L. Dredging Co.—Operation for the season has been suspended on account of shortage of water. The old Dexter ditch, which takes water from Christina Lake to Rock Creek, is being enlarged, in order to obtain a larger supply of water for next year.

Hidden Hand—This mine continues to produce high-grade ore, which up to the present time is being raised by a windlass. This property is near Lewiston. The ore is iron-stained quartz rich in gold.

Canada

ONTARIO

Mond Nickel Co.—Owing to the large amount of water encountered, something unusual in this district, shaft sinking on the Froude Extension property has been slow and expensive.

Dominion Nickel Copper Co.—This company will soon have five drills working on the Murry mine, besides two on the Cochrane and McVittie Blue Lake property. The company has secured an option on the Kirkwood mine where development work will soon be started.

Canadian Copper Co.—The Strathcona nickel property is under option to this company and three drills are at work upon it.

Moose Mountain Co.—The Gröndal magnetic-separation plant being erected to treat low-grade ore is about completed. Two separating units are completed, and the producer-gas plant and the briquetting kilns have been tested also. The briquetting press is not yet completed, but a preliminary test of the plant will be made this month.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Sept. 20, and for the year to date:

Beaver		244.26
Buffalo	60.82	864.57
Casey Cobalt		212.15
City of Cobalt.		887.99
Cobalt Lake	76.74	663.65
Cobalt Townsite	47.65	1,254.68
Chamb.-Ferland	32.00	321.05
Coniagas	.....	1,515.41
Crown Reserve		351.10
Drummond		330.30
Hudson Bay		538.47
Kerr Lake	.....	529.92
La Rose	44.73	2,537.23
Lost and Found	.....	15.00
McKinley-Darragh	.....	1,919.88
Nipissing	32.05	1,630.72
O'Brien	32.98	453.31
Penn.-Canadian	.....	29.70
Provincial.	.....	22.22
Right of Way	.....	242.82
Timiskaming	28.03	797.01
Trethewey	27.65	381.54
Wettlaufer	.....	265.74
Colonial	.....	63.14
Totals	382.65	16,071.81

Nipissing—During August, the output of this mine was valued at $226,613 net, and the shipments at $170,213 net. The production of bullion was only 236,000 oz., the high-grade mill having been shut down for 10 days while the tube mill was being repaired.

Hubert Lake Claims—A Toronto syndicate represented by A. P. Seymour, formerly manager of the Cobalt Lake, has bought the claims situated at Hubert Lake in the Elk Lake district from Dr. C. W. Haentschel, of Haileybury, and Samuel Tongue, of Maltawa, for $100,000.

Jajola—On this property at North Cobalt the shaft is down 200 ft. and will be sunk to reach a vein tested by diamond drilling.

ONTARIO—PORCUPINE

Crown Chartered—The directors have decided to call a special meeting of shareholders to consider a reorganization proposal, which includes the liquidation of the company's indebtedness by an issue of bonds. Dissatisfaction exists among the shareholders, and as the result of a meeting held in Toronto, Sept. 11, a writ has been issued against the directors charging them with fraudulently conspiring to deprive the company of the Davidson Claims, by causing a transfer to be made without authority of the shareholders, and asking for an injunction to prevent the sale.

McEnaney—The character of the ore has altered with depth and it is probable that the final details of the mill will not be settled until the 400-ft. level is developed.

Hughes—The vein picked up on the 150-ft. level 50 ft. from the shaft has been found to show improvement both in width and grade, as compared with the upper levels. Plans are in preparation for a 10-stamp mill to be installed this autumn.

Patricia—On this property, adjoining the Hughes, a vein 6 ft. wide with good showings has been uncovered. It is believed to be a continuation of the Hughes vein.

Mexico

GUANAJUATO

Humboldt—It is reported that the winze in the south breast continues through ore of improving grade. The shoot is apparently the same one that produced so abundantly in the Carmen.

MEXICO

Esperanza—During August the mill was in operation 28 days, crushing 7024 tons of ore, and treating 16,845 tons of tailing. The estimated receipts were $117,605; the estimated profit $27,800.

SONORA

The Thompson interests have a small force of men at work on their property 18 miles east of Cananea. A tunnel is being driven which will go through the hill which bisects the property.

Minneapolis Copper Co.—Owing to the presence of rebel bandits, this company has been obliged to stop work on the smeltery it was building near Cumpas. The pumping plant is being held at Tucson, Ariz., and several cars of lumber are across the line in Douglas.

TAMAULIPAS

Freeport & Mexico Fuel Oil Co.—This company has been organized by New York men to develop about 700 acres of land in the vicinity of the Panuco River, about 20 miles from Tampico. Wells are now being drilled, and 55,000-bbl. tanks are being erected at Tampico and at Freeport, Tex. J. S. Mayberry, Tampico, is manager.

Africa

TRANSVAAL

Gold production from the Witwatersrand in August was 732,197 oz., and from the outside districts 32,540 oz.; a total of 764,737 oz., being 1601 oz. less than in July. For the eight months ended Aug. 31, the total output was 5,398,817 oz. in 1911, and 6,037,982 oz.—or $125,549,208—in 1912; an increase of 675,165 oz. this year. In August there were 63 mills in operation, having a total of 10,063 stamps. On Aug. 31 there were 203,811 negro laborers employed in the Transvaal, 8766 at coal mines, 15,934 at diamond mines and 179,111 at gold mines. The total was 3445 less than at the end of July.

Messina (Transvaal) Development Co.—The production for August was 281 tons of 48% copper ore. Development consisted of 965 ft. of drifting and 18 ft. of shaft sinking. The face of the west drift, No. 5 level, is 75 ft. from the main crosscut and is in good ore all the way; over a width of five feet, an assay of 15% copper for a distance of 40 ft. is reported.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Sept. 25—The coal trade in the West is active and prices are strong. Car shortage is getting to be an important factor, and the approaching close of the Lake trade is also taking much coal, so that there is difficulty in supplying coal as fast as it is wanted.

In the seaboard bituminous trade, supplies are curtailed by car shortage and by the West Virginia labor troubles. Deliveries are behind and stocks cannot be filled. This is especially the case with the coastwise trade.

Anthracite producers have not yet made good the April-May shortage, and the collieries are being urged to their utmost to make the needed shipments.

It is announced that the New York Central Co. has made an agreement providing for exchange of traffic between its Pittsburgh & Lake Erie road and the Western Maryland. This will give a through line from the Pittsburgh district to tidewater at Baltimore, and an outlet for coal from that district to the seaboard.

Coal and coke tonnage of all lines of the Pennsylvania R.R. east of Pittsburgh and Erie eight months ended Aug. 31, short tons:

	1911	1912	Changes
Anthracite........	7,649,696	6,452,287	D. 1,197,409
Bituminous......	26,875,301	30,207,895	I. 3,332,594
Coke.....	6,962,313	8,597,730	I. 1,635,417
Total............	41,487,310	45,257,912	I. 3,770,602

Total increase was 9.1% this year.

Iron Trade Review

New York, Sept. 25—The iron and steel trades continue strong and active, with a tendency to advancing prices, while producers are still holding back on long commitments. Contracts for the first quarter of 1913 are a good deal in evidence, and are generally at advances.

September has shown practically no change from August in the volume of finished-steel specifications passing to the mills. On an average the specifications are considerably in excess of current shipments, so that the mills are falling farther and farther behind. In sheets the mills have from six to 10 weeks' work in actual specifications, in tinplates from 10 to 12 weeks, and in bars, plates and shapes they have from six to 12 weeks actually specified, with definite engagements for specific jobs that practically fill them up for the balance of the year. On the basis of specifications actually in hand and certain to come in, barring serious accidents, the mills in the majority of lines are filled for the remainder of the year, and they therefore regard it as settled that they will have full operation to Apr. 1 at least, for this would occur even should specifications undergo a very material shrinkage.

Export business is good and the fact that prices abroad are generally higher than here is helping it along. Both British and German steel makers are full of work, and are quoting above our level, which is rather an unusual condition.

Pig iron, which has been slower to develop activity than steel, is now in active demand and at advancing prices. Foundry and basic iron are especially called for. Some Alabama iron has been taken for export to Italy, but in small lots.

Baltimore

Sept. 23—Exports for the week included 90,800 lb. tinplates, 66,805 lb. structural steel and 111,569 lb. miscellaneous iron and steel to Havana; 4,398,040 lb. billets and tinplate bars to Liverpool; 1,579,200 lb. steel billets, 1,833,695 lb. skelp steel to Glasgow. Imports included 250 tons steel scrap from Liverpool; 5050 tons manganese ore from Poti, Russia; 16,350 tons iron ore from Cuba.

Birmingham

Sept. 23—Continued strength is to be reported in the Southern pig-iron market, the demand being strong and prices advancing. During the first three weeks of this month more than 100,000 tons of pig iron were sold by Southern furnace companies, the greater portion of it for delivery during the first half of 1913. The prices range between $13 and $13.50, for No. 2 foundry. Two of the furnace companies of the district are practically out of the market, having sold ahead as much as they desire to. Less than 35,000 tons of iron which can be resorted to on short notice are in the yards. The make will be increased shortly after the first of October. It is estimated that four furnaces will start up between now and the end of the year, two of them in October, one in November and the fourth during December.

Cast-iron pipe makers are melting more iron now than ever before. The Dimmick plant at North Birmingham, which was recently placed in operation again after having been thoroughly repaired, is making some of the largest sized pipe. There is no end to the demand for pipe. Announcement is made that two more pipe foundries will be constructed at Anniston, which will bring the total production of pipe at that place to large figures. No change is to be noted in steel. The activity at the various plants is interesting, all shapes in steel being in demand, especially fabricated steel. Rails and wire, too, find a steady output and the rolling mills are busy.

The scrap-iron market is still strong, while charcoal iron shows no weakening, though the production is light. Molders are still on strike, which affects the foundry business.

Chicago

Sept. 24—Buying of pig iron has been of fair volume in the last week, though the aggregate tonnage has not been so high as in the previous week. Most sales have been of less than 3000 tons and some have ranged up to 5000 tons. The melters who use a medium amount of iron are coming into the market very generally now for their first-quarter needs, and there is still some iron to be sold to meet last-quarter requirements. Prices continue to advance, and there is now no difference in quotations for the last and the first quarters. Southern No. 2 foundry sells in most cases for $13.50, Birmingham, or $17.85, Chicago, with some available at 50c. less. Northern No. 2 foundry brings $17@17.50, at furnace, which means $17.50@18 with Chicago delivery, so that Northern and Southern are on about an equal basis as regards prices. Some melters are eager to cover for the whole first half, but furnace agents are not anxious to go beyond first-quarter sales on the lower quotations. Charcoal iron continues at $16, furnace, or $17.75, Chicago, with a very good demand.

The demand for finished materials continues large and business goes almost wholly to Eastern mills, because of the crowded condition of the local mills. Business for 1913 is being locally accepted, but most of it has been done with Eastern makers, and the pressure is so great that the rising prices seem not likely to check it. Bars are in large demand; railroad supplies and structural material show no falling off in the total of requirements; sheets, plates and wire goods have a wide and large sale. Much buying is being done for warehouse stocks, in all lines.

Cleveland

Sept. 23—There is more demand for ore from furnaces. Wild boats are in some demand, 10 or 15c. advance being offered.

Pig Iron—Demand is strong and some large contracts have been placed. Prices have advanced sharply. Bessemer is quoted at $15.90@16.40; No. 2 foundry, $15.75@16, Cleveland delivery.

Finished Material—Large orders for bars and plates have been placed, running over into first-quarter deliveries. Local mills are full of orders.

Philadelphia

Sept. 25—Comparatively little business has been closed this week, partly because furnaces are over sold, and prices have been advanced nominally at least, especially for next quarter's delivery. Even inquiries are few in number and most of this week's sales have been in small lots, chiefly in basic. A few fair-sized orders for forge have been placed, but many mills are postponing further ordering. Offerings of Southern irons are being made without any business worth noting. The few lots of low-grade iron have been taken by pipe foundries to piece out requirements. Activity in iron may develop any day, as it is recognized that the present upward tendency may become more aggravated. No. 2 X foundry is quoted today at $17.25 as an outside price; gray forge, $16.50; basic, $16.50; with Southern forge of not best make offered at $15.50 per ton.

Steel Billets—Forging billets are quoted at $30@32, mill price, with two or three early delivery transactions at $33. Rolling billets are quoted at $27.90, with some business at premium rates.

Bars—Bars are active, with steel bars at 1.50c., iron 1.45c., with business easy to get.

Sheets—Some recent business offered at sheet mills has been temporarily declined, owing to oversold conditions. There appear to be a good many buyers hanging around the market who want small lots.

Pipes and Tubes—Tube work is urgent, but no large orders have been placed as yet. Merchant pipe is strong and prices have been advanced a trifle during the week on store sales.

Plates—Several large orders have just been sent to the mills, deliveries extending in some cases throughout the first quarter of next year. Inquiries for extensive requirements have reached the offices this week and quotations will be furnished within 24 hours. A batch of orders from shipyards has gone through successfully, including some business from Western points. The mills are gradually getting into a congested condition.

Structural Material—Orders, large and small, are being taken at the mills with apparent ease, but at prices which are not given. The tone of the market is exceptionally strong and prices for delivery during the rest of the year have been marked up. For early delivery, quotations are given at 1.60@1.65c. Universal plates, 1.70c. for October delivery, with advances for later delivery.

Scrap—The scrap market is active, with a conceded advance of 50c. on the grades most in demand.

Pittsburgh

Sept. 24—The market for the new year is gradually opening up in both raw and finished products. In the Pittsburgh-Valley district there has been heavy buying of bessemer and basic iron for first quarter. At the same time some Connellsville coke for first half has been closed, at about $2.50, ovens. The sheet and tinplate mills have opened their books for first-quarter business, and season business in the case of tinplates for makers of packers' cans, with rather heavy buying of both sheets and tinplates for the new delivery. In bars, plates and shapes there is also some activity for the new year.

The shortage of box cars is being felt still more seriously. Mills are making every effort to keep up a supply and avoid having material accumulate in warehouses. More frequently than formerly they are making minor repairs to box cars at their own expense, to fit them for service, such repairs being usually by way of remedying leaky sides and roofs.

There has been no improvement in the labor supply, which continues scant, but an improvement from the mill viewpoint is likely as soon as the weather becomes unfavorable for outside operations.

Pig Iron—Bessemer pig iron has been advancing sharply, and sales are reported of 25,000 tons or more for first quarter at $16, Valley, an advance of 50c. in the week, or $1 in the fortnight. Sales of basic have been still larger, totaling not far from 75,000 tons, at steadily advancing prices, until the latest sales were at $15 and $15.25, Valley, the latter being somewhat exceptional. The furnaces have tried to avoid any stir being made over the heavy sales and advancing prices, as they are anxious neither to attract a speculative following nor encourage idle furnaces to blow in. Two of the Valley furnaces long idle, however, are now scheduled to blow in, Alice, at Sharpsville, this week, and Sharpsville, also at Sharpsville, on Oct. 1, the first on basic, the second on bessemer. Foundry iron has not been as active as steel-making iron, but is quotable 25c. higher. We quote: Bessemer, $16; basic, $15; No. 2 foundry, $14.50@15; forge, $14@14.50; malleable, $14.75@15, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Prompt material is very scarce and while demand is relatively limited, premiums are readily obtained, $60 and higher being paid on carload lots. The English makers do not seem to be working in entire harmony any longer, as some have made a $3 advance while others are still quoting the old price, established Sept. 9. We quote contract at $56.50 and prompt at $60 to $65, Baltimore.

Steel—The market for unfinished steel is hardly quotable, as the mills are almost all refusing to sell for this year, on the plea that they are sold up, while for next year they state they are not yet ready to figure. On small lots for guaranteed early shipment, brokers are frequently able to secure fancy prices. We quote higher prices by 50c. or $1 a ton than last week, but would note that even the new prices are largely nominal: Bessemer billets, $23@23.50; bessemer sheet bars, $24; openhearth billets, $24@25; openhearth sheet bars, $25.50; rods, $26.50@27, all f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—The leading interest late last week advanced blue annealed sheets $1 a ton to 1.55c., while three or four of the independents had already advanced to 1.60c., either because they could make early deliveries and felt the delivery entitled them to a higher price, or because they were so well sold up they wished to withdraw from the market. Yesterday the leading interest formally opened its books for sheet contracts for first quarter, and has booked considerable business in the two days, while the independents are also selling. Prices for first quarter are the same as have been ruling for this year. The mills on an average have at least half their respective make for the balance of the year actually specified, which makes it certain they will carry a large volume of specifications into the new year. Premiums are frequently obtained for early delivery. We quote regular mill prices as follows: Blue annealed, 10 gage, 1.55@1.60c.; black, 28 gage, 2.15c.; galvanized, 28 gage, 3.30c.; painted corrugated, 2.35c.; galvanized corrugated, 3.35c., both per pound for 28 gage.

St. Louis

Sept. 23—Business has been good and prices are firm. Southern No. 2 foundry brings $13@13.50 Birmingham, or $16.75@17.25 St. Louis. Northern No. 2 is quoted around $17@17.50. Business in finished products is also good.

Coke is quoted at about $5.50, St. Louis, for good foundry.

Iron Ore Trade

Sales are reported of about 100,000 tons of iron ore from Wabana, Newfoundland, to Eastern furnaces for 1913 delivery. The price is an advance of 25c. over this year's quotations.

Shipments of iron ore from the Lake Superior region by ports for the season to Sept. 1 are reported by the Cleveland *Iron Trade Review* as below, in long tons:

Port	1911	1912	Changes	
Escanaba ...	2,418,251	3,[illegible]	I.	[illegible]
Marquette.... ...	1,200,748	2,0[illegible]	I.	[illegible]
Ashland ...	1,509,841	2,[illegible]	I.	1,3[illegible]
Superior	6,382,273	9,066,190	I.	2,683,917
Duluth ...	4,370,117	[illegible]	I.	1,[illegible]
Two Harbors ...	3,724,838	5,[illegible]	I.	[illegible]
Total	19,606,068	29,[illegible]	I.	9,[illegible]

The August shipments this year were 7,760,248 tons, of which 6,375,673 tons, or 82.2%, were delivered to Lake Erie ports.

Foreign Iron Trade

Australian Iron and Steel—The Broken Hill Proprietary Co. has bought land at Newcastle, N. S. W., and is making arrangements to erect extensive iron and steel works there. David Baker, of Philadelphia, will act as consulting engineer for their construction. The iron ores for the plant will come from the Iron Knob and Iron Monarch deposits in South Australia, which are controlled by the company.

German Iron Production—The German Iron & Steel Union reports the production of pig iron in the German Empire in August at 1,487,448 metric tons, or 19,037 tons more than in July. For the eight months ended Aug. 31 the total was, in metric tons:

	1911	1912	Changes	
Foundry iron	2,027,748	2,138,977	I.	111,2[illegible]
Forge iron	364,683	354,450	D.	10,2[illegible]
Steel pig	1,152,784	1,403,024	I.	25[illegible]
Bessemer pig	234,726	256,806	I.	2[illegible]
Thomas(basic)pig	6,478,746	7,226,834	I.	748,088
Total .	10,258,687	11,380,0[illegible]	I.	1,121,404

Total increase this year, 10.9%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

METAL MARKETS

New York, Sept. 25—The metal markets have been generally active and firm. Speculation in tin is still strong.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess	
Gold				
Aug. 1912.	$[illegible]98,472	$5,576,[illegible]	Imp.	$3,[illegible]
" 1911	480,799	4,105,331	Imp.	3,624,532
Year 1912	43,159,972	34,589,111	Exp.	8,[illegible]
" 1911.	15,910,449	40,473,010	Imp.	24,562,561
Silver				
Aug. 1912	5,574,644	3,952,279	Exp.	1,622,365
" 1911	[illegible]	3,653,329	Exp.	1,216,030
Year 1912	45,834,920	32,652,869	Exp.	13,182,051
" 1911	44,587,570	29,534,724	Exp.	15,052,846

Exports from the port of New York week ended Sept. 21: Gold, $26,587; silver, $[illegible] to London and Paris. Imports: Gold, $634,800; silver, $[illegible], chiefly from Mexico and South America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Several lots of gold, reaching a total of $2,600,000, are reported taken in London for shipment to New York.

Iridium—No change is reported, pure metal being quoted at $63@64 per oz., New York.

Platinum—Business is improving a little, as the demand for the jewelry trade is looking up. The market is well supported and there is no change in quotations. Dealers ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes under date of Sept. 12 that in comparison with the last fortnight the market has revived; the demand became higher, but no large business has been made, as the prices of buyers do not satisfy sellers. The works of the starateli are developed and the offer of platinum by them is high. The prices remain generally unchanged. The quotations are: in St. Petersburg—37,300-37,500 rubles per pood; at Ekaterinburg, 9.80 rubles per zolotnik, for crude metal, 83% platinum. These are equal to $36.65 and $36.85 per oz. respectively.

Silver—The market shows some advancing tendency, aided by speculative purchases.

SILVER AND STERLING EXCHANGE

September	19	20	21	23	24	25
New York....	63[illegible]	63[illegible]	63	63[illegible]	63[illegible]	63[illegible]
London .	29[illegible]	29[illegible]	29[illegible]	29[illegible]	29[illegible]	29[illegible]
Sterling Ex.	4.8530	4.8540	4.8545	4.8555	4.8550	4.8560

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 12, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes	
India ...	£5,528,400	£6,95[illegible],200	I.	£1,421,8[illegible]
China	981,700	[illegible]3,500	D.	56,2[illegible]
Total	£6,[illegible]18,100	£7,886,700	I.	£1,3[illegible]

Exports of gold from London to India, eight months ended Aug. 3, were £9,482,691, an increase of £2,278,666 over last year.

Foreign trade of the United States eight months ended Aug. 31 is valued as follows by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise	1911	1912
Exports	$1,25[illegible],702,687	$1,416,529,431
Imports............	1,[illegible]05,745,541	1,188,233,756
Excess, exports......	$151,[illegible],146	$228,288,675
Add excess of exports, silver		13,182,051
Add excess of exports, gold .		8,570,861
Total export balance		$250,041,587

The gold and silver movement in detail will be found in the table at the head of this column.

Copper, Tin, Lead and Zinc

NEW YORK

September	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin, Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
19	17[illegible] @17[illegible]	17.45 17.50	50[illegible]	5.10	4.95 @[illegible]	7.50 @[illegible]	7.35 @7.4[illegible]
20	17[illegible] @17[illegible]	17.45 17.50	50	5.10	4.95 @[illegible]	7.50 @7[illegible]	[illegible] @7.40
21	17[illegible] @17[illegible]	17.45 17.50	50	5.10	4.95 @[illegible]	7.50 @[illegible]	[illegible] @[illegible]
23	17[illegible] @17[illegible]	17.45 17.50	50¼	5.10	4.95 @[illegible]	7.50 @[illegible]	7.35 @[illegible]
24	17[illegible] @17[illegible]	17.45 17.50	4[illegible]	5.10	4.95 @[illegible]	7.50 @7.55	7.35 @7.40
25	17[illegible] @17[illegible]	17.50 17.55	5[illegible]	5.10	4.95 @[illegible]	7.50 @7[illegible]	[illegible] @[illegible]

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries, and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
19	[illegible]	[illegible]	8[illegible]	2[illegible]	[illegible]	[illegible]	2[illegible]
20	7[illegible]	[illegible]	[illegible]	2[illegible]	[illegible]	[illegible]	2[illegible]
21	....						
23	[illegible]	80	84	[illegible]	2[illegible]	[illegible]	27¼
24	7[illegible]	[illegible]	84	2[illegible]	2[illegible]	2[illegible]	2[illegible]
25	[illegible]	[illegible]	84	2[illegible]	2[illegible]	2[illegible]	27[illegible]

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ±21¾c.

Copper—The market was, if anything, rather quieter up to Sept. 21. Sales for domestic consumption have been rather moderate. The leading agencies are holding for their price of 17¾c., usual terms, and are generally getting their price. Sales have been made abroad on terms which mean a shade over 17½c., New York. Consumption continues very large both here and on the other side, and there are no present signs of a slackening in the demand. With the opening of this week a very heavy demand developed in Europe, which resulted in a very large volume of business for export. European manufacturers, hoping against hope for lower prices, had allowed their stocks to run down, but when they heard of the strikes at the mines of the Utah Copper Co., they decided not to delay buying any longer, and this in a measure explains the sudden appearance of foreign orders. The strike, however, had little effect on the market here. At the close, the market is firm, with Lake copper quoted at 17⅝@17¾c., and electrolytic copper in cakes, wirebars and ingots at 17.50@17.55c. Casting copper is quoted nominally at 17.35@17.40c. as an average for the week.

The London market showed a steady tendency toward higher prices, closing firm at £79 for spot, and £80 for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small advanced. Cookson's is quoted at 9¾c. base, carload lots at mill.

Copper exports from New York for the week were 5579 long tons. Our special correspondent gives the exports from Baltimore at 2068 tons for the week.

A sale of copper from Katanga is reported at Antwerp, Sept. 6, when 130,805 kg. blister copper brought 184 fr. per 100 kg.—equal to 16.1c. per pound.

Tin—The advance in the London market has been resumed and quotations have been carried to a level higher than previously attained. The intrinsic strength of the market and the confidence of the bulls is demonstrated by the large transactions in future tin, which is now selling at about £2 below spot, while all along the backwardation has amounted to £3 and more.

So far as this market is concerned, consumers have become very cautious, and their buying seems to be restricted to their absolute needs, especially as at this time they cannot contract for future material at much concession from the price of metal, which they can get for near-by delivery.

The market closes in London at £228 15s. for spot, and £226 15s. for three months, and in New York at about 50¼c. for September delivery.

Lead—The market is unchanged at 5.10c., New York, and 4.95@5c., St. Louis.

The scarcity of near-by lead is still the feature of the foreign market, which remains firm at £22 5s. for Spanish lead, and 2s. 6d. higher for English.

Spelter—The market has been quieter, although near-by spelter is still in good demand. Prices for early deliveries have been a shade lower and the difference noted last week between the New York and the St. Louis parity has disappeared for the present. There is a good deal of inquiry for future deliveries, but smelters are not inclined to commit themselves too far ahead, principally on account of the uncertainty about the supply of gas in the Kansas district. The prices of ore and the supply of ore are also considerations in respect to future deliveries. Upon the whole the market is strong at the recent slight concession, and closes steady at 7.35 to 7.40, St. Louis, and 7.50 to 7.55, New York.

The foreign market continues very firm, and is again higher at £27 5s. for good ordinaries, and £27 10s. for specials.

Base price of zinc sheets is $8.90 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7½@7¾c. per lb., New York.

The Granby Mining & Smelting Co. expects to have its new zinc works at East St. Louis, Ill., in operation by the end of next year.

Imports and exports of zinc and zinc products in Germany seven months ended July 31, metric tons:

	Imports		Exports	
	1911	1912	1911	1912
Spelter	28,134	29,469	43,529	51,648
Scrap zinc	1,268	1,208	2,440	2,573
Zinc sheets	278	462	24,690	14,988
Zinc dust	512	357	1,830	2,434
Zinc pigments	4,469	5,283	19,963	21,414

Imports of zinc ore were 148,500 tons in 1911, and 161,368 in 1912; exports were 30,809 tons in 1911, and 23,333 tons this year.

Other Metals

Aluminum—The market is firm and sales have been good. Prices are firmer and we quote 25¼@25½c. per lb. for No. 1 ingots, New York.

Antimony—The market is strong and sales have been heavy. Prices have again advanced. Cookson's is quoted at 9¾c. per lb.; Hallett's at 8¾@8⅞c.; Hungarian, Chinese and other outside brands, 8½@8¾c. Higher prices are expected.

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The quotation continues at 700 marks per 100 kg., f.o.b. works in Silesia, Germany. This is equal to 75.6c. per lb., at works.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, seven months ended July 31, figures in long tons, except quicksilver, which is in pounds:

Metals	Imports	Exports	Excess	
Copper, long tons	73,486	31,961	Imp.	41,525
Copper, 1911	87,408	45,632	Imp.	41,776
Tin, long tons	24,380	27,073	Exp.	2,693
Tin, 1911	25,868	26,733	Exp.	865
Lead, long tons	122,001	30,091	Imp.	91,910
Lead, 1911	129,476	39,768	Imp.	89,708
Spelter, l'g tons	86,815	5,162	Imp.	81,653
Spelter, 1911	76,822	5,965	Imp.	70,857
Quicksilver, lb.	3,237,088	1,147,113	Imp.	2,089,975
Quicksilver, '11	3,098,840	1,716,214	Imp.	1,382,626
Minor met's, tons	4,382	15,546	Exp.	11,164
Minor, 1911	3,264	12,612	Exp.	9,348
Ores				
Tin ore and con.	17,024	....	Imp.	17,024
Tin ore, 1911	17,683	....	Imp.	17,683
Pyrites	528,034	....	Imp.	528,034
Pyrites, 1911	553,619	....	Imp.	553,619

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Minor metals include nickel, aluminum and the minor metals and alloys.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 21—Zinc advanced to $67, on a base per ton of 60% zinc ranging from $59 to $64.50. Zinc silicate sold on a base of $31@33 per ton of 40% zinc. The average price, all grades of zinc, is $56.62 per ton. With an increased tonnage of unsold ore on hand at the week-end prices declined slightly on

SHIPMENTS, WEEK ENDED SEPT. 21

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,071,260	....	789,000	$176,990
Joplin	2,607,350	..	300,040	80,278
Galena	1,771,250	....	88,450	57,698
Duenweg	823,870	....	89,790	27,544
Alba-Neck	656,320	....	18,840	20,929
Granby	57,180	977,160	12,150	17,120
Miami	348,170	....	149,740	14,814
Carl Junction	314,670	......	7,200	10,717
Oronogo	369,450	..	.....	9,893
Carthage	284,460	.	......	7,964
Jackson	235,410		....	7,067
Spurgeon	73,670	256,790	....	6,760
Sarcoxie	45,000	....	.....	1,305
Totals	12,658,060	1,233,950	1,455,210	$439,079
38 weeks	400,805,000	24,936,060	68,058,300	$12,841,207

Blende val., the week, $373,211; 38 weeks, $10,551,396
Calamine, the week, 20,095; 38 weeks, 383,611
Lead value, the week, 45,773; 38 weeks, 1,906,200

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	....	41.29	....	59.33	...
October	42.38	..	40.89	....	54.72	..
November	45.40	..	43.25	.	57.19	..
December	44.13	....	40.76	....	62.03	..
Year	$41.45	.	$39.90	....	$56.76	....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

under-grade ores, the $59 base price being paid Saturday. Lead sold on a base price of $65 per ton, the high price reaching $67 and the average price, all grades being $62.92 per ton.

The production of zinc ore was never higher for a term of successive weeks than it has been throughout August and September, ranging from 6500 to over 7000 tons per week. There is more unsold ore now than for several months, yet the bin stock tonight will but slightly exceed 3000 tons, with less than 1000 tons unsold.

Platteville, Wis., Sept. 21—The base price paid this week for 60% zinc ore was $60@62 per ton, the highest ever paid here. The base price paid for 80% lead ore was $63 per ton.

SHIPMENTS, WEEK ENDED SEPT. 21

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	665,000	....	......
Highland	531,000	....	..
Benton	438,800	...	367,150
Galena	415,800	.. .	..
Platteville	304,000	...	198,000
Cuba City	297,520	.	124,660
Hazel Green	260,000	.	..
Harker	223,580	..	76,700
Shullsburg	148,000	.. .	......
Rewey	65,000	.	. ...
Linden		85,400	54,970
Total	3,348,700	85,400	821,480
Year to date	148,269,570	6,077,260	25,711,210

Shipped during week to separating plants, 2,291,410 lb. zinc.

Chemicals

New York, Sept. 25—The general market continues steady and fairly active.

Arsenic—The position continues strong, but speculative dealings are less in evidence. Prices are $4.75@5 per 100 lb. and are strong.

Copper Sulphate—Business is active and sales are increasing. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is firm. Spot nitrate is a shade higher, at 2.55c. per lb., while 2.57½c. per lb. is named for October-January deliveries. High ocean freights are a factor in futures.

Petroleum

Berlin dispatches report that the active competition for the oil business has been marked by a sharp reduction in prices of illuminating oils by the Standard Oil Co. representatives, which was promptly met by its German rival. Further price cutting is expected.

The budget law of Mexico for 1912-13 establishes a special internal tax on crude petroleum produced in the country, at the rate of 20 centavos (about 10c.) per ton.

Imports of petroleum and its products into Germany for the six months ended June 30, were 641,850 metric tons in 1911, and 847,789 in 1912; increase, 206,939 tons. Of the imports this year, 499,555 tons were from the United States, 128,841 from Austria, 87,831 from Rumania and 78,300 tons from Russia.

Mining Stocks

New York, Sept. 25—On Sept. 19, prices on the Exchange were firmer, on light trading. Copper stocks on the Curb moved up by fractions. Other mining stocks were rather weak on small sales.

Sept. 20 the Exchange dealings were broader and more active. Mining stocks on the Curb moved narrowly.

Sept. 21 increased activity and an upward tendency was manifest on the Exchange. The Curb was comparatively quiet, but coppers were firmer and other mining stocks in fair demand.

Sept. 23 the Exchange continued firm, but on a moderate amount of business. The mining stocks on the Curb were more active, with small fluctuations. The copper stocks were generally firm.

Sept. 24 and 25 the Exchange continued fairly active and strong. Sales of mining stocks on the Curb were good, at firm prices, especially for the coppers, though other stocks were also in some demand.

At auction, in New York, Sept. 19, a lot of $10,000 Waldorf Mining & Milling Co. first-mortgage 8% bonds, due Apr. 1, 1908, sold at $1000 for the lot.

Boston, Sept. 24—But one incident has happened locally to create any undue influence against a strengthening of copper-share prices. This was the failure of the Stock Exchange firm of S. R. Dow & Co. today, which precipitated a decline in the stocks which this house stood sponsor for. This failure will embarass somewhat the cash position of the various companies under Mr. Dow's charge, he being president of them, although his resignation has been accepted and R. M. Edwards, who has been associated with Mr. Dow in the management of the properties, has assumed the position of acting president.

Franklin mining stock fell $2.75 to $7.75, and the management states that an early assessment must be called. There are $223,000 in notes outstanding. The cash resources of the Algomah, Indiana and North Lake companies have been pretty well used up, although they each have a balance of quick assets over current liabilities. Algomah has fallen $1.50 to $3, Indiana 4.37½ to $11, and North Lake $1 to $4.

The increasing of the Anaconda's dividend adds another to those which have already taken like action and has invited a spirit of optimism such as has not prevailed for a long time. The general market is active and strong. Calumet & Hecla is up $22 for the week to $580. East Butte has taken on quite a bit of activity.

Activity has also developed on the Curb and a general higher range of

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments	4,134,569	2,224,441	1,242,836
Anaconda	22,750,000	23,000,000	25,250,000
Arizona Ltd.	3,300,000	3,200,000	3,260,000
Copper Queen	7,622,730	7,708,147	8,040,424
Calumet & Ariz.	4,160,000	4,748,000	4,514,000
Chino	1,474,979	2,945,000	3,437,309
Detroit	1,959,634	2,194,090	1,882,289
East Butte	1,267,343	1,261,304	1,410,500
Mammoth	1,849,953	1,818,738	1,802,590
Mason Valley	1,438,580	1,500,000	....
Nevada Con.	5,913,832	6,084,274	....
Ohio	665,000	617,500	.....
Old Dominion	2,130,000	2,543,763	2,620,000
Ray	3,004,195	2,985,965	2,888,095
Shannon	1,270,000	1,446,000	1,408,000
South Utah	162,335	142,555	224,855
United Verde*	2,500,000	2,500,000	2,500,000
Utah Copper Co.	8,772,742	10,602,000	11,248,992
Lake Superior*	15,600,000	19,500,000	21,000,000
Non-rep. mines*	8,300,000	8,970,000	8,170,000
Total production	98,275,892	105,991,687	
Imports, bars, etc.	24,262,292	....	...
Total blister	122,538,184	......	
Imp. in ore & matte	8,404,936	.....	
Total American	130,943,120	..	
Miami†	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	996,000	1,026,000	
Granby	1,888,400	1,802,753	
Mexican Cos:			
Boleo†	1,851,920	2,386,480	
Cananea	4,310,000	4,000,000	4,044,000
Moctezuma	3,176,819	3,094,016	3,229,839
Other Foreign:			
Cape Cop., S. Africa	....	.....	....
Kyshtim, Russia	....	1,325,000	......
Spassky, Russia	757,120	795,200	....
Famatina, Argen.	....	....	....
Tilt Cove, Newf'd	....	....	....
Exports from:			
Chile	9,856,000	8,960,000	8,512,000
Australia	8,176,000	8,288,000	8,064,000
Arrivals in Europe‡	12,667,200	14,114,240	20,200,320

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VIII, 1911	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,367	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,826
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,119,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150

VISIBLE STOCKS

	United States	Europe	Total
IX, 1911	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374

prices is at hand. Old Dominion trust receipts have advanced $1.50 to $8.50 on knowledge that good progress is being made on the securities controlled by this trust. Alaska Gold is firm around $9. Corbin Copper, a Dow property, has fallen from 60 to 21c. during the week.

Assessments

Company	Delinq.	Sale	Amt.
[illegible], Nev.	Sept. 26	Oct. 17	$0.05
[illegible], Ida.	Sept. 26	Oct. 26	0.01
[illegible], Nev.	Oct. 16	Nov. 6	0.03
[illegible], Utah	Sept. 14	Oct. 3	[illegible]
[illegible] Extension, Utah	Sept. 30	Oct. 23	0.02½
[illegible], Ida.	Sept. 23	Oct. 23	0.00½
[illegible], Ida.	Sept. 23	Oct. 23	0.002
Great Eastern, [illegible]	Sept. 28	Oct. 28	0.002
Hale & Norcross, Nev.	Oct. 3	Oct. 24	0.05
[illegible], Ida.	Sept. 5	Oct. 5	0.002
Little Butte, Ida.	Sept. 21	Oct. 21	0.001
[illegible] Hill, Nev.	Aug. 5	Oct. 5	0.01
[illegible], Ida.	Sept. 3	Oct. 3	0.002
[illegible], Utah	Aug. 28	......	0.50
[illegible]	Oct. 10		1.00
[illegible], Ida.	Sept. 7	Oct. 5	0.003
Savage, Nev.	Oct. 2	Oct. 24	0.10
Seg. Belcher & Mides, Nev.	Oct. 4	Oct. 25	0.02
Sierra Nevada, Nev.	Sept. 25	Oct. 16	0.05
[illegible], Ida.	Sept. 30	Oct. 30	0.005
[illegible], Ida.	Sept. 30	Oct. 30	0.002
[illegible], Ida.	Aug. 31	Sept. 28	0.02
[illegible], Nev.	Oct. 15	Nov. 6	0.15
[illegible]	Sept. 16	Oct. 10	0.05
Wasatch, Utah	Sept. 27	Oct. 16	0.01

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	[illegible]	53.795	56.260	[illegible]	[illegible]	25.887
February	[illegible]	[illegible]	[illegible]	23.794	24.081	27.190
March	51.454	[illegible]	[illegible]	[illegible]	[illegible]	26.875
April	53.221	[illegible]	[illegible]	[illegible]	[illegible]	27.284
May	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	54.150	[illegible]	60.654	[illegible]	[illegible]	27.919
August	[illegible]	52.171	61.606	24.428	24.082	[illegible]
September	[illegible]	[illegible]		[illegible]	24.209	
October	55.490	53.340	..	25.596	24.594	
November	55.635	55.719		25.680	25.649	
December	54.428	54.905	..	25.160	[illegible]	
Year	53.486	53.304		24.670	[illegible]	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York Electrolytic 1911	New York Electrolytic 1912	New York Lake 1911	New York Lake 1912	London, Standard 1911	London, Standard 1912
January	12.295	14.094	12.680	[illegible]	[illegible]	62.760
February	12.256	14.084	12.611	[illegible]	[illegible]	62.893
March	12.139	14.698	12.447	[illegible]	[illegible]	65.884
April	[illegible]	[illegible]	12.275	[illegible]	[illegible]	70.294
May	[illegible]	[illegible]	[illegible]	16.245	[illegible]	72.352
June	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	78.259
July	[illegible]	[illegible]	[illegible]	17.353	[illegible]	76.636
August	12.405	[illegible]	12.634	[illegible]	[illegible]	[illegible]
September	12.201		12.508	..	[illegible]	
October	[illegible]		12.370		[illegible]	
November	12.616		12.769		[illegible]	
December	[illegible]		13.768		[illegible]	
Year	[illegible]		[illegible]		55.973	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	[illegible]	42.529	July	[illegible]	44.519
February	[illegible]	[illegible]	August	[illegible]	45.857
March	40.157	42.577	September	[illegible]	
April	[illegible]	[illegible]	October	41.185	
May	43.115	46.053	November	43.125	
June	[illegible]	[illegible]	December	[illegible]	
			Av. Year	[illegible]	

[illegible] cents [illegible]

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	[illegible]	[illegible]	4.334	4.327	[illegible]	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	[illegible]	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	[illegible]	16.331
May	4.373	[illegible]	4.223	4.072	[illegible]	16.509
June	[illegible]	[illegible]	[illegible]	4.321	13.260	17.588
July	[illegible]	4.720	4.397	4.603	[illegible]	18.544
August	4.500	[illegible]	4.406	4.452	[illegible]	19.679
September	[illegible]		4.356		14.744	
October	4.265		4.139	...	15.332	
November	4.298		4.181		15.821	
December	4.450		4.332	.	15.648	..
Year	[illegible]		[illegible]		[illegible]	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	5.452	6.442	5.302	6.292	[illegible]	26.642
February	5.518	6.499	5.368	6.349	[illegible]	[illegible]
March	[illegible]	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	[illegible]	[illegible]	[illegible]
May	5.348	[illegible]	5.198	6.529	24.375	25.790
June	[illegible]	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869		5.719		27.750	
October	6.102		5.951	.	27.256	.
November	6.380		6.223		26.795	.
December	6.301		6.151	.	26.849	...
Year	5.758	..	5.608		25.281	..

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No. 2 Foundry 1911	No. 2 Foundry 1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	[illegible]	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	[illegible]	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	[illegible]	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	[illegible]	14.85
September	15.90		13.57		14.40	.
October	15.43	.....	[illegible]		14.34	
November	[illegible]	..	13.30	....	[illegible]	.
December	[illegible]		13.10	..	13.90	..
Year	$15.72		[illegible]	.	$14.49	

STOCK QUOTATIONS

COLO. SPRINGS Sept. 24

Name of Comp.	Bid.
Acacia	[illegible]
Cripple Cr'k Con	.02
C. K. & N.	18
Doctor Jack Pot	06
Elkton Con.	[illegible]
El Paso	1.12
Findley	[illegible]
Gold Dollar	18
Gold Sovereign	[illegible]
Isabella	.20½
Jack Pot	.05
Jennie Sample	07
Lexington	007
[illegible]	.07
Old Gold	[illegible]
Mary McKinney	[illegible]
Pharmacist	[illegible]
Portland	[illegible]
Vindicator	85
Work	[illegible]

SALT LAKE Sept. 24

Name of Comp.	Bid.
Beck Tunnel	[illegible]
Black Jack	08
Cedar Talisman	01
Colorado Mining	.12½
Columbus Con.	[illegible]
Crown Point	[illegible]
Daly-Judge	‡5.75
Grand Central	62
Iron Blossom	[illegible]
Little Bell	‡.30
Lower Mammoth	05¼
Mason Valley	12.00
May Day	15
Nevada Hills	1.75
New York	[illegible]
Prince Con.	[illegible]
Silver King Coal'n	2.75
Sioux Con.	04
Uncle Sam	.11
Yankee	.11

TORONTO Sept. 24

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	[illegible]	Hollinger	[illegible]
Hudson Bay	[illegible]	Imperial	[illegible]
Temiskaming	39	Pearl Lake	.18
Wettlaufer-Lor.	12	Porcu. Gold	23
Am. Goldfield	50	Porcu. Tisdale	[illegible]
Apex	[illegible]	Preston E. D.	[illegible]
Crown Chartered	04	Rea	[illegible]
Dobie	[illegible]	Standard	‡[illegible]
Dome Exten.	[illegible]	Swastika	.075
Foley O'Brien	[illegible]	West Dome	10

SAN FRANCISCO Sept. 24

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.92½
Belcher	.39	Jim Butler	.70
Best & Belcher	04	MacNamara	.22
Caledonia	1.25	Midway	.55
Challenge Con.	.05	Mont.-Tonopah	2.22
Chollar	.03	North Star	.42
Confidence	.50	West End Con.	1.60
Con. Virginia	37	Atlanta	.22
Crown Point	.35	Booth	7
Gould & Curry	01	C.O.D. Con.	09
Hale & Norcross	06	Comb. Frac.	.12
Mexican	2.85	Jumbo Extension	.35
Occidental	55	Pitts.-Silver Peak	.95
Ophir	.55	Silver Pick	.10
Overman	.65	St. Ives	‡.30
Potosi	.02	Tramp Con.	‡.04
Savage	.12	Argonaut	2.25
Sierra Nevada	.18	Bunker Hill	‡[illegible]
Union Con.	.56	Central Eureka	‡.30
Yellow Jacket	.29	So. Eureka	‡2.90

N. Y. EXCH. Sept. 24

Name of Comp.	Clg.
Amalgamated	[illegible]
Am. Agri. Chem.	[illegible]
Am.Sm.&Ref.,com	87⅞
Am. Sm. & Ref., pf.	[illegible]
Am. Sm. Sec., pf. B	88¼
Anaconda	47⅝
Batopilas Min.	[illegible]
BethlehemSteelpf	[illegible]
Chino	[illegible]
Federal M. & S., pf.	[illegible]
Goldfield Con.	3
GreatNor.,ore.,ctf.	[illegible]
Guggen. Exp.	[illegible]
Homestake	97
Inspiration Con.	20
Miami Copper	[illegible]
Nat'nalLead,com.	[illegible]
National Lead, pf	109
Nev. Consol.	22½
Phelps Dodge	215
Pittsburg Coal, pf.	[illegible]
Ray Con.	[illegible]
RepublicI&S,com.	[illegible]
Republic I & S, pf.	[illegible]
SlossSheffi'd,com.	[illegible]
Sloss Sheffield, pf.	96
Tennessee Copper	46⅞
Utah Copper	67
U. S. Steel, com	78
U. S. Steel, pf.	[illegible]
Va. Car. Chem.	47

N. Y. CURB Sept. 24

Name of Comp.	Clg.
Barnes King	78
Beaver Con.	.36
Braden Copper	[illegible]
B. C. Copper	05
Buffalo Mines	2
Caledonia	[illegible]
Con. Ariz. Sm.	
Davis-Daly	[illegible]
Diamfield Daisy	8
Ely Con.	24
Florence	88
Giroux	[illegible]
Gold Hill Con.	[illegible]
Greene Cananea	10
Greenwater	[illegible]
Internat. S. & R.	[illegible]
Kerr Lake	[illegible]
Keystone	[illegible]
La Rose	[illegible]
McKinley-Dar-Sa	[illegible]
Min. Co. of A. new	[illegible]
Motherlode Gold	[illegible]
Nev. Utah M. & S.	‡.01
Nipissing Mines	[illegible]
Ohio Copper	[illegible]
Pacific Sm. & M.	[illegible]
South Live Oak	[illegible]
South Utah M. & S.	[illegible]
Standard Oil (Old)	1110
Stand'd Oil of N.J.	409
Stand'd Oil Subs.	680
Stewart	[illegible]
Tonopah	[illegible]
Tonopah Ex.	[illegible]
Tri-Bullion	[illegible]
Tularosa	[illegible]
Union Mines	[illegible]
United Cop., pfd.	10
Yukon Gold	[illegible]

LONDON Sept. 25

Name of Com.	Clg.
Camp Bird	£1 8s 6d
Dolores	1 10 0
El Oro	[illegible] 14 6
Esperanza	[illegible] 2 0
Mexico Mines	7 10 0
Oroville	[illegible] 6
Stratton'sInd.	[illegible] 1
Tomboy	[illegible] 3

BOSTON EXCH. Sept. 24

Name of Comp.	Clg.
Adventure	[illegible]
Ahmeek	345
Algomah	3¼
Allouez	[illegible]
Am. Zinc	33½
Ariz. Com., ctfs.	4⅞
Bonanza	‡.40
Boston & Corbin	7½
Butte & Balak.	3½
Calumet & Ariz.	82
Calumet & Hecla	580
Centennial	19½
Cliff	[illegible]
Copper Range	[illegible]
Daly West	[illegible]
East Butte	[illegible]
Franklin	[illegible]
Granby	58
Hancock	[illegible]
Hedley Gold	19
Helvetia	.95
Indiana	[illegible]
Island Cr'k, com	54
Island Cr'k, pfd.	88
Isle Royale	[illegible]
Keweenaw	1
Lake	36½
La Salle	‡[illegible]
Mass	[illegible]
Michigan	‡[illegible]
Mohawk	[illegible]
New Arcadian	‡[illegible]
New Idria Quick.	[illegible]
North Butte	[illegible]
North Lake	4
Ojibway	4¼
Old Dominion	60
Osceola	113
Quincy	[illegible]
Shannon	[illegible]
Shattuck-Ariz.	23
Superior	46½
Superior & Bost.	[illegible]
Tamarack	43
Trinity	6
Tuolumne	[illegible]
U. S. Smelting	[illegible]
U. S. Smelt'g, pf.	[illegible]
Utah Apex	[illegible]
Utah Con.	[illegible]
Victoria	3
Winona	[illegible]
Wolverine	81
Wyandot	2

BOSTON CURB Sept. 24

Name of Comp.	Last
Bingham Mines	[illegible]
Boston Ely	[illegible]
Boswyocolo	[illegible]
Butte Central	[illegible]
Cactus	10
Calaveras	[illegible]
Chief Cons.	[illegible]
Corbin	.22
Cortez	[illegible]
Crown Reserve	[illegible]
First Nat. Cop.	[illegible]
Majestic	[illegible]
Mazatan	[illegible]
Moneta Porc.	[illegible]
Nevada-Douglas	[illegible]
New Baltic	2
Oneco	[illegible]
Raven Copper	26
Rhode Island Coal	11
San Antonio	‡3
S. W. Miami	6
South Lake	6½
Trethewey	.30
United Verde Ext.	.50
Vulture	‡5

‡Last quotation

The Engineering and Mining Journal

Vol. 94 OCTOBER 5, 1912 No. 14

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Enginmjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Situation in Mexico

The situation at present existing in Mexico is of a nature to reduce the mining industry to low terms, it being possible to operate mines and conduct business otherwise only in such parts of the country as have been unaffected by disorder and violence, and such parts are not many. Brains are puzzled to determine what steps to restore order out of this chaos can and ought to be taken. Years ago there was a common expression of wonder as to what would happen in Mexico after Diaz had gone. The answer is now before us and Diaz himself lives to read it.

Diaz, in the early days of his administration, appreciated that the prosperity of Mexico depended upon the establishment of order, and appreciating moreover that his people were not sufficiently enlightened to distinguish between liberty and license, he put the fear of the law into them by arbitrary, and even high-handed measures. These were often harsh and bloody; yet they were necessary, because how could business be conducted except in peace? What was the use of anybody operating a mine if his bullion were likely to be stolen on the way to the express office? How could mines be successfully operated if their managers ran the risk of assasination every time they went to and fro?

Assasination, highway robbery and brigandage were rooted out by the strong arm of Diaz and his corps of *rurales*, and it became possible to conduct business even in remote parts of Mexico with almost as much security as in the United States. For this Mexico owed a debt of gratitude to its great administrator. It is unfortunate that his officials introduced grafting that imposed too great burdens upon the people and led to the revolution, resulting in the ousting of Diaz and the substitution of Madero.

Whatever be the faults of Madero, it is evident that he has not had a fair chance, not having had sufficient time, and having been entangled from the outset by a series of rebellious disturbances. It is evident, moreover, that Zapata, Orozco and the others have not been in the field for any sincere purpose, but rather out of pique or for objects of personal gain. Since the dispersion of Orozco's main army the situation in the northern part of Mexico has been one of magnified brigandage, nothing else.

Such brigandage existed in Mexico in a way in the early days of Diaz's administration. Even then there were bold spirits, like Heraclio Bernal, in Durango, who, taking to the road, collected a band of two or three hundred around him, robbing wayfarers, raiding *haciendas* and occasionally taking a town. Bernal, who possessed a sense of humor, used to give receipts for property appropriated, his receipts being redeemable "when he became governor of Durango." Even in those days the dividing line between a leader of the political opposition and the professional bandit was uncertain. The government characterized every political opponent as a bandit, while the professional bandit called himself a leader of the political opposition. Diaz, however, put a stop to all that, and whether he was unconstitutional, dictatorial, autocratic or not, anyway he established order and made it possible for orderly persons to do business.

We see in Mexico at the present time a recurrence of the old evil, but greatly magnified. Instead of there being brigands here and there, we now see them almost everywhere. To refer to these gentry as "rebels" or "revolutionists" confers undue dignity upon them. They will continue to rob towns, mines and *haciendas* as long as they can. Out of fear they have heretofore pretty well let alone American and other foreign property, but recently they have become bolder and bolder in their threats against the mining camps and have raided more and more of them.

The operation of these plunderers has been retarded very properly by the embargo of the American Government upon the shipment of arms and ammunitions to them. The Mexican government is, however, too weak to control them. The present situation in Mexico is not very different from what it was in Arizona and New Mexico 30 years ago, when the Apaches were loose. The same methods will apparently now have to be applied in Mexico as then, but will the Mexican government be able to do it? In the meanwhile, Mexico is a disagreeable and dangerous country in which to live and its mining industry is seriously checked.

An Experiment in Technical Education

The Colorado School of Mines has inaugurated a novel experiment in technical education by the establishment of an experimental ore dressing and metallurgical plant, which in effect is a complete commercial mill. Into this the boys are to be turned to acquire that familiarity with practical work that is so prominently in the minds of most of our technical educators. The means of accomplishing this are various.

Freiberg and Clausthal supplemented the instruction of the lecture room with work in the laboratory and a required service in the mines and smelteries of the vicinity. The first mining schools in this country—in Boston and New York, remote from mining districts—introduced the then novel expedient of model laboratories in which the form of ore treatment was followed, if not the substance, and the students were sent on travels to see the real thing. Golden is the first to have the real thing in its own domain.

The weakness of the system of sending immature young men out upon inspection trips, from which they cannot by any possibility profit much, is recognized. The importance of putting young men into real work is also recognized. As the young man goes into real work as an employee with the feature prominently in his mind that not only must he do useful things, but also that his pay depends upon the intelligence and fidelity with which he does them, there is introduced the feeling of responsibility which is the most important thing in human development. Whether that can be inspired in the plant of the Colorado School of Mines remains to be seen.

Anyway, this experimental plant will, without doubt, be useful in the determination of much data that are needed, such as the efficiency of means of crushing ore, the relative capacity and efficiency of various screens, the advantages and disadvantages of many details of mill construction, etc. Data of this kind are sadly lacking in engineering literature and practice. It is possible that the educational services of the new department of the Colorado School of Mines may be of more consequence to the profession and industry in general, than to its own students.

Gold Production in 1912

There has been a good deal of discussion recently in the public prints on the question whether the increase in gold production which has been so marked in the last decade is going to continue. Most of this has been in connection with the assumption that the purchasing power of gold has decreased and that the higher prices which prevail over a large part of the commercial world are in part the result of the cheapening of the standard. This is a complicated question with which we have no space to deal here, beyond saying briefly that the assumption mentioned is, we believe, not justified by the facts, at least to the extent which some economists think.

Whether the production of gold in the world has reached its maximum for the present or not is a question which is also of considerable difficulty. There are indications which point both ways, and it is not altogether easy to balance them. Nor is it safe to look too far into the future without seriously endangering one's reputation as a prophet. A good authority has recently ventured the prediction that production will decline, but his argument involves certain assumptions which not everyone will be willing to accept.

We can, however, to take up only a small part of the subject, put together some facts which cover the production of the present year—three-quarters of which have now passed—and these seem to indicate that the gold output of 1912 will not greatly exceed—if it exceeds at all—that of 1911. Without exact data from most of the larger producers, there are, nevertheless, sufficient facts known to point to this conclusion. The largest and most important producer at the present time is the Transvaal, and that country is showing an increase this year from which the world's gain must come, if it comes at all. In the United States such returns as we have point to an output which will not vary greatly from that of 1911, and may be below it. No other producer from which any returns are to be had shows any increase, with the exception of West Africa, the contribution from which is small. On the other hand, the Australian mines are emphasizing this year the decrease which has been going on for several years past. The fragmentary returns from Russia indicate that labor scarcity and labor troubles have combined to reduce activity at the Siberian mines, while in the Urals there has been a large transfer of miners from the gold mines to the more profitable pursuit of platinum. In Mexico the unsettled state of the country has seriously interfered with mining. Rhodesia has failed to show the gain which was hopefully anticipated. South America is at a standstill, and no other country has developed any new sources of supply. No notable discoveries have been recorded anywhere.

Upon the whole the present presumption is that the gold production of 1912 is not going to differ much from that of 1911. As already indicated the difference will depend entirely upon the amount of increase in the Transvaal and whether the gains there will more than counterbalance losses elsewhere.

The present activity of the steel trade has started again the construction of new works and extensions of existing plants. Since 1908, not much has been done in this line, except to complete the enterprises started during the boom of 1906-7. At present, however, there are plants under construction or contract which will increase the total steel-making capacity by something over 2,000,000 tons yearly. All the new steel works use openhearth furnaces, so that the converter will continue to lose in comparative importance, as it has been doing for several years. In addition to the increase noted above, much new work is projected, but has not yet reached the stage of actual construction.

By the Way

The general manager glanced casually at the graduate. "I have no position to offer you," he said. "You misunderstand," responded the graduate. "What I want is a job." Two minutes later he was at work.

A mining engineer recently returned to the copper country of Michigan and brought with him a sample of copper ore from Arizona. One evening while visiting with some friends a Cornish miner was examining the sample and the following conversation took place: "What per cent. would 'e run?" "About twelve per cent.," said the mining engineer. "Goes 'ome—'e wouldn't run twelve per cent. if 'e was all copper. 'E 'edn't heavy enough."

We have just read an article on junk smelting which says that the insulation is burned off scrap wire, after which it is "simply remelted, poled, and cast again into wire, or into ingots or bars for redrawing." Some of our wire-mill friends will doubtless favor us with their reasons for preferring ingots for drawing purposes, or better, some of the junk men had better tell us more about casting wire, and we will then put the drawers out of business.

The good prices for the metals are not only increasing the prosperity of the individual mining companies, but have also begun to penetrate as far as the holding companies. Anaconda has increased its dividend from 8 to 12%, and it is expected that this increase will be reflected in the next dividend of the Amalgamated. The United States Smelting, Refining & Mining Co. has also increased the dividend on its common shares by 25c., paying 75c. per share for the third quarter, with the customary 87½c. on the preferred shares, and the Old Dominion holding company is now on a 16% basis.

Prof. H. S. Munroe tells of the examination, some years ago, of a gold-silver property, where the samples were taken, placed in bags and the bags carefully sealed before loading them on the cage to be delivered at the assay office. As an extra precaution a supply of ashes from the company's boilers was taken into the workings without the knowledge of the management. Every now and then a sealed bag of ashes was sent up with the samples. The ashes and the ore were assayed side by side with the result that Professor Munroe advised his clients that if they must have a mine, his assays showed that they could do no better than to purchase the mine that produced the coal used by this particular company, for in addition to being a good coal mine it appeared to be a surprisingly good gold-silver property.

After 11 years of underground work, fortune has smiled on a miner. His success, however, was not obtained in a rich pay streak, but in discovering that he had a "tenor voice of exceptional promise." At least that's the way his London press agent has put it, in announcing that Manager Dippel, of the Chicago-Metropolitan Opera Co., has engaged Morgan Kingston to sing with that organization for a number of years, beginning October, 1913. Kingston, it is reported, began work in a Nottinghamshire mine when 11 years old. One day, about three years ago, the manager of the mine, who had heard him sing, brought a friend down to hear him, with the result that Kingston later went to London to study.

An unusual court case was recently tried in Ishpeming, Mich., as a result of which Isaac Risku, a miner, was ordered by the judge to pay $2 in fines and about $12 in costs, because he forced John Karhn, a trammer, away from the place where he (the miner) was preparing to blast underground. Karhn and his partner were finishing loading a car, when Risku ordered him away. As the trammer did not move from the place as quickly as the miner desired, the latter grabbed him by the neck and menaced him with a crowbar. The judge held that, as the shift boss was but three minutes' walk away, the miner should have notified him when the trammer would not move, rather than take the law into his own hands and assault the trammer in the manner complained of. The trammer claimed that the danger from the blast was not so immediate as to cause the miner to act as he did. The miner intended to appeal the case to the circuit court, but meantime the mining company took a hand and discharged the trammer, so that he likely will not be in the county when the case is called. It may be that this dispute came about because the shift boss had not minded the famous advice of a certain old mining captain who contended that, "in placing your men, never put two of different smells in the same working."

Under the title, "Where Tungsten Comes From," the *Literary Digest* tells us that but a short time ago the average citizen could not tell whether tungsten was a patent medicine or the name of a manufacturer. With this kind of a set-up, it turns on the air and drills into the wonderful, so to speak, occurrence of the big "Tungsten Farm" in Colorado, quoting from the *Edison Monthly* as follows: "The supply of this Colorado 'tungsten farm' is practically inexhaustible. So vast is it in extent, so abundant and so easy to mine that the price of this valuable metal has gone down until it is available for widest commercial use. This 'farm' stretches for a great distance along a steep mountain side. The ore lies on it in great windrows, thousands, hundreds of thousands, perhaps millions of tons. As yet no one has attempted to calculate its extent. There is too much of it. Still more surprising, a great quantity of the ore is about 70% pure. Altogether it is probably the most remarkable deposit of this mineral in the world. Tungsten is usually found in veins from 60 to 100 ft. below the surface. Therefore, in some remote geological age this mountain side where the 'farm' now is was tilted by some mighty convulsion of the earth and the loose covering rolled and slid off the great ribs of black, heavy rock. Then, in the millions of years that followed, the action of the glaciers, the imperceptible but powerful touch of heat and cold, and the wash of the rains laid these mountain ribs bare. They were broken up and the fragments strewn in orderly confusion along their bases. At a distance it now looks like long piles of coal running up the mountain side with the same regularity as the windrows of tall grass that fall behind the scythe." From which one might gather that there is a "grand" opportunity for an intensive agriculturist on the big "tungsten farm."

A writer in the London *Mining Journal*, endeavoring to clarify mining nomenclature, presents the following paragraph: "Fissures are sometimes filled with angular débris of rock and clay, the result of the alteration of the 'country.' The Australian miner calls this 'mullock' (an old English word meaning rubbish or dirt), and he speaks of 'mullock veins,' or of a vein being 'mullocky.' The name was originally applied to the altered basalts of the deep 'leads' of Ballarat. 'Mullock' is, therefore, more or less synonymous with U. S. 'bluff' [It has been understood that this was a term used to describe American diplomacy, business methods, character or anything else particularly American—Ed.], but the use of the word has been extended to Australia, and is now synonymous with waste rock. Thus we have 'mullock-tip' (dump), and 'mullocker' (dumper). The application of the word to waste rock has very properly been objected to; but we need a word to describe a lode-filling consisting of altered country, and 'mullock' and 'bluff' might be retained for this purpose, thus corresponding to the *formación* or *carrancho* of Colombians, and *cascajo* of the Venezuelans. Besides 'waste' or 'waste rock' (Ger. *Berge*, Fr. *décombres*, Span. *escombros*) we can use the terms 'attle' and 'deads,' but 'rubbish,' 'refuse,' 'offcast,' 'trade,' and 'stuff' are not needed. Waste rock, however, should not be confounded, as it sometimes is, with waste used as packing—'attle-packing,' c.m., 'gob' or 'goaf' (Fr. *remblais* Ger. *Bergeversatz*, Span. *relleno*, It. *riempimento*)." This is now surprisingly clear. However, we still think that the necessity exists for an *Académie* to unify the English languages spoken in the so called English-speaking countries.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Geology Applied to Mine Examination

I have read with a great deal of interest the article by Ira B. Joralemon, in the JOURNAL of Aug. 10, 1912, as well as your editorial comment in the following number. Now it may have become the custom for the large copper companies, such as Mr. Joralemon represents, to require a tremendous amount of development, before they will examine a property, and to object to making a substantial payment when it does suit them, but this is not only rank heresy from the prospector's point of view, but it can be shown from the history of the company for which Mr. Joralemon works, that it is not always the most satisfactory and profitable method of doing a mining business; and if I were asked to supplement his needs of good judgment and breadth of vision, I should add one syllable only, viz.: nerve, which is more frequently lacking than all the other elements of success.

To illustrate, it is not many years ago that the Calumet & Arizona Mining Co. was organized to carry out one of the riskiest pieces of mining that has ever been inaugurated in Arizona; this was to sink a shaft to open up an indicated body of ore at a depth of more than 1000 ft., lying alongside of the Copper Queen's wonderful deposit. Such was the risk attached that this latter company would not even buy the ground, which was offered to them at different times, either not being convinced of its value, or perhaps not conceiving that anyone had the nerve to go after it; however, the unexpected happened, and another great mine was born. But not under Mr. Joralemon's specifications; not only was there no ore in sight, but the possibility of ore was denied to the extent that the stock of the company, which, after the ore was actually found, sold for $200 per share, just before the reaching of the orebody was peddled about the town, with no takers at very low prices, reported at the time as $1 per share, and the whole enterprise was derided as a wild-goose chase by the thoughtless and the timid.

Again, there has recently been opened up a body a good ore of such merit that it is thought by the owners that it is going to make one of the great mines, and its present behavior in the way of shipments is going far to prove this claim; this mine, the R.R.R., was held under option by the C. & A., as it is generally known here, for a considerable time, and was finally refused, not on account of the price, which was a fraction only of what it sold for later, but because a first payment was required; in this case the original owners were out the considerable sum of $35,000, in work, in preparing expert reports and in purchasing the interests of former partners, and I believe that they agreed to take only one-half of this sum as first payment, to no purpose, because the trade fell through on this account.

In sober truth the business of prospecting is bound to die out, if it becomes apparent that buyers of mines are not willing to pay a reasonable first payment to the finders; the decadence already noticed and deplored may possibly be traced to the disinclination of buyers to pay at once. That is when the prospector needs money more than at any other time; he is usually in debt, and his credit is based on the ownership of his claims, and if he cannot secure some cash when he sells, it is a direct blow to his credit, and is a solar plexus for those around him. I can well remember when any sober and industrious prospector could get all the credit he needed, but it does not seem to be that way now, and it can be maintained against all arguments, that if the line of prospectors dies out, there will be little need of buyers, companies, geologists, or any other mining paraphernalia.

JOSIAH BOND.

Alto, Ariz., Sept. 12, 1912.

Safety Appliances in Mines

My attention has been drawn to a paragraph in an article appearing in the JOURNAL of Apr. 27, 1912, written by Claude T. Rice, on "Safety Appliances in Inclines."

Knowing that Mr. Rice—and I daresay all of your readers—are desirous of learning what they can on such matters, and also in defense of Australasian mining laws, I am pleased to be able to state that the man- and ore-skips in the incline shaft on this property are fitted with safety appliances which are tested regularly. The man-skips take 10 men and the ore-skips are of 2½ tons capacity. Tests made last week showed that none of the four skips dropped more than 2 in. when let go. In addition to these safety grips, the equipment includes safety detaching hooks in case of overwinding, before which point, however, the skip has passed over automatic blocks, which assume an upright position behind the wheels of the skip and against the framing of the roadway of the headgear. This is a seconday precaution to supplement the other safety devices.

The Long Tunnel incline shaft was sunk in two sections to a depth of 2228 ft. in February, 1904, at an angle of 49° 3′, and it was shortly after that date that the above mentioned appliances, in compliance with the mining regulations, were adopted. The shaft is now a composite one, being 4000 ft. on the angle given and 300 ft. vertical. The rock covering directly over the latter portion of the shaft is in the vicinity of 4000 ft. vertical.

There is much in Mr. Rice's article that most mining men will agree with, but one can scarcely put "several sets of guides" against the lives of men, or even against the destruction of a skip at the bottom of the shaft.

JOSEPH MILLER,
General Manager, Long Tunnel Mining Co.
Walhalla, Victoria, Aug. 30, 1912.

Prohibition Mining Camps

The remarks about liquor licenses in the town of Highgrade, Calif., in the JOURNAL of Aug. 31, 1912, remind me of conditions in Morenci, Ariz., several years ago. At that time no liquor licenses could be obtained there, but there was some land about two miles away not owned by any of the big companies, and on this a number of resorts had been erected, known as "Slagtown," or "Jagtown." A line of lanterns could be seen going over the hill from Morenci to Slagtown on dark evenings, and returning later. Perhaps in time Highgrade will also have its "Slagtown."

O. S. WEBBER.

St. Louis, Mo., Sept. 6, 1912.

A Question of Royalty

Various opinions have been advanced here as to the effect that drying ore would have on the royalty. Should this be paid on the railroad weights of the ore shipped or on the ore as it is mined? If the former, then if by drying the ore looses 10% of its weight, should the fee owner loose 10% of his royalty?

I should be glad to have the views of other readers of the JOURNAL on this subject.

QUESTIONER.

Virginia, Minn., Sept. 26, 1912.

Trimming Roofs of High Stopes

By Claude T. Rice

When trimming loose slabs from low stope roofs in the lead districts of southeastern Missouri the miners stand on portable horses. To reach roofs from 12 to 60 ft. high, four-post stages are used. Pillars are trimmed by the use of ladders. The general practice is to trim the roofs as the running stope advances.

The disseminated ore now being mined in the lead district of southeastern Missouri, is the lower 30 or 40 ft. of a flat-dipping dolomitic limestone. At times the lead extends higher up in the Bonne Terre formation. Much of the ground in the district has a tendency to break away in slabs, depending on the nature of the rock and the shattering due to the slight crumpling the region has undergone.

In good ground 50 ft. is left between pillars, while with a bad roof the distance is sometimes reduced to 20 ft. The general width of pillar is 20 ft., although in high stopes this sometimes increases to 40 ft. From 17 to 35% of the ore is left behind as pillars, the usual average being 20 to 25%. Of course, whenever possible, pillars are cut in the poorest ore. Even with frequent pillars the roof sometimes slabs when the miners break into the limestone overlying the ore.

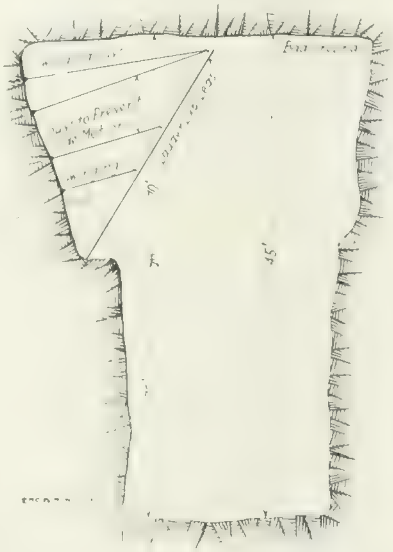
WATER CAUSES SLABBING

Much of the trouble in this regard may be due to hydrostatic pressure generated by wedging shut all water-bearing crevices in the surrounding workings. This water forces its way out along fissures leading over neighboring stopes and the pressure soon loosens large pieces of rock. The stopes are under constant inspection and the wedges are blasted out, as soon as any seepage appears on the roofs, the imprisoned water escaping into the workings. It is cheaper to pump than to bar down slabs from a high roof. Pressures up to 90 lb. per sq.in. have been measured in fissures at the Federal mines.

The roofs are easily reached when the top benches of the stopes are first cut and the running stope is being advanced. Generally trimming is done at this time. Drummy slabs are, as a rule, brought down by gads and bars, but it is often necessary to blast an especially large or stubborn area. Wedging down the roof is more expensive than blasting, but the results are better. It is always necessary for the sake of safety to trim a blasted roof by hand. Holes for blasting are drilled in a variety of ways, depending largely on location and position. Double-hand drilling, piston machines, pluggers and diamond drills are all used for this purpose.

MINERS STAND ON HORSES

Two men always work together when trimming roofs. On high back, up to 12 ft., portable horses are used to support the workmen; they are lighter and easier to handle than the four-post stage, which is employed in the higher stopes. The accompanying illustration shows their construction. The horse is about 7 ft. long; up to a height of 9 ft., the legs are 2x4-in. pieces, the higher horses have 2x6-in. legs. The legs are given a spread of 4 to 5 ft. at the bottom, and are nailed to a 2x6-in. longitudinal piece at the top. From 12 to 18 in. below the top 2x6-in. cross-braces are nailed to the legs; 2x4-in. diagonal struts reach from the ends of the cross-braces back to the legs. The 10 or 12-in. planks on which the men stand are nailed to the cross-braces, one on each side. The horse is placed with its end facing the slab to be barred down; this enables the men to get close up to their work, and at the same time the legs are not in position to be injured by falling rock. One man stands on each side of the horse to balance it.



METHOD OF TRIMMING EXCEPTIONALLY HIGH ROOF

FOUR-POST STAGES FOR HIGH ROOFS

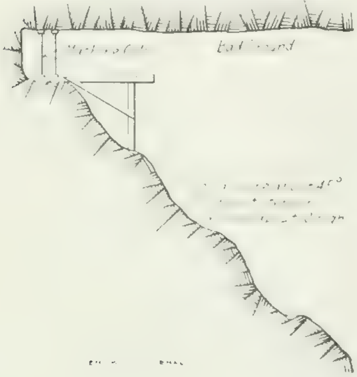
The four-post stages, used for roofs over 12 ft. high, are of two general types. In the first type all the legs bevel in two directions, or along the diagonals of the stage. In the second type the front legs are in a vertical plane and slope toward the sides; the two back legs bevel along the diagonals as in the first type. The vertical front legs, of the second type, enable the men to get close to their work by putting the front towards the slab. By this arrangement there is not much danger of a falling rock hitting a stage leg and knocking it down, but some mines guard against this possibility by drilling a 10- or 14-in. hole in the roof and driving into it a split eye pin with a wedge in the bottom. A rope is tied to the pin and fastened to the stage in such a way that, should either front leg be knocked out, the structure will still stand tied to the eye pin in the roof. This adds greatly to the safety of the work. To steady the higher stages guy lines are carried down from the tops and sides and made fast to pins in nearby pillars.

CONSTRUCTION OF HIGH STAGES

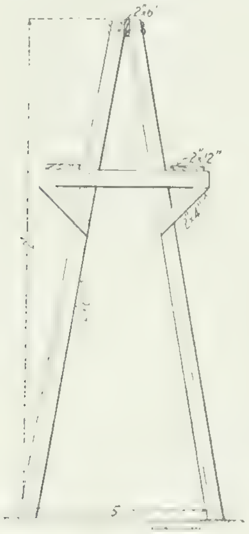
The accompanying drawing gives the details of the high-stage construction. The legs, at the bottom, are 2x6-in. and 2x4-in. plank nailed together to form angles; higher up a single 2x6-in. plank is used and sometimes a 2x4-in. piece is found on top of this. Planks 16 ft. long are used for legs and are spliced by a 24-in. lap joint. The spread of the legs at the stage bottom is about 8 ft., regardless of height, guy ropes being depended upon for stability. The diagonal-panel braces are 1x6-in. timbers; 2x6-in. horizontal side braces are spaced 10 ft. apart near the bottom and 12 ft. apart higher up. Half way between the horizontal side braces 1x6-in. horizontal diagonal braces tie the legs together guarding against failure of the structure should a slab fall down along the side, ripping out the horizontal side braces.

These diagonal braces are used as the intermediate braces on stages about 24 ft. in height when holes are to be put in by machine drill set up either on the ground or from a crib in the center of the stage. The platforms are usually 4½ to 5 ft. square at the top. In some cases the legs project about 4 ft. above the stage; railing planks are nailed to them on the sides and sometimes on the back; the front is always open so as not to interfere with the work. This idea of a railing to keep the men from falling off the stage should they slip or lose their balance, seems a good one, and should be incorporated in the design of all four-post stages. The structures are tipped over on their sides and moved about from place to place as needed, being raised again by means of poles and the guy ropes, care being taken to have an even pull on all the ropes. Broken high stages are used to build smaller ones. These stages have been built up to 65 ft. in height. I have personally seen one 54 ft. tall and have been on a 40-ft. one which was perfectly steady. The height limit appears to be about 60 ft., as after that they become weak in resisting bending when on their sides, and too heavy to move from place to place without breaking. This might be remedied by using bolts in the construction instead of nails, so that the stages could be moved in sections. At the same time it would be a difficult matter to raise such a stage without breaking it, when made sufficiently light.

A 145-ft. back was trimmed in the Federal mine, using a ladder made with 2x6-in. legs, and swung from a small bench on a pillar 75 ft. above the floor of the stope, as shown in the accompanying sketch. Front, side and intermediate guys led back to pins in adjacent pillars and the ladder made steady enough for two men to go to the top and drill holes by hand, for blasting down the loose slab.



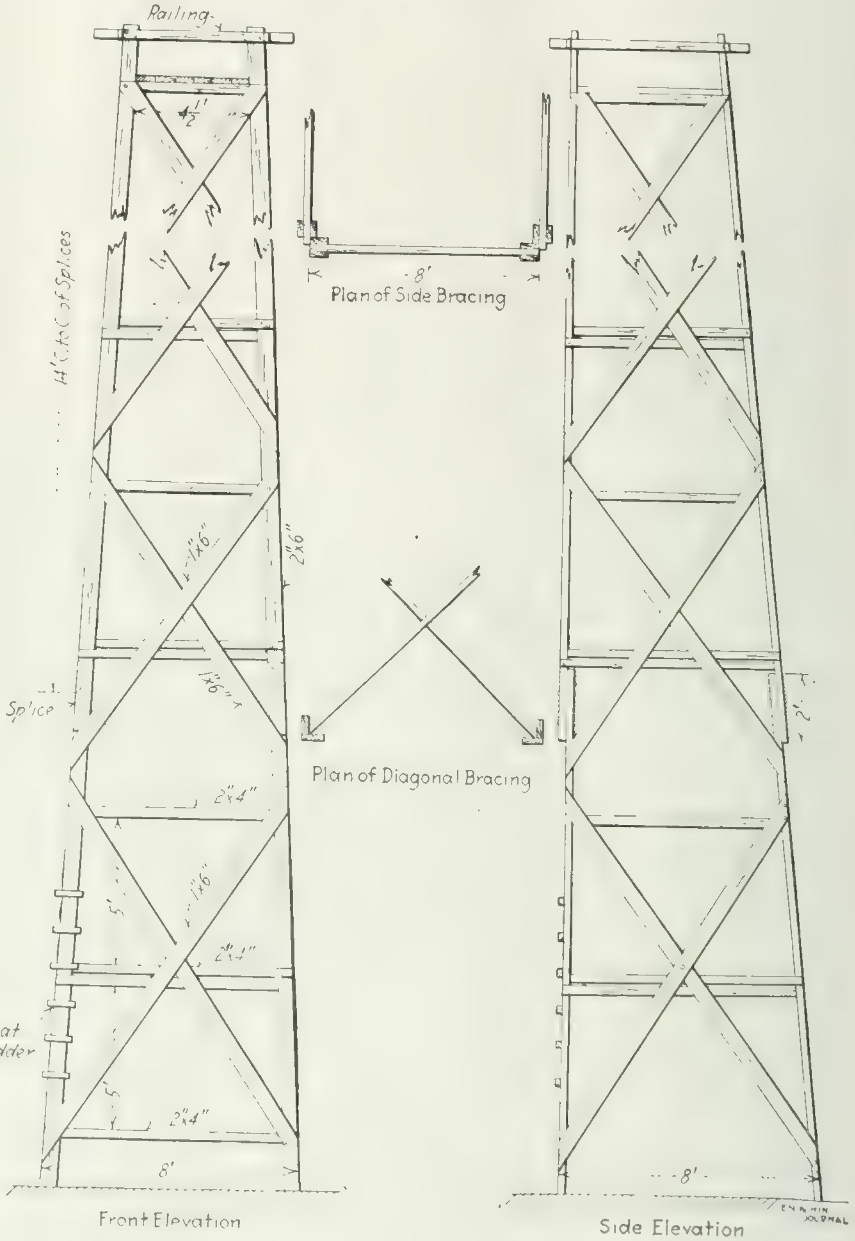
Stage from Running Stope



Saw-horse Stage

Long ladders are generally used to trim the sides of pillars. When the slabs are large and so high that the ladder may be broken by falling rock, it is possible to work on a platform hung from pins anchored in the side of the pillar. The ladder can then be removed. The use of ladders is economical, for even if the long ones are frequently broken the parts can be used again to better advantage than can the broken stages. It should be made compulsory for the miner to tie his ladder to a pin fixed in the solid ore, for it is impossible to tell which way a slab will bounce as it strikes the side of the pillar in falling. It could easily knock the ladder out from under the men working on it. A life line carried down the ladder from the pin would also be advantageous.

The sides of pillars have been scaled by a spiral plank walk carried on pins driven in holes drilled ahead from the last plank. This method has been used when the slab was near the top of a high pillar, inaccessible by ladder from the stope floor. Needless to say, this scheme is seldom used, but it is worthy of mention, as it is practicable in extreme cases.



Four-post Trimming Stage

The general practice is to trim the roof of all slabby ground as the top heading is advanced. Any brow caused by undermining a thinning bed of dolomite in the roof is broken down and any sudden drops from one bed to another are beveled off with a few half uppers.

In staging out from the top of the running stope, a bent of timbers supports the outer ends of the main longitudinal sills, while the inner ends which rest on the floor of the top heading are jacked down tight from the roof by machine columns as seen in the accompanying sketch. Cross planks are placed on the sills to complete the staging. The longitudinal sills are sometimes braced against side swing and a boom stage about 12 ft. long swung around the main stage as a pivot. The timbers of the boom stage go over one of the timbers of the main stage and back under the other one which may be jacked down from the roof by a machine column. When it is desired to extend the boom stage much beyond 12 ft., it is necessary to support it by ropes tied to pins in adjacent pillars.

A blast in a diamond-drill hole is a cheap way to get down a wide area of loose roof, not too far away from the place where it is possible to set up the drill. It is only possible to reach about

5 ft. in starting a diamond-drill hole. It is the best policy, however, to blast as little as possible; whenever shooting is required black powder should be used as it has less of a shattering effect than dynamite. Black powder tends to split the slab off along existing lines of weakness. The holes should be flat to allow the gases to spread out along the bedding planes.

At some of the Desloge shafts a trimming stage is used which is pushed up, with the men on it, by compressed air. It consists of a set of telescoping pipes, which carry a stage on their top section. From the top pipe a rod extends far enough to prevent the men being squeezed between the platform and the roof. When the stage has reached the proper height the pipes are clamped in position.

The legs of the four-post stage are not shown correctly in the side elevation in the sketch on p. 630; the plan of diagonal bracing in the same drawing, however, gives the proper construction of angle-legs of the stage.

Increase in Feldspar Production

The year 1911 showed the largest production ever recorded in the feldspar industry, the output being greater by 901 tons than that of 1907, the year of maximum production until 1911. The production in 1911, according to a report on feldspar and quartz, by Jefferson Middleton, of the U. S. Geological Survey, was 92,700 short tons, against 81,102 short tons, in 1910. In 1911 deposits in California, Connecticut, Maine, Maryland, Minnesota, New York, North Carolina, Pennsylvania, and Virginia were worked. Maine led all other states in quantity produced, with 25,976 short tons; New York was second, with 18,800 short tons; Connecticut third, with 16,497 short tons; Pennsylvania fourth, with 13,284 short tons; and Maryland fifth, with 12,694 short tons.

The principal use of feldspar is in the manufacture of pottery, enamel ware, enamel brick, and electrical ware. Of these the most important is its use in the body and glaze of pottery and vitrified sanitary ware, in which it constitutes from 10 to 35%. Other uses of feldspar, which do not require the high grades demanded by the pottery trade, are in the manufacture of emery and corundum wheels, in the manufacture of opalescent glass; as a poultry grit, and as a constituent of roofing material. Small quantities of the purest grades of potash feldspar are used in the manufacture of artificial teeth. For this purpose it brings the highest prices—from $6 to $8 per bbl. of 350 lb. It is also used in the manufacture of scouring soaps and window wash. The use of feldspar of the lower grades for poultry grit, roofing, etc., seems to be on the increase, and in 1911 a small quantity was used as railroad ballast.

Guatemala Systematically Prospected

Guatemala is the most backward of all the Central American Republics, as viewed from the standpoint of mineral production. With the exception of a small hydraulic property, at Las Quebradas, Department of Izabal, which has been worked from prehistoric times, there are no producers worthy of mention. On account of the difficulties of prospecting, common in all tropical countries, little intelligent development work was done.

This inactivity resulted in the granting of a concession to A. E. Spriggs, of Montana, carrying the exclusive right to prospect in the republic from May 15, 1911, to May 15, 1913, and the exclusive right to denounce any mineral discoveries until May 15, 1914. The Guatemala Mining & Development Co., an American company, with offices at 115 Broadway, New York, took over the concession and has just finished a systematic prospecting campaign, covering the whole republic with the exception of the Department of Peten, on the Yucatan frontier, where the climatic conditions and hostile natives make prospecting difficult.

The republic was divided, for prospecting purposes, into 50 districts, each district was assigned to an American engineer, who had in his party a practical miner and 50 natives. Each party made a reconnaissance of its district, getting as much information as possible from the native farmers regarding any mineral in their immediate vicinity. All prospects were carefully examined and notes taken on the territory covered. Each party was provided with a portable assay outfit with which rough determinations were made. Any property that looked at all promising was carefully sampled and the assays made at the central office in Guatemala City. The field notes of each party were sent to the central office from time to time and from them a complete geological map of the Republic of Guatemala has been developed. A total of 39 American engineers was employed. While the concession has served to keep foreign prospectors out of the country, it has caused great native activity. Before this time if a Guatemaltekan with no capital did find a prospect that looked promising to him, it was a difficult, if not impossible task, to do anything with it. The Guatemala Mining & Development Co. has established an office in Guatemala City, where all specimens are assayed free of charge. If they prove good an engineer is sent to examine the property.

A feature of the country which has caused great disappointment and has materially hindered prospecting, is that recent lava flows have capped and shut from view great sections of the most highly mineralized belts. An example of this is the Santa Maria volcano, which has covered an area of 50 sq.mi. with glass and volcanic ash from 10 to 100 ft. deep.

The results so far made public show that basic zinc ores are widely disseminated throughout the country, silver-lead ores are also frequently encountered. A fact worthy of note, however, is that up to the present no free-milling gold ore has been found. Aside from the work of prospecting, the Guatemala Mining & Development Co. has reopened and is developing a lead-silver *antigua* at Concepcion, in the Department of Chiquimula.

Mining in Rhodesia

Johannesburg Correspondence

At the end of June the ore reserves at the Globe & Phœnix mine were about 180,000 tons, of a value of £1,341,196, or practically the same as they were last year. Developments on the 19th, or lowest level, are poorer; but sufficient encouragement has been met to warrant the sinking of a new vertical shaft, the work on which has been begun.

A quartz-reef discovery was recently made near Gatooma by loaming and trenching. The grade is said to be high over a width of 10 ft. for 300 ft. A similar discovery was made in the Enterprise district, near Salisbury.

Roasting Plant at Antelope Mine

The ore reserves at the Antelope mine are 102,000 tons, valued at 40s. on the main oreshoot and 6300 tons valued at 32s. in other orebodies. The mine is to be equipped with an all-roasting plant on West Australian lines, to treat 4000 tons per month. Mining on this scale will exhaust 200 ft. in depth per year, as the shoot is short.

At the Cam & Motor mine, nearly a million tons of 10-dwt. ore are now exposed. In two crosscuts off the south drive, on the fifth level, the reef assayed 11 dwt. and 24 dwt., respectively, over 37 ft. and 15 ft. In places the orebody is 50 ft. wide.

The Giant mines continue boring to find the orebody lost at the seventh level; the results are encouraging. This mine has still about 300,000 tons in its reserves. In the past it has been one of the largest producers in Rhodesia. The Shamva mine has developed 2,142,000 tons, valued at £1 per ton recovery, with working costs estimated at 8s. per ton. The mine is valued in the market at about £1,600,000.

The yearly report of the Eldorado mine shows that a profit of £116,691 was made in 1911-1912. The ore reserves are 150,-

000 tons, valued at 13 to 15 dwt. over a stoping width. These show a reduction of 50,000 tons, due to a shortening of the oreshoot because of disturbed ground on the eighth and ninth levels. There are two parallel oreshoots and the total length of these at the seventh level was 790 ft. On the eighth and ninth levels the total length is about 300 ft. only.

The Falcon mine is developing a large quartz and schist body containing auriferous chalcocite and copper pyrite with some free gold. There are 630,000 tons fully developed above the fifth level, of a copper-gold value of 46s. per ton. In places the ore lenses are 90 ft. wide of a value of 60s. On the fourth level the lode is 20 ft. wide, assaying 9.7 dwt. gold and 4.22% copper. It is proposed to issue debentures to raise £300,000 to erect a plant consisting of concentrator and smeltery to treat concentrates. The proposed capacity is 15,000 tons per month. Probably the concentration plan includes a flotation process. The mine is at Umvuma.

The Bushtick mine, 30 miles from Bulawayo, is increasing its plant by four Nissen stamps and a tube mill, to treat 10,000 tons per month. The orebody is a vast shear zone in schist, but is of low grade.

The Wanderer mine, in the Selukwe district, has been working for many years crushing and cyaniding direct. So far, the 250,000 tons mined per year have been from the oxidized outcrops of bodies of pyritic hornblende schists; where the sulphides are reached, the ore is too hard and of too low grade to be payable. There are 350,000 tons in sight, but the mines have no future.

Two other mines will be producers in the future. The Eileen Alannah reports 215,000 tons of payable ore developed, and a plant to treat 3000 tons per month is ordered. The main oreshoot apparently pitches into the Cam & Motor ground.

In the Connemara mine, 90,000 tons of ore, valued at £160,000, are developed above the first level on an oxidized orebody. The orebody in the sulphide zone is promising, but has not been sufficiently explored to make the future of the mine secure. There has been another breakdown at the smelting plant of the Star of the Congo mine.

The reaction of the recent mining boom is now being felt in Rhodesia; business is stagnant and mining, despite a good output, is dull in most districts. Few discoveries are being made and new producers will be needed to take the place of the older mines, which are gradually dropping out.

The recent tin discoveries have given most disappointing results. The tin-ore occurrences in the pegmatite dikes have, as is usual in most parts of the world, proved too erratic to furnish reliable orebodies, and there are no important alluvial deposits. Owing to special freight rates, chrome iron ore is mined at a profit, sent by rail 560 miles to Beira and shipped to Europe; but the export of other base metals is unimportant.

September Mining Dividends

Mining dividends paid by 30 companies in September amount to $5,956,294; by holding, metallurgical, and industrial companies allied to the mining industry, $10,704,967; and by Canadian and Mexican mining companies, $1,610,181. Calumet & Hecla raised its dividend rate to $12 quarterly, the third successive quarterly increase. In view of the Mexican troubles, the dividend record of seven Mexican mining companies, of $1,238,457, is truly remarkable.

United States Mining Companies	Situation	Per Share	Total
Bunker Hill & Sullivan, l s	Ida.	0 20	65,400
Bunker Hill Con., g.	Calif.	0.05	10,000
Calumet & Ariz., c	Ariz	1.00	596,353
Calumet & Hecla, c	Mich.	12 00	1,200,000
Champion, c	Mich.	1 00	100,000
Colorado, l s g	Utah	0 03	30,000
Doe Run, l	Mo.	1 50	98,673
Fremont, g	Calif.	0.02	4,000
Federal M & S pfd, l s.	Ida.	1.50	180,000
Frontier, l z.	Wis.	2 00	2,500
Gold Chain, g	Utah	0.02	20,000
Gold Dollar Con, g	Colo.	0 00½	12,500
Golden Cycle, g	Colo.	0 02	30,000
Klar Piquett, l z.	Wis.	0 25	5,000
Hecla, l.s.	Ida.	0.05	50,000
Homestake, g	S.D.	0.50	109,200
Iowa-Tiger Leasing, l s g	Colo.	0.112*	
Nevada Con., c.	Nev.	0 37½	749,784
North Star, g	Calif.	0 30	75,000
Pittsburgh-Idaho, l.	Ida.	0.04	32,120
Quincy, c	Mich.	1.25	187,500
St. Joe, l.	Mo.	0 15	150,000
Success, l z s	Ida.	0 03	45,000
Superior & Pitts, c	Ariz.	0.30	449,939
Tom Reed, g.	Ariz.	0.05	45,478
United Verde, c	Ariz.	0.75	225,000
United Copper Min.	Wash.	0.01	10,000
Utah Copper, c	Utah	0.75	1,181,347
Wasp No 2, g	S.D.	0 02	10,000
Yukon Gold, g	Alaska	0.07½	262,500
Yellow Pine, g	Nev.	0 02	19,000

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
American Coal.	Penn.	0.75	37,500
Am Sm & Ref com	U. S.	1.00	500,000
Am. Sm. & Rf. pfd.	Mex.	1.75	875,000
General Asphalt, pfd.	U. S.	1.25	164,120
General Chem., com.	U.S.	1.50	122,269
Harbison-Walker, com.	U.S.	0.50	90,000
Int. Nickel, comm.	U.S.	5.50	637,200
National Lead, com	U.S.	0.75	154,914
National Lead, pfd.	U.S.	1 50	426,433
Phelps Dodge	U.S.	2.50	1,125,000
Pittsburgh Steel, pfd	Penn.	1.75	218,750
U.S. Steel, com.	U.S.	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Blanca s	Hid.	0.90	11,250
Crown Reserve, s	Ont.	0 05	88,441
Dos Estrellas, g.s	Mich.	2 50	750,000
Hedley, g.	B C	0 30	60,000
Kerr Lake, s	Ont.	0 25	150,000
Lucky Tiger, g s	Son.	0 05	35,767
Mex. Mines of El Oro	Mex.	1 46	262,140
Peñoles, g.s.l	Dur.	1.25	150,000
Santa Maria de la Paz, s	S.L.P.	2.50	21,000
Standard, s l	B.C.	0 02½	50,000
Tem. & Hud. Bay, s.	Ont.	3 00	23,283
Victoria, s	S.L.P.	2 50	5,000

*Dissolution dividend

Mining dividends paid by United States mining companies making public reports amount to $42,182,413 for the first nine months of the year, and for mining, metallurgical and allied companies, to $128,773,724.

Chronology of Mining for September, 1912

Sept. 3—An explosion of firedamp in the Clarence colliery, near Bruay, Département du Nord, France, killed 61 men, including some of the rescuers who entered the colliery after the initial explosion.

Sept. 4—Heavy rains flooded the Ruddy mine, at Biwabik, Minn., causing caving at the shaft and entombing three men.

Sept. 5—One man was killed and five slightly injured in an overwinding accident at the Bunker Hill & Sullivan mine, at Kellogg, Idaho.

Sept. 15—Mexican rebels captured the town of El Tigre, Sonora, Mexico, and robbed the Lucky Tiger-Combination Gold Mining Co., of bullion and merchandise.

Sept. 16—One man was killed and two injured by an explosion of gas in the Wharton Coal Co. colliery, at Coral, Penn., a few hours after the mine had been declared nongaseous by the inspectors.

Sept. 18—Miners at Bingham, Utah, went out on strike upon refusal of the companies to advance wages 50c. per shift and recognize the union.

Sept. 28—Nevada Consolidated Copper Co. voluntarily advanced wages at Ely about 25c. per day.

American Iron and Steel Institute

Secretary McCleary has sent out a preliminary announcement of the third general meeting of the institute which will be held at Pittsburgh, Oct. 25 and 26. There will be forenoon, afternoon and evening sessions on Friday, the papers and discussions relating respectively to business topics, technical and works subjects and welfare work. A banquet will be given Friday evening at which the members will be guests of the institute. Saturday will be devoted to seeing Pittsburgh and vicinity. Among the papers and addresses in preparation for the meeting are the following:

"The Use of Mayari Iron in Foundry Mixtures," by Quincy Bent, assistant to the president Maryland Steel Co.

"The Manufacture of Ordnance at the Bethlehem Steel Works," by E. G. Grace, vice-president and general manager Bethlehem Steel Co.

"Electric Power Production and Distribution in Steel Works," by Stewart C. Coey, engineer, Youngstown Sheet & Tube Co. Discussion led by B. R. Shover, Brier Hill Steel Co.

"Coal Mine Ventilation in the Connellsville Coke Region," by Austin King, chief mine inspector H. C. Frick Coke Co. Discussion led by Wilson A. Luce, General Manager Ellsworth Collieries Co.

"The Technical Training of Salesmen," by James Camp, Carnegie Steel Co. Discussion led by E. P. Thomas, president United States Steel Products Co.

"Microscopic Analysis of Steel Sheets," by C. Arthur White, American Sheet & Tin Plate Co.

"Recent Developments in the Preparation of Iron Ores," by J. W. H. Hamilton.

"The Buyer from the Manufacturer's Standpoint," by John L. Haines, assistant to the vice-president Jones & Laughlin Steel Company.

United States Foreign Steel Trade

Exports and imports of iron and steel and of machinery in the United States for seven months ended July 31, are valued as below by the Bureau of Foreign and Domestic Commerce of the Department of Commerce and Labor:

	1911	1912	Changes
Exports	$139,099,793	$164,958,525	I $25,858,732
Imports	17,942,937	15,960,533	D. 1,982,404
Excess, exp.	$121,156,856	$148,997,992	I. $27,841,136

Increase in exports, 18.6%; decrease in imports, 11%. The leading articles of iron and steel were, in long tons:

	Exports		Imports	
	1911	1912	1911	1912
Pig iron	76,577	148,703	97,552	64,604
Scrap	51,438	62,191	12,572	9,595
Billets, blooms, etc.	149,419	165,248	17,395	10,784
Bars	82,184	116,818	16,497	15,377
Rails	269,853	271,747	326	1,779
Sheets and plates	190,793	309,501	1,411	1,847
Structural steel	125,665	164,685	216	1,430
Wire-rods	9,560	37,219	10,002	8,381
Wire	120,911	143,933	.	
Nails and spikes	45,736	58,233	.....	.....
Tinplates	36,291	54,165	12,369	1,053
Pipe and fittings	111,784	153,933	.....	......

Imports of wire not reported in quantities; values were $820,002 in 1911, and $606,402 in 1912. Exports of mining machinery were valued at $4,054,615 in 1911, and $4,072,296 this year.

California Oil in August

The net production of petroleum in California fields in August was 7,170,989 bbl., a daily average of 231,321 bbl.; an increase over July of 139,131 bbl. in total net production and 5068 bbl. in daily average production. The increases were in Coalinga, Sunset-Maricopa, Midway, Lost Hills, Fullerton-Puente, Whittier, Coyote-La Habra and Ventura.

August shipments totaled 6,685,106 bbl., an increase over July of 370,527 bbl. The daily average shipments were 215,648 bbl. in August, and 203,373 bbl. in July, an increase of 12,275 in August. Field consumption in August was 421,346 bbl., a decline of 1480 bbl. from July consumption.

The stocks on hand at the end of August totaled 45,924,450 bbl., an increase over July of 434,275. This increase is 36,638 bbl. less than the increase from June to July.

Operation and development in the fields showed 31 new rigs; 73 completed wells; 5508 producing wells active; 704 wells capable of producing, but idle; 399 wells actively drilling; 335 wells on which drilling was suspended; 31 wells being deepened; 8 wells abandoned.

AUGUST OIL PRODUCTION

District	Bbl.
Fresno County	
Coalinga	1,579,576
Kern County—	
Midway	2,136,322
Kern River	905,365
Sunset-Maricopa	510,976
McKittrick	506,360
Lost Hills	116,554
Total Kern County	4,175,577
Santa Barbara County—	
Santa Maria, Lompoc, Cat Cañon	133,863
Summerland	4,350
Total Santa Barbara County	138,213
Southern Fields	
Fullerton-Puente	487,196
Salt Lake-Sherman	225,227
Coyote-La Habra	109,089
Ventura	59,873
Whittier	54,918
Los Angeles	31,842
Newhall	9,478
Total Southern Fields	977,623
Total All Fields	7,170,989

The Mineral Industry for 1911*

Vol. XX of "The Mineral Industry," covering the year 1911, made its appearance early in September, which is as early as it can be expected. It is hard for the casual reader to appreciate the length of time and the amount of labor required in its preparation. In our opinion, the editor of the present volume has performed his task in a highly creditable manner.

Vol. XX is like its predecessors in scope and arrangement, but is slightly larger than the two just before it. As is customary, statistics of earlier years have been carefully compared with the latest official publications, resulting in the correction of occasional errors found in preceding volumes, as well as the substitution of authentic for estimated figures. Consistency in error has never characterized "The Mineral Industry"; hence it is always safest to consult only the latest published volume.

Among the contributors to the present volume appear the names of most of those who have lent weight to its predecessors. Prof. J. W. Richards writes authoritatively on aluminum; L. S. Austin reviews the progress of copper smelting; Prof. C. H. Fulton outlines recent developments in cyanidation; Professors Richards and Locke abstract the recent literature on gold milling and on ore dressing and coal washing; Prof. H. O. Hofman analyzes the year's advances in lead smelting; Bradley Stoughton describes improved processes in the metallurgy of iron and steel; and W. R. Ingalls performs the same service with respect to zinc. George F. Kunz, as in years past, describes newly discovered occurrences of diamonds and other gems, besides reviewing progress in the older fields. Frederick Hobart writes his customary annual review of the iron and steel industry, and F. W. Parsons does the same for coal and coke.

Concerning these perennial features, it is enough to say that in every resect they maintain their habitual high order of excellence. Regarding certain of the technical reviews, however, it is possible to regret that their distinguished authors do not see fit to supplement their laborious and painstaking abstracts of other people's writings by criticisms and personal opinions of the ideas advanced.

The editor of Vol. XX has enlisted the services of a number of experts, no less distinguished, whose names have not heretofore appeared prominently on the lists of contributors. G. L. English, of Shelby, N. C., writes on monazite and allied minerals. T. T. Gray, chief chemist of the Tidewater Oil Co., describes recent progress in petroleum refining. F. W. Horton, formerly identified with the U. S. Geological Survey's platinum investigations, writes informingly on that metal. Prof. E. C. Holden writes of sulphur, pyrite and sulphuric acid. F. J. Tone, works manager of the Carborundum Co., contributes the article on that subject. A bibliography of recent literature on mining subjects, compiled by Prof. L. E. Young, constitutes a valuable chapter of the volume. J. P. Hutchins and C. W. Purington describe the gold and platinum industries of Russia, a topic on which no better informed authorities could be mentioned. R. S. Morrison, distinguished writer on mining law, is the author of a chapter of abstracts of recent decisions. S. F. Shaw's tabulated data on the principal mines of the world, appearing first in the ENGINEERING AND MINING JOURNAL, is reproduced in full, and constitutes a most valuable innovation. The back of the book contains the usual statistical matter relating to the production and trade in mineral substances by the leading countries, revised and brought up to date, that is, as nearly up to date as the dilatory habits of the statistical bureaus in certain countries will permit. A full and clear index rounds out the volume and adds much to its usefulness.

It would be hopeless to attempt in this space to offer a critical review of the subject matter in the volume. The editor has not always successfully battled with a tendency toward prolixity manifested by some of his contributors. Neither has he always adopted the best possible arrangement of the material; for example, the article on placer mining, much of which might better have been distributed under appropriate captions in the review of gold mining. Similarly, the review on gold milling and that on cyaniding overlap so broadly as to suggest the desirability of combining the two articles in forthcoming issues. The use of the term "ore" is not to be recommended in connection with asbestos or barite.

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*The Mineral Industry During 1911. Vol. XX. Edited by Charles Of. 6x9, pp. 997, illus. cloth $10. McGraw-Hill Book Co., New York.

A good many typographical errors, and cases of faulty makeup, easily explained by the necessity for haste and by other circumstances attending the period of its preparation, mar the perfectness of the volume without, however, detracting from its value to those familiar with its many virtues.

American Institute of Mining Engineers

Notice is given that the adjourned annual business meeting to consider the report of the special committee and the proposed amendments to the constitution, will be held at 10 a.m. on Oct. 7, at the headquarters of the Institute in New York.

CLEVELAND MEETING

The 103d meeting of the Institute, for the reading and discussion of professional papers, will be held at Cleveland, Ohio, beginning on the evening of Oct. 28. The provisional program provides for sessions on Oct. 29, 30 and 31, and for trips to various points of interest in the Cleveland district.

The majority of the papers in the following list will be, as usual, read by title, or presented in brief oral abstract only. Printed copies of many of them will be on hand at the sessions. Members desiring to see any of these papers for the purpose of discussion at the meeting, are requested to communicate with the secretary, who will forward in reply advance copies of the desired papers, if they are in print, or will give opportunity during the meeting for an inspection of the manuscripts.

IRON AND STEEL DIVISION

"Method of Surveying and Sampling Diamond-Drill Holes," by E. E. White, Ishpeming, Mich.

"Cuyuna Iron-Ore Range," by Walter A. Barrows, Jr., Duluth, Minn., and Carl Zapffe, Brainerd, Minn.

"The Manufacture of Coke," by W. H. Blauvelt, Syracuse, N. Y.

"The Manufacture of Coke," by F. E. Lucas, Sydney, C. B.

"Notes on Ruff's Carbon-Iron Equilibrium Diagram," by Henry M. Howe, New York, N. Y.

"The Utility of Efficiency Records in the Manufacture of Iron," by John J. Porter, Staunton, Va.

"The Fuel Efficiency of the Cupola Furnace," by John J. Porter, Staunton, Va.

"Blowing In of Blast Furnaces," by Ralph H. Sweetser, Columbus, Ohio.

"On Blast-Furnace Air Pressure," by J. E. Johnson, Jr., Ashland, Wis.

"Notes on Titanium, and the Cleansing Effect of Titanium on Cast Iron," by Bradley Stoughton, New York, N. Y.

"N. M. Wittorff's Preliminary Investigation of Primary Crystallization and subsequent Physico-Chemical Permutations in Iron-Carbon Alloys Containing More Than 4% of Carbon," by Bradley Stoughton and Simon Marcus, New York, N. Y.

"Notes on the Structure of Steel," by William Campbell, New York, N. Y.

"A Novelty in Openhearth Steel-Furnace Practice," by N. E. Maccallum, Phoenixville, Penn.

"The Heat Treatment of Steel Castings," by C. D. Young, Rolla, Mo.

"The Case Hardening of Special Steels," by Albert Sauveur and G. A. Reinhardt, Cambridge, Mass.

"A Comparison of the Action of Various Carbonizing Materials," by Robert R. Abbott, Cleveland, Ohio.

"An Investigation into the Relations Existing Between Hardness as Measured by the Brinell and Scleroscope Methods and Depth of Carbonization Upon Different Kinds of Steel Hardened Under Different Conditions," by Mark A. Ammon, Cleveland, Ohio.

"The Effect of Alumina in Blast-Furnace Slags," by J. E. Johnson, Jr., Ashland, Wis.

GENERAL SUBJECTS

"Centrifugal Machines as Applied to Ore Grading and Ore Concentrating," by Godfrey T. Vivian, Cornwall, England.

"The St. Helens Mining District, Skamania, Wash.," by Horace V. Winchell, Minneapolis, Minn.

"Mine Fires in Metalliferous Mines," by George J. Young, Reno, Nev.

"Present Conditions of Mining in the District of Vladivostok, Siberia," by Albert F. J. Bordeaux, Vladivostok, Siberia.

"The Sampling of Gold Bullion," by Frederic P. Dewey, Washington, D. C.

"A Titaniferous Iron-Ore Deposit in Boulder County, Colo.," by E. P. Jennings, Salt Lake City, Utah.

"An Experience in the Use of Water Power," by C. M. Myrick, San Francisco, Calif.

"Our National Resources and our Federal Government," by R. W. Raymond, New York, N. Y.

"The Ta-yeh Iron-Ore Deposits, Hu-pei Province, China," by C. M. Weld, Lowmoor, Va.

"Clinton Iron-Ore Deposits in Kentucky and Tennessee," by S. Whinery, New York, N. Y.

"The Wood Flotation Process," by Henry E. Wood, Denver, Colo.

"Gold in Eocene Deposits, Texas," by E. T. Dumble, Houston, Tex.

"A Graphic Solution of D'Arcy's Formula for the Transmission of Compressed Air in Pipes," by Nathaniel Herz, Lead, N. D.

"The Alundum Extraction Thimble Used in the Determination of Copper," by L. W. Bahney, New Haven, Conn.

"Notes on the Metallography of Alloys," by William Campbell, New York, N. Y.

"Constitution and Melting Points of a Series of Copper Slags," by Charles H. Fulton, Cleveland, Ohio.

New Geologic Map of Alaska

A map of Alaska, compiled under the direction of Alfred H. Brooks, and recently issued by the U. S. Geological Survey, shows in a general way what is known of the mineral resources of that territory. On the map, which is 17x24 in., areas of gold and silver quartz, gold placers, copper lodes, tin deposits, petroleum areas and gypsum mines are indicated by various symbols in red; marble quarries are aso shown. Because of the interest in Alaskan coal lands, the following different classes are shown by separate colors: Areas underlain by anthracite and high-grade bituminous coal; those which may contain such coal; known areas of low-grade bituminous coal and those which may contain such coal; areas known to contain lignite and those which may contain lignite. The price is 10c. per copy or $6 per hundred.

Imports and Exports of Metals

Exports and imports of metals in the United States, seven months ended July 31, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess	
Copper, long tons	213,354	105,482	Exp.	107,872
Copper, 1911...	205,097	80,111	Exp.	124,986
Tin, long tons..	344	31,012	Imp.	30,668
Tin, 1911........	842	28,884	Imp.	28,042
Lead, short tons	42,688	55,110	Imp.	12,422
Lead, 1911...	61,503	53,623	Exp.	7,880
Zinc, short tons..	6,180	3,100	Exp.	3,080
Zinc, 1911 . .	3,565	1,257	Exp.	2,308
Nickel, lb........	15,672,944	22,083,095	Imp.	6,410,149
Nickel, 1911....	14,233,495	16,589,322	Imp.	2,355,827
Antimony, lb.....	40,992	9,419,796	Imp.	9,378,804
Antimony, 1911.	160,844	6,489,053	Imp.	6,328,209
Platinum, oz.....	....	56,302	Imp.	56,302
Platinum, 1911.	47	60,983	Imp.	60,936
Aluminum, lb....	211,036	11,453,636	Imp.	11,242,600
Aluminum, 1911	....	....	....	
Ores, etc.				
Zinc in ore, lb...	13,420,634	15,631,149	Imp.	2,210,515
In ore, 1911....	13,127,026	20,435,926	Imp.	7,308,900
Zinc oxide, lb. ..	20,351,097	....	Exp.	20,351,097
Zinc oxide, '11..	16,519,115	....	Exp.	16,519,115
Zinc dross, lb....	403,918	....	Exp.	403,918
Zinc dross, '11..	5.238,021	....	Exp.	5,238,021
Chrome ore, l.t..	....	31,566	Imp.	31,566
Chrome ore, '11	5	23,068	Imp.	23,063

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Quantity of zinc ore imported in 1912 was 23,026 tons; exported, 13,766. Imports of aluminum were not reported previous to July 1, 1911. Exports of manufactures of aluminum were valued at $781,545 this year. The metal exports given above, include re-exports of foreign materials.

U. S. Chemical Trade

Imports and exports of chemicals and fertilizers, including raw materials for chemical manufacture, in the United States for the seven months ended July 31 were as follows:

	Imports	Exports	Excess	
Copper sulph. lb.	....	5,504,879	E.	5,504,879
Copper sul., '11	....	6,344,851	E.	6,344,851
Bleach, lb	41,520,981	400	I.	41,520,581
Bleach, 1911....	50,907,542	17,368	I.	50,890,174
Potash salts, lb..	374,784,300	1,710,625	I.	373,073,675
Potash salts, '11	409,709,337	2,428,039	I.	407,281,298
Soda salts, lb....	7,187,205	300,808	I.	6,886,397
Soda salts, 1911	17,024,885	337,909	I.	16,686,976
Acetate lime, lb.	....	45,777,383	E.	45,777,383
Acetate, 1911...	....	46,964,099	E.	46,964,099
Nit. of soda, tons	310,504	6,034	I.	304,470
Nitrate, 1911...	357,519	3,934	I.	353,585
Phosphates, tons	....	702,767	E.	702,767
Phosphates, '11 .		710,458	E.	710,458
Sulphur, tons...	15,377	24,944	E.	9,567
Sulphur, 1911..	12,027	16,297	E.	4,270
Pyrites, tons....	555,059	....	I.	555,059
Pyrites, 1911...	578,424	....	I.	578,424
Magnesite, lb .	128,756,843	1,333,024	I.	127,423,819
Magnesite, 1911	164,125,494	1,443,095	I.	162,682,399
Sul. ammonia, lb.	56,560,924	357,600	I.	56,203,324
Sul. am'nia, '11	96,223,359	....	I.	96,213,359
Arsenic, lb.......	2,983,425	850	I.	2,982,575
Arsenic, 1911...	2,951,920	3,000	I.	2,948,920

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total quantity of sulphur imported this year was 223,562 tons.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Emergency Pump Installation

By D. R. Thomas*

The following notes on pump installation may be of interest to those in charge of mines subject to sudden flows of water. I was once compelled to install a 400-gal. pump in as short a time as possible to save the mine from being drowned out. It may be mentioned this mine was 60 miles from a railroad and no facilities were at hand such as are found in ordinary mining camps. After the pump station was finished and the muck cleaned out, 8x8-in. cross ties were laid on the floor; on these were laid longitudinal stringers on which the pump rested. While the timbermen were leveling up the timbers the mechanics were bolting the pump together and in a few hours the pump was running; by this time the water had gained on the sinkers till the men were knee deep in water. When the pump was started up it rocked when running at high speed; however, as the pump was a compound machine of the "bob-tail" type, it did not matter much; the exhaust steam was turned into the sump as no time was found for connecting up the condenser. In a few days the water was under control and a box was made around the pump and concrete was run in between the timbers on which the pump rested. In a few days this hardened so that the pump was perfectly solid. The condenser was then connected up. It may be mentioned that no bolts of any kind were used except four lag screws through the feet of the pump.

To avoid putting screens around the suction a partition was placed in the sump like a division in a zinc box; whatever material floated on the water was caught and all the grit and sand sank in the first compartment so that the pump had clear water to handle all the time.

In order to be sure of holding the water from overflowing the sump and flooding the shaft, a wheel about 10 in. diameter was bolted on the throttle valve (the throttle valve used was a plain globe valve) over which a bell rope was passed to a float in the sump and a counterweight at the pump. This arrangement proved satisfactory to hold the water level within a range of four inches.

Hydraulic Surface Exploration

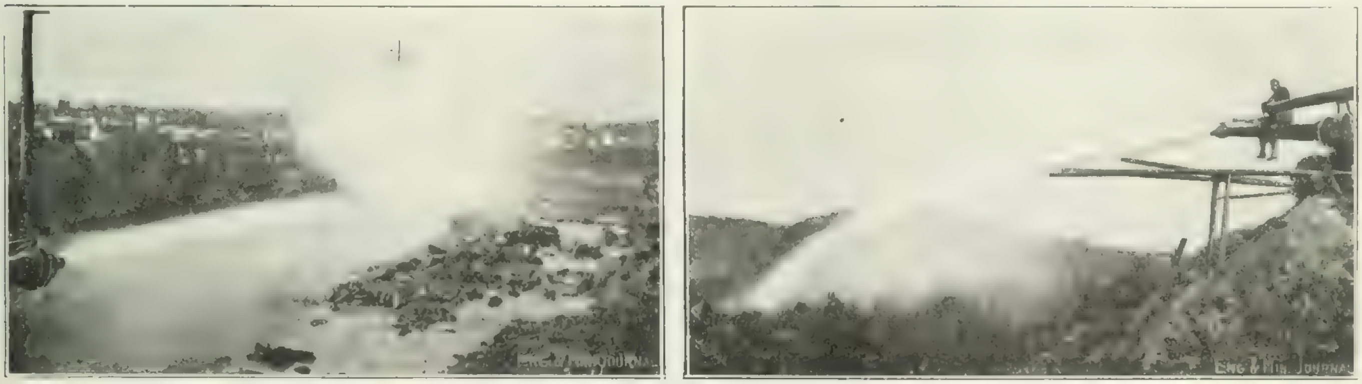
By Herbert A. Megraw

An interesting method of surface prospecting is being practiced by the Nipissing Mines Co., in the Cobalt district of Ontario, Canada. The bedrock is covered with drift, soil and vegetable growth, which makes examination of the rock by the usual trenching method slow and expensive. In view of the existence of many small fissures, which traverse the rock in all directions, an examination of the surface is believed to be of great advantage in assisting exploration and a method has been devised for exposing the rock at a minimum expense.

The method consists in washing off surface débris with a stream of water under pressure. To do this there has been installed a single-stage centrifugal pump, with a capacity of 48,000 gal. per min., directly connected to a 650-hp. motor, which pumps water from Cobalt Lake and delivers it through a pipe line to a hydraulic giant of the type usually used in placer mining. Three nozzles were furnished with the giant to vary the pressure of the water stream. A 3½-in. nozzle throws the water with a pressure of 125 lb. per sq.in. at a height of 150 ft. above the pump. When the 3-in. nozzle is used a pressure of 140 lb. is attained, while with the 4-in. nozzle a corresponding reduction of pressure is made.

When the ground is tight and heavy roots and boulders are to be moved, the highest pressure is used, and where there is less weight and plenty of swing is attainable, the lower pressures are put into service. Sometimes heavy boulders or deeply rooted stumps are encountered that do not yield readily to the water pressure, and, in such cases, dynamite is used to break up the rock or to uproot the stumps. It is also simple to open fissures in the rock when it seems desirable for purposes of exploration, by putting in a shot or two and then washing away the débris with the water stream.

As the object is not to move a quantity of material, but simply to uncover the bedrock, it is unimportant what happens to the débris after its removal from the area to be explored. An area once uncovered, explored and its condition recorded, may be then covered up by the débris from another area. The system allows the examination of the bedrock surface at a cost which is low compared with the expense incurred in trenching.



Prospecting by Hydraulicking the Overburden from the Bedrock, Nipissing Mine, Cobalt, Ontario

Pulsometer Handling Solid Material

The pulsometer, having no moving or delicate parts, can handle water containing a large percentage of gritty and solid material without injury to itself. The manufacturers report that a No. 6 machine handled five tons of limestone and quartz per hour, pieces ranging in size from ⅛ in. down, with the greater proportion smaller than 1/16 inch.

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*Mining engineer, 55 Liberty St., New York.

Gasoline Locomotive Underground

The excellent ventilation of the Desloge Consolidated mines in the lead district of southeastern Missouri permits the use of gasoline locomotives in the main haulage ways without any provision being made for the removal or purification of the exhaust gases.

The locomotives have a single 11x18-in. cylinder and are rated at 25 hp. each. They have a plain mixing valve; all openings are large with the exception of the one feeding the gasoline into the carburetor and this is easy of access. The sparker is of the make-and-break type, using a set of eight Columbia multiple dry cells, which last for about 1250 miles. This is a specially constructed cell, well adapted to mine work as it has only two binding posts, consequently fewer connections to wear loose and less danger of broken wires. Due to the one-cylinder construction of the engine a double flywheel is provided for the accumulation of power.

The power is transmitted through a friction clutch of the expanding-spoke type. By means of the slip that is allowed between the clutch and the driving wheel the speed of the locomotive is regulated. No trouble has been experienced with the clutches slipping when full speed is desired. It is also possible to regulate the speed by an adjustable governor, but this is only used in making the larger variations, such as occur at the end of trips. The maximum speed of the locomotive, which is built by William Ellison & Sons, St. Louis, Mo., is 15 miles per hour. On the level it will haul 20 to 25 cars of 1½ tons capacity or 16 such cars up a ¾% grade. Hauls very from 1600 to 2500 ft. With longer pull one locomotive hauls 600 tons in eight hours against a ¾% grade and could easily handle 1000 tons under the same conditions.

The gasoline locomotives have been in use at the No. 4 shaft for three years and elsewhere on the property from 1½ to two years. An extra locomotive is always in reserve for each one in use, making necessary a double equipment.

Mules are used for tramming throughout the mine except in the main haulage levels. This gives a good basis for the comparison of costs. With hay at $12 per ton and corn at 40c. per bu., as it was three years ago, the locomotive is no cheaper than the mule, but with hay at from $28 to $30 per ton and corn at 75c. per bu., as is the case at present, there is an advantage in favor of gasoline haulage.

The ore occurs in and near the bottom of a flat-dipping dolomite formation and about 400 ft. below the surface. The workings are particularly well ventilated by means of churn-drill holes from the surface and a thorough system of underground connections. This fact alone is responsible for the successful operation of the gasoline haulage without any attempt to offset the vitiating of the mine air by the exhaust gases.

Prospecting Headframe

By Charles Mentzel*

Doubtless many have seen headframes similar to the ones here described, but there are a good many who have not, judging from the weird affairs one so often sees when visiting a new camp. A little consideration of the stresses in a headframe and a few minutes calculation will show that a frame of good design and sufficient strength and stability for sinking purposes can be constructed at considerably less cost than the four-post frame, cross-braced on all sides, so often found over a prospecting shaft. In addition, the greater convenience, decrease in surface attendance and greater speed in handling buckets, owing to the self-dumping arrangement, give the type to be described a decided advantage.

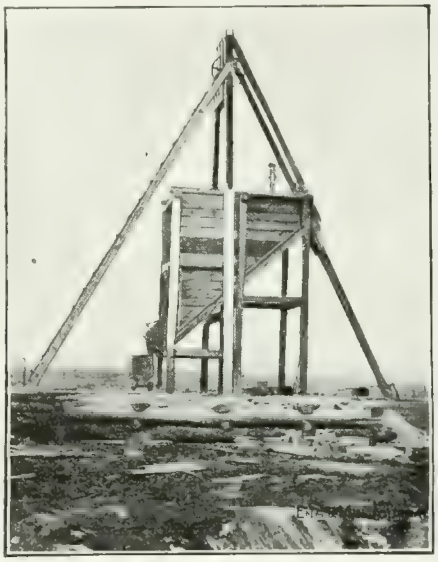

Fig. 1. Headframe with Ore Pocket

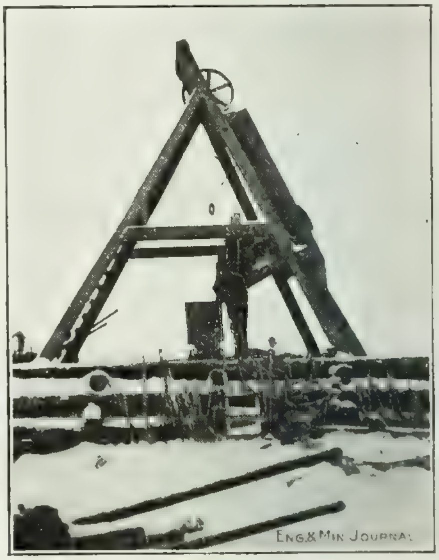

Fig. 2. Low Type of Headframe

This improved headframe can be used either for vertical or inclined shafts. In the former, skids are easier than guides to place in the shaft, and they obviate the use of the crosshead, often a source of danger. Where the ground is good, all the timber necessary is a wall plate about every 8 or 10 ft. tightly wedged to the ends of the shaft. The skids are spiked to the plates.

Prospecting shafts usually follow the ore and, therefore, are almost always inclined; and generally the inclination varies from time to time. The accompanying photos show headframes which I constructed at the West Dome mines at Porcupine in 1911. The one with the pocket is about 40 ft. high and the smaller one about 22 feet.

The essential points entering into the design of a headframe are the height of the car used to remove the hoisted muck, and the distance of the hoist from the shaft. If it is considered advisable to build a frame with a pocket, which will do away with the services of a top man on night shift, it is calculated to hold about 30 tons and to fit between the front posts.

The construction of the bucket is the next consideration. A bucket of approximately 10 cu.ft. capacity is usually about 26 in. diameter at the top, 24 in. at the bottom and about 34 in. deep. Two horns, 8 or 9 in. long and 1¼ in. diameter, are fastened to opposite sides of the bucket about 9 or 10 in. from the bottom, as shown in Fig. 4. They are attached to flanges riveted inside and outside the bucket as shown in detail in Fig. 5. Having the bucket in dumping position, a line may be drawn through the horns at the angle of the shaft as shown in Fig. 3. If the dip of the shaft is greater than 65°, it is better to draw this line at not more than 65°, so as to have the dumping bucket far enough from the shaft to prevent a spill.

The position of the sheave depends upon the height of the dumping device and the amount of overwind allowable. In prospecting shafts the danger of overwinding is small with the slow, low-power, geared hoists usually employed, so 5 ft. is sufficient, and taking the length of bale, clevise, thimble and about 2 ft. of cable doubled to clamp it, gives about 10 or 12 ft. as the distance from the dump to the tangent of the sheave wheel. Knowing the diameter of the sheave and the size of the pillow blocks in the headframe shown in Fig. 1, the vertical posts can be readily located.

Having the front posts, the back braces may be drawn as follows: Scale off distance *CB* of hoist from collar of shaft as shown at Fig. 6. Draw *AE* tangent to hoist drum and sheave. Theoretically the line *AD* bisecting the angle *EAB* is in the best position to receive the pull of the hoist and the resisting pull of the load if these forces are equal. *AD*, however, may be too close to the line of the vertical posts to ensure stability, and it is better in any event to place it so that the foot comes closer to the hoist at *F*. The position of the posts and back braces have now been decided. To find out how to place these with respect to the shaft we must consider how the bucket rides on the skids. This is shown in Fig. 7 and in Fig. 3 at *A*. The skids are 6- or 8-in. round skinned poles dressed at the parts where they are fastened to the wall plates and are placed so that the bucket rides on them as shown, without touching the wall plates. The horns do not come in contact with anything in the shaft. With this sketch made we have the position of the hoisting cable with respect to the shaft and headframe, and referring to Fig. 3, we can locate the posts and back braces.

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*Mining engineer, 29 Broadway, New York.

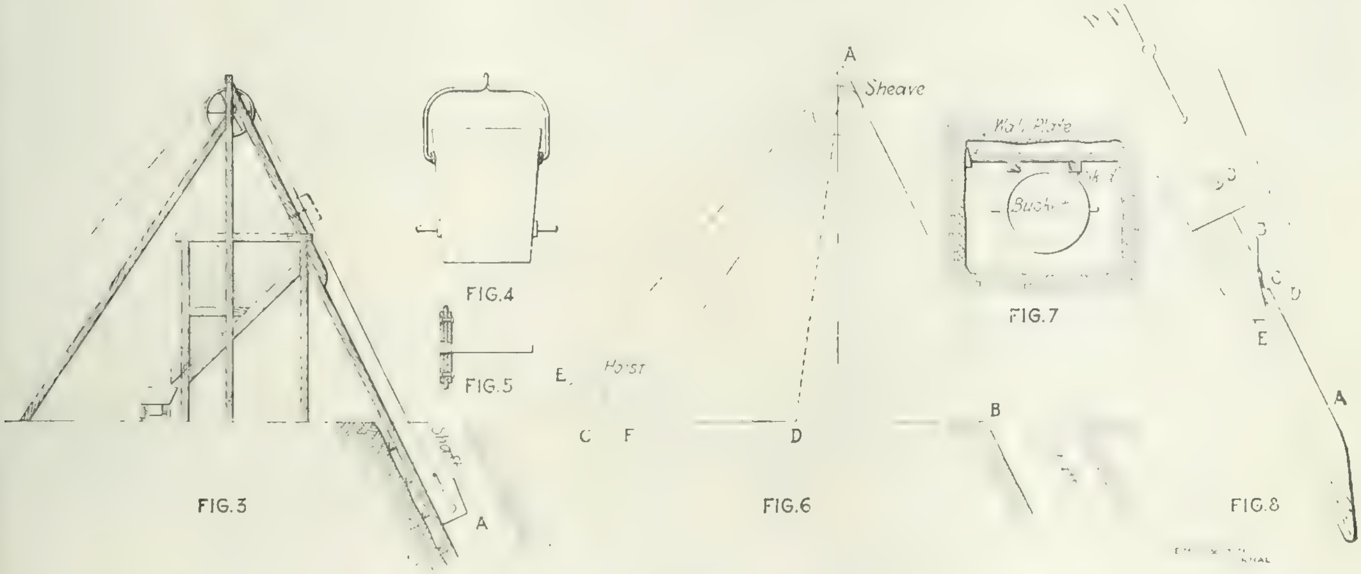


FIG. 3 FIG. 4 FIG. 5 FIG. 6 FIG. 7 FIG. 8

DETAILS OF HEADFRAME AND AUTOMATIC BUCKET DUMP

The posts are tied with three girts and a cap, and the back braces with two girts. The batter may be 1 : 8 or 1 : 10, depending on the size of the shaft. For foundation, ordinary log cribwork is built up and filled with waste rock and the stringers spiked to the cribbing with drift bolts. In the larger frame 10x10-in. hewed timber was used and 1-in. tie rods and bolts, and 8x8-in. timber for the bin, which had an arc gate made of ¼-in. boiler plate operated by levers as shown in Fig. 1. This worked satisfactorily. The smaller frame, shown at Fig. 2, is constructed of 8x8-in. timber and ¾-in. tie rods. The front posts are set at the inclination of the shaft and are connected with the back braces by means of girts and tie rods as shown.

The shaft skids run from the shaft to the point of dump. The dumping skids of 8x8-in. timber begin about 6 ft. below the dump and are bolted to the headframe as shown in Figs. 1 and 2. As the bucket is hoisted out of the shaft the horns ride on the runners on the dumping skids, which are placed so that the distance between the inner faces is an inch or two greater than the width of the bucket to allow clearance. The shaft skids prevent the bucket from tipping on the horns at this point. The bucket continues up the dumping skids until the horns drop into a dap on each skid. At this point the hoist is stopped and the bucket allowed to swing by gravity, thus dumping. The bucket is now raised a foot or so and then lowered. In lowering, the horns engage trippers which are thrown over the daps allowing the horns to slide down without catching in the daps. The trippers then swing back by gravity leaving the daps free to hold the horns of the bucket on the next trip.

The dumping device is simple and can be made by any mine blacksmith. Fig. 8 shows the construction. The tripper *E* is shown in full lines in its normal position. When the horn *B* engages it on its down trip it carries it with it until it is stopped by the catch *D*. This enables the horn to go past the dap *C* without being stopped by it as shown by the dotted lines. After the bucket has passed, the tripper swings back to its first position by gravity as the lower part of the tripper is made heavier than the upper. The runner *A* with dap *C*, which should be at least 2 in. deep, is made of ⅜x2-in. iron bolted flush with the timber. The tripper is best made of ⅝x3-in. iron and about 20 in. long and should swing from a 1-in. bolt. The construction is apparent. The headframes shown were built at a cost of about $50 for the smaller and $150 for the larger, including all material and labor. Any carpenter of ordinary ingenuity should have no trouble in designing and framing them. For vertical shafts the same form can be used, carrying the skids up and bending them at the collar to meet the frame at the dump. A few saw cuts on the inside of a green pole make it possible to bend it through a considerable angle without breaking. Of course, a roller for the cable is required at the shaft collar in this case.

Concrete Shaft Collar at the Wolverine

At the Wolverine No. 5 shaft, which is being sunk to prospect the Osceola lode at that mine, a concrete collar was put in 56 ft. long and 22x11 ft. in section; outside measurements. The reinforcement was put in differently than at the Mohawk No. 6 shaft, the construction of the collar of which was described in the JOURNAL of Aug. 10, 1912, partly because of less depth of overburden, 16 ft., and partly due to the fact that triangular-mesh reinforcement was used to carry the ropes in the forms as well as to aid in reinforcing the collar.

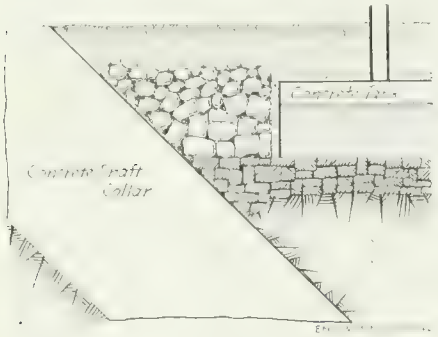
In prospecting for the lode it was necessary to trench through the overburden although previous calculation had shown approximately the position of the lode at that point. This trenching dried up the wells, as the shaft is situated in a small gully that is a water course draining the country near-by. In order to restore the wells to use and to enable the making of a well for supplying the boiler plant, it was decided to make the collar also serve as a dam to back up the water, so confident was W. F. Hartman, the company's engineer, of the watertightness of the concrete collar after his experience with the one erected at the Mohawk shaft.

A funnel was put through the concrete to let the water go through into the shaft while the collar was being erected. Then, after the collar had been completed, the surface that was to be toward the water was coated with tar to help make it waterproof.

In making the cistern for the boilers,

a dry wall of rough masonry was put in on the bottom of the shaft trench, as shown in the accompanying sketch, and a tank with concrete walls was erected on that as a foundation. This tank, or cistern, was covered with concrete, a terra-cotta tile 24 in. in diameter being inserted in the top to serve as a manhole. After this tank had been completed a piece of waste saturated with cement was inserted in the funnel and rammed tight. This shut off the flow of water into the shaft almost instantly, and concrete was then poured in on top of the waste. Next, large boulders were piled in the pit around the shaft and tank, and finally dirt was put on top, and the concrete cistern completely covered over with dirt.

The water rose in the cistern and quite a little water reserve for the boilers was obtained, as the water would filter through the loose rock around the collar and up through the loose masonry at the bottom of the tank into the cistern as fast as the water was pumped from it. About 16,000 gal. of water was thus stored back of the dam, and the water rose to a height of about 12 ft. above the place where the collar was seated on solid ground. Little seepage has resulted, although the collar has been in use for several months, and the shaft has been sunk with the aid of only the bucket to do occasional bailing, the foreman calling it a dry shaft.



Cistern for Collecting Boiler Feed Water above Concrete Shaft Collar

This shows how watertight it is possible to make these concrete collars by careful construction, so that water can be purposely dammed up around them.

Owing to the fact that triangular-mesh reinforcement was used to center the rope reinforcement in the forms at the Wolverine shaft, and as the depth of burden was only 16 ft., the pieces of old hoisting cable were put in seven inches apart at the bottom. As the collar grew in height the interval was increased to 10 in. Only at the bottom were the side walls reinforced. In other respects the reinforcement was quite similar to that used in the Mohawk shaft, and the method of knock-down forms and of sliding the concrete down troughs to a plat whence it was shoveled into the forms, was adhered to.

An Index System for Maps

By H. L. Botsford*

The system of filing and indexing maps described herewith is one which I have used for several years in an engineering office and found it to meet all requirements.

FIG. 1. INDIVIDUAL INDEX CARD.

Subject

Number
Index

See Also

Scale Surveyed by Drawn by Traced by Checked by Remarks	Date Notes Computations Sketches	Drawing Tracing Print Sketch

FIG. 2. GENERAL SUBJECT INDEX CARD.

General Subject

Number	Index	Detail Subject

The maps, tracings, blueprints, etc., are filed flat in shallow drawers which are made to accommodate several standard sizes of drawings. Only one size should be filed in a drawer.

Nine by twelve inches was taken as the unit and the larger drawings were made some multiple of this, as 12x18, 18x24, 24x36 in., etc. Possibly a better unit is the standard letterhead paper, 8½x11 in., which permits folding drawings of any of the sizes so as to be mailed or filed with accompanying correspondence.

Each drawing as it is made is marked with a serial number and an index and a card is made for it showing the subject, scale, date, number, index, authority, references and any general information necessary. Fig. 1 shows the special printed card, 4x6 in., used for this purpose. These descriptive cards are filed consecutively with guide cards at even tens.

The various drawers in the map cabinet are designated *A*, *B*, *C*., etc., and the maps in each drawer are numbered from one up, beginning at the bottom. Thus *A*-4 is the fourth drawing from the bottom in drawer *A*; *A*-10 is the tenth, etc. In this way, knowing the index of any drawing, it can be readily found.

Reference or subject cards, shown in Fig. 2, are made on which are listed all the drawings pertaining to the various subjects. These subject cards are filed alphabetically and are the ones referred to when in search of drawings. Thus on the card for "Compressors," would be found the title and index and serial number of all drawings of compressors. To further facilitate reference to the files the subject cards were divided into two general divisions, viz., 1—Mechanical, and 2—Mine, Geologic and Topographic Maps.

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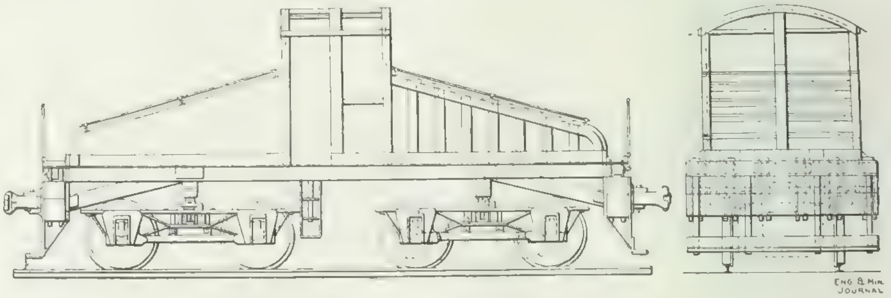
*Mining engineer, Creighton Mine, Ontario.

A Homemade Electric Locomotive

It is often well to realize that a machine shop at a fair-sized mine is equipped sufficiently well to do large jobs, and that often work which ordinarily would not be thought of as being within the range of the shop, can, if the master mechanic is ingenious, be done at the company's shop at a considerable saving in cost compared to what it would have been if the machine or device were bought outright.



Electric Locomotive Made in the Shops of the St. Louis Smelting & Refining Co.

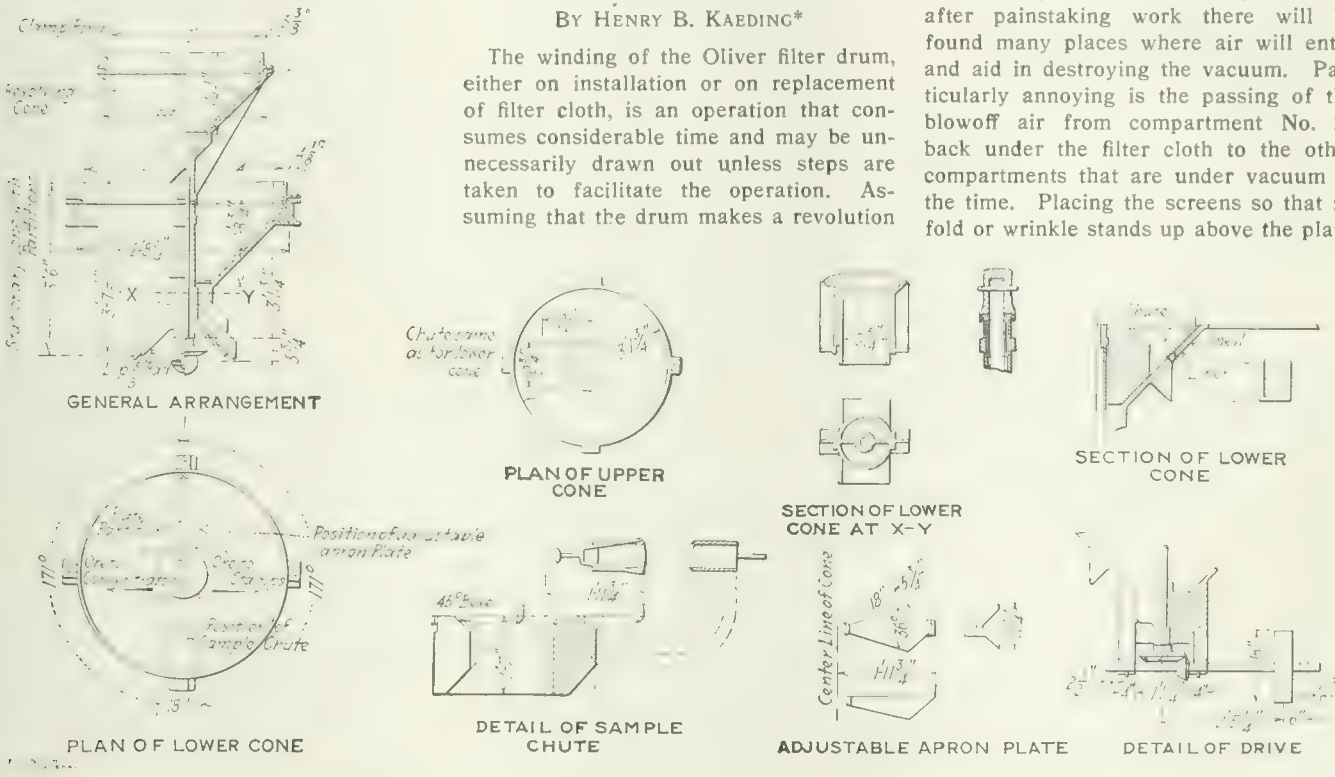
Most mine operators would not think of building a 40-ton electric locomotive at a mine, but that has been done at the machine shop of the St. Louis Smelting & Refining Co. in southeastern Missouri, in order to keep the men at the shop busy at odd times. The accompanying drawings give an idea of the work. The floor and sides of the locomotives are made of ¼-in. sheet iron. This floor is carried on a series of I beams. Every other one of these beams is cut in two and spliced together by plates, so as to come down at an angle to the bumper timbers at each end of the car. Through the center of this car on each side of the king pin are carried two 6-in. channels which help brace the transoms above the trucks. The work was carried on most successfully and a locomotive produced which was entirely satisfactory for the work at hand.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Automatic Sampling at Tigre Mill

The distributing and sampling device, used at the Tigre mill, El Tigre, Sonora, Mexico, is described by D. L. H. Forbes (*Bull.* A. I. M. E., August, 1912). It is used to distribute the ore between its two mills and at the same time to take a 5% sample. The device, shown in the accompanying engraving, consists of a cast-iron cone with a single discharge spout that revolves about a vertical axis over a stationary cone with three compartments. Between the two large compartments is an adjustable partition which may be set to various positions corresponding to percentages of the total ore that it is desired to give to the No. 1 mill.



AUTOMATIC ORE SAMPLING AT TIGRE MILL, EL TIGRE, SONORA, MEX.

From the compartment corresponding to No. 2 mill, a discharge spout delivers the material to a 12-in. conveying belt, which carries it to the stamp battery ore bin. From the sample compartment the portion of ore cut for sampling is dropped into a 7x10-in. Blake crusher, which reduces the size of the largest pieces to 0.75-in. ring. A Snyder sampler placed below the crusher takes out 10% of the original sample, and the large pieces in this sample are crushed in a 2x6-in. Sturtevant roll-jaw crusher, after which the amount of the sample is reduced again by sets of riffle boxes until about 40 lb. are obtained for sending to the assay office. The rejected portions of ore at each step in the sampling drop into the broken-ore storage bin of No. 1 concentrator.

Winding the Oliver Filter

By Henry B. Kaeding*

The winding of the Oliver filter drum, either on installation or on replacement of filter cloth, is an operation that consumes considerable time and may be unnecessarily drawn out unless steps are taken to facilitate the operation. Assuming that the drum makes a revolution in 8 min., it will require 77 hr. to place the wire in position, unless the speed be increased. The manufacturers advise an arrangement of pulleys somewhat similar to my own idea, whereby this time may be cut to considerably less; but the best arrangement of pulleys and countershafting will be found outlined in the accompanying drawing.

In assembling the filter I have found it necessary to use the greatest care in making all joints airtight. The staves that form the body of the filter should be laid in place with the greatest care, and when the ends of the piping are screwed into the staves, these ends should be first hot-tarred and a wisp of oakum packing should be wound about the pipe so that the lock-nut may screw down on it. When all pipes and horizontal strips are in place a liberal application of hot tar (asphaltum) should be given to both sides of the periphery of the drum, running it in around the pipe from both sides where they pass through the wood.

It is not possible to exercise too much care in the endeavor to have the joints airtight and the compartments isolated hermetically from each other; and even after painstaking work there will be found many places where air will enter and aid in destroying the vacuum. Particularly annoying is the passing of the blowoff air from compartment No. 24 back under the filter cloth to the other compartments that are under vacuum at the time. Placing the screens so that no fold or wrinkle stands up above the plane of the rest of the screen offers no particular difficulty, the idea being to avoid high spots that would wear holes in the canvas. The filter cloths may then be put on and the calking ropes driven down and edges tarred.

An examination of the drawing will show a method of arranging the motor, pulleys and countershafts, where the motor is assumed to run at 1027 r.p.m. and the filter drum to take eight minutes per revolution, the number of teeth in the wormwheel being assumed to be 160. The motor drive pulley, a rawhide pulley, 10- or 12-in. face and 5-in. diameter, is belted, either with or without idler, to a 48-in. pulley on the main countershaft. It is preferable to use for this belt an endless one of leather without an idler, setting the motor on rails that the belt may be kept tight. If an idler is necessary let it be of the type that fastens to the motor frame, causing the belt to cling better to the drive pulley by bringing more surface in contact with the face. At the other end of the main countershaft will be found a 9-in. pulley that belts to a 48-in. pulley on the wormshaft of the filter, thus giving the shaft a speed of 20 r.p.m. Should there not be room for this size pulley on the wormshaft furnished by the manufacturer a longer shaft may be used, allowing the pulley to clear the end of the filter box; or a slight reduction in the size of both pulleys may be made.

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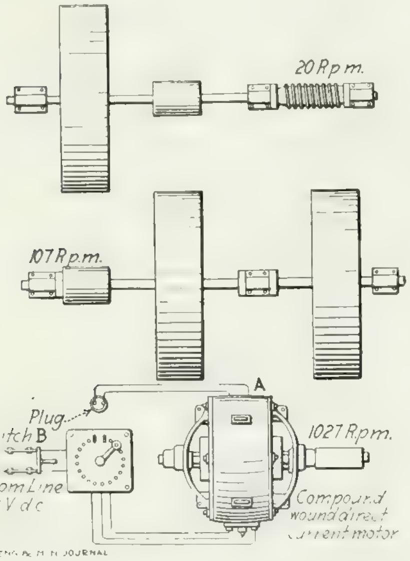


Arrangement for Winding the Oliver Filter

A 48-in. pulley on the countershaft is placed opposite a 9-in. pulley on the wormshaft, without boxing between; this permits of throwing the belt off one set and on the other without trouble, the filter then being belted for winding and the worm shaft having a speed of 570 r.p.m. and the filter drum a speed of 3½ r.p.m. If it is desired to expedite matters still further an arrangement such as is shown at the motor at *A* may be made use of. At any convenient point such as *A*, the shunt field wire may be cut between coils and the two ends brought out and connected to an ordinary porcelain wall socket located near the starting box. Into this socket screw a fuse plug that has been prepared by placing No. 12 copper wire in place of the fuse wire. The result is that when the plug is screwed in till it forms part of the circuit, the motor is a compound-wound machine of its regular type of winding and of constant speed, but when the plug is removed the motor becomes a series-wound motor and the speed is doubled. A switch could be used in place of the plug but is not as foolproof, offering a temptation to the ignorant to pull it out and investigate, which would cause the filter to double its speed.

To operate this device conveniently, start the motor with the plug in and bring all up to full speed with the starting box; then pull the main line switch *B*, unscrew plug, and when the lever of the starting box has sprung back, throw in main line switch *B* and immediately catch up the speed to full with the starting box. If this is neatly done there is little, if any, diminution of speed in changing the motor from compound- to series-wound. The machinery may also be started on the series motor with the plug permanently out, but care must be exercised to start slowly and get up speed gradually and the starting box is almost certain to overheat during the operation. It is preferable to start with the compound winding and switch off to the series as soon as full speed is attained.

The utility of this method is obvious, the filter drum making nearly 8 r.p.m., or a revolution in 8 sec.; at this rate the entire winding of wire can be put on in 1 hr. and 20 min., exclusive of stops. In practice, however, it will be found to take much more time owing to delays in getting up speed, in slowing down for stops, in repairing broken wire and in stopping for stapling. It is advisable to stop every six or eight turns for stapling unless the operator is sufficiently skillful to drive his staples while the drum is in motion.

Sampling from the Lip of a Challenge Feeder

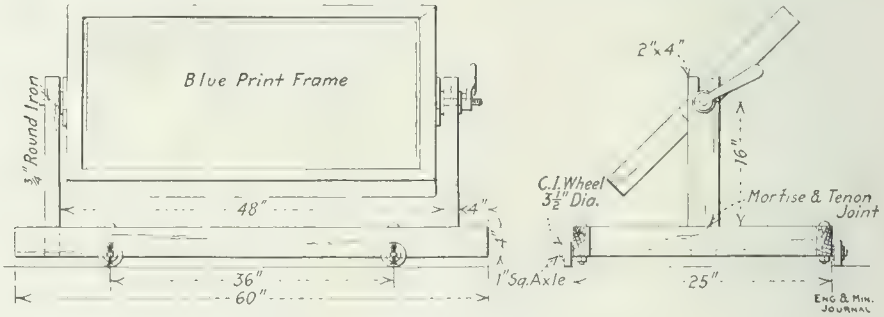
Taking a sample of mill-feed material is not an easy matter when the ore is crushed in cyanide solution. A sample of the pulp issuing from the machine is useless, due to the action of the cyanide solution on the metal content of the ore and also to the amount of metal carried by the cyanide solution itself. A sample before the ore gets into the cyanide solution is thus a necessity and unless a machine-sampling plant is available it is difficult to get a real sample of the mill feed.

Under conditions of this kind one company succeeded in getting a good sample from the lip of the automatic feeders back of the stamps. It was found that to get anything like an accurate sample it was necessary to use the greatest care in carrying out every operation. As a sampler, a narrow, curved box was made of such size that it could be introduced in the mortar opening just under the round plate of the Challenge feeder. A long iron handle was fixed to the box for convenience. The box was made sufficiently deep to prevent the stones bouncing out.

This box was held below the feeder lip for a fixed period of time at fixed intervals, and care was taken to secure all of the stream of falling ore. The success of the sample depends upon getting the entire stream of ore for the fixed period of time, and attention must be paid to the intervals also. It was found that although the sample might not be exact for one day of work, the average over several months was satisfactory.

Truck for Blueprint Frame

The accompanying illustration shows a simple type of truck for supporting a frame when making blueprints. The truck is easily constructed and answers all the purposes of a more expensive device. The clamping device permits the placing of the frame at the best angle for printing. This truck can be made at any mine shop from materials that will ordinarily be found at hand.



Simple Truck for Blueprint Frame

How to Purify Mercury

W. R. Forbes has recently advised, for clarifying mercury, that small amounts of the element be run in stream form through nitric acid and mercurous-nitrate solutions. In greater quantities, mercury should be partially oxidized by drawing air through it. The usual impurities, such as lead and zinc, then rise to the surface as scum.

This may prove unsatisfactory, says Dr. L. K. Hirshberg, since it is apt to leave a large proportion of the impurities in the mercury unoxidized, in which case it is desirable first to oxidize with air and then to shake the metal with powdered charcoal which has been first impregnated with oxygen. After this has been done the charcoal will appear on the top of the mercury carrying all foreign matter and impurities in it.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Filling Shrink Holes in Cast Aluminum

The following mixture is given in *Foundry*, October 1912, to fill shrink holes in cast aluminum: Aluminum, 1 part; zinc, 11; tin, 29; phosphor tin, 1 part. Melt in the order given. As soon as the aluminum castings are shaken out, examine for shrink holes and if found, rub a stick of solder in the hole until the hole is filled up. While the solder is still liquid, the surface of the casting underneath the solder, where the two metals are to be united, is scraped with any suitable tool, but care must be exercised that the surface being scraped in this way is entirely covered with the molten alloy to exclude the air, thereby preventing the formation of aluminum oxide. After the surface is nicely tinned, the casting is not disturbed until it has cooled sufficiently to permit the solder to solidify. We have soldered lugs on castings with this alloy, and have never had any difficulty with the joints after they have been made in this way. When using the solder in the usual way, it is necessary to tin the surface to be soldered, similar to the manner of tinning cast iron, by continual rubbing with the copper or by heating with a blow torch and by scraping as described for filling shrink-holes. If two pieces of aluminum are to be soldered together, both surfaces should be tinned and the pieces should be sweated together, as aluminum solder will not flow in a joint.

Vanadium in Pig Iron

That vanadium is a more common constituent of pig iron than is usually supposed is the view of Porter W. Shimer (*Bull.* A. I. M. E., August, 1912). In general, he states that the Lehigh Valley pig irons carry from 0.02 to 0.05% of vanadium, and 0.10 to 0.20% of titanium. These elements follow silicon, and a high-silicon, low-sulphur pig will carry a maximum of vanadium and titanium. These elements seem to be particularly high in irons reduced from magnetites, although this does not always follow.

In remelting, the loss seems to be about 14% of the vanadium present. The vanadium irons usually show a fracture of dull dark gray patches in a white network. Superficially the appearance is that of hard mottled iron, but the iron is really soft. The metals titanium and vanadium do not alloy with the iron, but apparently crystallize out as carbides before the iron has begun to solidify.

It is suggested that these carbides serve as nuclei for the rapid crystallization of the iron; in this way causing a finer grain, and consequent greater strength, than would be the case in the absence of these elements.

From Mr. Shimer's analyses it seems that vanadium should be looked for in pig oftener than it is.

Rockey-Eldridge Copper Refining Process

Walter S. Rockey and Hilliary Eldridge have patented a copper-refining process (U. S. pat. 1,037,538, assigned to Metallurgical Research Co.), in which the copper is melted in an oil blast furnace, or in some equivalent melter of high efficiency regardless of any contamination from furnace gases. From this furnace the molten metal flows through a bath of carbonaceous material, and from here through a bath containing anhydrous boron trioxide or its equivalent, with or without an admixture of carbon. The idea of the first bath is to remove the oxygen from the copper oxide, and of the second to remove foreign oxides and metals. Both of the purifying baths will require some external heating.

Uses of Electric Furnace Steels

In discussing P. Heroult's paper on the recent development of the electric steel furnace, before the Congress of Applied Chemistry, Mr. Rogers, of the American Steel & Wire Co. made the statement that it had tried the electric-furnace steels for many sorts of wire, ropes, music wire, hat wire, etc. The engineers had noted that apparently the electric-furnace steel is of greater density than openhearth, but that there seemed to be no great difference between the electric and basic openhearth steel, although apparently it was not quite so good as the acid.

In drawing wires, the hardness after each successive reduction seemed a little greater in the electric steels, but on "life" tests of the electric and ordinary openhearth wire there seemed to be no essential difference. They had much difficulty in getting the carbon low, and at the same time keeping the bath deoxidized in the electric furnace.

Mr. Brady, of the Illinois Steel Works, said he made electric steel from blown bessemer, putting the product into rails, and found it satisfactory. Mr. Speller, of the National Tube Co., stated it had used electric steel for seamless and welded tubes. It did well in the former, poorly in the latter. Dr. J. W. Richards said that a certain amount of included slag is necessary for a good weld, and that the poor results in welded tubes were due to lack of these inclusions.

He also stated that in Norway this last summer, he had seen electric furnaces working in conjunction with producer-fired melting furnaces, and that this combination was the most economical, although electric power was only $8 per horsepower-year, and coal (English) cost $4 per ton.

Assaying Cobalt Ores

In a paper before the International Congress of Applied Chemistry, J. O. Handy stated that he had had the greatest success with the crucible assay of Cobalt ores. For this he mixes up a "silver-ore flux": Na_2CO_3, 4 parts; K_2CO_3, 4 parts; $Na_2B_4O_7$, 2 parts. The charges are: Pulp, 0.2 a.t.; silver flux, 30 grams; litharge, 60 grams; flour, 1 gram; mixed on a rubber cloth, placed in a 30-gram crucible with a cover of eight grams of borax glass. The crucibles are heated at a medium red heat for 20 min. in a closed muffle, then the temperature is raised to bright yellow for 30 minutes.

The crucibles are poured into conical iron molds, the buttons hammered free from slag, and cupelled in single rows. The temperature is kept as low as possible, and feathers should form entirely around the button. After the blick, large buttons are covered with hot cupels. Small buttons are simply cooled slowly to avoid sprouting. Metallics are run separately by scorification, using a little borax and ground silica with the test lead.

High-grade Cobalt ores are assayed in the same way as the low, except that 90 grams of litharge are used instead of 60, and the metallics are assayed by crucible instead of by scorification assays. The charge is: Metallics, 0.5 gram; high-grade ore flux, 50 grams; flour, 1 gram.

In discussing this paper, Mr. Liddell said that many assayers had trouble with the wet assay of cobalt ores, apparently because of the precipitate of arsenious oxide, which settled on the beaker and refused to be wiped off. This precipitate occludes silver compounds and the assay results are low. This could be avoided by a suggestion of A. M. Smoot, of Ledoux's laboratory, who treats the beaker with a caustic alkali, then neutralizes this solution with nitric acid, adds one drop of hydrochloric, and adds the resulting precipitate to the assay. Under these conditions he thought the wet assay easier to manipulate than the fire.

In response to a further remark of Mr. Liddell, Mr. Handy said he had been surprised that he was able to cupel the crucible buttons without first scorifying, but that such was the fact.

Ramage's Detinning Process

In the detinning process invented by Alexander S. Ramage, of Newark, N. J. (U. S. pat. 983,931, assigned to John S. Maugham), a solution of plumbate of soda is first prepared by boiling litharge or lead residues in sodium hydrate. The scrap to be detinned is then treated with this solution, dissolving the tin and leaving a flocculent lead precipitate floating in the solution. The tin scrap is preferably immersed successively in plumbate liquors of increasing strength. After stripping thoroughly, the detinned scrap is washed and baled.

The stannate solution is run through a centrifugal machine, and the spongy lead separated and washed. The stannate solution thence is run over galvanized scrap, dissolving the zinc and precipitating tin, which is held in suspension, and separated out later from the solution. The sodium zincate is then electrolyzed, using iron anodes and zinc-sheet cathodes, with a current of about 20 amp. per sq.ft. The zinc is not entirely precipitated, as it is not economical to throw down all of it.

The regenerated caustic-soda solution, containing a little sodium zincate, is then used to dissolve more lead oxide, to begin a new cycle of operations. The reactions all take place at about 180 Fahrenheit.

New Uses for Tungsten

Tungsten is finding an increasing use in the electrical arts outside its application in incandescent-lamp filaments, says the *Electrical World*. On account of its high surface tension, the metal is well adapted for sparking or arcing terminals. In some of the newer Crookes or X-ray tubes which are designed to work at enormous intensities, being capable of absorbing 10 kw. and taking "snapshot" skiagraphs of even the thickest parts of the human body, tungsten has been used as the anode target for the cathode rays, the rare metal being backed up with copper to convey away the heat developed. Although rendered molten by even this instantaneous impact of electrons, the great surface tension of the tungsten prevents its loss or change of shape. Tungsten electrodes have also been used for gas-engine spark gaps and show longer life than those of other metals of equivalent cost.

Melting Points of Fire Bricks

A complex substance such as a firebrick cannot be said to have any definite melting point, so for experiments on this point the U. S. Bureau of Standards defined the melting point as being the lowest temperature at which a small piece of brick could be distinctly seen to flow (*Technologic Paper, No.* 10).

The following melting points of important materials in the manufacture of firebrick were determined: Kaolin, 1740° C.; pure Al_2O_3, 2010°; pure SiO_2, 1750°; bauxite, 1820°; bauxite clay, 1795°; chromite, 2180° C. Silicon carbide begins to decompose at 2220° after prolonged heating, but does not melt at much higher temperatures with short heating.

Forty-one samples of fireclay brick were tested, the melting points of which as above defined, were from 1555° to 1725° C.; eight samples of bauxite brick had melting points from 1565° to 1785°; three of silica brick from 1700° to 1705°; one chrome brick gave 2050°, and one magnesia brick gave 2165° Centigrade.

It should be noted that the melting point of a brick is not the only property to consider in determining its fitness for any given purpose. Its crushing strength when cold, its behavior under load when heated, and its resistance to fluxes should all be noted.

Distinguishing Brass by Color

The composition of brass may be readily determined, approximately, by the color, says the *Brass World*, Sept. 1912. The following shows the color of the various percentages of copper and zinc:

When the brass contains 5% of zinc, it has a red color scarcely differing from that of pure copper. When 10% of zinc is present, the mixture has a true bronze color. With 15% of zinc, the brass has a light orange shade. When the amount of zinc reaches 20%, the color of the mixture is greenish-yellow and is known as "green brass." With 25% zinc, the color is practically that of the 20% mixture so that this, too, is a "green brass." Brass with 30% zinc has the true, yellow brass color. The same is found with 35% of zinc, but at about this point the yellow color begins to disappear, for at 40% zinc, a reddish yellow color is found. Brass, therefore, that has a reddish-yellow shade will always contain more than 35% zinc. The "dead line" seems to be about 38% zinc, for at this percentage, the transition from the real yellow to the reddish-yellow begins.

When the zinc is increased to 45%, the color of the brass is a rich golden color and, strictly speaking, it may be called "orange." The mixture containing 50% zinc has also a golden shade, but even richer than 45% zinc alloy. At 55% zinc, the color resembles that of 14-k. gold. When 60% of zinc is reached, the brass has a yellowish white shade, and as the quantity increases, the color becomes white and finally gray.

In comparing colors a highly polished surface is not so good as a dead one, for the reason that the reflections are likely to deceive the observer. A freshly cut surface is necessary in order to get away from the effects of tarnishing.

Colorimetric Iron Determination in Lead Products

A colorimetric determination of iron in lead or lead oxides is proposed by John A. Schaefer (*Journ. Ind. Eng. Chem.*, Sept., 1912). For litharge or metallic lead weigh out 1 gram of sample, add 15 c.c. of water and enough nitric acid to dissolve the lead as nitrate. With red lead add 10 c.c. of 1:35 hydrogen peroxide after action of the nitric acid has ceased to carry the lead peroxide into solution. Neutralize the solution with NH_4OH, then make faintly acid with HNO_3. If lead peroxide precipitates during neutralization, add a little more peroxide to clear the solution.

Wash the solution into a 100-c.c. Nessler cylinder, and add 15 c.c. of 1:20 ammonium-sulphocyanide solution, and dilute to the mark. As a standard for comparison use ammonium-ferrous-sulphate made by oxidizing 0.7022 gram of the salt in dilute sulphuric acid with permanganate until the pink barely shows, then diluting to 1 liter; 1 c.c. = 0.0001 gram Fe. Prepare the blank by placing in the Nessler 10 c.c. of 1:35 peroxide, the quantity of acid used to dissolve the lead, 15 c.c. sulpho-cyanate solution, dilute almost to the mark, and run in the ferric standard solution.

Color Reaction for Ammonia

A reaction for ammonia has been studied by P. Thomas (*Bull.* Soc. Chem., 1912, p. 796), which is said to be of equal sensitiveness to the Nessler test, and somewhat easier of execution. It depends on a discovery of Berthelot, that when an excess of phenol and a little sodium hypochlorite are added to a dilute solution of ammonium salt, a blue color develops. A 4% solution of phenol is used, and a comparison is made with a standard ammonium-chloride solution.

Argilite

Argilite is a new aluminum alloy, invented by Prof. Gaston Jacquier, says *Foundry*, October, 1912. It is claimed to be a hard, light alloy suitable for pipes, tubes, and armor plate, and to resist corrosion. Its composition is: Al, 90%; Bi, 2; Cu, 6; Si, 2 per cent.

Settling Slimes at the Tigre Mill

By R. T. Mishler*

Experiments indicate that the rate of settling of slimes is usually independent of depth of setting column. Extremely thick slimes are governed by different laws from those applicable to thin slimes. A formula is devised by means of which laboratory results may be used as a basis for mill design.

While conducting some settling experiments on the slimes produced in the cyanide plant of the Tigre Mining Co., of Sonora, Mexico, some interesting principles of settling were observed which have not been recognized in any published article as far as I am able to ascertain. If these principles are as general as the results on the Tigre slimes seem to indicate, a few simple laboratory tests will provide the mill designer with a direct and reasonably accurate method of determining the settling equipment required for any special case.

Uniform Conditions For Tests

The tests used for the development of these principles were made on a variety of slimes, ranging from almost pure clay to comparatively clean, reground sand. The moisture ratios varied from 2 : 1 to 60 : 1. A fairly wide range was thus afforded on which to base any general conclusions. Table I gives a description of the various slimes used in the tests. An effort was made to keep the nature and temperature of the pulp and the percentage of lime and cyanide in solution the same in laboratory tests as they were in the cyanide plant. This gives additional meaning to the comparison of laboratory results with results obtained in actual practice.

For ease in calculation the degree of thickness of the different pulps is expressed in terms of the ratio by weight of liquid to slime (*L*:*S* ratio). In the formulas only the first character of the *L*:*S* ratio is used; for example, the thickness of a pulp with an *L*:*S* ratio of 15 : 1, is expressed by the figure 15. The rate of settling for both quiet and continuous settling is measured by the depth, in feet, of clear solution formed per minute. By the words "quiet settling," it is intended to distinguish undisturbed, intermittent settling in a decantation tank or laboratory vessel, from continuous settling in a mechanical or cone-bottom settling tank.

Settling of Dilute Slimes Is Independent of Column Depth

The effect of depth on the rate of settling of dilute slimes was first investigated. Table II gives the results of laboratory settling tests on three different slimes. In order that the deep columns should settle to the same final consistency as the shallow columns, the duration of the tests was made proportional to the depth. The table shows that in settling a dilute slime to a required degree of thickness, the average depth of clear solution formed per minute is virtually independent of the depth of the settling column.

The same principle is illustrated graphically in Figs. 1 and 2. Fig. 1 shows that at the beginning of the test the rate of settling was greater in the shallow than in the deep column. The settling rate in the deep column, however, increased as the test proceeded, thus equalizing the first advantage gained by the shallow column. The shape of the two curves is practically the same with the exception that the abscissas of the 24-in. column are three times the length of the corresponding abscissas of the 8-in. column. This further corroborates the principle that the average depth of solution formed per minute in settling between two degrees of thickness is virtually independent of the height of the settling column. With the *L*:*S* ratio of the thickened pulp plotted as abscissas and the settling rate plotted as ordinates, as in Fig. 2, the two curves practically coincide.

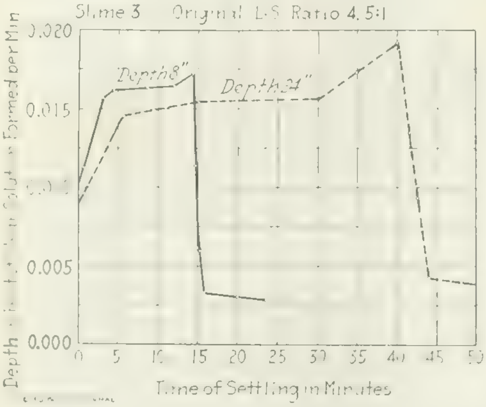


FIG. 1. EFFECT OF DEPTH ON RELATION BETWEEN RATE OF SETTLING AND DURATION OF TEST

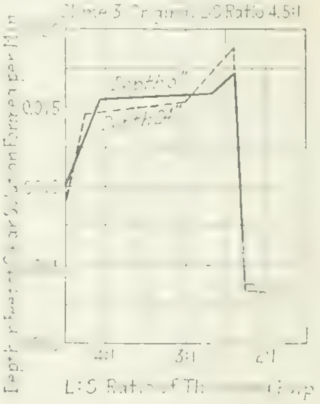


FIG. 2. EFFECT OF DEPTH ON RELATION BETWEEN RATE OF SETTLING AND DILUTION OF THICKENED PULP

Table III gives the results of a series of laboratory tests to determine the effect of depth on the continuous settling of slimes. It will be noticed that with the exception of very shallow depths, the volume of overflow per min. is independent of the depth of the vessel. Test F of Table III shows that the low rate of settling for shallow depths may be overcome by the proper distribution of the feed.

The above experiments indicate that in settling a dilute slime. to a desired degree of thickness, the average rate of settling is virtually independent of the depth of the settling column.

Depth of Column Not Controlling Factor

As a corollary to this principle, it may be stated that the depth of the settling column has virtually no influence on the settling efficiency of dilute slimes. In a recent article, some radically different inferences were drawn from similar tests, these inferences being based on the assumption that the efficiency of settling should be determined by dividing the volume of clear solution formed in a given time, by the original volume of pulp in the settling tank. This assumption is misleading. For example imagine two continuous settling tanks of the same diameter, one 5 ft. high and the other 10 ft. high, both receiving the same nature and quantity of feed per day. Table III indicates that the same volume of overflow would be secured from the low tank as from the high one, providing the feed of the low tank was properly distributed. If we accept the assumption that the efficiency may be measured by dividing the volume of overflow by the volume of pulp in the tank, the 5-ft. tank would show twice the efficiency of the 10-ft. tank. This, however cannot be the case. Both tanks receive the same feed per day, produce the same volume of clear solution per day, and yield the same volume per day of pulp thickened to the same consistency. Therefore the efficiency cannot be otherwise than the same.

Parallel conclusions may be drawn for the case of quiet settling. Imagine the two tanks of the preceding paragraph working intermittently as decantation tanks. It may require 5 hr. of quiet settling in the tank 5 ft. deep in order to produce pulp of a desired degree of thickness. At the end of the 5 hr., the volume of clear liquid decanted from the 5 ft. tank might easily be the same as would be decanted from the 10-ft. tank in the same length of time. Under these conditions, the assumption of the preceding paragraph would lead us to suppose that the shallow tank was doubly as efficient as the deep tank. This, however, is not the case. The 5-ft. tank must be discharged and refilled at the end of 5 hr., and again discharged at the end of 10 hr. The 10-ft. tank handles the same amount of feed in one operation. Table II and Figs. 1 and 2 show that in 10-hr. both tanks would produce the same volume of clear liquid and yield the same volume of pulp thickened to the same consistency. The settling efficiency of the two tanks must therefore be the same.

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TABLE I. DESCRIPTION OF SLIMES TESTED

Slime No.	Origin	Nature	Sp. Gr. of Dry Slime	200 mesh %	Solution KCN %	Solution CaO per ton, lb.
1	Overflow from overloaded continuous thickeners...	Principally flocculant particles of clay	2.625	98	tr	0.1
2	Overflow from classifiers handling tailing from concentrating plant	Mixture of slime No. 1 with fine particles of sand	2.628	90	tr	0.1
3	Overflow from classifiers handling reground sand from tube mills.........	Principally sand	2.640	80	0.16	2.0
4	Average pulp after receiving 48-hr. treatment in air agitation tanks	Mixture of slimes Nos. 1, 2 and 3	2.635	85	0.17	1.9

TABLE III. EFFECT OF DEPTH ON RATE OF CONTINUOUS SETTLING OF THIN SLIME

Test	Slime No.	Depth of column ft.	Duration of test, min.	L:S ratio Feed	L:S ratio Discharge	Total cu.ft. of feed	Total cu.ft. of overflow	Cu. ft. feed per min.	Cu. ft. overflow per min.
A	3	1.4	77	5:1	3.5:1	3.60	1.07	0.047	0.0139
B	3	0.7	33	5:1	3.5:1	1.58	0.46	0.048	0.0139
C	1	1.4	53	24:1	17:1	1.12	0.35	0.021	0.0066
D	1	0.7	65	24:1	17:1	1.57	0.44	0.024	0.0068
E	1	0.35	20	24:1	20:1	0.52	0.095	0.026	0.0047
F	1	0.35	10	24:1	16:1	0.19	0.064	0.019	0.0064

Continuous settler made from glass carboy, 2 ft. high by 1.15 ft. diam., provided with subsurface feed and overflow launder of adjustable height. Slime level kept 0.15 ft. below overflow level. The first five tests were conducted with one subsurface feed, near center of vessel. Test F was conducted with three subsurface feeds near periphery of vessel

Settling Efficiency Proportional To Clear Liquid Formed in Unit Time

From the above illustrations, it appears that if it is desirable the settling efficiency may be determined by dividing the volume of clear liquid formed in a given time, by the average volume of feed during that time, but that it is erroneous to consider the settling efficiency as proportional to the quotient obtained by dividing the volume of liquid formed in a given time by the original volume of pulp in the tank. To me it appears that the simplest and most logical manner of determining settling efficiency is to regard it as proportional to the volume of clear liquid formed per unit of time.

The preceding paragraphs indicate that the settling efficiency of dilute slimes would be virtually the same in very shallow tanks as in the comparatively deep tanks used at the present time. Practically, however, tanks of reasonable depth have certain advantages over more shallow ones. In shallow, intermittent settling tanks, much time would be lost in frequent changes of pulp. In shallow, continuous settling tanks, difficulty would be experienced in properly distributing the feed and in properly regulating the underflow. For these reasons shallow settling tanks of either type would require more attention than do the comparatively deep tanks used at present. In cyanide plants, deep settling tanks have the additional superiority of prolonging the duration of treatment in proportion to their depth. On the other hand shallow tanks would have the advantage of less first cost and also the advantage of using up less of the available fall about a plant. It thus appears that the matter of depth is a question of expediency rather than of settling efficiency.

Thick Slime Subject to Different Law

The principle that the rate of settling is independent of the depth is not true for excessively thick slime. Table IV gives the results of a series of laboratory tests, showing the effect of depth on the settling rate of thick slimes. The table shows that as a rule, the settling rate of thick slimes increases with the depth of the settling column. It also indicates that, for each depth, there is a critical dilution at which a slight increase in the *L:S* ratio causes a large increase in the rate of settling. When the dilution is greater than the critical

TABLE II. EFFECT OF DEPTH ON RATE OF SETTLING OF THIN PULPS

Height of settling column in feet	Duration of test in minutes	L:S Ratio Beginning of Test	L:S Ratio End of Test	Depth of clear solution at end of test feet	Depth in feet of clear solution formed per minute
Slime No. 1					
0.66	10	10:1	9.2:1	0.05	0.005
1.33	20	10:1	9.2:1	0.11	0.005
2.00	30	10:1	9.2:1	0.16	0.005
0.66	10	30:1	24.9:1	0.11	0.011
1.33	20	30:1	24.8:1	0.23	0.011
2.00	30	30:1	25.2:1	0.37	0.012
0.66	10	60:1	24.0:1	0.39	0.039
1.33	20	60:1	24.7:1	0.76	0.038
2.00	30	60:1	26.7:1	1.09	0.036
Slime No. 2					
0.66	10	8.5:1	7.9:1	0.04	0.004
1.33	20	8.5:1	7.9:1	0.09	0.004
2.00	30	8.5:1	7.9:1	0.13	0.004
0.66	10	15 :1	13.1:1	0.08	0.008
1.33	20	15 :1	13.1:1	0.17	0.008
2.00	30	15 :1	13.1:1	0.23	0.008
0.66	10	25 :1	18.2:1	0.18	0.018
1.33	20	25 :1	18.2:1	0.35	0.018
2.00	30	25 :1	18.3:1	0.52	0.017
Slime No. 3					
0.66	10	3.0:1	2.2:1	0.15	0.015
1.33	20	3.0:1	2.2:1	0.28	0.014
2.00	30	3.0:1	2.3:1	0.41	0.014
0.66	10	4.5:1	3.1:1	0.18	0.018
1.33	20	4.5:1	3.2:1	0.38	0.019
2.00	30	4.5:1	3.2:1	0.52	0.017
0.66	10	7.0:1	4.2:1	0.25	0.025
1.33	20	7.0:1	4.2:1	0.50	0.025
2.00	30	7.0:1	4.3:1	0.74	0.025

Quiet settling in a glass cylinder 2.3 ft. high by 0.1 ft. diameter

TABLE IV. EFFECT OF DEPTH AND INITIAL THICKNESS OF PULP ON SETTLING RATE OF THICK SLIMES

Slime No.	Initial L:S ratio	Final L:S ratio	Depth in ft. of clear solution formed per min. Depth of column ½ ft.	Depth of column 1 ft.	Depth of column 2 ft.
4	1.9:1	1.8:1	0.0001	0.0001	0.0002
4	2.1:1	2.0:1	0.0002	0.0002	0.0004
4	2.7:1	2.6:1	0.0002		0.0009
4	3.2:1	3.0:1	0.0003	0.0004	0.0012
4	3.6:1	3.4:1	0.0004		0.0045
4	4.5:1	4.3:1	0.0009	0.0031	0.0072
4	4.7:1	4.5:1	0.0013		0.0073
4	5.0:1	4.7:1	0.0014	0.0067 0.0090	0.0087
4	6.5:1	6.2:1	0.0092	0.0092	0.0090
1	6.0:1	5.7:1	0.0001	0.0001	0.0001
1	8.0:1	7.6:1	0.0002	0.0003	0.0004
1	9.0:1	8.5:1	0.0007	0.0021	0.0042
1	12.0:1	11.4:1	0.0009	0.0087	0.0092
1	14.0:1	13.3:1	0.0032	0.0092	0.0094
1	17.0:1	16.1.1	0.0067	0.0095	0.0092

Quiet settling in glass cylinder 0.1 ft. diam. Each test made by noting time required to form a volume of clear solution equal to 1/20 part of the original volume of pulp. Below the broken lines the slime begins to follow the principles of settling for thin slime.

point the rate of settling is not increased by a further increase in depth, the settling thus following the principle for dilute slimes. It further appears that as the depth of the settling column is increased the *L:S* ratio corresponding to the critical dilution is decreased; likewise, as the depth is increased there is a less noticeable decrease in the settling rate at the critical point. It is reasonable to suppose that for the comparatively deep tanks used in actual practice, the critical dilution would entirely disappear and there would be only a gradual decrease in the settling rate as the initial *L:S* ratio is decreased. In other words, in tall tanks the relation between settling rate and initial dilution of thick slimes might be expressed graphically by a straight line. This principle will be used later in this article and will be shown to give results approximating actual practice closely.

TABLE V. RATE OF QUIET AND CONTINUOUS SETTLING OF THIN SLIME IN LARGE TANKS COMPARED WITH SETTLING RATE AS DETERMINED IN LABORATORY TESTS

	Original *L:S* ratio	Duration of test min.	Total depth of clear solution formed ft.	Depth of clear solution formed per min ft.
24x6 ft Vert 45° cone bottom tank settling slime similar to No 2 but containing larger proportion of fine sand and concentrate				
Continuous settling in tank	9.5:1	60	0.45	0.0075
Quiet settling in laboratory	9.5:1	10	0.081	0.0081
Same tank as above settling slime containing larger proportion of clay.				
Continuous settling in tank............	10 :1	30	0.188	0.0063
Quiet settling in tank	10 :1	60	0.425	0.0071
Quiet settling in laboratory	10 :1	10	0.061	0.0061
11x10 ft Vert 45° cone bottom tank settling slime similar to No. 1.				
Continuous settling in tank	24 :1	20	0.168	0.0084
Quiet settling in tank	24 :1	100	0.768	0.0077
Quiet settling in laboratory	24 :1	.10	0.082	0.0082

Laboratory tests made in glass cylinder 2 ft. high by 0.1 ft. diam. Continuous settling test made by first lowering surface of solution 1 ft below overflow level, then regulating the underflow to maintain pulp level at constant height and measuring depth of clear solution formed per minute.

It was further observed that a slime, which was too thick to permit the classification of the fine sand particles, settled to a much greater degree of thickness in 24 or 48 hr. of quiet settling, than did the same slime, when settling from a dilution which was thin enough for the sand particles to separate. This observation may prove useful in cases where it is desired to secure a very thick pulp.

Rising Liquid Prevents Settlement of Surface Slime

In making the tests on dilute slime, it was noticed that the slime particles were more or less separate and held in suspension in the liquid. The thickening of the pulp began in the bottom of the vessel, and the liquid which was set free arose between the suspended particles higher up, thus preventing thickening in the upper part of the vessel. It appears that only a limited amount of liquid can filter between the suspended particles without carrying them upwards. This seems to be the reason why the settling rate of dilute slimes is independent of the depth.

The settling of excessively thick slime, on the other hand, appeared to be caused by the contraction of the spaces between the particles, due to cohesion. A system of cracks was formed, which ultimately developed into channels, through which the clear liquid reached the surface. The liquid coming from the lower part of a deep vessel had a tendency to open up the channels in the upper part of the vessel, thus facilitating settling near the surface. This was especially noticeable at the critical dilution and explains why, at this point, an increase in depth caused a large increase in the settling rate. Occasionally at the critical dilution the settling rate in the deeper columns was found to be greater than it was for the same slime when slightly more dilute. The reason for this appeared to be that at the critical point the liquid arose through the channels, without greatly disturbing the surface. When the same slime was more dilute, the upward current of liquid became so great that the particles in the upper part of the column were thrown into suspension, and the rate of settling was limited by the amount of liquid which could filter between the suspended particles, as was the case with dilute slimes.

TABLE VI. RATE OF CONTINUOUS SETTLING OF THIN SLIME FOR VARIOUS DILUTIONS OF FEED COMPARED WITH THE CORRESPONDING RATES OF QUIET SETTLING IN LABORATORY TESTS

Actual Practice						Laboratory test (From Fig. 3)
Days averaged	R_1 L:S ratio of feed	R L:S ratio of underflow	F Tons of dry slime per 24 hr.	$F(R_1 - R_2)$ Tons overflow per 24 hr	$S = 0.0000\text{-}4912\ F(R_1 - R_2)$ Depth in ft. of clear solution formed per minute	Depth in ft. of clear solution formed per minute
6	3.9	2.1	155	279	0.014	0.016
2	4.0	2.3	156	265	0.013	0.017
3	4.2	1.9	136	313	0.015	0.017
3	4.3	2.2	161	338	0.017	0.017
1	4.4	1.6	163	456	0.022	0.018
3	4.5	2.0	162	405	0.020	0.018
2	4.6	1.9	161	435	0.021	0.019
1	4.7	2.2	153	383	0.019	0.019
3	4.8	2.7	161	338	0.017	0.020
3	5.0	2.4	137	356	0.017	0.020
1	5.1	2.1	161	483	0.024	0.021
1	5.3	1.9	165	561	0.028	0.022
5	5.5	2.6	150	435	0.021	0.023
4	6.0	2.7	134	442	0.022	0.024
2	6.5	2.8	150	555	0.027	0.027
7	7.0	3.2	115	437	0.021	0.030
2	8.0	3.1	128	627	0.031	0.035
Average	5.27	2.45	145.4	410	0.020	0.022

Results of continuous settling are from daily samples over a period of 49 days in a 12x24-ft. mechanical settler, treating slime No. 3. Laboratory tests, of 10 min. duration each, were made in glass cylinders 2 ft. high by 0.1 ft. diameter.

The previous paragraphs indicate that in most cases of settling of slimes the settling efficiency may be regarded as independent of the depth. Previous writers have shown that the settling efficiency is practically proportional to the settling area. If these principles are true, the settling rate of a given pulp should be the same in a small laboratory vessel as in large settling tanks. In order to check this deduction, a series of parallel tests was made in settling tanks and laboratory vessels. The results of these tests are given in Table V. In making experiments on quiet settling, the duration of the tests was timed so that the final dilution of pulp would be roughly the same in laboratory tests as in actual practice. An examination of the table shows that the rate of continuous settling appears to be slightly less than the rate of quiet settling. It also appears that the rate of settling, as determined in the laboratory, could be used with a fair degree of accuracy, to represent the rate of either continuous or quiet settling, in tall tanks.

TABLE VII. RATE OF CONTINUOUS SETTLING FOR VARIOUS DEGREES OF THICKNESS OF FEED COMPARED WITH THE CORRESPONDING RATES OF QUIET SETTLING IN LABORATORY TESTS

Actual practice						Laboratory tests. (From Fig. 3).
Days averaged	R_1 L:S Ratio of feed	R L:S Ratio of under flow	F Tons dry slime per 24 hr	$F(R_1 - R_2)$ Tons overflow per 24 hr	$S = 0.00009\text{-}88\ F(R_1 - R_2)$ Depth in ft. of clear solution formed per minute	Depth in ft. of clear solution formed per minute
1	1.7	1.5	153	31	0.0008	0.0007
1	1.8	1.7	153	15	0.0004	0.0011
2	1.9	1.75	153	23	0.0006	0.0015
2	2.0	1.7	167	50	0.0012	0.0020
4	2.1	1.65	197	89	0.0022	0.0024
6	2.2	1.66	182	98	0.0024	0.0028
5	2.3	1.8	179	90	0.0022	0.0031
7	2.4	1.74	183	121	0.0030	0.0035
8	2.5	1.8	231	162	0.0040	0.0039
10	2.6	1.82	221	172	0.0042	0.0042
12	2.7	1.87	225	186	0.0046	0.0045
17	2.8	1.94	224	192	0.0047	0.0048
9	2.9	2.1	219	175	0.0043	0.0051
3	3.0	1.9	241	265	0.0065	0.0054
1	3.1	2.1	240	240	0.0059	0.0057
2	3.2	2.25	224	213	0.0052	0.0060
Average	2.6	1.83	208	150	0.0037	0.0040

Results of continuous settling are from daily samples over a period of three months in two 12x24-ft. mechanical settling tanks treating slime No. 4. Initial *L:S* ratio in laboratory tests correspond to *L:S* ratio of feed in continuous settling.

LAW EXPRESSED IN FORMULA

This last principle may be used advantageously by the mill designer. With the settling rate approximately established by laboratory test, a simple mathematical formula gives the relation existing between the thickness of feed and discharge, tons of feed, tons of clear solution produced, and the settling area necessary to secure any of these relations.

Let S = Rate of settling, expressed in terms of depth in feet of clear solution formed per minute.

Let F = Feed of dry slime, expressed in tons per 24 hr.

Let A = Settling area, expressed in sq.ft.

Let $R_1 = L:S$ ratio of feed. (6:1 expressed by the figure, 6).

Let $R_2 = L:S$ ratio of discharge (expressed as above).

Then:

Tons per day of clear solution

$$= F(R_1 - R_2).$$

Cubic feet of clear solution per min. =

$$\frac{32\,F\,(R_1 - R_2)}{1440} = 0.0222\,F\,(R_1 - R_2)$$

Depth in feet of clear solution formed per min. =

$$\frac{0.0222\,F\,(R_1 - R_2)}{A} = S \quad \text{(formula No. 1)}$$

Transposing;

$$A = \frac{0.0222\,F\,(R_1 - R_2)}{S} \quad \text{(formula No. 2)}$$

In Fig. 3, are plotted the settling rates corresponding to a series of original dilutions of the four principal slimes produced in the Tigre mill. The base of each curve represents the thickness of the slime after settling 24 hr. From this point a straight line was drawn to the point on the curve corresponding to the test in which classification of the sand particles was first observed. This straight line closely approximates the rate of settling of thick slimes in actual practice. Laboratory tests, shown by the dotted lines, indicate a much lower settling rate. The curves shown in Fig. 3 may be termed "settling curves." Tests at the Tigre mill indicate that with the settling curve of a slime determined by laboratory tests, any problem of settling pertaining to that particular slime, may be solved with a reasonable degree of accuracy. To illustrate, it may be desired to determine the diameter of a continuous settling tank, capable of handling 145.4 dry tons per day of pulp No. 3. The slime ratio of the feed is supposed to be 5.27 : 1, and the desired thickness of pulp in the underflow corresponds to the L:S ratio of 2.45 : 1. An inspection of the settling curve for Slime No. 3 (Fig. 3), shows that it is possible to secure a final moisture ratio of 2.45 : 1. The same curve gives 0.022 feet per minute as the settling rate corresponding to an initial L:S ratio of 5.27 : 1. Substituting these values in formula 2;

$$A = \frac{0.0222 \times 145.4\,(5.27 - 2.45)}{0.022} = 414\ sq.ft.$$

The diameter of a tank, whose area is 414 sq.ft., is 23 ft. In actual practice at the Tigre mill, a mechanical settling tank, 24 ft. dia., does exactly the work outlined above. It thus appears that a close approximation of actual results may be secured by the use of the settling curve and formula. The tons feed, or the final degree of thickness, obtainable with a fixed settling area, may be calculated in like manner.

SETTLING RATE OF SLIME DEPENDS ON DILUTION

The calculations given above are based on the principle that the settling rate of a given slime depends primarily on the dilution of the feed. To further check this principle and to prove that the settling rate corresponding to any dilution of feed may be determined by laboratory tests, daily moisture samples were taken, over a period of several weeks, from the feed and discharge of two mechanical, continuous settling units. The rate of settling for each dilution of feed was calculated from formula No. 1. On days having the same value of R_1 (dilution of feed), the values of F (tons feed per day) and R_2 (dilution of discharge) were averaged. The settling rates thus obtained, were then compared with the corresponding rates given in the settling curves. Table 6 shows the results in a single 24-ft., mechanical thickener, treating dilute slime, and Table 7 shows the results in two 24-ft., mechanical thickeners, acting as a single unit and treating extremely thick slime. The results of actual practice are slightly erratic, due to irregularities in sampling and to changes in the nature of feed from day to day. It will be noticed however, that there is a marked increase in the settling rate as the dilution of feed is increased: Likewise that the average result obtained in actual practice corresponds closely with the laboratory results taken from the settling curves. It would be interesting and useful if similar comparisons might be made in other plants, in order to prove whether the method outlined above may be used universally in solving the settling problems which confront the mill designer.

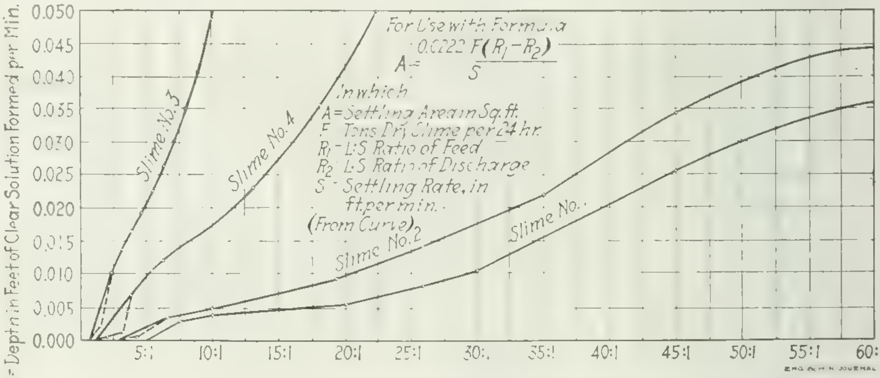


FIG. 3. SETTLING CURVES ON VARIOUS DILUTIONS OF EACH PULP SETTLED 10 MIN. IN GLASS CYLINDER 2 FT. HIGH BY 0.1 FT. DIAMETER

U. S. Fluorspar Production

Last year the total quantity of domestic fluorspar reported to the U. S. Geological Survey as marketed in the United States was 87,048 short tons, compared with 69,427 short tons in 1910, an increase of 17,621 short tons. The production in 1911 was the largest ever recorded, 62,825 short tons of domestic gravel spar being marketed, against 52,013 short tons in 1910. The highly satisfactory condition of the fluorspar industry in 1911 was due partly to the ability of American producers to meet the demand more nearly than heretofore and to produce a better and more uniform grade of gravel spar than can be obtained by importation, and partly on account of the import duty of $3 per ton.

Fluorspar is used in the manufacture of glass and of enameled and sanitary ware, the electrolytic refining of antimony and lead, the production of aluminum, the manufacture of hydrofluoric acid, and in the iron and steel industries, where it is used as a flux in blast furnaces and in basic openhearth steel furnaces. It is estimated that about 80% of the American fluorspar output, mainly in the form of gravel spar, is consumed in the manufacture of basic openhearth steel. The use of fluorspar is increasing in practically all these industries.

While the United States imported over 50,000 tons of tin in 1911, valued at $43,346,394, this country produced but 63 tons of metallic tin from tin ore mined in its boundaries, according to the U. S. Geological Survey; detinning plants, however, recovered 14,706 tons.

German Electric Mine Locomotives

By A. Gradenwitz[*]

The general practice at German mines is to generate three-phase current at the surface and convert it to direct current at 250 to 500 volts underground. Single-phase locomotives are sometimes used. Accumulators or storage-battery locomotives are used where overhead wires or third-rail conductors are not feasible. Automatic accumulator locomotives serve for auxiliary haulage. Relatively low operating cost of electric-locomotive haulage has favored its adoption.

Electric locomotives intended for mining work obviously have to comply with conditions entirely different from those of other locomotives. A locomotive for underground traction was developed in Germany at a comparatively early stage of electrical engineering.

Factors Affecting Underground Design

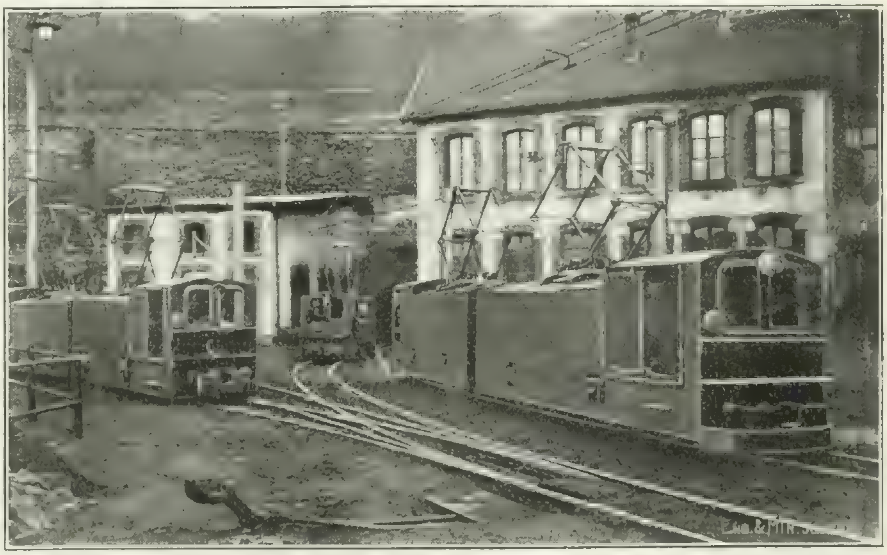
The main factors to be considered were: The narrow gage, sometimes as small as 450 mm., which determines the output of the motor mounted between the wheels; the section of the tunnels, the height and width of which sometimes restrict the overall construction to given dimensions; the small carrying capacity of the underframe which makes low wheel pressure and slow speed desirable, and finally the conditions generally prevailing in a mine, which call for an adequate protection against dirt, moisture, and rough handling. A locomotive which may be taken as typical of the best German practice, is shown in one of the accompanying halftones. All parts lie inside the cast- or wrought-iron frame and are thus protected from injury which might otherwise be caused by objects accidentally projecting into the locomotive profile.

The wheel axles are made of Siemens-Martin steel, the wheel centers being of cast iron with steel tires, which can be replaced when worn. The bearings consist of strong cast-steel cases with dust-tight covers. The bearing bushes, which can be readily exchanged, are made of gun metal and are rigidly fixed in the bearing supports. A grease box is provided for lubrication, which is filled through an opening in the bearing box. This grease box contains a lubricating pad, which is pressed against the axle journal by springs. The frame is supported on the axle bearings by leaf springs, special precautions being taken to prevent these springs from being displaced. Among other mechanical equipment are: A powerful quick-acting hand brake, which can be released immediately by a pedal; a sand-strewing device, and a signal gong.

The motors are the totally inclosed series type, running at a low speed; they are mounted on the axles and are spring-suspended from the frame. They drive the axles from single-reduction gearing, which is likewise inclosed. The motors are regulated by a controller in conjunction with resistances. The speeds are so designed that after the starting period both motors are connected in parallel, when running upon the track, and give their full output at a predetermined speed. On the other hand, for shunting service the motors are connected in series, receive only half the voltage and run at half speed. An automatic main-current switch and a main fuse prevent dangerous overloading of the motors. The lamps for the headlights are connected with a branch circuit, which is also protected by fuses. A wall socket allows a hand lamp to be used, which facilitates the inspection of the interior of the locomotive.

The current is received, in the majority of mining installations, through an overhead contact line, the return current being sent through the rails. A three-phase plant is installed in most generating stations for mining services; it is generally converted underground to continuous current, which is then led to the contact line at a tension of from 250 to 500 volts.

Small bows are used for the current collectors, which reverse automatically according to the direction of travel, when the overhead contact wire is laid at an approximately uniform height. If the height varies considerably, or if it is necessary to protect the contact line at low points by a wooden covering, trolley collectors are most suitable, and this form must also be used for double-pole overhead lines. For heavy currents, such as are necessary for the 125- and 250-hp. locomotives employed in ore mines, for example, it is advisable to adopt a pantograph-roller collector, similar to that shown in the first halftone. As may be seen, these heavy locomotives differ appreciably in other respects also from the form of construction previously described.



High-power Electric Mine Locomotives with Pantograph-roller Collectors

The lower part is constructed with a double frame of sheet metal 20 mm. thick. The locomotive can be controlled and braked from either end. As the locomotives also work in the open air, the driver's seat is completely inclosed. Removable covers facilitate access to the motors. The four-axle locomotives consist of 2 two-axle locomotives coupled together, each of which has a driver's cab. In order to avoid the construction of two driver's cabs, the more recent forms of heavy locomotives have been constructed with one central seat.

The construction of single-phase railways above ground and the successful results obtained with them, have naturally led to the designing of single-phase railways underground. The conditions for the latter, however, are much less favorable. The chief advantage, namely, that of using pressures from 5000 to 6000 volts, no longer comes into question for underground service, where only pressures from 250 to a maximum of 500 volts are permissible. Further, the voltage drop is so great on single-phase lines in consequence of the induction, that in most cases it is necessary to lay special feeder cables. In consequence of the feeder cable and the transformer stations along the track, the installation costs are usually as high as for a plant with a converter station.

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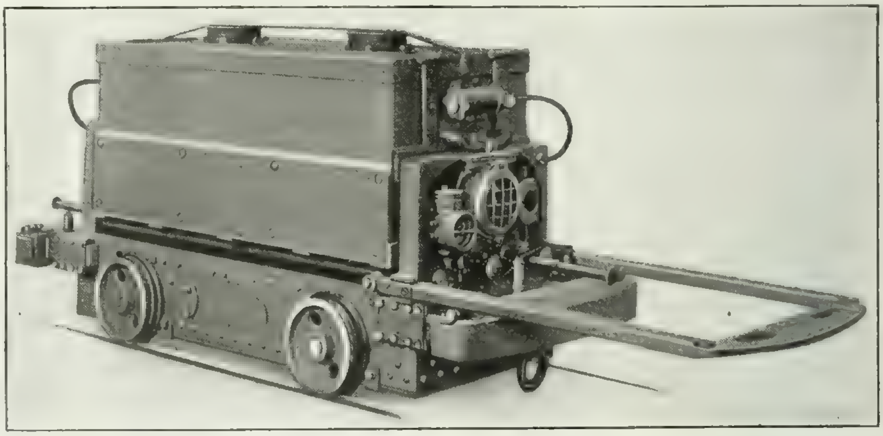
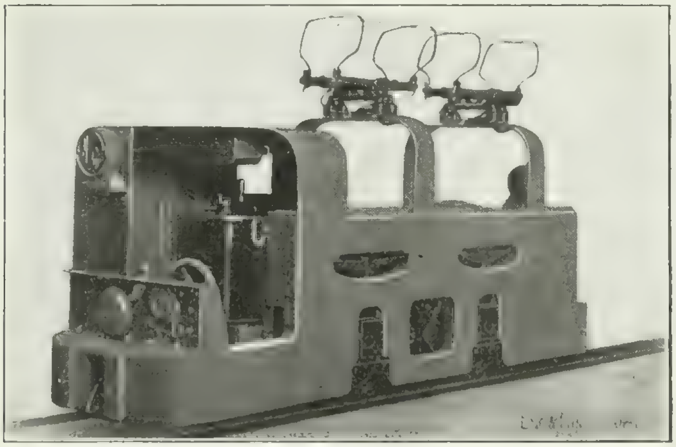
Accumulators Sometimes Used

In cases where, for any reason, it is not permissible to lay an overhead line, the employment of accumulators may be considered. Since special charging stations have been provided for charging the batteries instead of charging them from the overhead line, excellent results have been obtained with the transportable batteries. The equipment consists of the charging station and the locomotives. As a locomotive can seldom make a sufficiently long pause to allow a fixed battery to be recharged, the batteries are made interchangeable, two or more batteries being usually provided for each locomotive.

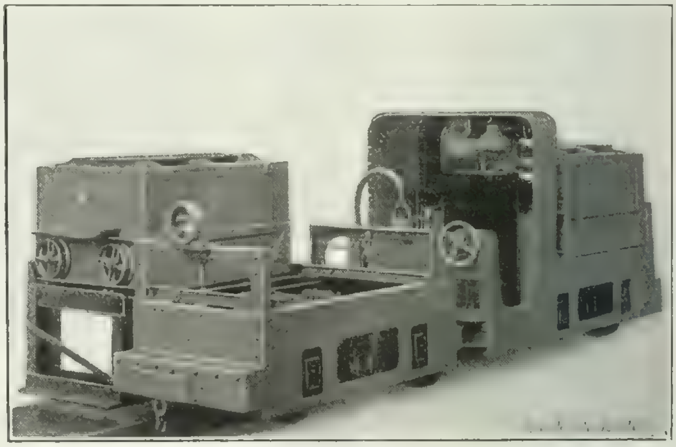
In order to effect a saving in running expenses in cases where the haulage is intermittent, the Allgemeine Elektricitäts Gesellschaft has recently constructed automatic accumulator locomotives. As the name implies, this type of locomotive travels without a driver. The controller is operated by means of a long wooden bow which projects about one meter in front of the locomotive. If the bow comes in contact with any obstruction on the track, it is pushed inward, and thus switches the motor out, applying the brake at the same time. For traveling in the opposite direction the bow must be reversed. Various ingenious and simple devices for the setting of the points by the locomotive, and for the mutual protection of the trains, enable the locomotive to run by itself, to a given place, after the current has been switched on, and thus the service is completely automatic. The locomotives at present constructed weigh 1.5 to 2.5 tons, and draw trains of 10 to 15 trucks in coal mines at a speed of one meter per second.



Automatic Accumulator Locomotive for Auxiliary Service



Typical Electric Mine Locomotive with Bow-collector



Accumulator Type of Locomotive Used in German Mines

Automatic Locomotives as Auxiliaries

The accumulator locomotives of all sizes can be constructed entirely explosion proof, and may, therefore, be used wherever danger of firedamp exists. Although the driverless locomotives seldom come into question for main haulage, they are of great importance for auxiliary service and for side tracks, as they can travel over any track over which trucks run.

In order to avoid the necessity of laying overhead lines in side tracks which are only used temporarily, the locomotives intended for this service are equipped with a cable drum. Before the locomotive leaves the overhead contact line, the flexible cable is hooked on behind one of the contact line clamps. The locomotive is now able to travel for a further distance of about 150 m. A small electric motor which is coupled to the cable drum, is constantly under current. It holds the cable tight as it runs out, and winds it up again at the necessary speed on the return journey.

If the gradients of the side tracks are so steep that it is no longer economical for the locomotive to travel over them, the cable drum is replaced by a winding drum which is mounted on the locomotive and enables the driver to draw in trucks from a distance of about 100 meters.

Working Costs Low

The final decisive factor for the introduction of electric haulage is the working costs. Great reliability in working with simplicity of operation, unsurpassed adaptability to any conditions, facility in the extension of existing plants, all these obvious advantages would not have led to such a rapid introduction of electric-locomotive haulage in all branches of mining, if at the same time the working costs had not been reduced to such an extent that large plants could be written off in a few years solely from the economy effected as compared with previous costs.

The working costs for a mine railway, which consists of interest and writing off of capital costs, expenses for wages, maintenance of plant, and the cost of current and material, can only be determined for a new installation, by the preparation of a detailed estimate and by giving due consideration to all the important factors.

If approximate values are required for general preliminary purposes, the following figures may be taken under ordinary conditions: Working costs for continuous-current locomotives with overhead contact line, 0.5 to 0.65 pence per ton-mile; for single-phase locomotives with overhead contact line, 0.5 to 0.65 pence per ton-mile; for accumulator locomotives, 1 to 1.15 pence per ton-mile.

Notes on Bag Filtration Plants

Anton Eilers, discussing bag filtration of fumes before the recent Congress of Applied Chemistry, said that it is not a paying process on furnaces carrying low-grade charges, except indirectly in stopping law suits, but is highly profitable on converters treating leady mattes.

Up to about 25 years ago, the baghouse was only employed in producing zinc oxide. The first lead-furnace baghouse was erected in 1887 by the Globe Smelting Co., of Denver, Colo., but owing to hot furnace tops and too short flues, the bags often caught fire, and the experiment was not imitated for many years.

Owing to the increase of sulphide ores, resulting in increased roasting and consequent heavy losses, about 1902 experiments were made by the American Smelting & Refining Co., and it was found that with sufficiently large flues of a length from 1000 to 1800 ft., that there was no difficulty making the bags last. Most of the silver and gold settles in the flues, but there is much lead fume which would be lost without a baghouse or some spraying apparatus.

Two typical plants were selected for description. One treats an ore charge carrying 10 to 12% Pb, much moisture, and up to 4%S; the other treats refinery slags, leady copper mattes, and the ores necessary for slag making. The furnace charges in this case are often over 40% in lead, and rather low in the precious metals. The same plant also converts lead-copper matte to blister copper. A separate baghouse is provided for this operation.

The Murray Baghouse

The Murray baghouse was put into service July 7, 1907. Its cost was $127,195, including the cost of 4032 cotton bags, of distributing flue the entire length of baghouse, one 15x6-ft. Buffalo Forge fan, one 100-hp. motor, fan house, small bath house, and about 100 ft. of 17x16-ft. brick flue to connect with blast-furnace flue.

The outside dimensions of the baghouse are 216 ft. 6 in. by 90 ft. 6 in., height to roof trusses being 51 ft. 6 in. Construction is of brick, the outside wall being 21 in. thick for a height of 16 ft., then reduced to 17 in. for 18 ft., and 13 in. for the remaining 17 ft. 6 in. There are 24-in. brick buttresses projecting 4 ft. at floor line and tapering to about one foot at the roof-truss line, to stiffen the walls. Fifteen buttresses are built on each side of the building and five on each end.

Roof Construction

The original roof commenced to leak after a few months, due to the corrosion of the brads holding the elaterite roofing in place. After two years the nails holding the 1-in. board sheeting were eaten to such an extent thata a heavy wind blew about one-third of the roof off from one compartment, and it was evident that nails could not be depended upon for holding the roof down. In the early part of 1910 a new roof was put on top of the old roof in No. 1 compartment, allowing an airspace between the two roofs. On top of the old roof 2x4-in. battens were laid at 3-ft. centers, 1-in. sheeting was then nailed on and elaterite roofing with horizontal seams nailed to this, allowing a lap of about 4 in.; 2x2-in. battens, spaced 3-ft. centers, were put on top of the elaterite roofing and the two roofs were bolted to the 6-in. channel purlins. To give added strength, 3x6-in. pieces, 3 ft. long, were put on the 6-in. channels, between rafters, the 2x4-in. and 2x2-in. battens coming directly on top of these and bolts going down through them. This roof has been in use for over two years and is in excellent condition. The air space appears to prevent any condensation and keeps bags drier than in other compartments. In the other compartments, the old rafters were in fair condition, but additional rafters were put in. making the rafters 1-in. centers; 1-in. sheeting was nailed on top, then elaterite roofing with seams horizontal, then 2x4-in. battens 3 ft. apart. Lag screws were used to hold 2x4-in. battens to the rafters, making a roof that will stand as long as the rafters are good, or until the elaterite roofing disintegrates. To prevent the 2x4-in. battens from cutting into the elaterite roofing, a washer of elaterite was used under all of them. The roof of these three compartments has been in use a trifle under two years, but has never leaked and is in good condition.

Exhausting Gases from Bag House

Each of the four compartments has a steel stack, 6 ft. in diameter by 78 ft. high, coming out from the apex of the roof, about the center of the compartment. When the stacks were built the joints were lapped so that some of the condensation finds its way to the outside of the stack, continually giving them an unsightly appearance. This also weakens the stacks, due to the corroding influence of the weak acid solution going through the joints. The four stacks are now corroded to a considerable extent and one or two holes can be observed at a distance of about 32 ft. from the top. About every two years the stacks have been painted on the outside.

To take care of the condensed moisture that trickles down the inside of the stacks, a lead-lined pan is hung under the stack at a sufficient distance so as not to interfere with the draft. From this lead-lined pan a lead gutter runs out onto the roof. At certain seasons considerable solution is caught in these pans. We had some sad experiences trying to use an iron elbow and iron pipes to lead this solution to the roof, as the iron pipe would eat through, and before we knew of the condition, several bags would be ruined by the weak acid falling on them. The lead gutter with a lead connection from the pan solved this difficulty and gives good satisfaction.

Compartments and Cellars

The baghouse is completely divided into four compartments by means of brick partitions running from the floor line to the apex of the roof. These partitions are the same thickness as the outside walls. Below the thimble floor, each compartment is divided into four chambers or cellars by means of 13-in. brick partitions. These cellars are 87x12 ft., each one having a 4x8-ft. iron door, through which the dust can be removed.

A 16x16-ft. distributing flue built of brick, jack arch roof construction, runs the entire length of the baghouse and connects with each of the 16 cellars by means of 42-in. bull's-eye valves, made of ¼-in. sheet steel stiffened by angle irons. These dampers are hinged at the top and open into the distributing flue. They are operated by means of 2-in. gas-pipe stems running through the distributing flue.

On top of this distributing flue is a smaller flue 11x16 ft. running the entire length of the baghouse and connected to each cellar by means of 34-in. bull's-eye valves. The dampers in these valves open into the cellars and were originally operated by means of gas-pipe stems running through the flue, but now, due to the stems corroding, the dampers are closed and opened by means of a chain on the thimble floor. This upper flue is connected to the baghouse fan flue by means of a 6-ft. sheet-iron downtake containing a butterfly damper, and is used to conduct the gases from any chambers that are in the sintering process, back to the fan and thence into the distributing flue.

The thimble floor, as has been previously stated, is divided into four compartments, each compartment containing 1008 steel thimbles 17 in. inside diam-

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Note—An abstract of a paper by Anton Eilers, read before the International Congress of Applied Chemistry (Vol III, Proceedings), Sept. 4 to 13, 1912.

eter and 10 in. high. These thimbles are made of No. 14 steel plates and are riveted to the steel floor which is made of No. 10 steel plate.

Hanging and Shaking of Bags

The bags are 18 in. in diameter and 30 ft. long. The original 4032 cotton bags were wired at the top and suspended by this wire from hooks fastened to small 3-in. channel irons. To shake the bags it was necessary to air the compartment completely and then go in between two rows of bags, shaking the bags on each side by hand. In 1910 each row of bags was hung on a 1½-in. gas pipe which was suspended by a U-bolt from the old bag hooks. By means of a lever on the outside of the building, this gas pipe could readily be given a horizontal motion of about five inches, the pipe coming to a sudden stop by means of a collar striking an iron plate on the inside of the baghouse wall. In addition to the horizontal motion, about ½-in. vertical motion is given, which motion is also beneficial. Forty-two bags are shaken by means of one lever; this requires not more than three or four minutes. This shaking device has many advantages, I believe, over the system used at the Selby plant, where gas pipes are run on ball rollers. The ball runs and ball rollers have a tendency to accumulate moisture and fume, making it necessary to clean at intervals. The construction of ball runs and rollers is a more expensive construction than the U-bolt hangers; also there is no vertical motion.

When this shaking device was installed it was decided to have all bags folded over three inches and sewed across at the lower part of the fold. This allowed us to put a broom handle or any piece of round stick through the bag and hang up by means of this stick. The old method of gathering the top of the bag and fastening it with wires has a tendency to allow the dust to stick in the folds and in time to rot the bags at the top. With the stick running through the fold, the bags stay open in better shape and also there is no wire to come in contact with the fiber of bags.

Cotton Bags First Used

Originally 4032 cotton bags 18 in. in diameter by 30 ft. long were put into use July 7, 1907. These cotton bags cost $2.136 apiece, f.o.b. Murray, and were purchased from the Denver Dry Goods Co., Denver, Colo. At the end of two years it was computed that the average life of the cotton bags was 17 months, 11 days. Owing to no drip pans being provided under the four steel stacks many bags were lost in the first eight months, due to condensation of moisture in these stacks and the consequent dripping of this moisture (containing small traces of acid) on to the bags. In fact during the first eight months 588 bags were replaced. The leaky roof after about one year's run was also instrumental in destroying many bags.

No. 4 compartment was equipped with woolen bags purchased from the Buell Manufacturing Co., St. Joseph, Mo. These bags cost $4.7185 apiece f.o.b. Murray. The compartment was put into commission May 19, 1909, and to date there have been no bags replaced. About 12 bags have been lowered one foot during this time due to rotting near the bottom. The fiber of the bags is quite strong as yet, and I would estimate that the average life will be nearly four years. Shortly after these bags were put into commission about one-third of the roof on No. 4 was blown off, and a rain storm occurred at the same time, which drenched at least half of these woolen bags with no apparent ill effect. The woolen bags in this compartment are all hung by means of wire twisted around the tops of the bags.

At the present time we have no cotton bags in service, and are completely equipped with woolen bags with the exception of 273 thimbles that are not now in use, but will have woolen bags put on them shortly. These 273 thimbles were reserved to use up the old cotton bags, the last of which were rotted away last winter. I might add that 90 woolen bags were purchased from the La Porte Woolen Mills, La Porte, Ind., at an average cost of $4.784 f.o.b. Murray. These bags were installed about two years ago and appear to be of a good quality.

Filtering Area 3.45 Sq.ft. per Cubic Foot of Gas

There were 570,012 sq.ft. of surface provided for filtering 165,000 cu.ft. of gas per min. or at the rate of 3.45 sq.ft. of filtering surface per cubic foot of gas per minute. When one compartment was shut down for sintering, however, there would be 2.59 sq.ft. of filtering surface per cubic foot of gas per minute, and as it was expected that one compartment would be down most of the time, 2.5 sq.ft. was the basis used for calculating the number of bags needed.

A Buffalo Forge exhaust fan with impeller 6x15 ft. brings the gases from the blast furnaces and forces them into the distributing flue and through the bags. This fan is capable of handling 1500 cu.ft. of gas per revolution at pressure of 1-in. water. A 100-hp. motor, taking 60 i.hp., was formerly used when the fan was running at 93 r.p.m. and handling gases from eight blast furnaces. Later a 50-hp. motor was installed, as we had only 5 or 6 furnaces in blast. The indicated horsepower required when running at 80 r.p.m. with the 50-hp. motor is about 45. The countershaft is equipped with ring oil bearings and inner fan bearings are water jacketed. Little difficulty has been experienced with this fan since its installation. Pressure in the distributing flue is usually about ½ in. of water, at times going up to ¾ in. just before shaking the bags.

Conducting Gases from Furnaces

The blast-furnace gases are conducted through 795 ft. of brick flue and 70 ft. of sheet-iron gooseneck; 725 ft. of this brick flue is 16x17 ft., walls 17 in. thick, roof 8 in. jack arches, 5 ft. centers; 70 ft. of the brick flue is 16x20 ft., walls 17 in. thick, roof of reinforced concrete slabs 4 in. thick. The sheet-iron gooseneck is 20 ft. in diameter made of ¼-in. steel. Back of the blast furnaces is 262 ft. of 16x20 ft. flue with sloping bottom, so that No. 1 blast furnace is about 865 ft. from the baghouse fan, while No. 8 blast furnace is about 1127 ft. from the baghouse.

AVERAGE TEMPERATURE OF GASES ENTERING FAN

Month	1909 Deg. F.	1910 Deg. F.	1911 Deg. F.
Jan.	81.4	83.3	79.9
Feb	73.0	93.0	79.9
Mar.	83.9	113.4	83.47
Apr	91.3	107.2	93.4
May	102.0	106.3	108.65
June	115.5	124.2	114.5
July	117.1	131.0	123.9
Aug	115.3	130.9	120.5
Sept.	99.46	110.7	114.3
Oct.	105.68	93.7	93.9
Nov.	103.02	89.15	90.7
Dec	94.6	87.0	81.9
Average	98.52	105.82	98.75

The temperature of the gases leaving the blast furnaces varies somewhat. Some readings showed 119° F. in the flue near No. 1 blast furnace and 85° F. at baghouse, showing a drop of 34° F. in the 865 ft. of flue when the outside atmosphere was 64° F. No tests have ever been made at this plant to find how much SO_3 and arsenic are thrown out in the flues due to the drop of temperature. The gases entering the baghouse were analyzed, however, at a time when there was a decided deterioration of the bags and were found to contain 0.003% SO_3.

Details of Baghouse Operation

The gases discharge from the fan into the distributing flue; the lower bull's-eye valves being open, the gases enter the 16 cellars, filter through the 4032 bags and discharge through the four steel stacks on top of baghouse. Once every 24 hours all the bags are shaken, the operator using the outside lever and shaking each row of 42 bags. All doors in compartments are kept closed while shaking bags, so as not to allow the temperature in the baghouse to go down too low. The shaking operation is done by first closing the four dampers in the lower valves of one compartment, shaking the bags, opening the valves again and taking the next compartment in turn until the bags in all four compartments have been shaken. This usually occupies the attention of one man for about three hours each day, but could be done much quicker if necessary.

On the first of each month, one cellar

door in each compartment is opened, dust measured and representative sample taken. This is done for the purpose of taking stock. The doors are then closed and sealed by means of mortar. When the dust has accumulated to a thickness of about 24 in., the entire compartment is closed off from the distributing flue, the cellar doors and valves connected with the return flue are opened and fume in the four cellars is lighted by means of hot coals. Formerly we set fire to the fumes across the front, allowing the burning gradually to creep to the back, but as this generally took from 10 to 14 days to complete the sintering process, we changed the method and now throw the hot coals all over the surface of the fume. This apparently gives a much better sinter and the operation is complete within five or six days, so that the fume can be removed. Spontaneous ignition was frequent the first two or three years we were operating the baghouse, but of late it is rare. The exact cause of this spontaneous ignition has never been definitely determined at this plant, but we have found that it generally occurs when over 24 in. of fume has accumulated.

RECOVERY OF FUME, ETC., FOR ENTIRE OPERATION OF MURRAY PLANT BAGHOUSE, JULY 7, 1907, TO FEB. 29, 1912.

	Charge Smelted	Fume recovered	Assay Fume recovered	Per cent of Charge recovered in fume	Value of Metals recovered
Weight.	1,666,857 tons	13,857,645 lb.		0.415%	
Gold..............	256,874.986 oz.	125.595 oz.	0.018 oz. p. ton	0.049	$2,587.10
Silver	24,725,274.19 oz.	14,885.62 oz.	2.15 oz. p. ton	0.063	8,028.25
Lead	354,693,161 lb	4,492,288 lb.	32.4%	1.269	141,745.02
Copper.	16,521,715 lb.	1,947 lb.		0.0118	330.15
Total					$152,690.52

Operating Expense

Labor	$16,440.05
Motive power .	13,542.10
Supplies and repairs....	46,871.28
Total	$76,853 43

Profit Statement

Treatment charge 6929 tons at $10.00. .	$69,290.00
Operating cost	76,853.43
Total cost . . .	$146,143.43
Value of metals recovered . . .	152,690.52
Gain to: 4 years, 8 months.. .	$6,547.09

ONE MAN OPERATES BAGHOUSE

Except when sintered fume is being removed from the cellars, one man on day shift operates the baghouse. For the other 16 hours, an oiler comes over every two hours, takes a temperature reading at the fan inlet and oils the bearings.

The laborers take a shower bath and change their clothes before leaving the bath house. When the baghouse was first started, rubber suits were furnished the bag shaker and foreman, but this was found unnecessary, and cleanliness is the only essential.

An accompanying table shows the apparent gain from the Murray baghouse in 4⅔ years. But the figures given do not include interest and amortization. Interest at 6% on the construction cost, $127,195 for 4⅔ years, would be $35,614, and 5% amortization would be $29,679, changing an apparent gain of $6547 into an apparent loss of $58,746.

If the Murray plant had been equipped to recover arsenic from this fume, instead of having to ship it, it would have lost only $24,101. This shows that on the immediate financial outcome, a baghouse is not profitable in lead plants where the charge is low in lead. However, the elimination of lawsuits may make a baghouse a profitable installation.

An analysis of sintered Murray fume is: Au, 0.014 oz. p.t.; Ag, 2.4 oz. p.t.; Pb, 27.3%; Cu, 0.05; SiO_2, 2.5; Zn, 4.2; S, 4.2; As, 33.5; Fe, 5.2 per cent.

OMAHA BAGHOUSE, FISCAL YEAR 1910

Material to Converters in Tons

	Matte	Iron	Coppery Lith'rge	Ore	Flux and Lining	Slag	Cleanings	Fume	Total
Basic	11,885	167	2,424	668	1,890	7,765	1,964	1,253	28,016
Acid	9,659		2,496		2,671	6,427	3,443	1,055	25,751
Total	21,544	167	4,920	668	4,561	14,192	5,407	2,308	53,767

Contents of Charge and Recovery in Tons

	In Matte and Litharge		In Returns		Total charge		Fume Produced*	Lead Recovery
	Lead	Copper	Lead	Copper	Lead	Copper		
Basic	4,639	5,766	3,233	595	7,602	6,361	1,849	1,115
Acid	4,309	4,176	3,003	649	7,312	4,822	1,629	974
Total	8,948	9,942	6,266	1,244	14,914	11,183	3,478	2,089

*Part returned to converter.

OMAHA CONVERTER BAGHOUSE SYSTEM

The gases from two stands of acid-lined converters and one Peirce-Smith are led into a 1250-ft. steel flue and thence to a baghouse. One set of bags filters about 1600 tons of lead-sulphate fume, representing 4500 tons of blister copper. Long life for the bags, apart from cooling the gases, seems to be attained by drawing the filtered gases away rapidly, so the baghouse is connected to a 300-ft. self-supporting steel stack, brick-lined. In winter a small reverberatory leads into the stack to warm it. Following are some of the data: Cubic feet of flue, 68,000; cellar, 67,000 cu.ft.; bag chamber, 174,000 cu.ft.; 940 bags, 28 ft. long, filtering area, 124,000 sq.ft.; production about 45 tons of blister copper per day from matte assaying: Cu, 45%; Pb, 23; S, 18 per cent. In February, 1911, there were 1667 tons of blister produced, 100 dry tons of fume were taken from the flue, 130 dry tons from the fan, and 385 dry tons from the baghouse. For each ton of blister, 0.221 tons of lead were saved. The cost of operating for seven years was $0.787 per ton of blister.

SAVED IN OMAHA BAGHOUSE

Contents of 1551 tons fume			
5559.44 oz. Ag @ 0.54	$3,002.00		
2,650,774 lb. Pb @ 4.30	113,983.00		
10,818 lb. Cu @ .08	865.00		$117,850.00

Direct Cost or Expenses

Labor	$904.16		
Power	1985.29		
pplies and repairs	2953.05	5842.50	
Smelting 1551 fume @ $2 .	3102.00		
Refining 1325 tons lead @ $5	6625.00	9727.00	15,569.50
		Apparent Net Profit	$102,280.50

Less 6% interest on cost of Baghouse No. 1 about $42,000....	$2520.00	
2½% Amortization.........	1050.00	3,570.00
	Net profit....	$98,711.50

OMAHA BLAST-FURNACE BAGHOUSE

Two baghouses serve the Omaha blast furnaces. In 2½ years there were 2623 tons of fume carrying 50% lead collected, the charge meanwhile carrying 31,254 tons of lead. This shows a saving of 4%. On an average of seven years, the cost of operating the baghouse per ton of lead treated was $0.847, the saving about 42c. per ton.

Burnt fume, carrying, say, 18 to 20% of arsenic and 2% of antimony, is fused in a small reverberatory, and the fumes led to a 300-ft. stack. About 5% of arsenic remains in the slag. The fused material is cooled and then charged alone into the residue furnace of the lead refinery, with a little reducing agent, if necessary, reducing a little lead to take out the silver. The slag from this operation carries about 5 to 6% Sb and 3 to 4% As. This is reduced in a blast furnace with lead skimmings. The metal carries about 10% Sb and 3% As, and is purified by a fire method from the latter.

In fusing the burnt baghouse fume, a Pb-Te speiss settles out on the bottom of the furnace, from which tellurium is recovered as a marketable product.

In the fiscal year 1910-1911, when there was only about half the customary amount of material treated in the blast furnaces, this baghouse still gave satisfactory results, as is shown by the accompanying table:

MATERIAL SMELTED, 1910-1911

		Tons
Copper byproducts		23,090
Ore		22,762
Lead refinery byproducts		13,710
Matte		2,672
Limestone		6,345
Burnt lime		39
Iron		1,391
		70,009
Blast furnace returns		4,103
Total.		74,112

FUME COLLECTED

580 tons, 1615 oz. Ag @ 54c		$872
460,000 lb. Pb. @ 4.30		19,780
		$20,652
Expenses		6,558
Smelting, 580 tons @ $2		1,160
Refining, 230 tons @ $5		1,150
		$8,868
Apparent profit		$11,784
Less interest @ 6%	$3600	
Less amortization @ 2½%	1500	4,100
Net profit		$7,684

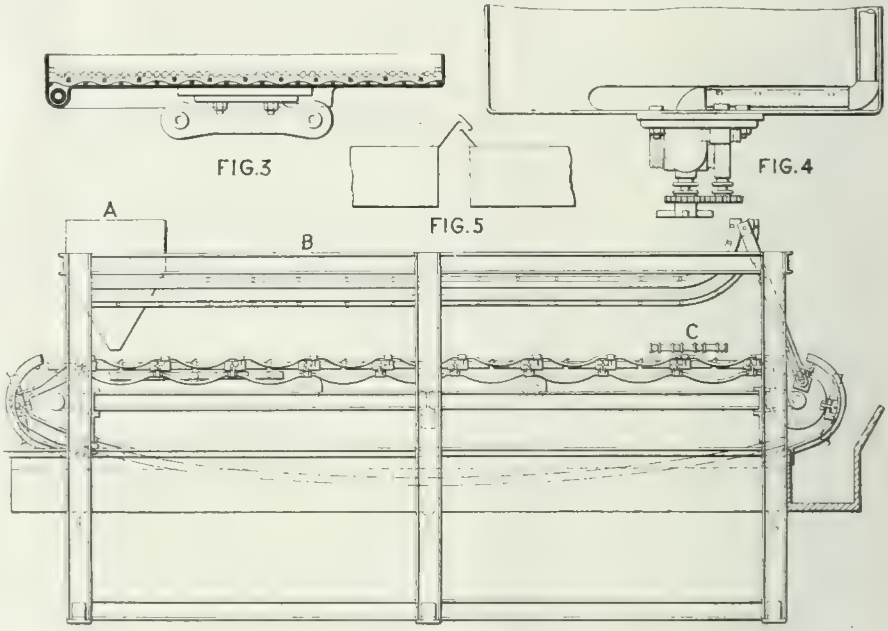
In discussing this paper, which was given in abstract without any figures, Doctor Heberlein said that the wet-condensation processes were in favor in Europe because of smaller cost and better sanitary conditions resulting. He said that there was no difficulty in effecting a scrubbing of the fume even at 70° C. by sprays or churning devices. The addition of lime helped, and the average recovery was 92%. Mr. Eilers said that his figures showed the baghouse to be less expensive both to construct and to operate, and there the matter rested.

Separation of Cadmium and Zinc

In the course of a paper by Eric John Ericson on spelter analysis, before the International Congress of Applied Chemistry, it was remarked that an easy separation of cadmium from zinc was given by the electrolysis of the mixed solution using a platinum electrode previously coated with cadmium. Under such conditions cadmium deposits even with as much as 10% of free H_2SO_4 present.

Traylor Slime Filter

Letters patent, No. 1,029,155, have been granted to Bruce W. Traylor, of New York, for a continuous slime filter. The machine is an improvement on that patented by the inventor, Apr. 19, 1910 (U. S. Pat. No. 556,430), and consists essentially of a series of narrow filtering pans flexibly connected and moving horizontally over two rollers fixed in a suitable framework. The series of pans move like a belt, each pan in succession receiving the pulp from the delivery hopper, as shown at *A*. The pans are connected with each other by two lines of hose, one reaching the compressed air supply and the other connecting with the source of vacuum. These connections are made with the pipes of each system by means of flexible hose connections, the movement of the system pipes being controlled as shown at *B* by the overhanging track.



DETAILS OF TRAYLOR SLIME FILTER

In order that the operation of the valves connecting the pans with the compressed air and vacuum sources may be operated automatically, the arrangement shown in Fig. 4 has been devised, in which both valves are set at the required point by the engagement of the lower star-wheel with a fixed pin.

An arrangement for spraying the cake with wash solution or water is placed near the end of the horizontal travel of the pans as shown at *C*. In Fig. 3 is shown a detail of the pan. After passing over the end roller, the pans are submerged in a water tank where, by the aid of a blast of air, they are thoroughly cleaned of adhering slime. In order to prevent spilling of the pulp during the filling operation a baffle shown in Fig. 5 is provided.

Increased Quartz Production

In 1911 the production of quartz in the United States was 86,823 short tons, according to a report by Jefferson Middleton, of the U. S. Geological Survey, an increase in quantity of 23,246 tons over 1910. The increase in quantity was entirely in the crude quartz, the ground material decreasing in both quantity and value. The production of quartz in 1911 was the largest in five years except for 1909, when it was 121,459 short tons.

The figures on quartz production issued by the U. S. Geological Survey deal only with massive crystalline quartz, with flint, and with quartzite that is used for other than building or paving purposes. These grades of quartz are used in the manufacture of pottery—when it should contain less than 0.5% of iron-bearing minerals—paints, and scouring soap and as wood filler. Considerable quantities of ground quartz are used in the manufacture of paint, in some cases as much as one-third of the total pigment consisting of this material. Quartz crushed and graded to various sizes is used in the manufacture of sandpaper, sand belts, as a scouring agent with sand-blast apparatus, etc. Blocks of massive quartz and quartzite are used in the chemical industry and as a flux in copper smelting. Ground quartz is also used in filters and in tooth powders and by dentists as a detergent.

The Allegemeine Electricitaets Gesellschaft of Berlin, has placed the Rathenau gold medal at the disposal of the American Museum of Safety for award annually for the best device or process for safeguarding life and limb or promoting health in the electrical industry.

Geology of Ocampo District, Mexico

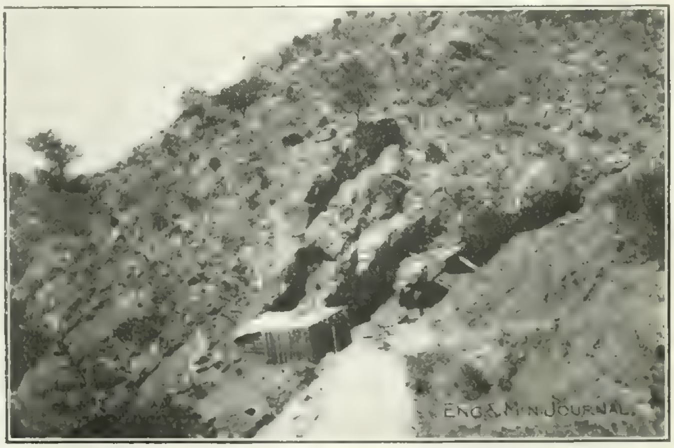
By Robert Linton*

The first discovery of ore in the Ocampo district was made less than a century ago. The ore occurs as shoots or lenses in lodes occupying fault planes in andesite, especially at the intersection of profound with minor faults. The valuable minerals in the ore are argentite and gold, the average grade being $12 per ton.

The old mining camp of Ocampo, or Jesús Maria as it was called until a few years ago, is in the extreme western part of the state of Chihuahua. It is 85 miles by mountain trail from Miñaca, the nearest railroad station, on the Chihuahua & Pacific R.R. A wagon road connects it with Temosachic on the Mexico Northwestern R.R., 107 miles distant.

Situated in the heart of the Sierra Madre mountains, the region is one of surpassing senic beauty. Broad mesas covered with splendid growths of pine lie to the east. The country immediately adjacent is an interminable series of deep, narrow cañons, unusually wooded and always rocky, through which flow crystal-clear mountain streams. The steepness of the country affords little chance for cultivation, but where any of the valleys widen sufficiently to permit it, the ground is cleared for ranching and good crops are raised—corn in the higher and oranges in the lower altitudes.

Rhyolite Tuffs on Temosachic Road


Outcrop of Oreshoot in Matulera Lode

Ocampo is on the western slope of the continental divide and in the Mayo River drainage. Within short distances, however, are streams flowing into both the Fuerte and the Yaqui Rivers. The Cumbre de Jesús Maria, 8500 ft. elevation, lies immediately above the town to the northeast; Santa Brigida peak, over 9000 ft. elevation, lies to the northwest. Both these are prominent landmarks. To the south and west the country rapidly drops down to a much lower altitude, and a few hours' ride suffices to bring one into the region of semi-tropical vegetation. The altitude of the town of Ocampo is 5900 ft. above sea-level.

Ore Discovered Less Than a Century Ago

The principal mines occupy an area about five miles long by one or two miles wide. The camp is a comparatively modern one, the discovery having been less than 100 years ago. The largest producers have been the Santa Juliana, Refugio, Santa Eduviges, San José, Matulera and Belén. Records of the total production are not available, but it has been estimated by men who were familiar with the days of most active operation at not less than $100,000,000. The principal oreshoots have been stoped to depths varying from 700 to 1100 ft. below the outcrop. Until recently mining operations have been confined to the orebodies that outcrop on the surface, although it is probable that the formation contains others that show no outcrop. In connection with the reopening of the Ocampo mines by the Sierra Consolidated Mines Co., a comprehensive study of the geology of the district was made by F. H. Kay, of the U. S. Geological Survey, whose excellent work in this connection merits special acknowledgment.

The rocks of the district consist of massive andesite flows, with interbedded rhyolite and andesite tuffs, and with also occasional flows of rhyolite. The period of volcanic activity, of long duration, was post-Mesozoic, and resulted in building up a series of extrusives of great thickness. Following it came a period of gentle folding accompanied by minor faulting. Ocampo lies on the northeast limb of one of the broad anticlines resulting from this folding.

Somewhat later a period of instrusion followed, which, however, was not extensive, and is confined to the western portion of the district. Here are found several dikes and intrusive masses of a basic andesite-porphyry and two small dacite dikes. None of the intrusions have any economic importance.

Orebodies in Fault Zones

After these intrusions occurred the major faulting of the region. The general trend of the principal fault zones is in a northwest-southeast direction, or more or less parallel to the axis of the anticline. It is in these fault zones that the principal orebodies occur. Intersecting them are other faults striking usually northeast-southwest, but these appear to be earlier as they are found to be offset at points where the intersection can be clearly traced. The determination of the throw of the faults is impossible in nearly all cases, owing to the local nature of the flows and the difficulty in correlation. In two cases, where the throw can be observed with reasonable distinctness, it is found to be 300 to 500 ft. vertically. The northwest-southeast fault zones are quite wide and their formation was accompanied by extensive shearing and alteration. The altered zones are invariably impregnated with ferric oxide, giving to the whole a characteristic red appearance. This results in part from the alteration of the original iron in the andesite, but since in many cases it occurs in the altered rock through all the minute fractures, the bulk of it is probably of secondary origin. Alteration is by no means confined to the fault zones, although it is much more strongly pronounced along them where the rock is sometimes completely serecitized and its original texture entirely lost. Generally the degree of alteration is inversely proportional to the distance from the most pronounced plane of movement in the fault zone, becoming gradually less marked until it can only be detected by the microscope.

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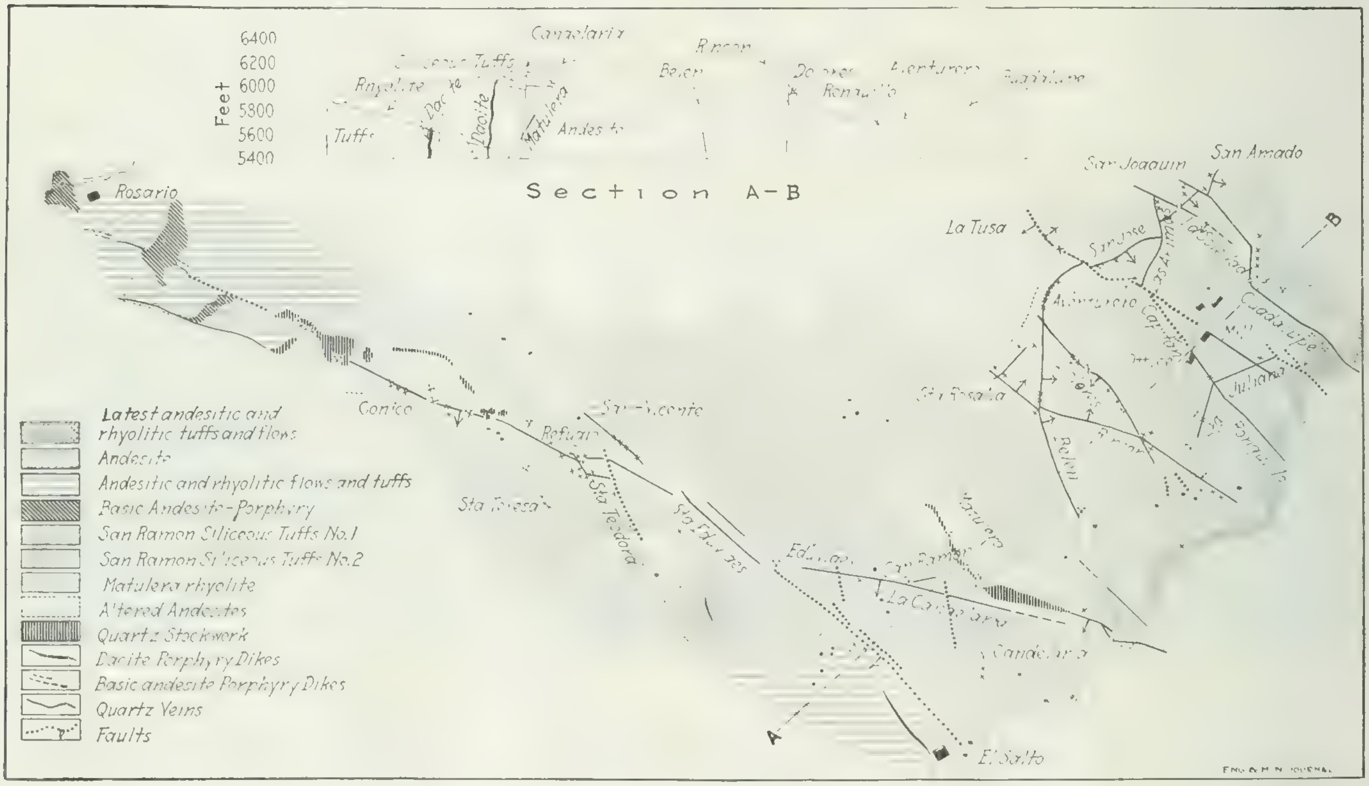
*General manager, Sierra Consolidated Mines Co., Ocampo, Chihuahua, Mex.



Geological Map of the Ocampo District

ANDESITE MOST ABUNDANTLY DISTRIBUTED

The andesite is by far the most abundant and characteristic rock of the region, covering fully nine-tenths of the mineralized area. The typical rock has a green or purple groundmass with numerous white plagioclase crystals, which render it distinctly porphyritic in appearance. The more massive variety has a fine-grained grayish-green groundmass with fewer and smaller phenocrysts. In many places the andesite has the appearance of a volcanic agglomerate or bréccia, in which inclusions of red or reddish-purple rock are inclosed in a greenish groundmass, or *vice versa*. The phases of this variety of andesite are numerous and varied, the inclusions ranging in size from microscopic particles up to three feet or more in diameter, and the dividing line between the inclusion and groundmass ranging from sharply-marked to a gradual shading out from the one to the other. Part of these occurrences are true volcanic agglomerates, in which the extrusive magma flowing over the surface absorbed fragments of rock resulting from the breaking down of previous flows of exactly the same character and composition.

Two distinct andesite flows are exposed, separated from each other by tuffs and rhyolite flows, which together have a thickness of nearly 600 ft. Overlying the upper andesite is the principal series of tuffs—both andesitic and rhyolitic—which form the bold outcrops capping the highest hills and constitute a prominent topographical feature of the district. The tuffs are usually massive, but occasionally exhibit a high degree of stratification, the dip being uniformly to the northeast.

The rhyolite variety, easily distinguished by its light color, predominates, but in many places, especially near the bottom of the series, a purple andesitic phase, usually mixed with fragments of the underlying flow, is rather prominent. The tuffs were laid down before the period of faulting, as the faults and shear zones can be traced upwards through them wherever they have not been eroded off.

ORE OCCURS AS SHOOTS OR LENSES

The ore deposits occur as shoots or lenses lying along some well pronounced plane of faulting in the wider shear zones, or in the smaller fault fissures. It is only in the latter that the deposits approximate a true vein formation. In the fault zones, which are well defined and traceable for considerable distances, the extensive shearing and subsequent infiltration of mineralizing solutions has produced an andesitic breccia, in which the crushed country rock has been recemented by quartz, and in which, at favorable places, there has been concentration of the gold and silver in sufficient degree to bring about the occurrence of pay shoots. Owing to the irregular distribution of the quartz deposits over the altered area, and the fact that the shear zones usually comprise several distinct fault planes more or less parallel, the ore-bearing formations are more properly termed lodes than veins, the lodes including not only the quartz and ore deposits, but also the more or less silicified altered eruptive which lies along the faults and which is directly related to the ore occurrence. The lodes are sometimes brought into relief by erosion, when the formation is highly silicified and thus rendered harder than the surrounding country rock. Such prominent quartz veins are found along the outcrops of some of the important oreshoots, but not along all of them, and as a matter of fact the lodes are marked throughout the greater part of their length more by the contrasting colors of altered and unaltered material than by topographic relief occasioned by outcropping lodes.

QUARTZ OCCURS IN ALL FORMATIONS

While andesite is the country rock surrounding most of the orebodies, there is no indication of any selective action on the part of the mineralizing solutions that would make the andesite the favorable horizon for ore deposition. The tuffs have been eroded over the greater portion of the area leaving the lodes outcropping in the underlying flows. As quartz outcrops are traceable at several points to the highest tuffs, and as orebodies have been found likewise in the tuffs in other mines in the vicinity, it may be concluded that quartz deposition has occurred in all formations without partiality. The evidence seems to show that the ores came from a deep-seated source and were deposited from ascending waters in the fissures and along the fault planes that afforded them channels of circulation.

The oreshoots are rather irregular in size, shape and grade. The long dimension is always in the plane of the lode, and usually conforming more to the dip than to the strike. There is always one well defined wall along which the ore lies, and occasionally two, although this is less common in the wide shear zones than in the smaller and simpler fault fissures. The most favorable locality is the intersection or junction of a minor fault or fracture with one of the more profound faults. Practically all of the large oreshoots that have been profitably worked lie along such intersection or junction points.

The three principal lodes are the Santa Eduviges, Matulera and Belén. The first mentioned is clearly traceable for over two miles and includes two of the largest mines of the district—the Santa Eduviges and Refugio. The Matulera lode is shorter, extending for a length of three-quarters of a mile and including the mine of the same name. The Belén lode is traceable for about two miles and includes the Belén, San José, Balvanera and San Amado mines. The best instance of an ore deposit in a simple fault fissure with little alteration of the andesite is the Santa Juliana at the extreme eastern end of the camp.

The shoots that have furnished the production of the larger mines have ranged from 300 to 700 ft. in length, from two to 20 ft. in width and extending to a depth as yet undetermined. The Santa Juliana mine was stoped down to a depth of 1100 ft., and recent development work in the Matulera mine has opened the shoot on the 1500-ft. level, with no tendency, it may be added, towards a lower grade of ore.

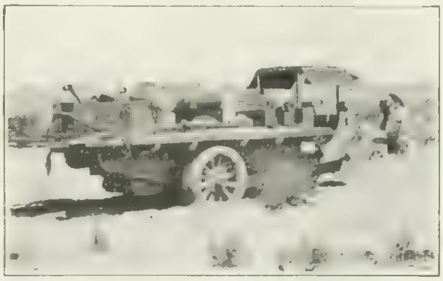
ORE COMPOSED OF ARGENTITE AND GANGUE

Mineralogically the ore is practically all argentite. Occasionally small amounts of more complex ores are found, but these occurrences are rare. Associated with the silver there is always some gold; the proportion by weight of silver to gold averaging about 60: 1. Pyrite occurs in abundance throughout all of the lodes, but only rarely is it associated with silver or gold. This pyrite, called by the natives *bronce* probably resulted from the alteration of the iron of the andesites. There is also a gold- and silver-bearing pyrite —called *pasta*—of occasional occurrence, associated with the silver sulphides in the oreshoots. This pyrite is probably of secondary origin. It is usually fairly rich. Near the surface, where the ore is largely oxidized, there is a certain amount of free gold, and in the richer portions of the shoots native silver is not of infrequent occurrence. Naturally in a formation of this character the grade of the ore varies within rather wide limits. The average gross value of the ore at present developed is $12 per ton, while in the enriched portions of the shoots the grade rises to above $500 gross per ton.

Motor Truck for Mine Transportation Service

The Arizona Southwest Copper Co. of Yucca, Ariz., has in use a 6½-ton Saurer motor truck to haul its concentrates from Copperville to the Santa Fé R.R. station at Yucca, a distance of 27 miles. The first 15 miles from Yucca is a continuous upgrade of from 2 to 4% over desert roads which have a number of deep sand washes. The next seven miles is a steep climb up the Wallapai Mountains. It takes the truck 2½ hr. to make this distance. The last five miles is a downgrade of from 6 to 8% to the mine.

The road surface is fairly good and the Goodrich tires with which the truck is equipped show little wear after running 3000 miles. The first two months the truck was in operation it was used to haul mill machinery and supplies to the mine. With lumber and supplies the round trip was easily made in one day but the delay incident to loading heavy machinery brought the average time per round trip up to 1½ days for the first month.



SAURER TRUCK TRANSPORTING MILL EQUIPMENT

The following costs, furnished by the International Motor Co. of New York, which is handling the Saurer trucks, has been taken as an average of the round trip for the first month.

Gasoline, 19 gal. @ 30c	$5.70
Oil, 5 qt. @ 20c	1.00
Grease, 1 lb. @ 12c	0.12
Driver, 1½ days @ $4.00	6.00
Total variable expense	$12.82

The upkeep expense is given at the following figures:

Interest on investment @ 6% and insurance for 1½ days	$2.11
Depreciation @ 10%	2.67
Repairs	2.25
Tires	2.83
Total upkeep expense	$9.86

The total cost per round trip, hauling five tons one way is $22.68; cost per ton $4.54. The former cost per ton, hauling with teams, by contract was $15, a saving of $10.46 per ton. The saving on each trip of the motor as compared with former hauling costs is $52.30. To make the round trip with horses it took on the average four days. When the mill is in operation and the truck is used for hauling concentrates the above conditions as to grade will be reversed as there will be only five miles upgrade against the load and practically 22 miles downgrade to the railroad.

Electric Furnace Desulphurization

The chemical action that takes place in an electric furnace during the refining of steel results in the dephosphorization and desulphurization of the bath according to the statement made by Cecil Myers in a paper read before the Manchester (Eng.) Association of Engineers. The action takes place in two stages. In the first, which is the oxidation period, the carbon, silicon and manganese are oxidized and in the second, which is the deoxidation period, the metal is dead-melted, and the sulphur is eliminated. The first action is brought about by adding to the charge, certain quantities of lime and oxide of iron, which, under the influence of the high temperature, oxidize the carbon, silicon and manganese, and remove the phosphorus as calcium phosphate. After this operation, the slag is removed from the bath, and further quantities of lime and sometimes carbon, are added. This is the second stage, when the sulphur passes into the slag as calcium sulphide, which is not soluble in the bath.

In the openhearth furnace, calcium sulphide would be readily oxidized into calcium sulphate which would combine with the iron to form sulphide of iron, carrying the sulphur back into the steel. In the reducing atmosphere of the electric furnace this change cannot take place, so that it is possible to remove the sulphur to almost any extent.

In reply to a question as to whether good steel castings could be produced by the electric furnace, Mr. Myers stated that they certainly could, but they would be more expensive at present than the product of the openhearth furnace, and probably not much better.

The power possibilities of the Green River, the main branch of the Colorado, have been little developed. The U. S. Geological Survey estimates that 1,500,000 hp. could be developed in the basin of the Green River, which has a fall of 11 ft. to the mile for a distance of 25 miles, and a total fall of 3875 ft. in 425 miles.

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20,228—WATERWHEEL—The Pelton Waterwheel. (Mines and Minerals, Sept., 1912; 1½ pp., illus.) Principles of construction of the impulse waterwheel; methods of calculating the power and speed. 40c

20,229—WIRE ROPES for Lifting Appliances, and Some Conditions that Affect Their Durability. Daniel Adamson. (Iron and Coal Tr. Rev., Aug. 2, 1912; 1¾ pp., illus.) 40c

SAMPLING AND ASSAYING

20,230—ANTIMONY—Ueber ein Quarzglasquecksilberthermometer nach Dr. H. Beckmann zur Bestimmung geringer Antimongehalte in Blei-Antimonlegierungen. K. Friedrich. (Metallurgie, July 22, 1912; 3 pp., illus.) On a quartz-glass mercury thermometer devised by Dr. Beckmann for the determination of small amounts of antimony in lead-antimony alloys. 40c.

20,231 — ELECTROLYTIC ANALYSIS with Platinum Electrodes of Light Weight. F. A. Gooch and W. L. Burdick. (Am. Journ., Sci., Aug., 1912; 6 pp., illus.) 40c.

20,232—FLUE-GAS ANALYSIS for Beginners. J. E. Terman. (Power, Sept. 3, 10 and 17, 1912; 8 pp., illus.) 60c.

20,233—FURNACES—Spirally Heated Laboratory Furnace. (Eng. and Min. Journ., Sept. 21, 1912; 1½ pp., illus.) Translated from Bull. de la Soc. d'Encouragement pour l'Industrie Nationale. 20c.

20,234—MARKING PORCELAIN AND SILICA CRUCIBLES, ETC. P. A. Young. (Journ. Ind. and Eng. Chem., Aug., 1912; 1 p.) 60c.

20,235—MINE SAMPLING—The System of Mine Sampling Used by Detroit Copper Co. E. F. Pelton. (Eng. and Min. Journ., Aug. 31, 1912; 1¾ pp.) 20c.

20,236—PREPARATION OF MINE SAMPLES for Assay. W. B. Blyth. (Journ. Chamber of Mines of Western Australia, July 31, 1912; 5½ pp.) $1.

20,237—RAPID METHODS of Technical Analysis. (Colo. School of Mines Mag., Sept., 1912; 1 p.) Continuation of article previously indexed.

20,238—WATER SUPPLY for Laboratory Purposes. W. J. Hulings. (Eng. and Min. Journ., Sept. 14, 1912; ¾ p., illus.) 20c.

INDUSTRIAL CHEMISTRY

20,239—SULPHATE OF AMMONIA—The Production of Sulphate of Ammonia in the Year 1911. (Am. Fert., Aug. 24, 1912; 6¾ pp.) 20c.

20,240—WATER PURIFICATION—The Art of Water Purification. C. Herschel Koyl. (Journ. Assn. of Eng. Socs., Aug., 1912; 8 pp.) 40c.

MATERIALS OF CONSTRUCTION

20,241—BUILDINGS—Comparative Cost of Buildings of Wood, Concrete, and Steel Framing. Henry Grattan Tyrrell. (Eng. Mag., June, 1912; 20½ pp., illus.) 40c.

20,242—CEMENT PLANT—Power Supply and Machinery Equipment of a New Portland Cement Plant. (Concrete-Cement Age, July, 1912; 2 pp., illus.) 20c.

20,243—CONCRETE SANDS—A Proposed Study of Concrete Sands. (Eng. News, May 30, 1912; 4½ pp.) Communication from J. R. Freeman on defective concrete sands, which is answered by E. E. Free and R. H. Gaines. 20c.

20,244—GRANACITE—Granacit. Fischer. (Zeit. f. Angew. Chem., June 28, 1912, 1¼ pp.) Granacite, a variety of granite from deep deposits in Saxony which is more resistive to acids, etc., and therefore valuable for technical purposes. 40c.

20,245—PAINTS for Metallic Structures. Allerton S. Cushman. (Proc. Int'l Assn. for Testing Materials, June 28, 1912; 15 pp.)

20,247 — PORTLAND CEMENT — The Metamorphism of Portland Cement. Albert B. Pacini. (Concrete-Cement Age, July, 1912; 3¾ pp.) An analysis of the changes in portland cement and conditions effecting changes. 20c.

20,248—PORTLAND CEMENT CO. in Utah. (Salt Lake Min. Rev., July 30, 1912; 3 pp., illus.) 20c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Frank Nicholson, of Joplin, Mo., has been visiting New York.

J. V. N. Dorr recently visited the Porcupine district, in Ontario.

C. Colcock Jones has returned to Los Angeles, Calif., from Nevada.

Frank H. Probert is in the Patagonia district, Arizona, engaged in professional work.

Frederick G. Clapp, of Pittsburgh, is examining reported gas discoveries in the province of Quebec.

H. C. Miller recently examined several gold properties in northern California for Eastern parties.

E. M. Hamilton is at the Nipissing mines, Cobalt, Ont., and expects to remain there until the end of the year.

R. B. Watson, general manager of the Nipissing Mines Co., arrived in New York Sept. 27, from a month's stay at Carlsbad, Germany.

T. M. Lowry has just returned from Northern Nigeria, where he was engaged for 14 months as acting inspector of mines, and is now in London.

P. Jansen, of Benkoelen, Sumatra, is visiting the Cobalt and Porcupine mining districts, in Ontario, to investigate the processes adopted for the treatment of ores.

C. E. Grunsky, Jr., of the American Engineering Corporation, San Francisco, has been appointed superintendent of the Standard Consolidated Mining Co. at Bodie, California.

F. F. Grout and E. K. Soper have returned to Minneapolis after a summer spent in the field investigating the clays of Minnesota for the Minnesota State Geological Survey.

F. Julius Fohs, of Lexington, Ky., has completed investigations of the Ohio and Allen County, Ky., oil and gas fields for Lexington parties, who will at once develop properties in these fields.

C. Ellison McQuigg has left the Boston & Montana Smelting Co., of the Anaconda Copper Mining Co., at Great Falls, Mont., to take charge of the Department of Metallurgy at the Pennsylvania State College.

A. D. Miles, formerly in charge of the Toronto office of the Canadian Mining & Exploration Co., Ltd., has gone to Copper Cliff, Ont., as assistant to President A. P. Turner, of the Canadian Copper Company.

Walter Harvey Weed has been examining the Kamloops property of the British Columbia Copper Co., and has gone to Cananea, Sonora, Mexico, to spend a few weeks looking over the Calumet-Sonora mine, of which he is consulting engineer.

G. C. Bateman, formerly at the Dome mine, in Porcupine, has been given charge of the Canadian Mining & Exploration Co.'s Toronto office in the Traders' Bank Building. Mr. Bateman was in New York early this week, leaving later for Vancouver.

Ocha Potter, who, as superintendent of the Superior mine, introduced and developed the use of the "one-man drill" in the Lake Superior copper district, has been appointed chief of the efficiency engineering department of the Calumet & Hecla and its associated properties.

Bergrath Dr. Vogelsang, general manager of mines and works of the Mansfeld Copper Co., at Eisleben, Germany, and R. Franke, director of the company, were in New York last week. They left Sept. 9 for Butte, Mont., and expect to spend October and November in visiting various copper mines in the West.

OBITUARY

Joseph H. Gorman died at Pottsville, Penn., Sept. 26. He was a grandson of one of the first operators in the anthracite region, and had himself operated for a number of years the Bell Colliery at Tuscarora, and an iron mine in Lehigh County.

Edward Leonard Dwyer was found dead at Janesville, Wis., Sept. 25. It is uncertain whether he was killed or committed suicide. He was 60 years old and had led a varied and adventurous life. At one time he was known as a mining promoter in Mexico and Colorado.

George Williams died in New York, Sept. 25, aged 72 years. He was for a number of years president of the Dutchess Mining Co., which owned and operated iron mines at Ancram, Copake, Halstead and Leedville in Dutchess County, N. Y. He retired from active business several years ago.

Henry Colt Mortimer, of New York, died at his summer home at Barnstable, Mass., Sept. 30, aged 62 years. He was head of the firm of Mortimer & Wisner, more recently Mortimer & Co., and was one of the oldest and best known dealers in heavy chemicals in New York. He was a director in several phosphate and chemical companies and a member of several clubs.

John G. Jennings died at Pittsburgh, Sept. 26, aged 48 years. He was born at Brady's Bend, Penn., his father being a prominent operator in the early days of the Pennsylvania oil field. He entered the oil business when a young man and became a large operator in Pennsylvania and later in the West Virginia field. He was manager of the Producers' & Refiners' Oil Co., president of the Jennings, the Delmar, the Kanawha and other oil companies.

Societies and Technical Schools

National Mine Rescue and First Aid Conference—This conference was to be held at the Bureau of Mines building in Pittsburgh, Sept. 23-26. A general discussion of the subjects indicated was expected, with reference of special topics to committees for consideration and report. A large number of engineers and representatives of mining companies were in attendance.

University of Pittsburgh—The mining school will open a four-year course in petroleum engineering at the opening of the college year, Sept. 30. During the first two years the curriculum will be the same as that of the mining engineer course. The last two years train the students in surveying, geological examinations, location of wells, laying out of power, pipe lines and pumping plants, and passing on the values of oil and gas properties. Roswell H. Johnson, who has been a consulting geologist in Oklahoma for the past four years, will be in charge of the geological instruction in this branch.

California State Miners' Association—The Executive Committee of the California Miners' Association has called a Convention to be held in the City of San Francisco, California, Dec. 9. The governors of the mining states will be requested to appoint delegates. The object of holding a convention of this magnitude is for the purpose of awakening interest in the mineral exhibit that is to be made at the Panama-Pacific International Exposition, which is to be held in San Francisco in 1915, so that the industry will be properly represented. There will be more or less expense incurred in carrying out this plan, and voluntary contributions to defray those expenses are asked. The office of the executive committee is in the Royal Insurance Building, San Francisco.

Colorado School of Mines—At this school, at Golden, Colo., the metallurgical ore dressing and experimental plant is now equipped with the concentrating unit and as the second quarter of the appropriation, amounting to $12,500, will be available on Oct. 1 the complete equipment for all the units is promised before the end of the year. C. E. Durrell has been making extensive tests with flotation on Colorado zinc ores and apparatus for the work has been arranged in the plant in advance of the completion of the permanent equipment. Last year a course in coal mining was added. As a result about 25 men are now attending the coal mining classes. One of the first coal mines opened in the state is within one-fourth of a mile of the campus, while the Northern Colorado lignite fields, the Cañon City domestic coalfields where longwall mining is carried on and the bituminous coalfield are all easily accessible to students for inspection trips.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francicso

Sept. 25—The California Miners Association will meet in 16th annual convention at San Francisco, for three days beginning Dec. 9, 1912. One of the chief objects of the convention will be to prepare for a mineral exhibit at the Panama-Pacific International Exposition in 1915. The preparation will be made in conjunction with the director of mining of the exposition management and will embrace not only the representation of the Pacific Coast, but of all the mining states and countries. An especial effort, however, will be made to arrange for an extraordinary exhibit of minerals representative of California and the Pacific Coast mining states. It is believed that the association will be able to gather a larger and better display of California mine products than has ever been assembled at any previous exposition. There has been but little effort on the part of exposition commissions to this end. At former expositions in California, there has been a disposition to give more attention to the romance of the gold seekers of the pioneer days than to the practical exhibition of the products of the mines and the modern methods of ore treatment.

The announcement that President Taft has withdrawn 37,000 acres of oil lands from entry to be devoted to the exclusive use of the government in supplying the navy with oil fuel is interesting. It is estimated that these lands will supply approximately 250,000,000 bbl. of oil, or enough for 25 years, allowing a liberal estimate of the needs of the navy. The lands withdrawn are in the Elk hills in Kern County. There are 58 geographical sections in the area. Of this area 50% is said to be undisputed public domain, 30% is held under patent by the Southern Pacific R.R. and other supposed owners, the remaining 20% is being prospected or operated by independent individuals or companies.

Denver

Sept. 26—Suit was filed recently before the railroad commission by the town of Glenwood Springs against the Colorado Midland, and Rio Grande companies for lower rates on coal from South Cañon to Glenwood Springs, a distance of four miles. It is declared that a charge of $1 per ton for haulage and $3 for switching each car from one road to the other is exorbitant.

The charter of the Colorado Fuel & Iron Co. expires Oct. 21, and its plans for the future have not been made public. It is believed here, however, that this corporation will ask for a charter renewal for 20 years as permitted under the Colorado incorporation laws. Last year, one of the best in the company's history, owed its good showing mainly to the demand for its openhearth rails. The rail mills' capacity is now booked for a year ahead.

It is announced by Victor G. Alderson, president of the state school of mines at Golden, that the new experimental ore-dressing and metallurgical plant built at a cost of $125,000, will be opened Nov. 1. Philip Argall and D. W. Brunton are on the advisory board.

The feud between the union and nonunion miners in the northern coal field is still on after over 2½ years' duration and on the night of Sept. 17, at Lafayette, 17 miles from Denver, a revolver and rifle fight took place in which about 400 shots were fired. Fortunately, they were very bad shots for only one man was wounded. The houses of the Bulgarian strike breakers were first bombarded with rocks, and they answered with bullets. The sheriff of Boulder County and his deputies are in control.

Coal tracts in the Yampa field on the survey line of the Moffat road are selling rapidly. For seven years the owners have given many options, but hardly a sale was made, but about two months ago what is known as the Lennox tract of 1720 acres was sold for $100 per acre and a payment was made. This tract is at the mouth of Wolf Creek, about 17 miles west of Steamboat Springs. About the same time 10,000 acres in the Sage and Dry Creek section, south of Hayden, was sold for about $75 per acre, this land being owned by Colorado City men. This week another 4000 acres was sold for $75 per acre. In every case the purchaser's name is being kept secret. Perhaps the knowledge that Newman Erb and his associates have taken over the Moffat road is behind the movement. Application by the receivers of the Moffat road to the district court for authority to issue $300,000 worth of receivers' certificates has been made, and it is stated that Newman Erb will take the issue; $200,000 of this money will be used for snowsheds, switches and turn-outs from timber-line to timber line on either side of the summit of the continental divide, known as Corona Pass, the elevation of the summit being 11,600 ft. This will prevent the congestion of traffic from snow blockade, and permit the hauling of the whole product of the Oak Creek district coal mines during the entire winter, which hitherto has not been practicable. So far all the purchases have been of bituminous and the best steam coals west of the Missouri River, but no anthracite tracts have changed hands.

An important suit now before the United States court of appeals is that of the Government *vs.* the Home Coal & Coke Co. and the Baldy Coal Co., to cancel a patent issued for 80 acres of coal land in the Pueblo district. The entry was made in November, 1904, by an individual who filed a nonmineral affidavit, and the government declares that the American Savings Bank of Trinidad advanced the entry fee on the credit of two other individuals. The entryman, it is stated, had no idea of holding the property, did not even know who paid the fee, and four days after his entry assigned it to the Home company.

Butte

Sept. 25—As the result of a bill passed during the last session of the legislature, the construction of a state sanitarium for the treatment of miners' phthisis and tuberculosis is now under way, and will be completed in about two months. The buildings are being erected about four miles north of Warm Springs in Deer Lodge County. Representative J. E. McNally, of Silver Bow County, introduced the bill, but the appropriation made at that time was found to be insufficient, and it was feared that the plan would have to be dropped, at least until another session of the legislature. In this crisis the officials of the Anaconda Copper Mining Co. were appealed to, and at once gave assistance, with the result that the hospital will soon be completed.

A Montana company started drilling for natural gas within the limits of the city of Great Falls on Sept. 24. The company was granted a franchise last summer by the city and since that time has been making preparations for the work. Charles E. Duffield, of Medicine Hat, who has charge of the work, has finished the erection of a steel derrick and drilling apparatus, and has begun drilling with a 20-in. bit.

It has been announced by Chief Engineer Charles A. Lemmon that the extension of the Butte, Anaconda & Pacific R.R. will be completed into Georgetown by Nov. 1. The bridge across the forks of Cable Mountain was completed Sept. 24. Most of the mining properties in the Georgetown district have been waiting for the completion of the road before beginning mining and have either been idle or engaged in development work only. The disagreement between the company and the electricians regarding the wages to be paid for electrifying that part of the railroad in Silver Bow County, has not been settled yet, but it is believed that the work will proceed again in the near future, and be carried rapidly to completion in Butte.

According to the report of the U. S. Assay Office at Helena, Madison County led all others in the production of gold during August, with a total of $42,686. The deposits of the various counties in the order of production were: Madison, $42,686; Lewis & Clark, $26,534; Fergus, $22,990; Chouteau, $17,736; Missoula, $7046; Lincoln, $4719; Silver Bow, $2610; Powell, $2332; Deer Lodge, $1706; Broadwater, $1475; Ravalli, $693; Jefferson, $528; Sweetgrass, $84; Granite, $80; Park, $55; a total of $131,274.

Salt Lake City

Sept. 26—The strike situation at Bingham is unchanged. The strikers are quiet, and there has been no disturbance or damage to property. Three hundred special deputies have been sworn in, and are on the Utah Copper ground to prevent possible trouble. All the mines are closed down, and also the concentrating plants at Garfield. The smelteries have a good supply of ore on hand, and are running. Ores from other camps are being received. Bingham furnished the Garfield smeltery with about 1100 tons of ore daily, the remainder, about an equal or greater amount, being received from outside.

The companies are willing to discuss the situation with the miners or committees appointed by them, but not with these committees as representatives of labor unions or agitators, who have brought about the present trouble. The outcome depends largely on the action of the Utah Copper, as other properties will follow. Conferences between mine owners and miners are being arranged for. Many miners have come into Salt Lake City, and some are seeking work in other camps until the present difficulties are adjusted. At Park City and Tintic there is no sign of a sympathetic strike.

At a meeting of Utah mine owners and operators held Sept. 14, it was decided to include operators from other Western states as well as Utah men in the proposed new mining men's organization, if possible, and a committee of three was appointed to correspond with mining men in Nevada, Idaho, Montana, Arizona, etc., with a view to ascertaining the sentiment in regard to the forming of an interstate organization.

Kingman, Ariz.

Sept. 26—Two mines of this county are producing more than $2,500,000 in gold annually and one zinc mine more than 7,000,000 lb. of zinc. In Kingman is the largest electric power plant in the state, supplying the town of Kingman, the Tom Reed and Gold Road mines and several smaller properties. In the River Range, several properties, which at the corresponding stage of development, have probably as good prospects as the Tom Reed or Gold Road, are under development and should soon become producers. At various other places in Mohave county, promising properties are being opened, the chief resources being gold, silver, zinc, copper, lead, tungsten, molybdenum and some gem stones. With its present output and potential wealth it is expedient that county roads shall be so constructed and maitained that they may assist the county's development by a decrease in freighting costs.

The law requiring a bi-monthly payday, which was recently passed by the legislature, is causing some anxious inquiry on the part of the mining companies in the county. The referendum was invoked against the law and acts as a stay in its execution until the question can be voted upon. Judging from the general sentiment of the electors, as learned from newspaper comments from various parts of the state, it is believed that the law will be affirmed. Its only unfavorable effect, so far as can be predicted, may be to cause inconvenience to the companies in their accounting departments, while, on the other hand, it will reduce the financial risk of the miner working for a company operating with a narrow margin of solvency.

Negaunee, Mich.

Sept. 28—Better conditions in iron-ore mining are indicated by the re-opening of the Princeton No. 2 mine at Gwinn, the Smith mine in the same district, and the Chase mine at North Lake, by the Cleveland-Cliffs Iron Co. The same company lately re-opened the Maas mine at Negaunee, and largely increased its force at the Negaunee mine, in the Negaunee Basin. The Republic Iron & Steel Co. is preparing to re-open its Cambria and Hartford mines, and the Breitung-Kaufman companies are opening a new mine at their Lucky Star property, while five miles south the Cascade Mining Co. is hurrying the development of a good-sized mine.

The Negaunee Basin and the Iron River district, which sections J. R. Finlay classed as having the largest ore reserves in Michigan, are both "booming," and men are scarce in these places, as compared to a year ago when men were plentiful, but jobs scarce.

At the American mine, the new iron-ore concentrator is practically completed and will soon be in operation. The mill is built following the ideas of J. R. Thompson, manager of the mine, who has hurried the matter along in order to take care of the low-grade soft ore which it is necessary to mine to penetrate to the high-grade ore. It is estimated that there are 600,000 tons of low-grade ore, containing 40% iron; the concentrator erected at a cost of $150,000, will make a 60 to 65% product. More low-grade ore will probably be encountered as the mine workings are deepened. The flow sheet will be subject to changes as the milling results become available. In general the scheme is as follows: The ore will be reduced to egg size at the crusher plant at the shaft where gyratory crushers are in operation. It will be conveyed by belt conveyor to the mill and will be classified, the larger material being sent to rolls which reduce to ⅜ in. The material is then classified and sent to different size pulsator jigs of new type which will concentrate to 60 to 65% ore, giving the bulk of the product of the mill. The slimes will be treated on Deister tables. The mill is not a hillside plant, and elevators are used.

Spokane, Wash.

A deed of trust to secure the issuance of first-debenture mortgage bonds of $200,000, bearing 7% interest, has been issued by the Central Republic Mining Co., with Thomas H. Brewer, president of the Fidelity National Bank, of Spokane, and Ortho Dorman, as trustees. The bonds will be issued to enable the company to start extensive development of its property, comprising the Valley View, D.D., Fingerboard and Evening Star claims, in the Republic district.

Porcupine

Sept. 26—The Ontario courts have dismissed the petition for a winding-up order of the Crown Charter company, recently filed by R. B. Lamb, who stated that the company owed him a large sum for commissions. This mining company has come through the first of a series of attacks, which will probably be made on it. A threatened combined attack by several shareholders presents a formidable danger. Until this matter is settled, the directors will have a hard time to provide the necessary funds for the continuation of the development work. At the present time, only a few men are working. A special general meeting of the shareholders has been called to consider the question of financing the mine, and a spirited contest is expected between the factions, led by J. P. Heffernan, and the disgruntled shareholders, who do not agree with his proposals for financing.

The Mining News

The Current History of Mining

Alaska

Alaska Treadwell—During August the mills crushed 82,796 tons of ore for a recovery of $197,346 in bullion and concentrates at a cost of $79,596 for operating expenses and $40,871 for construction expense, leaving a net profit of $76,879. The yield was $2.40 per ton of ore milled.

Alaska Mexican—During August, 20,643 tons of ore was crushed for a recovery of $61,771 in bullion and concentrate, at a cost of $28,046 for operating expense and $11,281 for construction, leaving a net profit of $22,444. The yield was $3.02 per ton of ore milled.

Arizona

GILA COUNTY

Superior & Boston—Shipments of ore, mostly from the Limestone vein, are being made to the old Dominion smeltery. The crosscut north on the 12th level is in broken, iron-stained schist carrying native silver but no copper. The two crosscuts south are being advanced. On the eighth level, a crosscut is being driven south into the quartzite foot wall, and near the end of the east drift, a drift has been started on a small vein, which is reported to be showing up well in copper.

Arizona Commercial—The steel headframe has been moved from the Eureka to the Copper Hill shaft and is being erected. The Wellman-Seaver-Morgan, 14x20-in. double-drum, geared hoist, is also being moved from the Eureka to the Copper Hill shaft. The only underground work at present consists of enlarging to three compartments and retimbering the Copper Hill shaft below the fourth level. About 20 men are employed. R. R. Boyd is superintendent.

Inspiration Consolidated—A new inclined shaft which will connect with the main tunnel has been started and will be used for lowering men and timbers below the tunnel level. At the Live Oak mine, sinking continues at No. 1 shaft, which is about 575 ft. deep. At No. 2 shaft, drifts are being driven east and west on the 570-ft. level. The east drift will connect with No. 1 shaft, more than 2000 ft. distant. The widening of the Sulphide tunnel has proceeded for 570 ft. from the portal.

Irene—At this silver mine, near Globe, recently leased by J. A. Fleming, one of the two miles of road that will be required has been built, and 1000 ft. of track has been purchased. Work will soon be started on the second and third levels of the 225-ft. shaft.

South Live Oak—Churn-drill hole No. 3 has been discontinued at a depth of 945 ft., and hole No. 4 will be started about 1000 ft. farther west. It is reported that hole No. 3 passed through 65 ft. of 2% copper ore, beginning at a depth of 750 ft., and at 815 ft. passed into barren ground.

Iron Cap—The east drift on the 650-ft. level has been in ore for the last 75 ft. Four cars of ore have been shipped and a fifth is being loaded.

Copper Reef—At this mine, 12 miles south of San Carlos, the oreshoot on the California vein has been opened up for a length of 300 ft. in the drift from the California tunnel. The 220-ft. raise to surface for ventilation has been holed through and the sinking of the winze resumed. A 14-hp. Hendrie-Bolthoff hoist has been ordered for sinking the winze.

Southwestern Miami—Churn-drill hole No. 8 is 910 ft. deep and reported to be still in chalcocite-bearing schist, as is also No. 7, which is now 1206 ft. deep. Hole No. 6 has been discontinued at a depth of 985 ft. without encountering ore and the drill has been moved to No. 4 hole, which was discontinued at a depth of 585 ft. The drilling of this hole will now be resumed.

MARICOPA COUNTY

It is reported that a deposit of strontium has been found 14 miles south of Gila Bend, and that a German syndicate is considering its purchase. A discovery of gold ore near the Palo Verde bend in Cave Creek is reported, and cinnabar has been found to the northeast of Phœnix.

Kay Copper Co.—This company has purchased a 90-hp. auto truck with trailers to haul ore 42 miles from the mine at Glendale.

Via Mining & Smelting Co.—A test has been made of the smeltery at Roger's Springs, high-grade matte having been made.

MOHAVE COUNTY

Chris Voght has several men at work on his property in the Wauba Yuma district on the west side of the Hualapai Mountains.

O. D. M. Gaddis is negotiating the sale of the Williams tungsten mine. Ore has been shipped during the last few years.

It is reported that a shoot of gold-copper ore of good grade has been opened on Mr. Loper's property at Valentine, in the Cottonwood district, east of Hackberry. There is ore on the dump and Mr. Loper is negotiating for a mill which he intends to remove from Yavapai County.

Tom Reed—The directors recently voted $60,000 for the August dividend.

Yucca Mining Co.—Prospecting has been done on the San Francisco mine with a diamond drill and on the 700-ft. level gold-bearing ore was found, which warrants further exploitation. A drift is now being driven. J. C. Goulding is superintendent.

Cordelia—It is reported that a rich strike has been made in this mine, in Bob Tail basin, just north of Todd basin. Hoffman brothers, the owners, have leased the property.

Nevada-Arizona Gold Mines Co.—The greater part of the machinery for the mill for this company's property in the Music Mountains is already on the ground and several carloads of lumber and some additional machinery will soon be shipped from Los Angeles. Cloyd Richardson is in charge of construction and will make the first run.

Keystone—This old mine, at Mineral Park, is being unwatered by James Uncapher preparatory to examination. In the early seventies, this mine produced rich ore which was shipped to Swansea, Wales.

California

AMADOR COUNTY

Keystone—The inclined shaft is 1800 ft. deep, which is 400 ft. deeper than when the present work was begun. It will be deepened to 2400 ft. C. R. Downs, of Sutter Creek, is manager.

CALAVERAS COUNTY

Hepster—Pay gravel is reported in the lower tunnel at a distance of 2100 ft. from the portal, on the west slope of Stockton Hill, near the town of Mokelumne Hill. The upper channel had been worked previously, but the lower channel has only been prospected; Stephen Hughes, superintendent.

INYO COUNTY

Bishop Creek—The new 10-stamp mill is completed. The stamps weigh 1250 lb. each. The mortar blocks are of concrete. The heavy timbering is of lodgepole pine grown in the vicinity of the mine. Algernon Del Mar, superintendent.

Tiptop—In July and August about 20 tons of ore per day was shipped from this mine, near Buena Vista. The mine is developed on three levels. The total underground excavation is about 1100 ft. The vein on the main level is about 29 ft. wide. The cost of mining is said to be about $1.40 per ton. The shipping ore is broken from a shoot 7 ft. wide. C. M. Thorndyke, of Laws, is manager.

Skidoo Mines Co.—During August, 1142 tons of ore was milled; about 11 days having been lost. Bullion worth $17,613 was produced at a total expense of $8069.

Mariposa County

Original—The first cleanup from the new mill amounted to $5100 from 335 tons of ore crushed. The mill had run 16 days, but for 9 days only 5 of the 10 stamps were dropping. The 200-ft. level has been driven on for about 90 ft. and the drift will be advanced to 300 ft. A quantity of ore has been blocked out, and it is the purpose to keep all the stamps dropping. The mine is dry; 25 men are employed. George W. Egenhoff, of Merced, is superintendent.

Nevada County

Gold Point—This old mine, in Grass Valley, is to be reopened. A new steam hoist will be installed, and the shaft will be deepened to 1000 ft. Alfred Onn is manager.

Siberia—This mine is to be reopened by advancing the lower tunnel. As soon as developments warrant it, the 5-stamp mill will be placed in commission. Walter and Garrett Bigelow are owners.

Birchville—A new 20-stamp mill and electric power will be installed. John A. Bunting, of Oakland, is managing director.

Coan—The shaft is 250 ft. deep and will be deepened to 300 ft. and a drift will be driven toward the Champion vein. C. D. McGonigal is manager and a lessee.

Sierra County

A tunnel has been driven more than 400 ft. into Rattlesnake Peak to tap a rich gravel channel, a fine blue wash and much coarse gold having been taken out of a 40-ft. raise which reaches the rim. This is evidently the same channel as the rich Gibraltar which it joins on the south. H. E. Deal and associates, of Downieville, are owners and operators.

Sierra del Oro—The old tunnel has been cleaned and retimbered and new track laid preparatory to running ahead under the rich shoot of ore recently discovered in this Jim Crow cañon property. Only 150 ft. will be required to reach the shaft and several hundred feet of backs can be obtained. W. I. Redding, John Mayer and associates, of Downieville, are the owners and operators.

Black Hills Standard—This company is operating steadily in the Ragged Top district, handling about 100 tons per day. C. G. Willard is in charge of the mill, and Edward Manion is general manager.

White Bear—Work has just been begun on this old gravel property, reopening the old Dutch tunnel by the present owner, John Costa of Downieville.

Gibraltar—At this gravel property near Downieville an engine house is being erected for a 50-hp. boiler, pump and hoist which are to be installed later to work the rich gravel discovered some time ago by the owners, Kieffer brothers of Downieville.

Monte Cristo—The main tunnel is being extended to the old works to permit prospecting the remainder of the company's ground and the extracting of rich ore that was left above.

Willoughby—The mill has been put in repair and is now handling good ore, a large quantity of which is blocked out. Henry Spaulding is in charge. Dr. R. L. Jump, of Fruitvale, is owner.

Swastika—At this Sierra City mine extensive mill repairs have been made and ore is being crushed from the good shoot recently developed. Lawrence Holley is in charge.

Keystone—A 75-hp. generator for the electric plant has been purchased to replace the old 50-hp. machine. The rich shoot recently struck grows wider and richer with drifting. S. W. Van Syckle has charge.

Siskiyou County

King Solomon—There is a probability that this mine, 14 miles southeast of Sawyers Bar, will be reopened. While the ore is low grade, averaging about $5 per ton, the mine was profitably worked. The ore was crushed in an 8-stamp and a Huntington mill with a combined capacity of 80 tons per day. W. H. Young is manager.

Ball—Engineers have recently examined this mine near Sawyers Bar. It has been idle for two years, and is equipped with a 20-stamp modern mill electrically driven. The mill is 1¾ miles from the mine. The ore is trammed by mules. Consolidated Mining Co., owner.

Advance—The tunnel will be extended and 70 tons of ore mined for a test run by the H. E. Wood Ore Testing Co., of Denver. If the results warrant it there is a probability of the mine being sold. The Siskiyou Syndicate drove the tunnel to 150 ft. and took out 30 tons of high-grade ore.

San Luis Obispo County

Capitola Quicksilver Mining Co.—A deposit of cinnabar 20 ft. wide has been encountered in the 120-ft. tunnel at a depth of 190 ft. in the Capitola mine. The walls are serpentine and sandstone. The tunnel is partly timbered and in good condition for work. The property adjoins the Klau quicksilver mine. C. A. Pemberton, of Klau, and others are owners.

Shasta County

Afterthought—It is announced that a modern smelting plant will be built at Ingot for the treatment of the zinc ores. It is expected to have the plant and the railroad from Bella Vista in operation early in 1913. S. E. Bretherton, of San Francisco, is manager.

Bully Hill Copper Mining & Smelting Co.—It is reported that an application to the government has been made for permission to resume operation of the smeltery at Winthrop. The plant was closed in 1910 because of complaints of the forestry department that the fumes destroyed vegetation. Since then experiments have been made in the smelting of the ores for the recovery of the zinc, which are said to have resulted satisfactorily. D. M. Riordan, of San Francisco, managing director.

Cougar—This mine near Stella formerly known as the Phœnix, has been sold to Dr. F. M. Sponogle of San Francisco. It was formerly a producer, but has been idle for several years.

Gambrinus—The mill is reported to be running on good ore. This is one of the old mines in the Whiskytown district that has been a fair producer.

Colorado

Lake County-Leadville

Ella Beeler—From the lower tunnel of this mine in Iowa Gulch, shipments are being made to the smeltery regularly. Connection has been made with the upper tunnel which will be driven south to the Houston vein.

Lime Tunnel—A fair tonnage of medium-grade zinc-carbonate ore is being taken out by lessees, from this property in California Gulch, about 200 yd. west of the Baby shaft.

Forfeit—From this shaft north of the Baby, lessees are shipping zinc-carbonate ore and filling the bins.

La Platte—From this mine on Rock Hill a carload per day of zinc-carbonate ore is being mined from the 360 level; ore bins and snow sheds are being built with a view of steady production during the winter.

Great Eastern—Work is to be resumed on this property on Prospect Mountain and arrangements have been made with the power company to supply power for the machinery.

Sugar Loaf Consolidated—Twenty tons of good-grade ore is being shipped from this tunnel daily, and the heading is being steadily advanced.

SAN JUAN DISTRICT

Camp Bird, Ltd.—The estimated net profit for August, from all properties of the company, was £28,771.

Iowa-Tiger Leasing Co.—This company is about to be dissolved, and, according to an official report, a final dividend amounting to 11.2% or $1417 has been declared, making the total dividends 121.2% since organization.

Suffolk—In the early "eighties" this mine at Ophir, about 12 miles west of Silverton, was one of the most noted producers of rich gold ore in the southern part of the state, but as depth was gained the free-gold ore of the oxidized zone turned to $8 or $10 sulphide which could not be shipped to the smelteries at a profit. For years the mine has made a poor record, chiefly under the leasing system. Now, however, the Ophir Gold Mines Milling & Power Co., under the management of George B. Pickett, is installing a cyanide plant of 150 tons capacity under the direction of F. L. Veatch. A Bleichert tram has been built to the mine and the old dumps will be treated as well as the mine ore.

Rico-Wellington Mining Co. — Shipments of copper and zinc ore are being made regularly to Salt Lake City. At the annual meeting held this week at Salt Lake City, Jesse Knight was elected president and the office of the company was voted to be moved to Provo, Utah. J. C. Jensen is the mine manager at Rico, Colorado.

Humboldt—This mine in the Sneffels district is an extension on the Ouray side of the range of the Smuggler-Union vein in the San Miguel district. It has been taken over by New York men represented by Charles S. Thomas Jr.; Frederick G. Farish is manager. The purchasers are to spend $60,000 in development during the coming year, build a mill and tramway the next year, and pay $200,000 for the mine the third year. The reserves are estimated at 70,000 tons of $15 silver-lead-gold ore. The mine is credited with a production of $300,000 gross.

King Consolidated Mining Co.—This mine in the Silverton district has been leased and bonded to Joseph Warner, formerly manager of the Silver Ledge mine, and a force of men has been put to work.

Revenue—Platt has increased his force to 90 men and will commence heavy shipments of high-grade concentrates from the mill in Sneffels basin near Ouray.

TELLER COUNTY—CRIPPLE CREEK

South Burns—From this mine on Bull Hill owned by the Acacia company, eight cars of smelting and medium-grade ore were shipped last month by the South Burns Mining Co., the chief lessee.

Black Belle—In this property on Beacon Hill, H. Barbee, lessee, has opened a shoot of rich ore; an electric hoist will be installed at once.

Portland Gold Mining Co.—The output is six carloads and the mill is treating about 500 tons per day. Station timbers are being set on the 1600-ft. level of No. 2 shaft. Fine ore is being mined in the 1500 level which was recovered by being unwatered by the deep drainage tunnel.

Gold Dollar Consolidated Co.—A quarterly dividend of ½c. per share has been paid amounting to $12,500. The company has a balance in hand of $27,957. Company's ore for the quarter brought $20,894 and lessees' royalties $3286. The gross receipts were $55,432.

Idaho

COEUR D'ALENE DISTRICT

Yankee Boy—Two leases have been obtained on this property on Big Creek. It has heretofore been worked intermittently by the owners. One lease covers the ground above No. 4 tunnel, from which all the ore so far mined has been taken. The other lease covers the ground below No. 4 and is in virgin ground. The ore consists chiefly of argentiferous gray copper and galena. Samples of the country rock for several feet on either side of the vein give assays of 6 oz. silver. Work has already been started on the upper lease and ore will be shipped in a short time.

Hecla—This company, which has been paying regular monthly dividends of two cents per share, will increase its regular dividend to three cents per share. A new oreshoot which was recently opened is responsible for the increase. This company is the fourth highest total dividend payer in the Cœur d'Alene.

Bunker Hill & Sullivan—Extensive improvements are to be made to secure a better supply of water to Wardner and Kellogg. Water and electric power for lighting have already been supplied by the company to "Bingville" as the miners' settlement at the mouth of Deadwood gulch is called.

Washington Water Power Co.—This company has begun constructing a high-potential line from its distributing station, at Wardner, to Pine Creek, two miles southwest, from which place branch lines will be run to the Nabob mine, a mile distant, and to the Surprise properties, a distance of two miles. The line will run through the Bunker Hill & Sullivan ground, permission having been granted by that company to build through its property. The power line will be completed to both mines and the current ready to turn on by Nov. 1.

Nabob—This company is now installing a 75-hp. Westinghouse motor, and a 15-drill Ingersoll-Rand compressor, which is being placed close to the face of the main working tunnel. This tunnel is 2000 ft. in and 600 ft. below the surface. Development has been suspended until the compressor plant is operating, but the men are at work on the ditch being built to bring water from Pine Creek to the site where the company is preparing to erect a mill next spring. The canal will be 1¾ miles long, and will furnish ample power for a concentrating plant of sufficient capacity to meet the requirements of the Nabob for many years.

Surprise—This mine was recently consolidated with the Highland Chief, and plans are being made to install new and larger machinery when the transmission line of the Washington Power Co. is completed.

LaClede—Work will continue at this property throughout the winter. Preparations have already been begun, to push the work as rapidly as possible all winter. In previous years work has been stopped in December, and not begun again until April.

IDAHO COUNTY

Bengal—Perry brothers and M. F. Tytler have a lease on this property and are preparing to ship ore to the custom plant in Elk City.

Clarence Ray—The long crosscut tunnel, driven 350 ft. through hard granite, cut the vein last week. The ore is of good milling grade.

Michigan

COPPER

Onondaga—This property, which adjoins that of the White Pine company in Ontonagon County, is operating one drilling machine on the Nonesuch lode. Much drill work is to be done to ascertain the possibilities of this formation on this property. The company was organized in July.

White Pine—A diamond-drill outfit has been sent to this property and much drill work will be done in the vicinity of No. 2 shaft to secure data on the faulting of the formation.

Mohawk—No. 6 shaft of this company is below the 800-ft. level and the lateral openings are developing ground that contains large quantities of mass and heavy copper.

Houghton Copper—This company is developing good ground in its shaft. Drifting south at the 640-ft. level is showing ground of a character equal to that opened at the Superior, and the winze which is being sunk at a depth of about 160 ft. from the north drift is also in good ground. A skip has replaced the temporary bucket and good progress is being made with the development work. The ore from the openings is being placed in a stockpile.

South Lake—Sinking the shaft will be resumed as soon as the air compressor can be put in commission. The shaft is down about 50 ft. and the concrete work to the collar has been completed and the headframe is ready so that further work can go forward without interruption. It is planned to start the first crosscut to the lode at a depth of about 600 feet.

Wyandotte—This company is sinking a winze on No. 8 lode which was encountered in the crosscut from the exploratory shaft at a distance of about 1100 feet.

Ahmeek—The hoisting engine for shafts Nos. 3 and 4 has been delivered and will soon be erected. A steel rockhouse is to be erected at these shafts.

Calumet & Hecla—At the No. 21 shaft, which is the only shaft that the company is operating on the Kearsarge lode, some excellent ground is being developed in the laterals from the 18th and 19th levels.

Isle Royale—This company has secured a drill core from a depth of about 540 ft., which is well mineralized and has the characteristics of the Kearsarge lode, although the management has not made any official announcement to that effect. Trenching has been started on the outcropping and further developments will be watched with interest.

Mass—The railroad connecting this property with the mill has been overhauled and the bridges put in shape so that traffic can be resumed. This company has sufficient ground opened to maintain production at the rate of about 700 tons daily. Underground conditions new shaft will be started before long are satisfactory and it is probable that a west of "C" shaft.

IRON

Smith—At this mine on the Swanzy Range, lately renamed the Gwinn, operations will shortly be resumed. A concrete shaft is down to bedrock, one of the first shafts sunk by the caisson method, and a little sinking and drifting has been done in rock. When work was stopped several years ago, the drifts were walled up near the shaft to facilitate progress in unwatering, and the shaft was allowed to fill with water.

Chase—This mine, near North Lake, on the Marquette Range, formerly called the Barnes, is to be re-opened. Pumping has been started to unwater the shaft and drifts; the former is 400 ft. deep. Captain Alfred Bone is in charge of underground work at present. The Cleveland-Cliffs Iron Co. shut down at this mine more than a year ago due to lack of demand for ore; the mine is not fully developed.

Cliffs Shaft—This hard-ore mine at Ishpeming is to be equipped with an electric underground haulage system. The east workings are under the city of Ishpeming, extending nearly the width of the city across the business section. The ore occurs in nearly vertical tabular bodies, not of sufficient width to make caving of the surface likely. The drifts will probably eventually be extended to connect with the old Moro mine workings, now closed down and situated on the opposite side of the city.

Minnesota

CUYUNA RANGE

It is reported that a second deep drill hole near Crosby has cut iron ore at a depth of 1000 ft.; the average depth of holes heretofore drilled has been about 300 feet.

MESABI RANGE

Three more diamond drills have been put in operation in the Adams district, near Eveleth, making a total of five drills in use.

Oliver Iron Mining Co.—Ark Terrace, on the west end of the range, is being surveyed by this company, and it has been reported that stripping operations will be started.

Great Northern—This company is about ready to begin stripping operations on Sec. 16, near Marble. It is reported that tracks will be laid in to the pits before cold weather sets in.

Minnesota Mining & Developing Co.—This company is operating the Alberta, a state mine, and 10,000 tons of ore has been sold for delivery this autumn.

Missouri

JOPLIN DISTRICT

Nine of the 12 holes put down by S. Y. Ramage in the vicinity of South Carthage, have shown ore at shallow depth and drilling is being continued.

Granby Mining & Smelting Co.—This company is putting its lead smeltery, which recently burned, in temporary shape for smelting the ore on hand. The company is still undecided in regard to rebuilding the plant, because its zinc smelteries are in Illinois.

Continental Zinc Co.—The mill near Carterville is being completely overhauled after six years of continuous running. The roughing jigs will be remodeled and new elevators will be put in. The water is very acid, rapidly corroding steel and iron work.

Cowhead—The mine west of Joplin is being reopened. It is planned to work the lower ground where deposits of sheet ore exist. Pumping is now in progress and is being facilitated by the draining of near-by mines.

Montana

BUTTE DISTRICT

Glengarry—Negotiations have been practically completed for the transfer of this property in the southeastern part of Butte, adjoining the East Butte property, to F. M. Bell & Co., of Butte. Before the silver panic of 1892 this property produced more than $500,000 in silver alone, but with the slump in silver it was closed, and except for a small amount of work done by lessees, it has never been reopened.

DEER LODGE COUNTY

Southern Cross—A force of 35 men is now employed at this property in the Georgetown district, which was purchased last spring by the Anaconda company. The old two-compartment shaft which is between 300 and 400 ft. deep, is being enlarged to three compartments, and retimbered throughout. As soon as this work is completed the shaft will be sunk an additional 200 ft. The mine will be equipped with electricity, and for that purpose a survey has been made for a power line to the mine from the Flint Creek power line.

Pyrenees—Preparations are being made to install an uptodate plant at this property, in the Georgetown district.

Holdfast—Robert Lindberg, owner of this mine in the Georgetown district, has between 20,000 and 25,000 tons of ore blocked out in preparation for extensive mining after the railroad's completion. He is mining a small amount of ore and making occasional wagon shipments.

Big Bill—A force of 15 men has been put to work at this property by Rodgers, Rodgers & Gordon, the owners, who expect to begin mining and shipping when the railroad is extended to Georgetown.

GRANITE COUNTY

Granite-Bimetallic—A cyanide plant recently installed near Phillipsburg for the treatment of tailings has been in operation for about two weeks, and is treating about 50 tons per day. John R. Lucas, manager of the company, states that some changes will be necessary in the equipment, after which the amount treated will be more than doubled. Charles McClure, of St. Louis, president of the company, is now at the property-to superintend the needed changes.

LEWIS & CLARK

Barnes-King Development Co.—This company has taken an option on the Piegan-Gloster group of gold claims in the Marysville district, and Manager George McGee, of the Barnes-King company, has left for the property to let a contract for an extension of the tunnel to cut a shoot in which considerable ore was blocked out during previous operations. The price asked is $175,000, with deferred payments, the last one of $50,000 to be made July 20, 1914; or in case the option is taken up by Mar. 20, 1913, the price is set at $100,000. The mine still contains large bodies of low-grade ore running about $6 per ton, which with modern methods can be mined profitably. The group consists of about 200 acres of patented claims extending over a mile on the Gloster vein, as well as several unpatented claims. Negotiations are being made for an electric power line to be carried to the property from the Missouri River Power Co. plant.

MADISON COUNTY

Blowout—An important mining deal has just been made in the Rochester mining district, by the purchase of this copper property by a Boston syndicate from Connors and Forvilly, of Rochester. The mine has been worked to a slight depth. The new owners intend to sink a 500-ft. shaft, at once, and have ordered the necessary machinery. Excitement has been caused by the sale, and many claims in the vicinity have been staked in the last few days.

Valley View—A vein of steel galena carrying gold and silver has been opened in this property near Twin Bridges, in Goodrich gulch. A shipment has been made to Salt Lake, and preparations are being made for another shipment. The property was prospected by Mrs. Florence Kidder and daughter, who organized the Valley View Gold Mining Co., to operate it.

Nevada

CLARK COUNTY

James M. Hill, of the U. S. Geological Survey, is making an examination of the Yellow Pine and other mines preparatory to a preliminary report on the district.

Yellow Pine—The production for August consisted of 1200 tons of zinc, and 350 tons of lead concentrate; crude ore was also shipped. Development work is proceeding rapidly, and a new shoot of lead-zinc carbonates has been encountered north of the shaft, on the third level. Orders have been placed with the Atlas Car & Mfg. Co. for six additional 10-ton cars for use on the narrow-gage railroad, and the company is contemplating the purchase of another locomotive.

Volcano—Zinc-carbonate ore has been discovered by the Williams brothers, lessees of this property. A road has been built to the shaft, and two cars of ore have been shipped during the month. The ore is hauled by wagon 12 miles to Jean, and sufficient ore is blocked to insure steady shipments for several months.

Monte Christo—This property, which a few years ago produced several thousand tons of high-grade zinc-carbonate ore, has been leased to Duncan & Fredrickson, who have a force of men engaged in development work. The ore was produced from a large vein, which faulted close to the surface, and the lessees will search for the vein on the opposite side of the fault.

Bullion—At a depth of 100 ft. in the shaft, the vein of galena has increased to a width of four feet. Two cars of rich lead ore were shipped during the month, all ore having been extracted in development work.

LANDER COUNTY

Glasgow & Western—Captain Case, the manager, reports that the new mill is running smoothly and that a supply of ore for two years' milling is broken in the mine.

LYON COUNTY

Mason Valley—The enlarged furnace has been blown-in.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Sept. 21, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,700	126,769
Tonopah Belmont	3,083	88,200
Montana Tonopah	1,075	39,273
Tonopah Extension	1,075	37,834
West End	980	28,122
Midway	50	470
MacNamara	460	13,685
North Star		170
Mizpah Extension	.....	40
Jim Butler	300	1,600
Totals	10,723	336,163
Estimated value	$268,075	......

Tonopah-Belmont—A new vein of high-grade ore, now over five feet wide and its full width undetermined, has been opened on the 12th level of the Belmont mine. The shoot of rich ore in the Shaft vein on the 1100-ft. level has been proved for a length of nearly 200 feet.

North Star—An important development is reported on the 1250-ft. level, where a southeast crosscut near the Belmont boundary passed through 30 ft. of quartz. On the hanging wall was 14 in. of rich ore which in 20 ft. of drifting widened to four feet. The ore carries one ounce of gold to one ounce of silver, whereas the usual proportion is one ounce of gold to 80 oz. of silver.

Jim Butler—The Fraction vein on the 600-ft. level is now more than 30 ft. wide with several streaks of good ore.

Gypsy Queen—The north crosscut from the 600-ft. level has cut a vein of low-grade ore, three feet wide and drifting has been started.

Tonopah-Sully Mining Co.—This company was recently organized to operate the property that George Wingfield had sold to W. C. Lamb, of Tonopah and eastern associates, the Sully group of five claims situated between the Little Tonopah and Tonopah merger properties.

Telluride Consolidated Gold Mines Ltd. This company, operating property eight miles east of Beatty, has developed some cinnabar ore to a depth of 470 ft. and is now installing a Scott furnace having a capacity of 40 tons per day.

WHITE PINE COUNTY

At a recent meeting of the trades unions at Ely it was decided to make a request for a raise in wages of 50c. No demand for recognition of the unions was made nor was there threat of a strike if the request were not granted. A dispatch of Sept. 28 states that a voluntary increase of 25c. per day was granted to all men receiving $3 per day or more, and 20c. increase to all receiving less than $3 per day.

Utah

JUAB COUNTY

Tintic shipments for the week ended Sept. 20 amounted to 193 cars. This is about the normal output. Increase in shipments was made by the Eagle & Blue Bell, May Day, Mammoth and Grand Central.

Chief Consolidated—The size of the shaft is restricting operations to some extent, and after the first of the year it will probably be enlarged from one to three compartments.

Eagle & Blue Bell—When the new orebins are completed, this company will be in a position further to increase shipments. More ore than ever before in the history of the company is being marketed. Shipments for the week ended Sept. 20 amounted to 10 cars, the ore coming from the 700- and 1200-ft. levels. Ore has been drifted through on the 1350-ft. level.

Opohongo—The output at present is four to six cars weekly, and earnings are in excess of the dividend rate.

Yankee—This company is meeting all operating expenses by shipments of zinc ore. Four cars were marketed during the week ended Sept. 20. Development is being done on the 1800- and 1900-ft. levels, and a mineralized fissure has been cut in the east drift on the 2000-ft. level.

Black Jack—Milling ore has been blocked out between the 600-ft. level and the surface.

East Tintic Development—Buckley & Scott, who have a lease on this property, have sent out their first car of zinc ore.

Dragon Consolidated—A drift is being driven toward the south on the 600-ft. level. Stoping on the ore reached from the No. 1 workings of the Iron Blossom has been discontinued for the present.

Carisa—Shipments are being made by lessees.

Beck Tunnel—Connections have been nearly completed between the main working shaft and the Humbug oreshoot, about 30 ft. still remaining to be driven. From 15 to 20 tons of ore daily are being mined.

Victoria—Orders for new machinery have been placed, and electrical power will take the place of steam. A large compressor has been ordered to replace two small ones now in use. Three cars of ore were shipped during the week ended Sept. 20.

Iron Blossom The raise from the 600-ft. level of the No. 3 shaft cut 25 ft. of copper ore some time ago, and this orebody has been drifted on about 300 ft. Development is in progress on the 500-ft. level south of the No. 1 workings. Some silver-lead ore has been opened here along the main Iron Blossom break, 100 ft. to the south of previous discoveries in that part of the mine. The raise driven through siliceous ore is now in lead-carbonate ore of good grade.

Eureka Leasing & Mining Co.—The main tunnel of this company's property in the Nebo district is in about 1200 ft. and development is being continued. Three cars of ore have been shipped so far during the present year.

Eva—This property, southwest of the Nebo Highland, is shipping steadily. A new boarding house is being built to accommodate the increased working force.

SALT LAKE COUNTY

Utah Copper—The August production was 11,841,044 lb. of copper.

Ohio Copper—The assessment of $1 per share is now reported as fully paid.

Utah Metal—A fissure carrying lead, zinc and iron has been cut in this company's tunnel between Tooele and Carr Fork. This is the sixth fissure so far cut, and the face is approaching ground known to be mineral-bearing.

Alta Consolidated—Some zinc ore has been developed at this property, and it is hoped that shipments of this material can be made to the smelteries of the Middle West.

Columbus Consolidated—This property, as well as all other Alta properties, has been closed down on account of a strike.

Cardiff—Steady shipments are being made, and winter supplies are being hauled to the mine.

Peruvian—The first shipment for this season amounted to 157 tons of lead-silver ore with some gold and copper, coming from tunnels Nos. 1, 2 and 3. This property adjoins the South Hecla on the west.

Michigan-Utah—The 4½-mile tramway down Little Cottonwood cañon has been overhauled, and the buckets adjusted. Several tryouts have been made.

Washington

OKANOGAN COUNTY

Dividend—This company contemplates the installation of an air-compressor plant on its property in the Oroville district. A fine shoot of ore has been found.

SNOHOMISH COUNTY

Florence-Rae—This company is making preparations for building a branch road from its property in the Sultan Basin district to connect with the Great Northern Ry. at Startup.

STEVENS COUNTY

Sunday After being shut down for several months, operations have again been started at this mine near Meyers Falls.

Clugston—This company recently made a shipment of three carloads of silver-lead ore. J. R. Brown, of Colville, is manager.

United Copper—A fine shoot of chalcopyrite and gray copper has been found in this mine near Chewelah. Conrad Wolff, of Spokane, is president.

Canada

BRITISH COLUMBIA

Inland Mining Co.—This company, operating mines at Paulson, has commenced milling ore from the main shaft. This is free-milling gold from which gold-bearing iron and silver-lead concentrates are also produced. The steam-power plant, mill and compressor were recently overhauled, and now the production pays all the expenses of operation, including development work. The head office of the company is at Walla Walla, Wash.

Beatrice—This mine, in the Lardeau district, has been sold to British Columbia and Washington men, who have made plans for extensive development work. The mine, which produces rich argentiferous lead ore, is opened to the 250-ft. level. About 1000 tons of ore has been produced from development openings, and shipped to the smeltery, at Trail. The tunnel will be driven to intersection with the vein at the 350-ft. level next summer.

Lucky Jim—The new tramway at this mine, in the Slocan district, is in operation, and a shipment of zinc ore is ready in the bins. This will be the first shipment since the fire that destroyed the mine buildings two years ago. The railroad, which was also destroyed by fire, has been completed to Bear Lake, and regular service is maintained. The company is considering plans to erect a concentrator on a site between the mine and Slocan Lake, where there is water power.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Sept. 27, and for the year to date:

Beaver ...	30 86	275 12
Buffalo		864 57
Casey Cobalt		212 15
City of Cobalt.		887 99
Cobalt Lake..	19 80	683 45
Cobalt Townsite	101 27	1 355.95
Chamb.-Ferland	41 28	362 33
Coniagas		1,515 41
Crown Reserve		351 10
Drummond	52 75	383 05
Hudson Bay		538 47
Kerr Lake	30 30	560 22
La Rose	118 80	2,656 03
Lost and Found		15 00
McKinley-Darragh	43 90	1,963 78
Nipissing	73 78	1,704 50
O'Brien		453.31
Penn.-Canadian		29.70
Provincial		22.22
Right of Way		242 82
Timiskaming		797 01
Trethewey		381 54
Wettlaufer		265 74
Colonial		63 14
Dominion Reduction Co	56 64	56 64
Totals...	569 38	16,611.24

ONTARIO—COBALT

Kerr Lake—The annual statement for the year ended Aug. 31 shows cash on hand amounting to $491,615. The gross production for the year was 1,855,494 oz. against 2,388,420 oz. in the previous year. The cost of production was 18.34c. as against 14.7c. in 1911 and 13.3c. in 1910.

Timiskaming—This company has secured the Cochrane lot, south of the present property. A new shaft will be sunk on the southern extremity of the Cochrane vein, and the property will be thoroughly developed.

Townsite—In order to explore that portion of the property underlying the tailings pond of the Northern Customs Concentrator, Ltd., No. 1 shaft will be enlarged and deepened.

Casey Cobalt—The 10-stamp mill commenced operations this week.

Calcite Lake—A judicial sale of the assets of this company has been ordered under a winding-up order.

ONTARIO—PORCUPINE

Pearl Lake—The crosscut on the 400-ft. level has penetrated what is believed to be the extension of the McIntyre vein. This confirms the results obtained with the diamond drill, where ore was found between 400 and 800 feet.

Dome—The incline from the 100- to the 45-ft. level has broken through. Several raises had been connected with the 100-ft. level and in a short time practically all the ore will be raised from there.

Hollinger—Production is now being maintained at about $200,000 per month.

Hughes—A five-stamp mill will be installed.

Schumacher—The north crosscut ran into sand, and the mine workings are filled with sand and water from Pearl Lake. Some of the buildings in the town were threatened with destruction.

Newfoundland

Tilt Cove—The production from these mines of the Cape Copper Co., for August was as follows: East Mine, 654 tons of 3.25% copper ore; South Lode, 450 tons of 3.75% copper ore; West Bluff, 145 tons of 7.28% copper ore.

Mexico

SONORA

Compañia de Minas de Mexico—The old concentrating mill of this company, operating in the Sahuaripa district, is being reconstructed; the remodeled plant will have a capacity of 100 tons per day. A rich oreshoot has been opened between the eighth and ninth levels. The company is planning to blow-in the 100-ton smeltery in the near future and resume shipping concentrates and matte. W. E. Pomeroy, of Tonichi, is general manager.

Lucky Tiger-Combination Gold Mining Co.—During August, 6130 tons of ore was milled and 7478 tons of old tailings cyanided. The gross value of the bullion, concentrates and ore, produced and shipped, was $146,023; and the costs amounted to $83,298.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Oct. 2—Coal trade in the West continues strong and active. The complaints of car shortage and slow transportation are on the increase.

The seaboard bituminous trade is also strong. Car shortage and the West Virginia strike are limiting supplies, and prices are higher than for some time.

Anthracite mines are still active, but dealers are complaining that supplies come in slowly and that it is hard to get orders filled.

ADD COAL TRADE REVIEW.

German Coal Production—Coal production in the German Empire seven months ended July 31, metric tons:

	1911	1912	Changes
Coal	92,278,434	100,485,485	I. 8,207,051
Brown coal.....	40,818,351	46,075,323	I. 5,256,972
Total coal....	133,096,785	146,560,808	I. 13,464,023
Coke made	14,624,969	16,166,998	I. 1,542,029
Briquettes m'de	12,111,607	13,710,896	I. 1,599,289

Of the briquettes reported this year 10,735,368 tons were made of brown coal or lignite.

German Coal Trade—Exports and imports of fuel in Germany seven months ended July 31. metric tons:

	Exports	Imports	Excess
Coal..............	17,833,020	5,401,116	Exp. 12,431,904
Brown coal....	29,110	4,220,154	Imp. 4,191,044
Coke	3,160,950	325,802	Exp. 2,835,148
Briquettes . .	1,532,834	99,290	Exp. 1,433,544
Total........	22,555,914	10,046,362	Exp. 12,509,552
Total, 1911. .	19,032,807	10,662,979	Exp. 8,429,828

Exports this year included 22,556 tons of coke to the United States.

Austrian Coal Trade—Imports and exports of fuel in Austria half-year ended June 30, metric tons:

	Imports	Exports	Excess
Coal........	5,655,023	324,292	Imp. 5,330,731
Brown coal..	18,624	3,454,895	Exp. 3,436,271
Coke	420,847	163,764	Imp. 257,083
Briquettes...	46,808	69,733	Exp. 22,925
Total......	6,141,302	4,012,684	Imp. 2,128,618
Total, 1911...	5,291,872	4,043,863	Imp. 1,248,009

The imports and exports are chiefly from and to Germany.

Iron Trade Review

New York, Oct. 2—The iron and steel markets continue strong and active, the chief point now being the endeavors of the mills to make deliveries as fast as they are needed. Prices continue to advance here and there. Car shortage and scarcity of labor are still factors in the trade.

The iron and steel market shows an accretion of strength all along the line. While specifications on regular contracts for finished steel have not increased, they continue to average above current shipments, so that the mills are falling farther behind in deliveries, while business for the new year is opening up rapidly, and even for such delivery it is a sellers' raher than a buyers' market. In sheets, for instance, in which order books were formally opened last week, most of the mills show a decided reserve as to selling for the new year and doing little more than to try to take care of their regular customers. A number of the sheet mills are asking advances over current quotations for any delivery they can make.

The feature of the market is still active contracting for pig iron. Basic iron is in large demand and buying of foundry has been on a liberal scale. Prices are advancing and quotations are unsettled, especially on contracts for 1913 delivery. Several merchant furnaces are preparing to blow in, and others are reported getting ready. Scarcity of labor and coke, and possibly of ore later, may limit the increase in production.

Southern Pig Iron Rates—Proposed changes in the pig-iron rates from a number of Virginia furnaces to Philadelphia over the Chesapeake & Ohio and the Norfolk & Western have been suspended by the Interstate Commerce Commission until Dec. 30, pending an investigation into their reasonableness. Heretofore it is stated, the railroads "have published two sets of rates for the transportation of pig iron from the furnaces in Virginia to Philadelphia; one rate applicable by Hagerstown Transfer, Md., or Shenandoah Junction, W. Va., the other rate being applicable by Norfolk, Va. The rate by Norfolk was in each instance 20c. per gross ton less than the rate by other junctions, and was said to be made to meet water competition. For instance, the present rate from Bristol, Va., to Philadelphia is $3.35 per gross ton by Hagerstown Transfer or Shenandoah Junction and $3.15 by Norfolk. The supplements which have been suspended eliminate the lower so called water-competitive rates, thereby advancing the rates by Norfolk 20c. per ton."

Baltimore

Sept. 30—Exports for the week included 190,620 lb. steel plates to Liverpool. Imports included 80 casks spiegeleisen and 898 tons ferro-manganese from Liverpool; 41 casks manganese ore from Hamburg; 6200 tons manganese ore from Bombay, India; 6164 tons pyrites from Huelva, Spain; 13,178 tons iron ore from Cuba.

Birmingham

Oct. 1—Sales of pig iron by Southern furnaces continue and prices are firm. The quotation of $13 is no longer given: $13.25@13.50 is the present price for No. 2 foundry, with $14 quoted for next year's deliveries. Two additional furnaces will start up very soon and two more are being made ready to start a little later. Stocks in furnace yards are no longer in consideration, and everything promises good business.

The steel works and rolling mills are all busy, with promise of continuing active for some time.

Charcoal iron is in more demand and prices are firmer. The scrap market is looking up.

Chicago

Oct. 1—General conditions in the iron market remain strong for producers and sellers; there is a large demand for finished materials of every sort and pig-iron sales, while not individually large, are in the aggregate sufficient to maintain prices firmly.

The pig-iron market is the average user's, sales being numerous and of small tonnage—up to 2000 tons each. Buying in general is for the first half; those melters who have been restricting their purchases to the first quarter are buying for the second quarter and those coming into the market for supplies beyond the first of the year are contracting generally for six months' requirements A little iron is sold occasionally for last-quarter needs.

Northern No. 2 foundry coke iron brings $17@17.50 at the furnace, making the delivered price about $17.50@18. Southern pig iron of corresponding grade brings $13.50@14.50, Birmingham, which means $17.85@18.85, Chicago. The wide range given for Southern is because of varying local conditions and furnace demands; most Southern No. 2 brings, probably, $13.50 and some is said to have been sold at $13.25 in the last week, though no such price is now generally quoted.

In the market for finished materials more sales are being made for 1913 delivery because of the pressure from consumers, the local mills having been reluctant for several weeks to go beyond the first of the year. Bars are in heavy demand and sell at about 1.45c. for iron and 1.53c. for soft-steel bars. Railroad supplies are in heavy demand, both standard rails and track fastenings being generally sought. Structural material has a steady sale over a wide territory; sheets, plates and minor lines are in large demand, with nearly every manufacturing line showing prosperity and promise of continued heavy requirements.

Cleveland

Sept. 30—September tonnage down the Lakes has been kept back by car shortage on the railroads in the Lake district and by scarcity of labor. For the last week also fogs and bad weather have delayed the movement of boats.

Pig Iron—The market is strong and sales have been heavy, on advancing prices. Basic is in special demand. Bessemer is quoted $16.25@16.40; basic, $15.75@15.90; No. 2 foundry, $15.75@16, Cleveland delivery.

Finished Material—Sales continue large in almost all lines, and there is a good deal of buying for the first quarter of 1913. Prices on bars, plates and structural material are moving upward.

Philadelphia

Oct. 2—Active buying has prevailed throughout the Eastern market, much of the buying being of basic for early delivery. Western buyers are seeking accommodations in the East without closing much business. More foundry iron is being inquired for than the furnaces can possibly furnish in the times specified. Stocks are practically exhausted and contracts for first-quarter delivery are being booked only at top figures. Very little interference is felt from Southern iron, though some sales have been recently closed, growing out of inquiries made two or three weeks ago and at prices then asked. Cast-iron pipe makers are again in the market and inquiries amount to about 7000 tons, all for next year's delivery. Forge has advanced quotably 50c. a ton. Malleable is inquired for in small lots for next year's delivery. A higher range of prices seems to be inevitable. New Jersey and New England consumers have withdrawn inquiries presented two weeks for the reason that furnace interests are indifferent and where they quote are asking the very highest figure. Eastern No. 2 X foundry sold today at $17.25; Virginia is offered at $17.50; gray forge $16@16.50; basic the same and low phosphorus $21.50, at which business has been done.

Billets—Sales of billets for the past week were made at $28, forging billets $32, but openhearth billets could not be had at the above figure today. Billet capacity is practically exhausted and yet there are three or four large concerns who are in need of early deliveries.

Bars—Bars have advanced slightly over last week, not through higher quotations but by offerings of premiums. It is a question whether common iron could be had at 1.40c. Car-building requirements are urgent.

Sheets—Sheets are again advanced on all kinds and blue annealed is up $1 a ton.

Pipes and Tubes—Further activity is reported in pipes and tubes and a few buyers have been obliged to bid above the quoted rates for special accommodations.

Plates—The monotonous activity in plates is reported on all sides. Mills are managing to keep abreast of demand by accumulating orders on their books for still more remote delivery. Some smaller interests requiring a few hundred tons appear to be out in the cold.

Structural Material—Orders for structural material continue to crowd in on a basis for moderate-sized lots of 1.65c. for sheared and 1.70c. for universal plates, with higher quotations for delivery after October.

Scrap—All kinds of scrap are in active demand and stocks are at a minimum.

Pittsburgh

Oct. 1—Cold-rolled shafting has been advanced two points, under date of today, making the new discounts 60% off in carload and larger lots and 55% off in small lots. The advance amounts to about $2 a ton, the total advance from last February's low point being about $8 a ton.

The mills have a larger volume of steel-bar business on books than of any other commodity, most of them being practically sold up into next April, with specifications for a large part of the business already on books. The regular market is 1.35c. on bars, this applying to first-quarter business, while for delivery this year premiums are usually obtained. Plates and shapes are 1.40@1.45c. for extended delivery, the lower price being that of the Steel Corporation, the higher that of most if not all of the independents. The latter are able to dispose of a large tonnage as the steel corporation is rather reserved in making sales, being already so well sold up.

Pig Iron—The advance in the local pig-iron market has been spectacular, as after a very slowly rising market for months the market in the past fortnight has been advancing by 50c. at a time, and is easily $1 a ton higher than two weeks ago. While sales are being made as prices advance many buyers are holding off, since they are covered for the next three or four months. Furnaces, however, are almost equally reserved as to making sales. There have been several transactions in bessemer iron at $16.50, Valley, which now represents the minimum of the market. Basic has sold at $15.50 to the extent of at least 10,000 tons, and it is questionable whether any more can be secured at this figure. We quote the market as follows: Bessemer, $16.50@16.75; basic, and No. 2 foundry, $15.50@16; gray forge, $15@15.50; malleable, $15.25@15.75, all f.o.b. Valley furnaces.

The bessemer and basic pig iron averages for Sepember, as compiled by a large interest in the trade from actual transactions, are announced at $15.962 for bessemer and $15.134 for basic, both at Valley furnaces, these representing advances over August of $1.43 for bessemer and $1.13 for basic.

Ferromanganese—Several sellers have advanced their price on contract ferromanganese $3, to $59.50, but there seem still to be sellers at the old price. We quote the contract market at $56.50@59.50, and the prompt market at $62@65, all f.o.b. Baltimore.

Steel—The market has become almost unquotable, since there are only occasional sellers for this year's delivery, and for next year the mills are all refusing to quote, giving as a reason that they will have less unfinished steel to spare from their finishing mills, and will in addition have to carry over from this year a large volume of unfinished steel obligations. Brokers are occasional sellers of steel, but have little to offer. We quote as approximately representing the market: Bessemer billets, $25; bessemer sheet bars, $25.50; openhearth billets, $26; openhearth sheet bars, $26.50; forging billets, $32; rods, $27@28, all f.o.b. mill, Pittsburgh or Youngstown.

Sheets—Specifications on sheet contracts continue excellent. Mills are selling cautiously for first quarter shipment, but are picking their customers and are not pressing sales in any instance. For early deliveries premiums are readily secured. Operations are practically at full capacity, subject to shortage of steel and of labor at times. We quote black sheets at 2.15c.; galvanized at 3.30c., blue annealed at 1.55@1.60c., painted corrugated at 2.35c. and galvanized corrugated at 3.35c. per pound.

St. Louis

Sept. 30—The pig-iron market is strong. Buying has been chiefly in small lots. Most of the large consumers are supplied for the present, and the higher prices asked have rather discouraged inquiries. Southern No. 2 foundry is $13.25@13.50 Birmingham—$17@17.25 St. Louis, and sellers are asking $14, Birmingham, for 1913 contracts. Northern No. 2 is selling at $17.25@17.50. There has been some inquiry for basic iron.

Coke is higher and irregular, $5.75@6, St. Louis, being asked for good foundry.

Iron Ore Trade

Additional sales of Wabana ores from Newfoundland to Eastern furnaces are reported. High ocean freights are interfering with sales of Swedish and Spanish ores in the East for next year. Even with Cuban ore the rates are high and it is not easy to get vessels enough for the trade.

Imports and exports of ores in the United States, seven months ended July 31, long tons:

	1911	1912	Changes
Iron ore, imp	1,002,713	1,180,053	I. 177,340
Iron ore, exp	370,502	498,750	I. 128,248
Manganese, imp..	97,293	120,310	I. 23,017

Imports are from Cuba, Sweden, Spain, Newfoundland and Canada. Exports are chiefly to Canada.

Foreign Iron Trade

British Iron Prices—An unusual condition has prevailed in the market for some time, prices in Great Britain being considerably higher than here. Some quotations from the London *Iron and Steel Trade Journal* of Sept. 14 are: Middlesboro No. 2 foundry, $15.90; Scotch pig, $17.34; West Coast hematite (bessemer pig), $19.08. Some finished prices are: Common bars, $39.60 per ton; refined bars, $45.60; angles, $38.40; plates, $39@42.60; steel rails, $31.20 per long ton.

German Foreign Trade—Exports and imports of iron and steel and of machinery in the German Empire, seven months ended July 31, metric tons:

	Exports	Imports	Excess
Iron and steel..	3,425,706	387,230	Exp. 3,038,476
Machinery	287,617	53,226	Exp. 234,391
Total	3,713,323	440,456	Exp. 3,272,867
Total, 1911.....	3,280,855	395,296	Exp. 2,885,559

Total increase in exports 432,468 tons; increase in imports, 45,160 tons.

METAL MARKETS

New York, Oct. 2—The metal markets have been generally firm, with no marked changes. Speculation in tin is still active.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Aug. 1912..	$ 2,498,472	$ 5,576,900	Imp. $3,078,428
" 1911..	480,799	4,105,331	Imp. 3,624,532
Year 1912..	43,159,972	34,589,111	Exp. 8,570,861
1911..	15,910,449	40,473,010	Imp. 24,562,561
Silver			
Aug. 1912..	5,574,644	3,952,279	Exp. 1,622,365
" 1911..	4,869,359	3,653,329	Exp. 1,216,030
Year 1912..	45,834,920	32,652,869	Exp. 13,182,051
" 1911..	44,587,570	29,534,724	Exp. 15,052,846

Exports from the port of New York, week ended Sept 28: Gold, $50,750; silver, $1,356,125, chiefly to London. Imports: Gold, $573,548, from Mexico and South America; silver $90,561, principally from Central America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. More gold, $5,250,000 in all, has been taken in London for export to New York.

The cost of bringing gold bars across the Atlantic has been increased this season by an advance in freight rates on bullion shipments from 5-32 to 3-16, and in the insurance rate from 5c. to 7½c. per $100. This advance resulted from the "Titanic" disaster.

Iridium—An advance is reported, pure metal being quoted at $64@65 per oz., New York.

Platinum—Business is fair. The market is well supported and there is no change in quotations. Dealers ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium. The foreign market is firmer.

Silver—The market shows an upward tendency, owing to expectation that the Indian government may require more metal during the next few months; and in addition, China seems to be able to make some purchases.

SILVER AND STERLING EXCHANGE

Sept.-Oct.	26	27	28	30	1	2
New York....	63⅜	63⅝	63¾	63¾	63⅞	64⅛
London	29¼	29⅜	29 7/16	29 7/16	29½	29⅝
Sterling Ex..	4 8520	4.8510	4.8530	4 8530	4.8525	4.8525

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept 19, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.. ...	£5,829,800	£7,365,700	I. £1,535,900
China	989,700	933,500	D. 56,200
Total ..	£6,819,500	£8,299,200	I. £1,479,700

Indian currency reserve figures show 1310 lakhs silver coin, 30 lakhs bullion under coinage and 325 lakhs in transit; a total of 1655 lakhs of rupees, or 1007 lakhs less than at the corresponding date last year.

Copper, Tin, Lead and Zinc

Copper—Up to the end of last week, Europe continued to place good-sized orders, while domestic consumers, being well supplied, took no interest in the market during the entire week. Since the disturbances in the Balkan have become more acute, European buyers have also withdrawn. The unsettled conditions abroad have been reflected in a sharp decline in the standard market, which makes refined sorts in Europe available at lower prices than the quotations ruling here. The close is undecided at 17⅝@17⅞c. for Lake copper, and 17.45@17.50c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 17.30@17.40c. as an average for the week.

The advance in the London market culminated last Monday, when spot standard sold at £75 9s., and three months at £80 3s. 9d. Since then there has been a violent decline, due to political causes, and the close is cabled weak at £77 3s. 9d. for spot, and £78 3s. 9d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 6369 long tons. Our special correspondent gives the exports from Baltimore at 1162 tons for the week.

Visible stocks of copper in Europe on Sept. 30, are reported as follows: Great

NEW YORK

Sept.-Oct.	Copper		Tin	Lead		Zinc	
	Lake Cts. per lb	Electrolytic Cts. per lb	Cts. per lb	New York Cts. per lb	St. Louis Cts. per lb	New York Cts. per lb	St. Louis Cts. per lb
26	17[illegible] @17⅞	17.50 17.55	50[illegible]	5.10	4.90 @4.95	7.45 @7.50	7.35 @7.40
27	17⅝ @17⅞	17.50 17.55	50[illegible]	5.10	4.90 @4.95	7.45 @7.50	7.35 @7.40
28	17⅝ @17⅞	17.50 17.55	50	5.10	4.90 @4.95	7.45 @7.50	7.35 @7.40
30	17⅝ @17⅞	17.45 17.55	50⅝	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
1	17⅝ @17[illegible]	17.45 17.50	50[illegible]	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
2	17⅝ @17⅞	17.45 17.50	50[illegible]	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium

LONDON

Sept.-Oct.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
26	79	79 15/16	84	232	230	22[illegible]	27[illegible]
27	79	79 13/16	84	230½	228¾	22[illegible]	27[illegible]
28							
30	79¼	80 1/16	84¼	231	229½	22[illegible]	27½
1	78⅞	79[illegible]	84	227⅜	226⅛	21[illegible]	27[illegible]
2	77 3/16	78 3/16	82[illegible]	227½	226¼	21¼	27[illegible]

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Britain, 29,550; France, 7580; Rotterdam, 450; Hamburg, 3290; afloat from Chile, 1830; afloat from Australia, 5250; total, 47,950 long tons, or 107,408,000 lb. This is a decrease of 1520 tons from the Sept. 15 report.

Brass Prices—The following list was announced on Oct. 1 by the American Brass Co.: Sheets, high brass, 18⅜c. net per lb., low brass, 20½c. Wire, high brass, 18⅜c.; low brass, 20½c. Rods, high brass, 18⅜c.; low brass, 21¼c. Tubing, brazed, 23¼c.; open seam, 22⅞c. Angles and channels, 22½c. Scrap allowances, 13⅛c. net per lb. for high brass and 14½c. for low-brass scrap.

Tin—The statistics which were published at the beginning of this month show an increase of almost 2000 tons in the visible supplies, and served as a damper upon the bullish sentiment which was apparent in the London market during the week. The latter reached its highest point on Sept. 26, when it touched £232 for spot and £230 for three months' tin. From this point, it declined yesterday about £5 for spot and £4 for futures. At the lower basis, buying, especially for future positions, became more urgent, and the market closes steady at £227 10s. for spot and £226 5s. for three months.

Near-by material is becoming scarce in this market, where supplies seem to be well cornered. A premium of about one-quarter of a cent for spot tin has been established. Buying has been of a hand-to-mouth character, and the close is steady at about 50⅛c. per lb. for October delivery.

Visible stocks of tin on Sept. 30, are reported as follows: Great Britain, 6482; Holland, 2483; United States, excluding Pacific ports, 4280; total, 13,245 long tons, an increase of 1960 tons over the Aug. 31 report.

Shipments of tin from the Straits, eight months ended Aug. 31, were 34,807 long tons in 1911, and 38,466 in 1912; increase, 3659 tons.

Tin production of Federated Malay States eight months ended Aug. 31 was 28,669 long tons in 1911, and 31,329 in 1912; increase, 2660 tons.

Lead—The market is unchanged at 5.10c., New York. Offerings of Missouri lead have been more liberal, and slightly lower prices have been accepted in St. Louis, where quotations range between 4.90 and 4.95 cents.

The situation in the foreign market has relaxed considerably and larger quantities of lead are available. In consequence, a sharp decline took place, the close being cabled at £21 5s. for Spanish lead, and 2s. 6d. higher for English.

Spelter—Compared with the activity of recent weeks, the market has been rather dull. Consumers appear to have supplied their near-by wants and are not in a hurry to anticipate their requirements. On the other hand, there is not much pressure to sell because the production of spelter during the coming months may be greatly curtailed on account of the failing gas supply in Oklahoma and Kansas. However, it is reported that a further consignment of European spelter is on the way to this market. The close is somewhat lower at 7.30@7.35c. St. Louis, and 7.45@7.50c. New York.

The foreign market, due to purchases for this country, has experienced a further advance, and the close is cabled firm at £27 10s. for good ordinaries, and £27 15s. for specials.

Base price of zinc sheets was advanced 10c. on Sept. 25, and is now $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—Sales are good and prices have advanced sharply. Sales are reported made as high as 27c. We quote 26@26¼c. per lb. for No. 1 ingots, New York. The foreign market is strong.

Antimony—The market is strong and prices have again advanced. Cookson's is quoted 10⅛c. per lb. and Hallett's, 9¼@9½c.; while 9@9⅜c. is named for Chinese, Hungarian and other outside brands.

Messrs. Edward Hill's Sons & Co., New York, write, on Oct. 1: "While the demand for antimony is good, the present advance is in no sense due to the demand, but to a scarcity of antimony ore. The ore has never been found in large quantities, nor mined over a long period of time in any one country. At one time Turkey, at another time Algeria and at another time Portugal supplied the world and in each instance as the deposits in these countries gave out, the market advanced and continued high until new deposits were found elsewhere. During the last 15 years China has been, by far the largest producer, but the present indications are that these deposits are now exhausted. We believe history will repeat itself, and that we shall see a high antimony market until some country is found to take the place of China as a producer of antimony ore."

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 28—A premium price of $63 was paid for zinc ore; the base price of 60% zinc was $62 per ton. The base price paid for 80% lead ore was $62@64 per ton.

SHIPMENTS, WEEK ENDED SEPT. 28

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	641,600	......	....
Platteville	517,700	......	144,000
Shullsburg	470,000	...	....
Benton	344,500	67,400	360,000
Hazel Green	334,000	60,000	....
Highland	257,200	....	......
Harker	233,330	.	....
Galena	227,900		....
Dodgeville	200,000		......
Cuba City	81,000	.	.
Linden	62,010	......	....
Total	3,369,240	127,400	504,000
Year to date	151,638,810	6,204,660	26,215,210

Shipped during week to separating plants, 3,105,990 lb. zinc ore.

Joplin, Mo., Sept. 28—The highest price paid for zinc-sulphide ore was $67, the base per ton of 60% zinc $57@64. Zinc silicate sold on a base price of $30@34 per ton of 40% zinc. The average price all grades of zinc is $60.40. Some offers of a $65 base were made on Thursday, but sellers declined, hoping for lively competition on Friday, and a higher price, but buyers found little competition and dropped their offerings to $64. The high price of lead is $68, on a net base price of $65@67 per ton of 80% metal

SHIPMENTS, WEEK ENDED SEPT. 28

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,368,200	.	1,004,960	$167,571
Joplin	2,939,090	....	342,920	105,025
Duenweg	907,470	....	120,280	31,979
Alba-Neck	843,530	...	60,600	28,509
Miami	548,570	..	329,260	26,436
Galena	436,090	..	51,200	15,132
Cave Springs	445,950	......	.....	14,270
Oronogo	409,030	.	......	8,938
Carl Junction	263,540	......	......	8,828
Spurgeon	59,830	307,350	49,030	8,785
Carthage	233,660	....	....	6,775
Jackson	168,830		..	5,065
Granby		194,330	10,590	4,000
Quapaw	131,010			3,930
Sarcoxie	53,000	124,970	.	3,608
Wentworth	64,590	38,280	..	2,485
Lawton	60,160	.	...	2,045
Badger	20,810	.	......	624
Totals	11,953,360	664,930	1,968,840	$444,005
9 mos	412,758,360	25,600,990	70,027,140	$13,285,212

Blende val., the week, $369,153; 9 mos., $10,920,549
Calamine, the week, 11,966; 9 mos., 395,577
Lead value, the week, 62,886; 9 mos., 1,969,086

MONTHLY AVERAGE PRICES

Month	Zinc Ore Base Price 1911	Zinc Ore Base Price 1912	Zinc Ore All Ores 1911	Zinc Ore All Ores 1912	Lead Ore All Ores 1911	Lead Ore All Ores 1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	51.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	..	40.89	.....	54.72	..
November	45.40		43.25	..	57.19	.....
December	44.13	..	40.76	......	62.03	....
Year	$41.45		$39.90	...	$56.76	.....

NOTE. Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

content. The average price, all grades, is $63.80 per ton.

Of a total of approximately 3200 tons stock in the bins there is more unsold ore tonight than for many months, perhaps 1000 to 1200 tons.

Chemicals

New York, Oct. 2—The general market is rather quieter than it has been.

Arsenic—The position continues strong. Prices are $4.75@5 per 100 lb. and are firm.

Copper Sulphate—Business is active and sales are increasing. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is steady and prices are unchanged. Spot nitrate is 2.55c. per lb., while 2.57½c. per lb. is named for October-January deliveries.

CURRENT WHOLESALE PRICES

Ammonium sulphate	cwt.	3.25@3.28
Arsenic, white	lb.	0.04¾@0.05
Barytes, ground	sh. ton	12.50@14.00
floated	sh. ton	16.00@17.00
Calcium acetate, gray	cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls	sh. ton	70.00
Carbons, good drill quality	carat	85.00
Cement, Port., Am.	400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburg	M.	175.00
ore, 50%, ex-ship, N. Y.	lg. ton	14.00@16.00
Copperas, bulk	cwt.	0.55
bbl.	cwt.	0.65@0.85
Copper sulphate	cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg	ton	8.00@9.00
Magnesite, crude, 95%	lg. ton	10.00@11.00
calcined, powdered		30.00@35.00
brick, dom., f.o.b. Pittsburg	M.	160@180
Paints, litharge, Am. powd.	lb.	0.07@0.07¼
red lead, American	lb.	0.07@0.07½
white lead, Am., dry	lb.	0.05¾@0.06¼
zinc white, Am., dry	lb.	0.05¾@0.06¼
Phosphates, acid:		
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75
Potassium cyanide, 95@96%	lb.	0.24
Pyrite:		
Domestic, non-arsenical, furnace size, f.o.b. R. R. per unit		0.12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit		0.13½
Imported, arsenical, furnace size, size, ex-ship, per unit		0.12¾@0.13
Imported, fines, arsenical, ex-ship		0.11@0.12
Imported, fines, non-arsenical, ex-ship, per unit		0.12½

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

Sodium cyanide, 120 to 130% KCN (per 100%)	lb.	0.21
nitrate 95%, spot	cwt.	2.55
95% future	cwt.	2.57½
Sulphur, Louisiana prime, N. Y.	lg. ton	22.00@22.50
roll	cwt.	1.85@2.15
flour	cwt.	2.00@2.40
flowers, sublimed	cwt.	2.20@2.60
pow. com., bags	cwt.	1.50
Sicilian, crude brimstone	lg. ton	22.50
Zinc chloride, granular	lb.	0.04½@0.04¾

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Note. These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

Production of petroleum in California in August is reported at 7,694,442 bbl.; deliveries, 7,314,213 bbl.; stocks at close of month, 45,402,689 bbl. During August there were 82 new wells completed; on Aug. 31 there were 412 wells drilling.

MINING STOCKS

New York, Oct. 2—On Sept. 26 the Exchange was steady and moderately active. Mining stocks on the Curb were fairly active.

Sept. 27 business on the Exchange increased, notwithstanding higher rates for money. On the Curb mining stocks were in some demand, but prices were irregular.

Sept. 28 the Exchange was firm, though the volume of business was moderate. Mining stocks on the Curb were dull and irregular.

Sept. 30 there were sharp advances on the Exchange, followed by a slight reaction. On the Curb copper stocks were in some demand, but most of them eased off a fraction. Other mining stocks were rather quiet, but steady.

The check to speculation due to high call money on Oct. 1 and 2 was aided by the unsettled state of the European markets on account of the disturbances in the East. The Exchange was weak and irregular. On the Curb copper stocks were in small demand at fractional declines, while other mining stocks were dull and rather weaker.

Boston, Oct. 1—There is less activity in the metal-share market, due in a measure to the tightening of money rates. Some stocks show moderate reactions, while others have made new price records for the year and in some cases for two years. The Dow failure has passed as a market factor, although these issues are naturally weak on the levying of a $2 assessment on Franklin mining shares and $1 on Indiana shares.

Franklin sought a low level at $6.75, but has recovered fractionally, and Indiana went down $11.12½, recovering $1. North Lake broke over $2 to $2.87½ and Algomah $1.50 to $3.50. By Mr. Dow's action, the treasuries of these companies were depleted by a sum said to be about $300,000 all told. Calumet & Hecla rose $55 to $615, the highest for two years. Osceola is up $3.50 to $116. This company has changed its dividend payments from semi-annual to quarterly, although maintaining the yearly rate of $12.

East Butte has been conspicuous, advancing $1.75 to $16.87½. Some new financing is contemplated by this company, which accounts for this rise, together with the fact that the company is now earning close to $3 per share yearly, and is in rich territory. Shattuck & Arizona has advanced $8 to $30, and American Zinc spurted $3.25 to $34.75. U. S. Smelting common is up $5.25 to $51, ex-dividend. The company has increased its payments from 50 to 75c. quarterly.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments	4,134,569	2,224,441	1,242,836
Anaconda	22,750,000	23,000,000	25,250,000
Arizona, Ltd.	3,300,000	3,200,000	3,260,000
Copper Queen	7,622,730	7,708,147	8,040,424
Calumet & Ariz.	4,160,000	4,748,000	4,514,000
Chino	1,474,979	2,945,000	3,437,309
Detroit	1,959,634	2,194,090	1,882,289
East Butte	1,267,343	1,261,904	1,410,500
Mammoth	1,849,953	1,818,738	1,802,590
Mason Valley	1,438,580	1,500,000	....
Nevada Con.	5,913,832	6,084,274	.....
Ohio	665,000	617,500	.....
Old Dominion	2,130,000	2,543,763	2,620,000
Ray	3,004,195	2,985,965	2,888,095
Shannon	1,270,000	1,446,000	1,400,000
South Utah	162,335	142,555	224,855
United Verde*	2,500,000	2,500,000	2,500,000
Utah Copper Co	8,772,742	10,602,000	11,248,992
Lake Superior*	15,600,000	19,500,000	21,000,000
Non-rep. mines*	8,400,000	8,970,000	8,970,000
Total production	98,275,892	105,991,687	....
Imports, bars, etc.	24,262,292	25,586,735	....
Total blister	122,538,184	131,578,422	....
Imp. in ore & matte	8,404,936	7,748,392	....
Total American	130,943,120	139,326,814	......
Miami†	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	996,000	1,026,000	....
Granby	1,888,400	1,802,753	1,970,388
Mexican Cos.:			
Boleo†	1,851,920	2,386,480	.....
Cananea	4,310,000	4,000,000	4,044,000
Moctezuma	3,176,819	3,094,016	3,229,839
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Kyshtim, Russia	.....	1,325,000	.....
Spassky, Russia	757,120	795,200	902,720
Famatina, Argen.	.....	.....	....
Tilt Cove, Newf'd.	....	....	...
Exports from Chile	9,856,000	8,960,000	8,512,000
Australia	8,176,000	8,288,000	8,064,000
Arrivals in Europe‡	12,667,200	14,114,240	20,200,320

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U. S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	120,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	61,345,846	57,252,324
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	......	.	...

VISIBLE STOCKS

	United States	Europe	Total
X, 1911	140,894,856	191,945,600	332,840,156
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	.	107,408,000	......

Curb trading has been of good volume and prices maintain a strong tone. Alaska Gold touched $10. Corbin Copper, another Dow promotion, touched 15c., with heavy transactions in it. Nevada Douglas is also strong.

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Sept. 26	Oct. 17	$0.05
Black Bear, Ida.	Sept. 26	Oct. 26	0.01
Black Horse, Ida.	Oct. 18	Nov. 8	0.01
Black Jack, Utah	......		0.01½
Bullion, Nev.	Oct. 16	Nov. 6	0.03
Columbus Extension, Utah	Sept. 30	Oct. 21	0.02
Eagle Mt., Ida.	Sept. 23	Oct. 25	0.00[illegible]
Eastern Star, Ida.	Oct. 12	Nov. 1[illegible]	0.002
Empire, Ida.	Sept. 23	Oct. 23	0.002
Great Eastern, Ida.	Sept. 28	Oct. 28	0.00[illegible]
Hale & Norcross, Nev.	Oct. 3	Oct. 24	0.05
Hypotheek, Ida.	Oct. 14	Nov. 4	0.01
Indiana, Mich.	Oct. 1[illegible]		1.00
Little Butte, Ida.	Sept. 21	Oct. 1[illegible]	0.001
Michigan Cop. & Gold, Utah	Oct. 2	Oct. 22	0.00[illegible]
Oneco, Mich.	Oct. 10		1.00
Savage, Nev.	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev.	Oct. 4	Oct. 25	0.02
Sierra-Nevada, Nev.	Sept. 25	Oct. 16	0.05
Snowshoe, Ida.	Sept. 30	Oct. 30	0.005
Temple, Ida.	Sept. 30	Oct. 30	0.002
Twin Star, Ida.	Aug. 31	Sept. 28	0.02
Union Con., Nev.	Oct. 15	Nov. 6	0.15
Wabash, Utah	Sept. 16	Oct. 10	0.05
Wasatch, Utah	Sept. 27	Oct. 16	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	..	25.596	24.594	
November	55.635	55.719		25.680	25.649	
December	54.428	54.905	..	25.100	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	[illegible]	54.035	70.294
May	11.989	16.031	12.214	[illegible]	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189		12.570		55.170	
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		[illegible]	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.185	44.923	October	41.185	
May	43.115	46.053	November	43.125	
June	44.606	45.815	December	44.655	
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265		4.139		15.332	
November	4.298		4.181		15.821	
December	4.450		4.332		15.648	
Year	4.420	......	4.286		13.970	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	..	5.951	......	27.256	..
November	6.380		6.223	.	26.795	..
December	6.301		6.151	.	26.849	...
Year	5.758		5.608	..	25.281	..

New York and St. Louis, cents per pound. London pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.06	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90		13.57		14.40	..
October	15.43	......	13.44		14.34	
November	14.92	..	13.30	....	14.25	..
December	15.15		13.10	...	13.90	...
Year	$15.72		$13.94	.	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Oct. 1	
Name of Comp.	Bid
Acacia	.04
Cripple Cr'k Con.	.01
C. K. & N.	.07
Doctor Jack Pot	.06
Elkton Con.	.65
El Paso	1.16
Findlay	.05
Gold Dollar	.18
Gold Sovereign	.2
Isabella	19
Jack Pot	.9
Jennie Sample	7
Lexington	.07
Moon Anchor	.07
Old Gold	.03
Mary McKinney	.5
Pharmacist	.05
Portland	1.04
Vindicator	.86
Work	.01

SALT LAKE Oct. 1	
Name of Comp.	Bid
Beck Tunnel	.08
Black Jack	.08
Cedar Talisman	.01
Colorado Mining	.14
Columbus Con.	.10
Crown Point	.02
Daly-Judge	5.80
Grand Central	.62
Iron Blossom	1.20
Little Bell	.20
Lower Mammoth	.06
Mason Valley	12.50
May Day	.15
Nevada Hills	‡1.75
New York	.02
Prince Con.	1.65
Silver King Coal'n	2.85
Sioux Con.	.04½
Uncle Sam	.10
Yankee	.12

TORONTO Oct. 1			
Name of Comp.	Bid	Name of Comp.	Bid
Conagas	7.40	Hollinger	13.90
Hudson Bay	60.00	Imperial	[illegible]
Temiskaming	.38	Pearl Lake	.91
Wettlaufer-Lor.	.44	Porcu. Gold	.95
Am. Goldfield	.50	Porcu. Tisdale	‡.01
Apex	.02	Preston E. D.	.02
Crown Chartered	.07	Rea	.94
Doble	‡.20	Standard	.00
Dome Exten.	.14	Swastika	.11
Foley O'Brien	.14	West Dome	.05

SAN FRANCISCO Oct. 1			
Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.75
Belcher	.31	Jim Butler	.79
Best & Belcher	.04	MacNamara	.22
Caledonia	1.60	Midway	.54
Challenge Con.	.06	Mont.-Tonopah	2.35
Chollar	.03	North Star	.30
Confidence	.35	West End Con.	1.67½
Con. Virginia	.36	Atlanta	.20
Crown Point	.30	Booth	.05
Gould & Curry	.01	C.O.D. Con.	.08
Hale & Norcross	.11	Comb. Frac.	.12
Mexican	2.42½	Jumbo Extension	.33
Occidental	.70	Pitts.-Silver Peak	.96
Ophir	.52	Silver Pick	.09
Overman	.75	St. Ives	‡.30
Potosi	.03	Tramp Con.	‡.04
Savage	.11	Argonaut	‡2.25
Sierra Nevada	.17	Bunker Hill	‡4.50
Union Con.	.38	Central Eureka	‡.30
Yellow Jacket	.27	So. Eureka	‡2.90

N. Y. EXCH. Oct. 1	
Name of Comp.	Clg.
Amalgamated	90⅞
Am. Agri. Chem.	59
Am.Sm.&Ref.,com	83½
Am.Sm.&Ref.,pf.	109
Am. Sm. Sec., pf. B	86¾
Anaconda	46½
Batopilas Min.	1⅝
BethlehemSteelpf	79¼
Chino	43⅝
Federal M. & S., pf.	48
Goldfield Con.	2¼
Great Nor., ore., ctf.	5[illegible]¼
Guggen. Exp.	59
Homestake	99
Inspiration Con.	19½
Miami Copper	29¼
Nat'nalLead,com	65
National Lead, pf	108¼
Nev. Consol	23½
Phelps Dodge	215½
Pittsburg Coal, pf.	97¾
Ray Con.	23
Republic I&S com	35¼
Republic I & S. pf.	92
Sloss-Sheffi'd com	58½
Sloss Sheffield, pf	100
Tennessee Copper	45¼
Utah Copper	65¼
U. S. Steel, com	79
U. S. Steel, pf	116¼
Va. Car. Chem.	46⅞

N. Y. CURB Oct. 1	
Name of Comp.	Clg.
Barnes King	‡.78
Beaver Con.	.40
Braden Copper	7
B. C. Copper	5
Buffalo Mines	1½
Caledonia	25
Con. Ariz. Sm.	[illegible]
Davis-Daly	2¼
Diam'field-Daisy	6
Ely Con.	23
Florence	82
Giroux	1⅞
Gold Hill Con.	[illegible]
Greene Cananea	10
Greenwater	05
Internat. S. & R.	‡124
Kerr Lake	2 11/16
Keystone	2
La Rose	2 9/16
McKinley-Dar-Sa	1⅞
Min. Co. of A. new	2⅞
Mother Lode Gold	[illegible]
Nev. Utah M. & S.	‡.01
Nipissing Mines	8⅝
Ohio Copper	1 1/16
Pacific Sm. & M.	[illegible]
South Live Oak	1
South Utah M. & S.	[illegible]
Standard Oil (old)	1060
Stand'd Oil of N. J.	408
Stand'd Oil Subs.	‡380
Stewart	1⅛
Tonopah	6⅞
Tonopah Ex.	1 11/16
Tri-Bullion	[illegible]
Tularosa	[illegible]
Union Mines	[illegible]
United Cop., pfd.	8
Yukon Gold	3⅜

LONDON Oct. 2	
Name of Com.	Clg.
Camp Bird	£1 7s 6d
Dolores	1 10 0
El Oro	0 15 6
Esperanza	1 17 0
Mexico Mines	7 0 0
Oroville	0 5 3
Stratton's Ind.	0 3 1
Tomboy	1 6 0

BOSTON EXCH. Oct. 1	
Name of Comp.	Clg.
Adventure	7
Ahmeek	349
Algomah	3¼
Allouez	46½
Am. Zinc	34
Ariz. Com., ctfs.	4⅝
Bonanza	‡40
Boston & Corbin	7½
Butte & Balak.	‡3½
Calumet & Ariz.	82
Calumet & Hecla	609
Centennial	21½
Cliff	5
Copper Range	59
Daly West	4¼
East Butte	16⅛
Franklin	7½
Granby	68⅞
Hancock	‡26¼
Hedley Gold	20
Helvetia	.90
Indiana	12½
Island Cr'k, com.	54
Island Cr'k, pfd.	88
Isle Royale	35½
Keweenaw	3
Lake	35½
La Salle	5¼
Mass	7¾
Michigan	2
Mohawk	67
New Arcadian	3
New Idria Quick.	‡7½
North Butte	34¼
North Lake	3¼
Ojibway	4
Old Dominion	62½
Osceola	114
Quincy	‡89¼
Shannon	16
Shattuck-Ariz.	29½
Superior	48½
Superior & Bost.	1¼
Tamarack	‡43
Trinity	5½
Tuolumne	2 15/16
U. S. Smelting	49½
U. S. Smelt'g, pf.	51¼
Utah Apex	2⅛
Utah Con.	12
Victoria	2¾
Winona	5
Wolverine	68¼
Wyandot	‡2

BOSTON CURB Oct. 1	
Name of Comp.	Last
Alaska Gold M.	9⅝
Bingham Mines	5
Boston Ely	1 1/16
Boswyocolo	.02
Butte Central	7
Cactus	12
Calaveras	2 11/16
Chief Cons.	1½
Corbin	.23
Cortez	.80
Crown Reserve	3¼
First Nat. Cop.	2
Majestic	47
Mazatan	‡½
Moneta Porc.	‡.03
Nevada-Douglas	3 11/16
New Baltic	2 1/16
Oneco	1
Raven Copper	.27
Rhode Island Coal	10
San Antonio	3
S. W. Miami	5
South Lake	7¾
Trethewey	‡30
United Verde Ext.	40
Vulture	‡15

‡Last quotation.

The Engineering and Mining Journal

Vol. 94 OCTOBER 12, 1912 No. 15

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E C
Unter den Linden 31—Berlin N W 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed. None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

STATEMENT

of the ownership, management, etc., of THE ENGINEERING AND MINING JOURNAL, published weekly at New York, N. Y., required by the Act of August 24, 1912

Editor, Walter Renton Ingalls, New York, N. Y.

Managing Editor, Richard H. Vail, New York, N. Y.

Business Manager, W. LeBaron, New York, N. Y.

Publisher, Hill Publishing Company, New York, N.Y.

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(My commission expires Mar 30, 1913)

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*Illustrated

A new law requires newspaper publishers to file with the Post Office Department, under oath, a list of their editors and stockholders, and publish the same in their papers twice yearly. The legal notice for the ENGINEERING AND MINING JOURNAL will be found on this page. We are glad to furnish the list of stockholders for the benefit of some busybodies, who often accuse us of being owned by the Smelter Trust, the metal dealers or what not.

All of the five engineering weeklies of the Hill Publishing Co. are owned by the persons named, and by no others. All but two of these stockholders are employees or ex-employees, and the exceptions are the wife and daughter of the president.

Every member of the Hill Publishing Co. has a bread-and-butter-hold-my-job interest in the straight, square conduct of the company, aside from its possible earning of dividends. Of course, Mr. Hill, owning the controlling interest, is personally responsible for the good or ill these papers do—that's all the trust ownership there is.

The Price of Silver

The price of silver not only maintains its recent high level, but has even advanced a little. The immediate cause of the advance is the fact that the Indian Government has found it necessary to increase its depleted reserve of silver rupees, and has made considerable purchases for coinage. The Indian people are generally prosperous and the demand for silver currency has been large. Silver is still the money required by the great body of the people, notwithstanding the increase of gold imports and the apparent greater use of gold for purposes of accumulation. It must be remembered that gold is available only for a comparatively small part of the people, and that most of them are not able to extend their savings beyond the silver limit.

Moreover, customs change slowly and it will take a long time to eliminate the traditional preference for silver. Besides the Indian purchases there has been recently considerable buying for European countries and notably for Russia, which has found use for silver not only in coining rubles for home use, but also in its possessions and commerce in the Far East.

American Institute of Mining Engineers

The meeting of the members of the American Institute of Mining Engineers on Oct. 7 reminded us of the Duke of York's army of 10,000 men which marched up the hill and then marched down again. After much solicitation of proxies, circularizing of members, etc., no use was made of them. It is understood that Mr. Eilers held about 900 and Mr. Corning about 300 proxies.

The only definite accomplishments at the meeting were the withdrawal of the three pending amendments to the constitution and the discharge of the Committee of Five, with thanks, compliments, etc.

A long series of amendments to the constitution and by-laws was introduced, amounting in effect to a rewriting of both these documents, but without effecting any alteration in the present bad system of government. The drafters of these amendments assumed that the dual existence of the board of directors and the council must continue and specified a lot of details to tie them up in rectitude. If anything it is proposed to make the council a more purely honorary and inactive body than heretofore. In order to avoid there being two presidents of the Institute, it is now proposed to call the leader of the council a chairman. Well, even the Japanese made a distinction between the Mikado and the Tycoon.

Why it should be assumed that because the American Institute of Mining Engineers is incorporated under the laws of the State of New York it must have two governing bodies passeth our understanding. The Mining and Metallurgical Society of America is incorporated under the laws of New York but has not encountered this necessity; nor has the American Society of Civil Engineers; nor the Mechanical Engineers; nor any other society that we ever heard of.

The Institute needs a single, concentrated, responsible government, and we believe that is what its members want. If they could have a chance they would no doubt like to have the opportunity to express that idea in principle and let a committee draft the necessary constitutional amendments in the leisure of the study. Constitutions cannot be written in general meetings. The unanimous vote in favor of Mr. Moore's resolution at the meeting on Oct. 7 was an index of what the members want.

The controversy that has been going on in the Institute has had at least one good effect, i.e., it has awakened more interest than has been displayed in it in a long time. The organization that was thought even to be moribund has come to life again. However, the controversial questions that have been introduced up to date have been singularly characterized by the absence of broad constructive thinking.

The Bingham Strike

The conditions governing the strike at the Bingham, Utah, which affects chiefly the Utah Copper Co., are economic rather than arbitrary, which means that the personalities of Mr. Jackling on one side and Mr. Moyer on the other are trifling in comparison with the working of the great economic law of demand and supply. The miners at Bingham were getting $2.50 per day. The copper mining companies, in common with those of the rest of the country, have been enjoying great prosperity for nine months or so. Most of them had voluntarily made liberal advances in wages in order that their employees might share in their prosperity.

The Utah Copper Co. was not so generous and waited until a demand for an increase had been made. Then it offered 25c. per day, which was not enough. The strike ensued and the introduction of the question of recognizing the union. In the meanwhile many of the men have left Bingham for otner fields of employment. Any man who can work can get a job nowadays. In the railroad camps in the Rocky Mountain region men are being paid $2 per day and their board, which is better than $2.75 per day and board to pay. Even at equal terms, we do not wonder that anybody would rather go to anywhere than stay in Bingham, which is the most repulsive mining camp that we know of in the United States. We do not deprecate its unfortunate inhabitants, but refer rather to its physical conditions, which are uncomfortable, forbidding and unsanitary. Bingham has been most fittingly described as "A sewer four miles long."

Mr. Jackling and his fellow managers should give consideration to this in the adjustment of their rate of wages. We know that the men who work in open quarries, as at Bingham, shifting track, shoveling, etc., in the daylight, are not necessarily of the same class as the craftsmen who drill, blast and timber underground, but if they can get more money in daylight work on the railways than in the Bingham quarries they will go to the railways, and no persuasion will keep them in the quarries. This is economic law. Recognition of the union is merely a subordinate issue.

The strikes at Bingham and Ely will reduce the production of copper after the smelters have worked up their stocks of concentrates, which has not yet happened. If the strikes are soon settled the mines can no doubt replenish the smelters' bins without very much trouble. If, however, the strikes be prolonged there may be a diminution in the intermediate supply of copper which will make the smelting and refining outputs for the year more nearly alike and may enable the boomers to get away with the bluff that they have carried on for so long a time. When the smelting production was exceeding the refinery output we were brazenly assured that no such thing was taking place, and could not possibly take place.

The copper refiners' statistics for September may be accepted as showing two things, viz.: (1) The refinery production is now running at about the same rate as the smeltery; (2) the huge deliveries of a month or two back represented anticipatory buying by manufacturers or speculators, or both.

It is interesting to know that the Cananea company has adopted the Great Falls type of vertical converter, basic lined, to replace the old and ordinary type of horizontal converter. Vertical converters will also be installed in the new smelting works of the Arizona Copper Co. and of the Calumet & Arizona company.

By the Way

The use of coal ashes in mine examinations and the recommendation as to purchase of the coal mine, as described on this page last week, should be credited, writes Professor Munroe, to A. Chester Beatty.

It is to be the Southern Aluminium Co., not Aluminum. This is in deference to the wish of Doctor Heroult, who, like Prof. J. W. Richards, prefers the European spelling. However, the product will no doubt be bought and sold as aluminum, which is the generally accepted term in America.

The demand for gold seems to be urgent in all the leading commercial countries. The Bank of England and the Bank of France are adopting measures to prevent the export of gold, which both wish to avoid. Its transfer as the representative of capital, however, depends largely on the question of the interest which it can earn, and it is likely to go where it is wanted.

A certain large mining company tried to cut down its expenses by shanking its air-hammer drill steels in its own machine shop. The method employed was to cut down the diameter of the steel where the shank was to be, thus leaving a shoulder, then shrinking and rolling on the shank. As may be supposed, these either broke off or twisted loose, when put in the drill. A good drill sharpener would have done the work faster and more cheaply.

A few weeks ago the newspapers made a good deal out of some rails of remarkable durability on the New Haven road, which upon analysis were found to contain about 0.5% copper, and immediately the statisticians of the copper boom began to figure a wonderful new use for copper, which would cause the specter of the delayed and increasing surplus of copper to be forgotten promptly. Thus, for the United States alone 3,000,000 tons of rails at 10-lb. copper to the ton. It is easy to scribble. In fact, rails containing about 0.5% of copper have been used on the Pennsylvania road for a long time. Out of some ore it is impossible to make steel without a copper content. These rails seem to have been neither better nor worse than others. Anyway, they have never attracted especially the attention of the experts of the Society for Testing Materials.

One of the interesting features of the American Iron and Steel Institute meeting at Pittsburgh, Oct., 25 and 26, will be the display by Rogers, Brown & Co., of a series of moving pictures illustrating the principal operations from the mining of iron ore to the production of pig iron and steel ingots. Views of the large open-cut workings of the Mahoning mine at Hibbing, Minn., show the steam shovels actively engaged in stripping and mining operations. The methods of transporting the ore from mine to furnaces, including the handling of the ore at the shipping docks at Duluth and the receiving docks at Buffalo, will be shown. Views of the works will present the methods of stock-piling, charging the furnace, preparing the pig molds, casting pig iron and sampling. The essential operations in manufacturing Bessemer steel will also be illustrated.

Kamloops, B. C. celebrated its centenary on Sept. 17, 18 and 19, 1912, a part of the proceedings consisting of a historical pageant, dealing with the march of events from 1812 on. Of this pageant, no little part dealt with the Fraser River gold-mining days, of which many survivors reside in British Columbia or are scattered through the mining regions of the north. The Minister of Mines of British Columbia (also the premier) Sir Richard McBride, had a pamphlet prepared for distribution, primarily among the old timers, which at the suggestion of the deputy minister was called "The Days of Old and Days of Gold in British Columbia." The pamphlet is illustrated with Fraser and Cariboo River views, and Cariboo mining scenes, including several old ones—in particular, the "Cameron Claim, William's Creek, 1863," and "Old Black Jack & Burns Hydraulic, 1863."

At the Morro Velho mine of the St. John del Rey Co. in Brazil, ore is now being taken from the 17th level, which is 4900 ft. vertical depth below the surface. This does not equal the depths attained by the Tamarack and the Calumet & Hecla copper mines; but it makes the Morro Velho the deepest gold mine in the world, exceeding by 300 ft. the Victoria Reef at Bendigo, Australia, which has a shaft down 4600 ft. Moreover the Morro Velho expects to open next year the 18th level, at 5200 ft., and has plans for opening four additional levels, the 22d to be at 6500 ft. depth. In the Transvaal the greatest depth yet reached is in the Milner shaft of the Simmer Deep, which has been sunk 2900 ft. vertically and 3220 ft. on the incline, the bottom of the incline being 4850 ft. below the surface. The Cinderella Deep is down 3950 ft. vertical and 1160 ft. on the incline, to 4580 ft. below the surface.

The "Lost Spaniard" mine (name slightly changed, this time) has been discovered again. According to a Muskogee, Okla., dispatch, Dan Bellchamber, an enginedriver of the Missouri, Oklahoma & Gulf R.R., believes that he has discovered "the famous Lost Spaniard mine, for which prospectors and investors have been looking for the last quarter of a century, etc." He has procured a mining lease on a 20-acre tract of land, near Bromide, Okla., and has "let in" many of his friends, all of the stockholders being railroad men. The situation of the mine was, of course, found from an old Indian, and the mine "is supposed to date back to the days when the Spaniards from Mexico made frequent trips to this country." The new company that has been organized is aptly named the Mystery Mining & Milling Co. The shaft of the mine is reported to be about 27 ft. deep, and we presume that is part of the mystery of how laymen are induced to buy mining stock. The shaft, it is stated, has caved and the timbers have rotted, but enough ore projected so that a party of 20 railroad men who visited the mine were able to procure nice samples, which are reported to assay 200 oz. in silver and 63% lead. We presume they were so excited when they returned from this examination, that like the girl in "Ready Money," instead of taking time out to go to lunch, they wished to "wait right there at the company's office and watch the stock go up."

The Research Corporation, the workings of which were described by F. G. Cottrell before the International Congress of Applied Chemistry, represents another effort to bring academic research nearer to commercial needs. It will be remembered that Mr. Cottrell at one time proposed to give to the Smithsonian Institution all rights to his own inventions in electrostatic fume condensation, except the foreign rights, those in six Western states, and those of one portland-cement corporation. The Institution, however, thought it inadvisable to become the direct owner of royalty-bearing gifts, so the Research Corporation was chartered to administer this and any similar donations. The stock is non-dividend paying, $100 par, and is distributed in lots of from one to three shares among the following subscribers: Charles Kirchhoff, Benjamin B. Lawrence, Arthur D. Little, Hennen Jennings, James Douglas, T. Coleman du Pont, Cleveland H. Dodge, Edward D. Adams, Frederick A. Goetze, Elon Huntington Hooker, Thomas C. Meadows, H. C. Perkins, Charles A. Stone, James J. Storrow, Elihu Thomson, Henry R. Towne, and Charles D. Walcott. The moneys paid in by these subscribers, it is believed, will pay expenses until the Corporation is more than self supporting. The Corporation will administer those patents given to it, and acquire others by purchase if it seems wise, and finances permit. If it prove what its founders hope, its surplus revenues will be given to the advancement of research in schools and societies. Apart from the good which a wisely administered society of this sort can do toward encouraging research, it is pointed out that often times a patent given to such a society, that could protect certain persons in its use, would be of more public benefit than to give the patent freely to the public, for what is every body's business, is nobody's business, and without some limited protection no one uses the invention.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

A Difference in Views

In the JOURNAL of Sept. 28, 1912, on the first page, there is a prominent editorial in reference to the affairs of the American Institute of Mining Engineers.

In that article the suggestion of the Committee of Five that the honorarium of the retired secretary be discontinued as a measure of economy is characterized as "indecent." We decidedly object to having any action taken by us or a committee of which we are members characterized as "indecent."

The Committee of Five found that the institute, in order to meet its unavoidable financial obligations, would have to have more money; and the recommendation that salaries be cut in order to economize and to provide funds to meet aforesaid obligations was, therefore, made. We do not believe it indecent to recommend economies or to carry them out in order to live within one's means.

We ask that this communication be published in full.

GEORGE C. STONE
C. R. CORNING

New York, Oct. 7, 1912.

[This attitude is like that of an able-bodied man saying to his aged father: "Well, old fellow, if I don't earn any more money, I'll have to turn you out of the house." We characterized this as indecent, considering the word to fit the case. Webster gives these synonyms: Unbecoming, indecorous, indelicate, unseemly. They conform to our ideas about appreciation, loyalty and recognition in this case, which pertains to life-long, self-sacrificing services.—EDITOR.]

Illuminating the Cross Hairs

In the JOURNAL of Sept. 28, 1912, I notice, in "Details of Practical Mining" under the head of "Illuminating the Cross Hairs in Mine Surveying," the description of a method that, so far as I know, is in general use on the Mesabi range.

I find that tracing cloth held behind the plumb-bob string works well when the mine is dry, but if there is any water dripping, the cloth soon becomes soaked and useless.

To overcome this difficulty I save the heavy oiled paper that my blueprint paper comes wrapped in, and use this. I find that the water has little effect on it and that it lasts much longer than tracing cloth does under the circumstances, besides giving just as good results.

The method is especially good when an acetylene lamp is used behind the paper instead of a candle.

J. SMITH.

Hibbing, Minn., Oct. 1, 1912.

[A domestically minded contributor to *Coal Age* suggests that the surveyor ask his wife to get him an embroidery ring and insert the tracing cloth or paper in that. It is then tight as a drum head and a lamp behind it will give a good illumination to plumb-bob string and cross hairs. If the surveyor is unmarried, he can ask his best girl.—EDITOR.]

A Tempest in a Teapot

We wish to take exception to some of the statements in the editorial comment appended to our letter in the JOURNAL of Aug. 31. Our letter called attention to the impropriety of publishing Frank H. Probert's detailed description of what is essentially the Fairlie electrolytic cabinet 4½ years after it had been adequately described by us in another journal, without mentioning the designer's name.

In the first place, we deny that Mr. Probert's article is more useful than ours. Our article excels Mr. Probert's in many instances, whereas the only point on which Mr. Probert's article excels ours in utility consists in publishing the names of some dealers in the various parts of the apparatus described, information which belongs in the advertising columns, perhaps, but not in a technical or scientific description. In the second place, the following editorial statement does not apply to the point at issue: "Nor do we conceive any impropriety in failing always to attach the inventor's name to a description of a method that has become standard."

No originality was claimed by us for the use of the rotating anode in the electrolytic determination of copper. It was the apparatus, not the method, for which credit should have been given. The editorial comment continues: "For example, basic copper converting is frequently the subject of description and discussion without any reference to Messrs. Peirce and Smith."

We venture the opinion that no reputable journal would publish an article describing a basic converter which from drawings and photographs accompanying the article could readily be distinguished as a Peirce-Smith, without mentioning the names of the designers. It is an odd circumstance, which does not add force to the editor's argument, that in an article entitled "Progress of Basic Converting," in the very same issue of the JOURNAL (p. 408) the names Peirce-Smith appear four times within the space of an inch and a quarter. We have consulted the editors of two other important technical papers published in New York, and both are emphatically of the opinion that in the instance of which we complain an impropriety was committed, and that the ENGINEERING AND MINING JOURNAL committed a further impropriety in failing to acknowledge the earlier one.

Finally, we did not say that Mr. Probert is not an honorable engineer, but we do say that it was his duty to investigate the published literature on the subject of rotating anodes before attempting to add to it.

ANDREW M. FAIRLIE,
ALBERT J. BONE.

Copperhill, Tenn., Sept. 18, 1912.

[Mr. Probert described a method used in the laboratory of a company under his direction, not mentioning its fathers, not knowing them; and we published his article and commented approvingly of the method, also without mentioning its fathers, not knowing them. Mr. Probert and we are duly sorry that we offended them. However, our conscience does not convict us of any impropriety, the opinion of the "editors of two important technical papers," or two hundred, to the contrary notwithstanding. The attitude of our correspondents rather reminds us of a theater program, "costumes by Jenkins," "wigs by Blenkens," etc.—EDITOR.]

Acetylene Lamps

In the issue of the JOURNAL of Sept. 28, 1912, I notice that "Surveyor," of Calumet, Mich., strenuously objects to the use of acetylene lamps for underground surveying. I have also experienced similar difficulties to those he mentions in attempting to level up with the lamp in the hand, or to take sights with the lamp in the hat. I have found a simple remedy, however, which has proved effective. By buckling a small leather strap around the chest just under the arm-pits and over the vest, a convenient place is found upon which to hang a small lamp, where it will give ample light for leveling up, using notebook, and the general manipulations about a transit. It is readily attached and detached, and does not interfere with sighting. If the strap tends to slip down this is prevented by a couple of belt straps sewed to the vest.

W. A. FUNK

Idaho Springs, Colo., Oct. 5, 1912.

Peculiarities in the Drift

By Josiah Bond*

A description of some ore deposits in which the valuable minerals occur in pay shoots in the vein. Some of these shoots are irregular and the indications are that they were formed later than the vein and by different agencies.

There seem to be as many varieties of ore occurrence as there are veins; indeed, the same vein may show diverse ore occurrences. This will happen frequently in the part of the vein that is in the zone of oxidation or secondary enrichment. Such parts of the vein show great irregularities, even though the unaltered vein is regular. This is the more striking if a distinction be made between the pay ore and that which is not so rich, as must be done in a mining venture. An old saying is, "Find your vein or lode and then find a pay streak; veins being many and pay streaks (that are found) being few." Sometimes when found the pay streak is a narrow, weakly thing and often quite short.

I used to hear discussions as to the possible length of a continuous pay streak, and from what the old miners said and from what I have seen, it has gradually become an opinion of mine that it is a lucky man who can uncover a pay streak as long as a mine claim or 1500 ft. There are a few such, but not many. The few there are if they carry ore of good grade, become bonanzas of the first order. One or two of the great bonanzas have had no such length of pay streak in the orebody. After the lode has been found it becomes necessary to find the pay streak, which is not easy to do. It would be simpler if the assumption were always made that every lode has its pay shoot, and if the discoverer always had enough money to work systematically until that pay shoot could be found.

THREE PAY SHOOTS CLOSE TOGETHER

The following examples of oreshoots may be of interest in that they show the variations in ore occurrences in what are, considered as a whole, regular lodes; the reason for the ore occurring in shoots being unknown. In searching for the ore, the walls are left undisturbed whenever possible, and in these must be sought the principal determinants of the situation of oreshoots. The discussion of this feature must be left to another time. Take the occurrence illustrated in Fig. 1, which is a plan of the lower tunnel of the Blaud. In this figure, as well as in the others, the checked portions indicate low-grade ore, probably under a commercial grade, while the shaded portions show good ore, the real pay streak. In driving this adit a mineralized area was entered at 50 ft., another at 140 ft., while the last one was met at 190 ft., from the portal. It is possible that all these belong to the same pay shoot, being the upper fringe; oxidation having gone to unequal depth along the top of the ore. The first ore streak was about 3 ft. wide, but the last widened out, as the adit was driven, until as it now stands it is about 12 ft. wide. Of this about 3 ft. is solid pay ore; the remainder is of undetermined value, but improving with every foot of drifting with the probability that, if not now, it will all soon be merchantable ore, in which case the deposit will be of great value. The ore contains copper and silver, the copper occurring as chalcopyrite. Chalcocite was found in the upper part of the vein and covelite near the surface. The country is diorite and the vein, as indicated by the quartz, was deposited in an open fissure. Work is now progressing on this oreshoot.

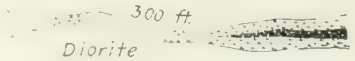

FIG. 1

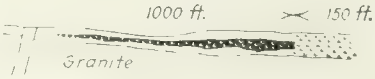

FIG. 2

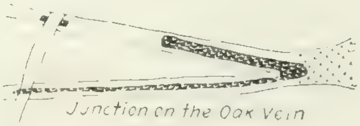

FIG. 3

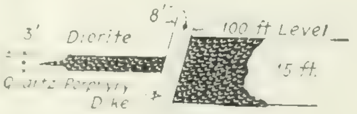

FIG. 4

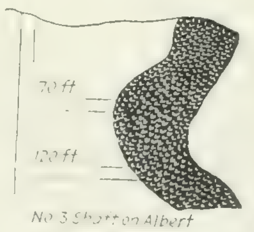

FIG. 5

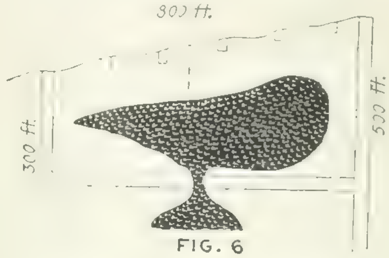

FIG. 6

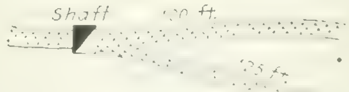

FIG. 7

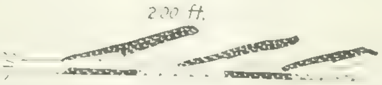

FIG. 8

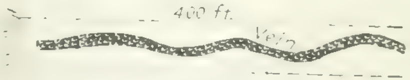

FIG. 9

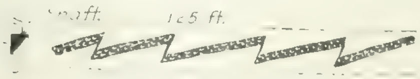

FIG. 10

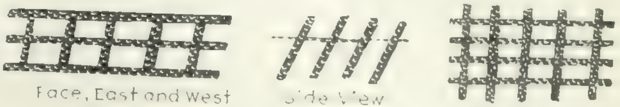

FIG. 11

SOME TYPES OF ORESHOOTS

In Fig. 2 is shown the plan of the great oreshoot in the Alto as opened on the level of what is called the 300-ft. tunnel. The rock is coarse granite. The shoot of ore is nearly 1000 ft. long and widens from a point to more than 4 ft., and is ore of good quality without a break and continually widening and getting better until a decomposed section is reached. On the surface over this section was found a body of high-grade silver ore, and Kirby Thomas suggested that this is only a part of the vein where oxidation has proceeded to greater depth than elsewhere, and under this oxidized section might be found the greatest body of ore in the mine. He also raises a point in general that in the dry Southwest, it might not always be advisable to sink on that part of vein which shows the best ore or at least the largest bodies of oxidized ore, on the principle that the larger the body of surface ore, the greater the depth to which oxidization has gone, and the permanent ore might and usually would be reached at less depth on a part of the vein which was not so marked by surface enrichment. It is probable that work may soon be done near this very point, but lower down. A tunnel has also been started at a place 500 ft. lower, and when it reaches the payshoot the latter should be well delineated.

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*Mining engineer, Alto, via Patagonia, Ariz.

Shoots of Primary and of Secondary Ore on the Same Level

On the Oak claim is found a condition which is nearly the same as the two foregoing, but which is marked by a junction of two veins or two branches of the same vein. The plan is shown in Fig. 3. The rock is granite and the vein was reached by the crosscut which opened the narrow shoot first. Drifting on this finally showed the wider shoot. These two shoots come together making a fine body of ore, which on this level ends in oxidized low-grade ore. A peculiarity of this ore occurrence is that the narrow shoot is what might be called primary ore, the copper mineral being chalcopyrite, while in the other branch the copper mineral is tetrahedrite, generally supposed to be secondary. Both carry about the same percentage of copper, but the tetrahedrite also carries 80 oz. of silver. I cite Dr. C. P. Berkey to the effect that silver is an essential constituent of tetrahedrite (and tennantite, too, I suppose), an opinion that is confirmed by several hundred assays of the mineral for silver that have been made on these gray-copper deposits, as without exception silver was always found in significant amounts.

A Pay Shoot Crossing a Dike

The North Star vein lies in diorite and running down a hill offered a good site for tunnels. Fig. 4 shows the upper tunnel, which starts in on a 3-ft. vein, which is all pay shoot after the surface alteration is passed. About 40 ft. in, the vein is cut off by an 8-ft. dike of quartz-porphyry crossing nearly at right angles. Upon driving through this the pay shoot was again found, but instead of being 3 ft. wide as before, it was 15 ft. wide and a homogeneous ore. The ore consisted of quartz, copper and iron sulphide, which averaged 5% copper and carried 6 to 8 oz. of silver and a small amount of gold. While this ore from the heart of the Santa Ritas is not a very profitable shipping ore, it can undoubtedly be treated profitably on the ground, and if it holds its present width and copper tenor it will make a good mine.

Shoot with Reverse Pitch

In Fig. 5 is shown a section of the oreshoot and the work done on the Albert claim. This shoot, the length of which is not yet known, begins at the surface to pitch to the west and for that reason a shaft was sunk far enough to the west to intersect the shoot at about 200 ft., if the pitch continued regularly. The work, however, showed that at the 100-ft. level the shoot changed its pitch to the east, at about the same angle that it pitched above to the west. This was a good body of ore, generally netting $35 per ton, from copper, lead and silver when shipped. From the pay shoot about $40,000 has been returned. This mine was shut down for three years and the water that gathered in the workings became so impregnated that it contained about 16 lb. of copper per ton. When the shaft was unwatered a rude precipitation works was built and tin cans and old iron was used with the result that several tons of 40% cement copper was obtained. At this time the water was rich and, besides much iron and copper, carried so much free acid as considerably to hinder precipitation. The iron part of a shovel, that had been but little used, was entirely dissolved in this water in less than two days. It may be remarked that this was the driest time ever known at the mine and the solution was more concentrated than would ordinarily have been the case.

Shoot Missed in Two Shafts Found in Connecting Drift

In Fig. 6 is shown the Jenny Lind oreshoot. There were two claims staked on this vein, the dotted line showing the line between the two. They belonged to two owners. A stranger bought the lower claim and sunk the shaft 300 ft., finding nothing that he could utilize. Thinking well of the vein he bought the upper claim and sunk the shaft on it 500 ft., again finding nothing. He then drifted between the two running both ways, and just as the two were joined he cut a little neck of good ore. When further developed the orebody was as shown. If his first shaft had been 20 ft. further up the hill he would have cut the pay shoot; if the second shaft had been 25 or 30 ft. further down hill it would have been in ore a good part of the way. It is not known as yet how the shoot flares below this drift, but it would be in keeping for the neck to be narrow and short. The persistence on the part of the miner achieved results in this case.

In Fig. 7 is shown the lower or 200-ft. level on the Star claim, which is a ramifying vein in trachyte. The two branches and the main stem are equal in width, each being about 3 ft. wide, and on this level they carry copper-sulphide ore containing about 3½% copper and several ounces of silver. Unlike the vein shown in Fig. 3, where the two branches are of different kinds of ore, in this case the branches carry the same kind of ore, which argues for simultaneous deposition, while in the other case there were different periods of deposition or a complete alteration of one of the veins.

In Fig. 8 is represented a replacement lode. The rock here is brecciated dacite. This occurrence is on the lower Jersey Girl claim. The ore is good, containing about 10% copper, 30% lead, and is rich in silver. The main vein is from 1½ to 4 ft. wide, and two shoots of pay ore are known. The branching shoots are, as a rule, narrow, as far as they have been followed, but the grade of ore is better. How far these pay shoots run off is unknown, but it is thought that they pinch out shortly, the greater part of the ore being in the main vein. In the vein under discussion a common feature of replacement veins is well illustrated; it is that the replacement has planed down one wall while the structure of the other has not been disturbed. In cases of this kind that have come under my observation the pay shoot is found against the smooth wall, and if there are many branchings they run out into the other wall.

A Tortuous Pay Shoot in a Straight Vein

The next two figures represent pay shoots, the course of which is not the same as the vein. Fig. 9 shows a tortuous shoot about 2 ft. wide in the 8-ft. vein, as shown in the lower tunnel of the Fortuna group. This is in trachyte, and it is thought that the vein was a deposition in a fissure. The pay shoot was a later enrichment by replacement. This shoot carries base ore, valuable for its copper, silver and gold. Outside of the pay shoot the whole vein carries quartz with a little copper, but not enough to make pay ore. In an upper tunnel, however, this quartz vein carries copper, so that possibly greater depth might show ore. If this is so the pay shoot on this level may be merely a redeposition of part of the original contents of the whole vein. A still lower tunnel may be driven on this vein and when this is done the whole process may become clear.

In Fig. 10 is shown a peculiar ore occurrence in drift No. 2, of the Eureka. The rock is andesite porphyry. The vein is regular, running straight across several claims. The pay shoot appears as if it were faulted, but aside from this, is regular. The pay shoot is secondary, however, the ore being gray copper with silver running up to 500 oz. Just what happened here is obscure to me. I have thought that the shoot may be merely a zig-zag, with the cross members nearly obliterated, this being a relic of the original joint structure of surrounding rock, but the vein may have been faulted, as at first sight appears. Deeper work on this vein may elucidate this problem, which is out of the ordinary.

A Peculiar Stockwork

In Fig. 11, three views of a stockwork on Ash Creek are shown. These views are taken in a cut running from south to north in the deposit. The rock is andesite. The size of the deposit is not known or its richness, but it looks good enough to be of commercial value. The north and south stringers dip to the west, while the east and west stringers dip to the north. It is rather curious that the dip of the latter represents the average dip of the veins of the neighborhood, while the dip of the former is of about the same as the dip of the oreshoots. The ore in many of these stringers which cut up the rock into oblong pieces about

9x12x18 in., and are themselves from ½ to 2 in. wide, is heavy sulphide. It will take much work to demonstrate the value of this deposit, which is not likely to be done while so many more simple chances are open.

Angels Camp, California

By Lewis H. Eddy

The mining situation in Angels Camp district, Calaveras County, Calif., despite apparently unfavorable conditions, presents evidence that systematic development may put the large mines again on a paying basis and encourage the reopening of old mines that have been idle for lack of capital and modern methods of mining and treatment.

Mill Capacity Exceeds Ore Supply

The crushing capacity of the mills in the district approximates a total of 1200 tons per day, including five large mills and two or three smaller plants. Of the 240 stamps forming the total equipment of the large mills, only 80 stamps are now dropping, and the 20 or 30 other stamps are also idle. In the first quarter of the present year there were 220 stamps dropping in the camp. In the first part of the second quarter the 60 stamps of the Lightner were closed down, and shortly after that the 40 stamps of the Dolling also stopped dropping. Both mills had practically exhausted the ore supply and the necessity for exploration of the lower ground for new orebodies being recognized, development was pushed vigorously with encouraging results in both cases.

The history of mining in Angels Camp shows that large orebodies carrying high-grade ore have been generally confined to shallow depths. At a depth of about 300 to 400 ft. a body of talc, approximately 100 ft. thick, intrudes into the schist hanging wall, cuts across the quartz and enters the foot wall, at an angle of 50 to 55° easterly. A small quantity of pay rock has been found in portions of this talc, and in some instances it has been milled with the quartz. Experience has proved that greater economy results from ignoring the small gold content in the talc and continuing the exploration at greater depth. At the time of closing down the Lightner mill, the vertical shaft was down 700 ft. and into the talc. The shaft has since been deepened to 1000 ft. Having passed through the talc, a drift was driven west 150 ft. to the foot wall at the 900-ft. point. In this drift ore of an encouraging character was encountered. The shaft will be further deepened to the 1200-ft. point, when another drift will be driven.

The Dolling mine, which was formerly known as the North Star, is situated about three-quarters of a mile south of the Lightner. The Dolling is a new mine, having been in operation about a year when the mill was closed, pending the development of new orebodies. The depth of the inclined shaft is 400 ft. Ore was extracted from four levels, keeping 30 stamps dropping until last January, when 10 more stamps were added. The property is owned and operated by the Dolling Gold Mining Co., D. G. Overall, superintendent. It is expected that the mill will be again placed in commission the latter part of this year. The sinking of a new vertical working shaft is contemplated.

Utica Company Is Principal Producer

The Utica company, a close corporation, occupies an interesting and peculiar position in the district. It is not only the most important mining operator and producer in Angels Camp, but in addition operates electric-light and power and water plants, furnishing power and water to some of the mines and light and power to the town of Angels Camp. The company has kept 100 stamps dropping during the present year in spite of the mishaps that have occurred at the Gold Cliff and the continued exploration for new orebodies in the Cross shaft of the Utica mine.

The 40 stamps of the Gold Cliff were closed down at the end of August from ore shortage, because many muckers became frightened and refused to work after the surface caved into an abandoned portion of the mine, on Aug. 18. The closing down of the mill should be only temporary, as the working shaft was not damaged and no active part of the mine was interfered with. The Gold Cliff produced about 200 tons per day, but the mill has been required to keep pace with the extraction in order to meet the demands for exploration and development and to aid the exploration and development of the Utica.

The 800-ft. working shaft is connected with a winze at a point 150 ft. northwest and the 1000- and 1100-ft. (winze) levels are connected with the shaft by raises; the 1600- and 1700-ft. (winze) levels are in good ore and when extended northerly toward the Utica, are expected to tap the orebodies in the extensions south from the Cross shaft. The purpose is to connect these two mines at a depth that will develop pay orebodies, and thus extend the life of the mines. The mines are about three-quarters of a mile apart, the Utica mine and the Stickles mill being situated at the town of Angels Camp, the Gold Cliff mine and mill to the southwest of the town. Added to other costs the company was recently obliged to order a new electric hoist motor to replace the one destroyed in June by caving of overburden. There was the further loss by the destruction of the entire hoisting-engine plant, but the expense of new machinery is obviated by the use of a plant formerly operated by water on an adjoining property, which will be electrically driven when equipped with a 225-hp. Westinghouse motor.

The Angels mine is still extracting ore and the mill is dropping 20 of the 40 stamps, as it has been doing in the present year. Allan Randall has succeeded Thomas Fullen as superintendent. The operating and development plans of the mine and mill have not been made public, but it is understood that the mine will be further explored with the purpose of developing new orebodies and the operating of the mill to full capacity.

August Operations at Goldfield Consolidated

During August, 1912, the total production of the Goldfield Consolidated Mines Co., according to the official report of the general superintendent, J. F. Thorn, was 32,538 tons, containing $465,289, or an average of $14.30 per ton, of which 30,330 tons was milled with an average extraction of 89.31%, and 2208 tons was shipped of an average value of $15.26 per ton, the net recovery from all ore being $12.88 per ton. The total net realization to the company was $223,581, or $6.87 per ton. The total cost of mining, development, transportation, milling, office and general expense, was $6.14 per ton, distributed as shown in the accompanying table.

GOLDFIELD CONSOLIDATED OPERATING COSTS FOR AUGUST, 1912

Mining, including stoping and development	$3.30
Transportation	0.11
Milling	1.86
Marketing	0.05
General expense	0.28
Bullion tax	0.03
Marketing ore shipped	0.53
Total cost of operation	$6.16
Miscellaneous earnings	0.02
Net cost per ton	$6.14

From the Combination, 136 3X, the new stope from the second level, 200 ft. northeast of the shaft, 577 tons of $23 ore was produced. At the Jumbo No. 2 the 217 drift on the 200-ft. level going south, encountered a small vein which produced 50 tons of $74 ore. Not enough work has been done to determine the extent of this vein in length or depth.

At the Mohawk the stopes being carried through the old Sheets-Ish and Begole lease workings produced 1801 tons of ore averaging $19 per ton. The stope in the old Hayes-Monette lease workings above the 250-ft. level produced 454 tons of ore averaging $24 per ton. The 202 stope being carried through the old Francis-Mohawk workings produced 531 tons of ore averaging $20 per ton. The 348 stope being worked through the Loftus-Davis lease workings above the 450-ft. level produced 291 tons of $72 ore. The 490-I stope which was cut out of the 438X drift between the 600- and 450-ft. levels produced 1856 tons of ore averaging $84 per ton.

At the Clermont the 571 drift on the downward extension of the 510 orebody between the 900-ft. and 750-ft. levels produced 100 tons of ore averaging $40 per ton. On the 1300-ft. level of the Grizzly Bear a sill is being cut in the 802 orebody and has produced 140 tons of average $22 ore, which was shipped to the smelter. The Grizzly Bear shaft has been completed to the 1400-ft. level and a sump cut: the drift on this level was advanced 30 ft. from the shaft.

Oriental Consolidated

The report of the Oriental Consolidated Mining Co. for the year ended June 30, 1912, shows that its mines in Chosen, Asia, produced 323,703 tons of ore having a gross value of $5.86 per ton. This tonnage was less than the previous year, due to shortage of labor and cordwood at the Candlestick and Kuk San Dong mines. The yield in the form of bullion and concentrate was 89.9% of the above amount. While the total gross receipts were the largest in the history of the concession, the net profit of $652,527 was $20,193 less than the previous year. The total cost per ton of $2.83 was 20c. higher than last year. This was mainly due to larger construction and development expenses, a decrease of 2% in the free-milling percentage of the ore, increased government tax on fuel and the extraordinary expense ($10,917) of fighting the flood at Charabowie mine.

The development work during the year amounted to 23,037 ft. and gave satisfactory results in all but the Kuk San Dong mine. The estimated ore reserves, July 1, 1912, were 741,000 tons containing $3,840,000. At the Taracol mine the orebody dips away from the working shaft. To avoid driving long drifts, further sinking of the main shaft will be abandoned and instead a winze will be sunk from No. 7 level in the orebody to develop the lower levels. For the same reason no further sinking on the main Chintui shaft or on the winze in block 16 will be done; but sinking will be continued on the No. 3 level winze in block 2. On Feb. 18, 1912, cracks in the roof of old stopes in the Charabowie mine opened, allowing water from the river to rush in. By the use of extra pumps, etc., the flooding of the mine was prevented.

The average actual running time of the 240 stamps in five mills was 313.5 days, the stamp duty being 4.5 tons per day. The Taracol tube-mill plant, designed by A. E. Drucker, metallurgist of the company, to take the place of the old Taracol leaching plant, was completed in May, 1912, at a cost of $65,000. This sum includes the cost of complete power installation for both the tube-mill plant and the dump-retreatment plant. The treatment consists of classifying, all-sliming, continuous Pachuca agitation, Merrill zinc-dust precipitation supplemented by zinc boxes, and filter pressing. One strong cyanide solution is used for grinding and total treatment. The plant consists of one 5x18-ft. tube mill, two 3-in. Morris sand pumps, two vertical triplex pumps, four 10x40-ft. Pachuca agitators connected for continuous agitation, four cone classifiers, six Callow cone thickeners, two 6x25-ft. settling tanks, two 6x25-ft. sand filters, one Merrill zinc-dust press, five zinc boxes, one Monteju receiver, one 50-frame Dehne filter press, two Morris solution pumps, two vertical triplex pumps, one 10x30-ft. solution sump, one 10x15-ft. gold sump, two stock-solution tanks and set of lead electrodes for the electrolysis of sump solution. The results for July are as follows: Tons of concentrate treated, 2070; value, $29.20 per ton; extraction, 88.2%. It is believed that the results will improve as the plant becomes adjusted.

Cyaniding of Concentrate

The results of experiments, made by Robert Linton to determine whether it would be advisable to cyanide certain concentrates rather than ship them to a custom smelter, are given in the *Journ.* Chem. Met. and Min. Soc. So. Africa, July, 1912. The analysis of the concentrate was as follows: Insoluble, 44%; Fe, 26.50; Cu, 1.30; Zn, 1.20; MnO_2, 0.41; Al_2O_3, 1.40; CaO, 1.75; MgO, 0.47; As, 0.03; S, 18.20; Ag, 4.29; Au, 0.06; total, 99.61%. The silver occurred as sulphide, chiefly or perhaps wholly, in the form of argentite. The gold was carried in the silver sulphides.

Agitation in water indicated that the concentrate was neutral, but when agitated with N/10 acid and titrated with N/10 NaOH it showed alkalinity of 0.44%. The concentrate was ground to pass 200 mesh and the treatment carried on in a model Pachuca tank, 10 in. diameter by 30 in. deep, with a 1½-in. pipe for air lift and a ¼-in. pipe for air feed.

The first tests showed a constantly increasing alkalinity in the solutions used, although no lime was added to the charge after commencing agitation. An analysis of the solution after agitating five hours gave the following results: Total cyanide, 0.097%; free cyanide, 0.092; protective alkali, 0.1433; alkaline hydrates, 0.0762; hydrocyanic acid, 0.0033; ferrocyanides, 0.0289; sulphocyanides, 0.0358; alkaline carbonates, 0.1407; zinc, 0.0040; copper, 0.0688. There was no reaction for alkaline sulphides, although K_2S probably formed and immediately combined with more potassium cyanide to form potassium thiocyanate, KCNS. This would seem to explain the increase in alkalinity observed—and to indicate that this increase in alkalinity involves a direct loss in cyanide. The reactions would be as follows:

$$(1)\ FeS + 6KCN = K_4Fe(CN)_6 + K_2S.$$
$$(2)\ K_2S + KCN + H_2O + O = KCNS + 2KOH.$$

Several bottle tests were made to determine whether or not lead acetate would react with the K_2S and prevent the excessive consumption of cyanide. With less than 1% lead acetate, it appears to have little if any effect; with 1% or over the increase in alkalinity above noted gradually disappeared, but at the same time the consumption of cyanide greatly increased. The results of five tests of agitating 10 grams of concentrate with 50 c.c. of solution titrating 0.73% KCN for 72 hr. are given in Table I. The extraction of gold and silver in each case was practically the same.

TABLE I. EFFECT OF LEAD ACETATE IN CYANIDING CONCENTRATE

Test No	Lead Acetate added %	Per cent. KCN after 72 hr agitation	P.A. after 72 hr. agitation
1	None	0.22	0.056
2	1	0.21	0.036
3	2	0.205	0.025
4	4	0.185	0.002
5	8	0.047	0.000

From a study of the preliminary tests an outline of treatment was formulated and a test run of 76 hr. was made in the small Pachuca agitator. Details of this run are given in Table II.

TABLE II. DETAILS OF CYANIDE TEST ON CONCENTRATE

Hours agitating	Cyanide added per ton concentrate lb.	Lime added per ton concentrate lb.	Solution		% Extraction	
			% KCN	P.A.	Au	Ag
2		109				
4	62.6					
7			0.58	0.31	17.4	20.8
13			0.18	0.35	54.9	40.5
19			0.12	0.35	79.2	52.6
22	62.6	62.6				
25			1.30	0.36		
31			0.91	0.44	79.2	63.2
37			0.75	0.47		
43			0.59	0.48		
45			0.56	0.48	82.6	74.6
46	62.6	93.9	Fresh Solution			
48			1.17	0.30	82.6	80.8
54			1.08	0.35	87.3	82.2
57			0.98	0.35	87.3	85.2
60			0.92	0.39	88.5	87.8
62			0.88	0.39	90.2	87.9
64			0.87	0.39		
66			0.85	0.39		
68			0.82	0.40	90.2	89.1
70			0.78	0.40	90.2	90.5
72			0.78	0.40	91.1	90.6
74			0.77	0.40	91.8	92.5
76			0.77	0.40	92.1	92.7

Another test was run, using less cyanide in solution, but higher protective alkalinity, and lead acetate equivalent to 3.5% of the weight of the concentrate treated, also raising the ratio of solution to concentrate to 3:1 (previous tests having been at 2.5:1). The results of this test are shown in Table III.

The results of all the tests run seemed to indicate that the most economical treatment was to grind the concentrate in a solution of about 0.2% KCN, then agitate in a 0.6% KCN solution, raising to about 0.8% toward the end of the treatment. Maintaining a high protective alkali proved to be of little benefit, about 0 10 to 0.15 being sufficient. The use of lead acetate appeared to be of no benefit in preventing destruction of cyanide, although the use of a small amount serves to keep the solutions clear.

TABLE III. DETAILS OF FINAL CYANIDE TEST

Hours agitating	Cyanide added per ton concentrate lb.	Lime added per ton concentrate lb.	Solution		% Extraction	
			% KCN	P.A.	Au	Ag
2		74			..	..
3	23		0.15	0.39	..	..
4	26				..	..
6			0.37	0.44		
7	16 4					
8			0.27	0.55	45 0	36 8
14			0 09	0 57	46 8	49 0
20			0 06	0.58	54 0	68 3
22	32 8					
26			0 45	0.66	55.2	68.4
32			0 19	0.69	56 4	68 3
38			0.17	0 70	58.1	69 2
44			0 15	0.71	61.0	70 9
46			0.15	0 72	63.3	71.4
47	49 2	93 8	Fresh Solution			
50			1.0	0 39	63 8	73.5
54			0 88	0.41	65.0	76.7
58			0 78	0 45	67.4	77 2
62			0 70	0.47	75.0	88.8
64			0 67	0 48	75 0	90 6
66			0 67	0 48	76.4	91.6
68			0 65	0 49	80.0	91 7
70			0 63	0.50	82.0	91 8
72			0 62	0.50	82.0	92 2
74			0 61	0.50	84.0	92 2
76			0 57	0.50	85 0	92 5
78			0 57	0.50	88 0	92 6

The World's Nitrate Supply

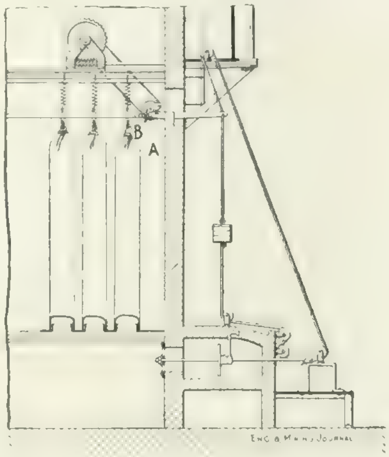
That the current statements regarding the exhaustion of the world's supply of fixed nitrogen are uncalled for, is asserted by William S. Myers, official delegate of the Chilean government to the International Congress of Applied Chemistry, and head of the Nitrate Propoganda in this country. In a letter to the New York *Times*, he says that the exhaustion of the Chilean nitrate supplies is by no means imminent:

> First of all, there is a vast amount of unsurveyed nitrate ground on the Chilean pampas that is known to contain immense quantities of nitrate of soda. Second, grounds already surveyed still contain enormous quantities of nitrate. There are probably in round numbers, 1,000,000,000 tons of nitrate in the deposits of Chile, and, without doubt, large supplies also exist on lands now but incompletely prospected. The surveyed and certified tonnage opened up at the present time ready for extracting is fully 250,000,000 tons.
>
> The probable life of the surveyed deposits is at least 400 years, even allowing for a steadily increasing annual rate of consumption. Moreover, there remains the interesting question as to whether by the end of the ensuing century we may not find that nature has manufactured an immense additional amount of Chilean nitrate for the uses of the world.
>
> Sir William Crookes' prophecy that the world would starve as soon as the Chilean nitrate supplies were exhausted has for some years led the chemical public to believe that a wheat famine was in sight, but that time is so far distant that no one living today need have misgivings on the subject.

Meier's Bag Shaking Device

A bag-shaking device has recently been patented by A. J. Meier, of Glendale, Mo., U. S. Pat. No. 1,030,477. As shown by the illustration, the bags are suspended by springs at the top, allowing both a lateral and vertical motion. The arrangement of the baghouse is the customary one, i.e., a number of independent compartments, each compartment containing its quota of bags opening into a cellar for the dislodged dust.

There is a cam-driven device which shuts a damper cutting off the flow of gas into the bags about to be shaken. This allows the pressure inside and out to be equalized, so that the dust will drop when the bag is shaken. Another cam, *A*, pushes the rod connecting the tops of a row of bags to one side, and when this releases the roller, *B*, the rod is drawn back by the springs, imparting both a lateral and vertical shaking motion.



MEIER'S BAG SHAKER

By means of a cam for each row of bags, all the bags in a section are shaken at the same time, after which the cam holding the damper-closing apparatus lets go, and the section resumes its normal working.

Foreign Coal Trade of the United States

Imports of coal and coke into the United States for the seven months ended July 31, were, in long tons:

	1911	1912	Changes
Anthracite	....	30	I 30
Bituminous	755,301	869,403	I. 114,102
Coke	49 225	47,790	D 1,435
Total	804,526	917,223	I 112 697

Canada furnishes a large part of the coal and nearly all the coke. Imports are chiefly on the Pacific Coast and for Northwestern states.

Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, seven months ended July 31, long tons:

	1911	1912	Changes
Anthracite	1,986,421	1,645,892	D. 340,529
Bituminous	7,039,969	8,077,177	I. 1,037,208
Coke	574,481	479,434	D. 95,047
Bunker coal	3,296,619	4,319,514	I. 1,022,895
Total	12,897,490	14,522,017	I. 1,624,527

The bunker or steamship coal is practically all bituminous. Canada takes about 70% of the exports; other large shipments are to the West Indies, Mexico and Panama.

Condition of Kentucky Fluorspar Mining*

The further development of old properties in Kentucky has given assurance of the recurrence of fluorspar shoots, both at depth and laterally, sufficient to verify previous predictions as to the possibility of large production from this district. That the output continues small in spite of good demand is attributed by F. Julius Fohs, of Lexington, Ky., to insufficient capital and improper management in the development of fluorspar prospects. It is contended that the systematic development of a limited number of properties would yield an attractive profit.

The working of deposits containing fluorspar and small quantities of zinc and lead has proved unprofitable in some instances because of failure to recognize the fact that the fluorspar is the most valuable mineral and the others merely helpful byproducts.

Fluorspar companies have sought to hide the presence of zinc at their mines, but since the separation of fluorspar and zinc is no longer difficult, the zinc may become a valuable byproduct.

The purchase of leases upon the advice of unscrupulous promoters, the installation of mine and mill equipment before sufficient development work has been done or without competent engineering advice, and the improper handling of vein and surface waters are given as some of the causes for losses in fluorspar mining.

It is suggested that the serious difficulties caused by lack of skilled miners may be overcome by proper instruction of the miners, instituting a bonus system and raising the standard of living. Under present working methods in Kentucky, it takes an average of 2.5 men, working 10 hr., to produce one ton of fluorspar ready for shipment. By proper management it is probable that this could be reduced to 1.5 men, inclusive of development work.

The consumption of fluorspar in America is estimated at about 110,000 tons annually, of which England supplies at least 25% from the tailings of lead mines. In spite of the import duty of $3 per ton levied since 1909, the foreign product is still able to compete at points near the Atlantic seaboard. It is suggested that 10 properly developed mines could supply the present American requirements. Failure to recognize this fact and to extend present and create new markets may lead to economic loss.

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*Abstract of a portion of the report of the State Mine Inspector of Kentucky for 1910.

Granby Consolidated

At a meeting of the directors of the Granby Consolidated Mining, Smelting & Power Co., William H. Nichols was elected president, succeeding George Martin Luther, who retires because of ill health. Arthur C. James and A. L. White retire as directors, the number of directors being reduced from 15 to 13. Deducting depreciation on works and securities for the year ended June 30, 1912, there was a shrinkage of surplus for the year of $17,183; the working expenses of mines and smeltery, freight, refining, and selling, amounted to $2,128,211; foreign ore purchased to $163,170; while metal sales brought in $2,874,760; leaving an operating profit of $583,379. However, a deduction of $600,562 was made for depreciation on works and securities.

At Phœnix and Grand Forks, the mines and smeltery were down for four months because of lack of coke. No new orebodies were discovered at Phœnix, but the known bodies were further developed, and the company closes the year with a total of 6,433,418 tons of ore in sight, which may be expected to carry about 1.25% of copper, 0.29 oz. of silver, and 0.043 oz. of gold per ton.

At Hidden Creek, development has gone steadily ahead, and over $200,000 has been expended in work preliminary to the construction of a smeltery. Prospecting has been carried on in the country surrounding Grand Forks and Phœnix for a radius of 200 miles, but the apparently meritorious claims are too inaccessible.

There were 13,231,121 lb. of copper produced, 225,305 oz. of silver, and 33,932 oz. of gold, from 721,719 dry tons of Granby ore and 17,800 tons of outside ore smelted. The mining cost, including development, was $0.771 per ton. The cost per ton, allowing for all expenses except depreciation, was $2.90, the cost per pound of copper was $0.111.

New Hill Building

Preparation is being made for the erection of a high building at the northwest corner of Tenth avenue and Thirty-sixth street for the Hill Publishing Co. George Milne has sold for James Bailey, representing the Tietjen and Fanning estates, to this company, John A. Hill, president, 469, 471, 473 and 475 Tenth avenue and 503, 505, 507 and 509 West Thirty-sixth street, forming the northwest corner, a plot comprising half the block on Tenth avenue by 175 ft. in Thirty-sixth street, including 17,500 sq.ft., and at present covered with tenement houses. During the last few years this section of Tenth avenue has attracted many large concerns.

The Hill Publishing Co. will erect a 14 or 16 story building of heavy construction, with the object of having the most complete publishing and commercial building in the city. Every known convenience for cleanliness, comfort, safety, low insurance and economical conduct of business will be installed. The publishing company will occupy several floors. A special feature of the building will be a roof garden for recreation for the use of the occupants of the building, both tenants and employees. The building will be ready for occupancy February, 1914.

Dos Estrellas Report for 1911

During the year 1911 the Compañia Minera Las Dos Estrellas, operating mining property in the Tlalpujahua district in the State of Michoacan and in the El Oro district, in the State of Mexico, Mexico, produced gold and silver worth 11,245,455 pesos; other receipts amounted to 2680 pesos, making the total gross income 11,348,135 pesos. The total expense of operation was 5,465,361 pesos, leaving a profit of 5,882,774 pesos. During the year four quarterly dividends, each of five pesos per share, were paid, making a grand total of 6,000,000 pesos paid to shareholders; 267,256 pesos was taken from the reserve fund to cover all disbursements. During the year a total of 223,344 pesos was spent to pay the cost of new installations, including three additional boilers to the steam-turbine plant, which is now prepared to furnish power to supplement that provided by the Mexican Light & Power Co. The surplus as of Dec. 31, 1911, amounted to 3,330,144 pesos. The total expense of installations, as of Dec. 31, 1911, amounted to $6,820,330, and this total amount of capital expenditure has been repaid and now stands in the accounts *pro memoria*.

A new contract was made with the American Smelting & Refining Co. covering the period from Jan. 1 to Dec. 31, 1912, by which better terms than formerly existed were granted to the company, so that it now gains 2½ pesos more per ton from smelting ore than formerly was the case. The sum of 3500 pesos was spent to purchase a small tract of land in Tlalpujahua from which limestone for use in the mills could be obtained.

During the year, 475,548 tons of ore was crushed in the two mills, one of 130 stamps, and the other of 120 stamps. The ore reserve, as estimated by General Manager Aldasoro, was 1,870,637 tons of ore of better grade, besides approximately 3,000,000 tons of low-grade ore.

Considerable work has been done to exploit the veins at greater depth, and so far this work has resulted in ascertaining that the veins persist for some distance as strongly as in the upper levels. This ore, while of lower grade, will produce a satisfactory profit.

American Institute of Mining Engineers

The adjourned meeting of the members of the American Institute of Mining Engineers was held on Oct. 7, in the United Engineering Building, with Professor Kemp, president of the institute, in the chair. About 50 members were in attendance. After the reading of the minutes of the previous meeting, which were approved, J. W. Richards, in behalf of the constitutional committee of the institute, with C. R. Corning seconding, made a motion to withdraw the pending amendments, which motion was unanimously carried.

C. R. Corning then introduced a long series of amendments to the constitution, drafted by himself and George C. Stone. J. W. Richards, as chairman of the constitutional committee, introduced two amendments. It was voted that all of these amendments should be printed so as to be available for discussion at the Cleveland meeting.

C. R. Corning then presented a series of amendments to the by-laws. Doctor Ledoux proposed to refer these to the board of directors, who have the right to make amendments to the by-laws, but Mr. Corning desired to have them printed for the information and discussion of the members. After considerable discussion, Mr. Corning's desire prevailed by a vote of 20 to 19.

Philip N. Moore moved that the sense of the meeting be expressed in favor of the abolition of the existing system of dual government of the institute and the concentration of authority in one body; and that the constitutional committee be requested to draft amendments to the constitution to carry out this idea. This motion was unanimously carried.

The Committee of Five was discharged with the thanks of the institute, after complimentary remarks about its work. The meeting was then adjourned to reconvene in New York, on Nov. 12.

Serpek Process in Norway

The exploitation of the Serpek patents in Norway is to be undertaken in Norway by Det Norske Nitriaktieselskab, of Christiana, with a capital of $2,700,000, already subscribed, says Vice-Consul General Haakon E. Dahr. Construction will commence immediately at Arendal, with the idea of using 10,000 hp. at first, and later 25,000. The annual output, commencing in 1914, is calculated at 40,000 tons of ammonium sulphate.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Determination of the Strike and Dip of Strata

By E. R. Rice*

In ordinary mine and geological work, it is often necessary to determine the strike and dip of veins, faults or strata. It is seldom that the strike and dip can be measured directly, and when so done, the results obtained are liable to error owing to local irregularities in the vein and also to the necessity of having to use a short measuring base. When direct measurements are imposible, the rectangular coördinates of the three points in the vein must be found, and from these, the strike and dip computed. It is to be noted that these three points must not lie in the same straight line. Herewith is given a graphical and an analytical method for the solution of this problem, the example being taken from actual practice. The graphical method is shown in Fig. 1, the points are P, Q and R and are shown in both plan and front elevation, the coördinates with respect to O, being as follows:

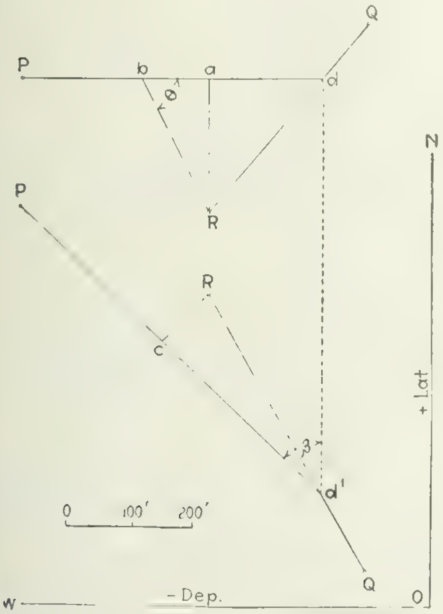

Fig. 1. Graphical Method for Determination of Strike and Dip

Point	Latitude	Departure	Elevation
P ..	+488.3	—483.1	3627.0
Q	+ 42.0	— 99.2	3688.3
R	+371.5	—266.3	3472.5

After the points are plotted in plan and elevation as shown, to get the strike and dip, proceed as follows: On the elevation, through either of the three points, as P, draw the horizontal line $P—d$ until it intersects the line $Q—R$ (or $Q—R$ produced). The line $P—d$ is a line of strike shown in front elevation. Then on the plan, draw the line $Q—R$ and project d to d'. Then draw the line $d'—P$ and the angle β will be the bearing angle of the strike. On the front elevation, draw the line $R—a$ perpendicular to the line $P—d$, and on the plan, draw the line $R—c$ perpendicular to the line $P—d'$. Lay off $a—b$ equal to $R—c$ and draw the line $R—b$ and the angle θ will be the angle of dip of the vein. The angles β and θ are measured with a protractor, and in this case the strike is approximately N43° 45′W and the dip is 63° 15′.

The analytical solution is shown in Fig. 2, the example being the same. Let the coördinates of the point Q, be X', Y' and Z', and those of the point P be X'', Y'' and Z'' with respect to the point R which is the lowest of the three points.

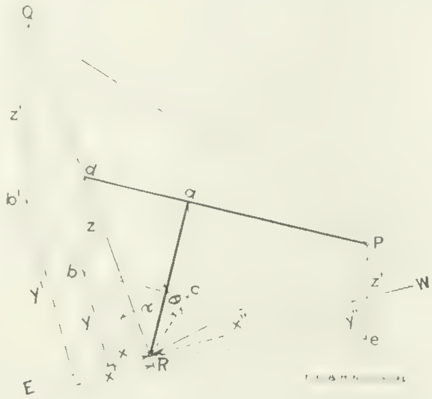

Fig. 2. Analytical Method for Determination of Strike and Dip

These coördinates are the differences between the total latitudes, departures and elevations of the point R and the other two points. The points b', b and e, lie in the same horizontal plane as R. Also $P—d$ is a horizontal line lying in the plane PQR and therefore is a line of strike and Z is equal to Z''.

From similar triangles, $Z' : Z = (b'R) : (bR)$ and $Y' : Y = X' : X = (b'R) : (bR)$. Therefore $Z' : Z = Y' : Y = X' : X$ and $Y = \frac{Y'Z}{Z'}$ and $X = \frac{X'Z}{Z'}$.

The tangent of the bearing angle of $dP = \frac{X'' - X}{Y'' - Y}$.

Let the azimuth of the line dP be represented by ρ, then the azimuth of $Rc = \rho - 90°$ (Rc and aR are in the same vertical plane and aR is a line of dip and is at right angles to the strike.)

Tangent of the bearing angle of $Rb = \frac{X}{Y}$. Let the azimuth of Rb be denoted by ρ'.

Then $\alpha = \rho - \rho' - 90$

$$bR = \sqrt{X^2 + Y^2}$$

$$Rc = bR \,.\, \cos\alpha = \cos\alpha \sqrt{X^2 + Y^2}$$

$$\operatorname{Tan}\theta = \frac{ac}{Rc} = \frac{Z''}{\cos\alpha\sqrt{X^2 + Y^2}}$$

The values of these coördinates are as follows, X', +167.1; X'', —216.8; Y', —332.5; Y'', +113.8; Z', 215.8; Z'', 154.5.

$$X = (+167.1)\left(\frac{154.5}{215.8}\right) = +119.6 \text{ and } Y$$

$$= (-332.5)\left(\frac{154.5}{215.8}\right) = -238.1.$$

$\frac{X'' - X}{Y'' - Y} = \frac{336.4}{351.9} = \tan\beta$. Therefore β = N 43° 43′ W.

Measuring azimuths from the south, a bearing of N43° 43′W corresponds to an azimuth of 136° 17′.

Therefore $\rho = 136° 17'$.

$bR = \sqrt{(119.6)^2 + (238.1)^2} = 266.4$

Tangent of the bearing angle of $Rb = \frac{+119.6}{-238.1}$, therefore the bearing of the line bR is S26° 41′E and $\rho' = 333° 19'$.

$\rho = 136° 17'$ or $496° 17'$, i.e., $(136° 17' + 360°)$. Therefore $\alpha = 496° 17' - 90° - 333° 19' = 72° 58'$.

$$\text{Tangent dip } (\theta) = \frac{154.5}{\cos 72° 58' \times 266.4}.$$

Therefore $\theta = 63° 12'$.

The difference between the values of β and θ in the two solutions is due to measuring to the nearest 15′ with the protractor.

Resoiling Dredged Areas

In order to prevent damage to land by dredging operations the Victoria regulations provide that where the soil and other earthly overburden are not less than two feet deep, such material shall be advance stripped to any depth that may be found down to seven feet below the surface, and from the face be conveyed either in a dry or moist state, but not in suspension in water, and distributed evenly with a flat grade on top of the coarse and fine material dumped from the boxes, and, unless otherwise directed, the newly formed surface shall be sown with approved grass seeds until they take root.

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*Mining engineer, Miami, Ariz.

Where the overburden is less than two feet, the greatest possible quantity of the fine material from the excavation shall, by means of silt distributors and brush or other dams, be distributed and spread on the surface of the tailings dump with a flat grade, and unless otherwise directed, be sown with approved grass seeds until they take root. The management of one dredge states it is finding the cost of resoiling is just about the cost of dredging the gravel.

Mining Methods at the Pilares Mine, Nacozari

The Pilares de Nacozari mine of the Moctezuma Copper Co., in Sonora, was described in a general way in the JOURNAL, May 20, 1911. Since that time, however, a different method of stoping has been introduced, which is described by D. C. Livingston, in the September *Bulletin* of the American Institute of Mining Engineers.

The mine is opened by two 3-compartment shafts, situated one at each end of the elliptical orebody, and an adit tunnel about a mile long, which taps the deposit at a point about 600 ft. below the collar of the shaft. This adit is large enough to allow narrow-gage, 25-ton railroad cars to load from the mine chutes, and it is chiefly due to this cheap handling of the ore that the enterprise has become so commercially successful. The railroad runs to the top of the bins above the concentrator, which is situated on the Nacozari railroad, at the town of Nacozari, about five miles from the mine. From here the concentrates are shipped to the smeltery at Douglas, Ariz. The daily output of ore is between 1500 and 2000 tons.

The levels in the mine are 100 ft. apart; and the general plan is to use every alternate level as a stoping base, the intermediate levels being used for development, ventilation, and the distribution of waste to the stopes that are being filled. At the present time practically all the ore is being mined above the adit level, which is known as the "700," and at the present rate of output there should be, on a rough estimation, an ore supply of approximately 10 or 12 years above this level. The shaft at the north end has been sunk to the 1000-ft. level, and some work has been done on this level as well as on the 800- and 900-ft. levels.

Owing to the scarcity of timber in the neighborhood, and to the high price of imported timber, it has been necessary to adopt mining methods which would eliminate the use of timber as much as possible. The nature of the rock is such that while it is not hard to drill or blast, it stands without timber in a most remarkable manner in most parts of the mine. This characteristic of the rock has also prevented the using of the caving and top-slicing methods, which are being used so successfully in some of the mines at Cananea. Accordingly, some systems of underhand stoping had to be devised, and the following two methods are used: (1) The old method, Fig. 1, which is room-and-pillar, with waste filling as the work progresses. (2) The new method, Fig. 2, which is shrinkage with waste filling after all the ore has been extracted.

With the room-and-pillar method the mine plan is laid off into pillar lines at right angles to the strike of the ore and placed 50 ft. apart, dividing it into alternate stopes and pillars. A main working drift is run approximately parallel to the strike, and crosscuts are turned off every 100 ft. in the pillars. From these crosscuts right-angle headings are turned off every 50 ft., and run to the center of the stope; from these the sill floor is cut to the limits of the ore and to the pillar lines, making the stope 50 ft. wide. The roof, where necessary, is supported by pipes or cribs, and a 6-ft. cut is then taken upward with stoping drills, the blasted ore being drawn off immediately, and filling run in from the level above through winzes to within 4 or 5 ft. of the roof. The short drifts from the crosscuts are timbered through the filling, and cribbed chutes and manways are carried up from the ends of these. In a stope 150 ft. long, there would be three of these chutes and manways.

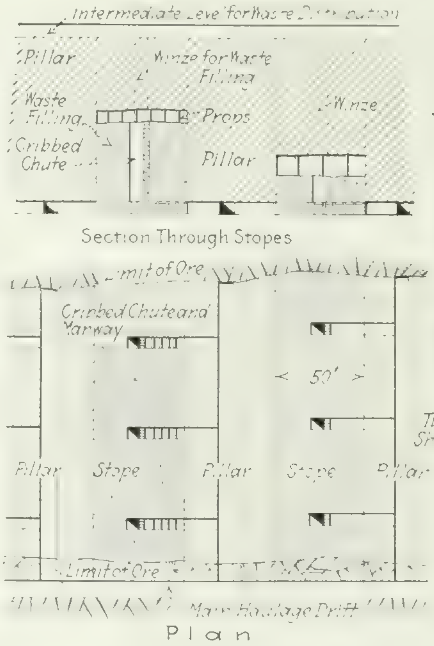


FIG. 1. ROOM AND PILLAR MINING

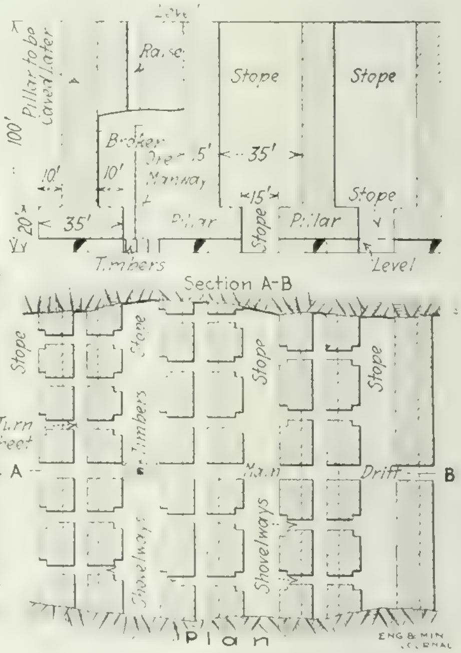


FIG. 2. SHRINKAGE SYSTEM OF MINING

There were no pillars being extracted during Mr. Livingston's visit, and it was probably the apparent difficulties of removing these pillars without losing a large amount of ore by mining with waste, which led to the adoption of the new method.

With the shrinkage method, designed by C. A. Smith, the use of timber is almost entirely eliminated, as not even timbered chutes are used. Crosscuts are turned off from the main-haulage drift every 50 ft., parallel to the pillar lines, and extending to the limits of the ore.

The next step is driving what are called the "stopes," which are breasts 15 ft. wide and the height of an ordinary drift. These are driven parallel to the crosscuts, and midway between them, and are carried to the limit of the ore. From the crosscuts, "shovel ways" are turned off at right angles at intervals of from 20 to 25 ft., and are driven to connect with the stopes. Turn sheets are placed at the mouths of the shovel ways. The ground is now ready to commence underhand stoping. The stopes are carried up the same width (15 ft.) with stoping drills to a height of 20 ft. above the floor, and are then widened 10 ft. on each side, making them 35 ft. in width, with 15-ft. pillars in between.

The machines are set up on the broken ore, enough being drawn out through the shovel ways to keep a working clearance. The stope is continued up in this manner to the next stoping level. This work was started last summer, but it is evident that the main drifts will have to be timbered where the stopes cross them in order to keep the broken ore off of the track and cribbed manways, built up through the broken ore at these points, but aside from this, with the exception of an occasional prop, no timber is used at all. There would be no absolute necessity for manways through the broken ore, as the stope can be entered by means of the winze from the level above.

The shovel ways, which are merely rock chutes, have been used in the mine for a number of years in the narrower portions of the vein, instead of timber chutes. The reasons for their adoption are: (1) No timber required. (2) Ease and safety in blasting large boulders, which can be more safely and easily blasted in the shovel ways than in the stopes, and without interfering with the work. (3) All work, except timbering, is done by contract with the natives, and it was found that unless all the rock was broken in the stopes sufficiently small to pass a chute readily (a difficult and expensive item in ground that breaks big where shrinkage is employed), it was just as cheap to have it shoveled into the car as to draw off from a chute that was continually hanging up, and the expense of the timber was also eliminated.

In mining the pillars in the shrinkage system, the plan is to put up raises in the pillars and from the raises to shatter the pillars with heavy shots, so that the pillars will cave when the ore is drawn out of the stope. If this method works out as expected, at least 95% of the ore should be recovered.

As regards the comparative cost of the two systems: Stoping in wide-stopes by the shrinkage system had not progressed for a sufficient length of time in the summer of 1911 to warrant giving a complete comparison, but what figures were available pointed to a considerable saving in the shrinkage over the room-and-pillar system. This should be the case after the sill floor has been opened up, because, in the shrinkage system, there is no rock handled in the stopes until the ore is drawn out, whereas in the room-and-pillar system both the ore and waste filling have to be handled in the stopes in wheelbarrows.

The miners of the Michigan Copper district wear a tight-fitting skull cap under their ordinary water-proof hats. It is made of light material and can be washed. They claim it keeps dust and dirt out of the hair and is more comfortable than an ordinary hat in a dry working place.

A California Dry Placer Dredge

By Percy E. Barbour*

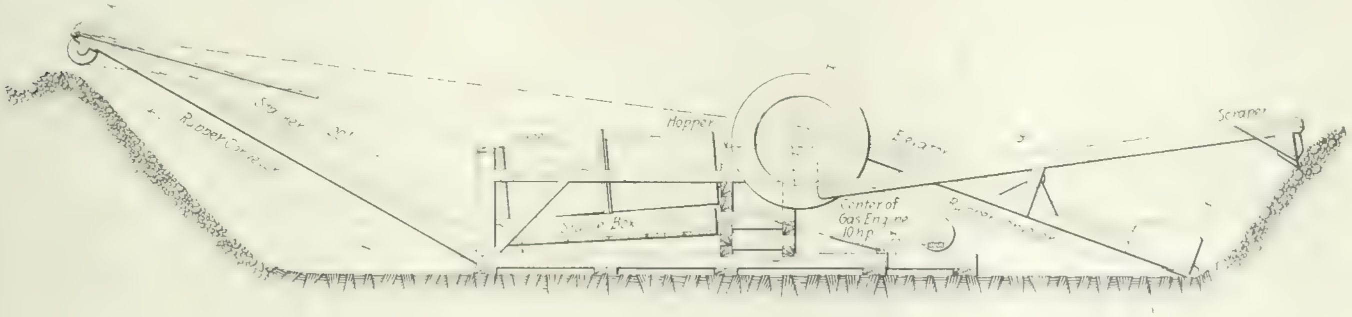
A dry-placer machine, called a dredge by the builders, is illustrated in detail in the accompanying engravings. This machine was successfully used in the Marysville district, California, and was made locally at small expense. It thus had the two prime requisites for a machine for a small operator; ease and cheapness of construction and satisfactory operation.

A general arrangement of the machine is shown in an accompanying engraving. A bull wheel operates a scraper arm, by means of a crankpin connection. The scraper rakes the gravel down to the foot of an 18-ft. traveling belt conveyor. This conveyor is operated from the bull-wheel shaft. The gravel drops from the head of the belt conveyor into a hopper, which inclines into a revolving screen of uniform mesh, the axis of which is set at a steep angle with the horizontal.

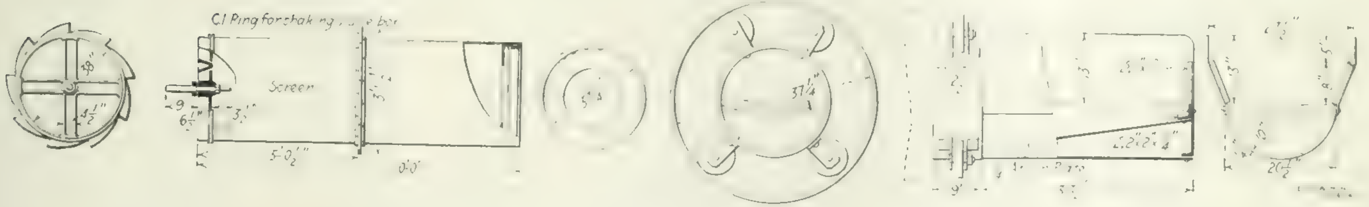
Underneath this revolving screen is the sluice box provided with the usual riffles. This sluice box is inclined toward the discharge end and the reject from it is effected by a bumping or shaking motion given to it by a shaking ring with cam-like teeth, which encircles the middle of the revolving screen. The screened gravel and the dry-washed gravel both discharge to the foot of another traveling belt conveyor, which stacks this tailing behind the machine.

The entire framework is of light timber construction, and in this case the motive power was derived from a 10-hp. gasoline engine. In the feed-hopper construction, shown in the accompanying illustration, the most interesting feature is the manner of supporting the feed end of the revolving screen. The arrangement consists of four small rollers set off-quadrant and forming a part of the hopper. These rollers run inside the revolving screen, which has a plain strap-iron band riveted inside for a roller track.

The whole machine is self-contained, with its scraper, elevator and stacker. It is an interesting approximation of standard dredge practice to a dry placer, and reflects credit on the local miners who devised it.



General Arrangement of Dry Placer Machine Used at Marysville, Calif.



Details of Revolving Screen and Hopper of Dry Placer Dredge

Detonator Troubles on the Panama Canal

Mining operations on the Panama Canal during 1907 involved the use of about one hundred 4-in. Star well drills and 150 tripod drills. Holes were spaced from 12 to 18 ft., with depths of 15 to 60 ft., blasting charges ranging from 200 to 1000 lb. of dynamite per hole, depending upon the class of material being mined. Serious troubles began to develop from the encountering by steam shovels of the unexploded dynamite. It was ascertained that this resulted from detonator failures and not from the quality of the dynamite, said A. L. Robinson in part, before the Eighth International Congress of Applied Chemistry.

Investigations were made to determine the cause of detonator failures. The heavy charging of holes and the condition of work often required detonators to be left in charged holes for 24 hours or more. It was discovered that some of the brands became saturated and the fulminate ruined after 24 hours, and while other classes did not absorb as much water, nearly all were found to have become affected.

The assumption that the drill-hole waters contained free acid which attacked the detonator shells seemed to have good foundation from the fact that a microscopic examination after immersion showed minute holes just below the sulphur plug. A number of detonators and samples of the water from drill holes were then subjected to tests and examinations in Ancon laboratory, which showed that deterioration was not due to free acids, but primarily to the composition and construction of the exploder itself. The conclusions of these tests were: (1) That the kinds of water used for immersion made little difference in the net results when the same conditions of time of immersion and pressure were maintained; (2) that the number of failures to get a normal explosion of cap increased almost geometrically with the length of time of immersion and the hydrostatic pressure, and (3) that corrosion began on the internal portion of shell at or near the point of contact between sulphur plug and the loosely packed portion of the charge, usually opposite or a little above the level of the platinum bridge.

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*Manager, Uwarra Mining Co., Candor, N. C.

Detonator manufacturers were notified of the troubles encountered and two of these later developed and furnished detonators which proved practically impervious under heads of 40 to 60 ft. In one brand a composition or cement plug is inserted just above the loose fulminate and at the point where shell deterioration had occurred. Above this plug a black viscous compound is inserted and above this compound the usual sulphur plug is put in as a cap. If this sulphur plug causes any deterioration of shell, no leakage through deterioration at this point can reach and spoil the fulminate.

The other detonator is composed of a double jacket or shell. The inner shell contains the usual packed fulminate at the bottom, a small quantity of gun cotton, the bridge and the usual sulphur plug at the top. This inner shell is set into an outer shell, filled with a black compound, which completely envelops the inner shell. If inner shell is deteriorated by sulphur action, the outer shell and compound will prevent moisture reaching fulminate.

With impervious detonators it was assumed that accidents from unexploded dynamite would become matters of history. However, in the spring of 1908 the number of missed holes, and consequent unexploded dynamite dug up by steam shovels called for a careful study of all conditions which might in any way cause misfires. It was decided to investigate the power for exploding detonators.

After ascertaining that the batteries were sufficiently powerful, it was thought that the detonator troubles were probably due to the series method of connecting them in circuit. With only an instantaneous pulsation of current the explosion of a large number of detonators must be impossible unless they are so uniform in construction as to allow of their bridge being heated to the explosive point by the same amount of current with the same time element.

A study was then made of the two variables entering into the heating limits of detonator bridges. It was ascertained, (1) that with the time element of current flow constant, detonators exploded with variable amounts of current, and (2) that with current flow constant, detonators exploded under variable time elements. With this knowledge it was understood why a large number of detonators wired in series could not be counted upon to explode from a momentary current from a battery, even though that battery had fired one detonator through a resistance equal to the number of detonators for which battery was guaranteed. With 50 detonators in series, requiring a varying exploding current value, that detonator requiring the lowest current value to explode would be the first to break down, thus breaking the circuit, with the result of leaving detonators requiring high current unexploded.

The results of experiments caused eight miles of primary pole line to be built along the canal between Bas Obispo and Pedro Miguel, the installation of transformers every 1000 ft., and the stringing of secondary wire from transformers throughout the blasting districts in this territory. The use of batteries was prohibited throughout this section, except for springing holes and for such other light work as would not result in accidents in case detonators failed to explode.

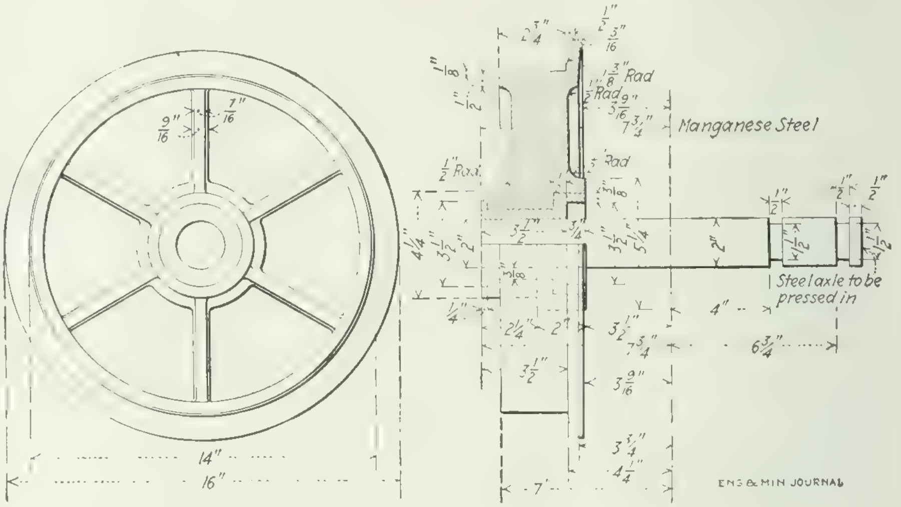
In all heavy mining operations detonators were connected in parallel to feed wires of No. 12 B. & S. gage, strung on stakes over the holes to be exploded. These feed wires were connected by blasting wiremen to the secondaries of No. 2 B. & S. gage wire which had been strung from transformers along the ground on portable trestles.

The installation of power lines and the adoption of the parallel wiring of detonators produced such an immediate reduction of missed holes and increased efficiency of explosives that this method was adopted throughout practically the whole of the canal construction.

The firing of detonators wired in parallel naturally requires a large current output and consequently a much more expensive current source than the ordinary hand battery. If the work is of sufficient magnitude to warrant such an expenditure, the danger to operators is greatly reduced, the efficiency of the explosives is largely increased and the general results obtained are much more economical and satisfactory.

Car Wheels for Sprag Braking

In the development of a flat ore deposit with an extremely irregular floor, such as is found in the lead district of southeastern Missouri, heavy and changing grades are frequently unavoidable. Where animal haulage is used in such mines, some method of holding the cars in check is necessary. The ordinary brake beam does not operate successfully on steep grades and the method sometimes used of making the animal help is hard on the animal.



Manganese-steel Car Wheel Used by Federal Lead Co.

The method largely used in such cases is to design the car wheels with heavy spokes between which the driver shoves a pin so as to lock or sprag the wheel, causing the cars to skid down the grade with as many wheels locked as necessary. The driver picks up the sprag pins at the top of the grade and moves from car to car locking the wheels. On the return trip the pins are thrown off at the head of the grade.

Cast-steel wheels were used for a time by the Federal Lead Co., but proved unable to withstand the severe shocks caused by spragging This company has now adopted manganese-steel car wheels of the pattern shown in the accompanying drawing. These wheels are used on 1.4-ton cars and no trouble has been experienced by their failure.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

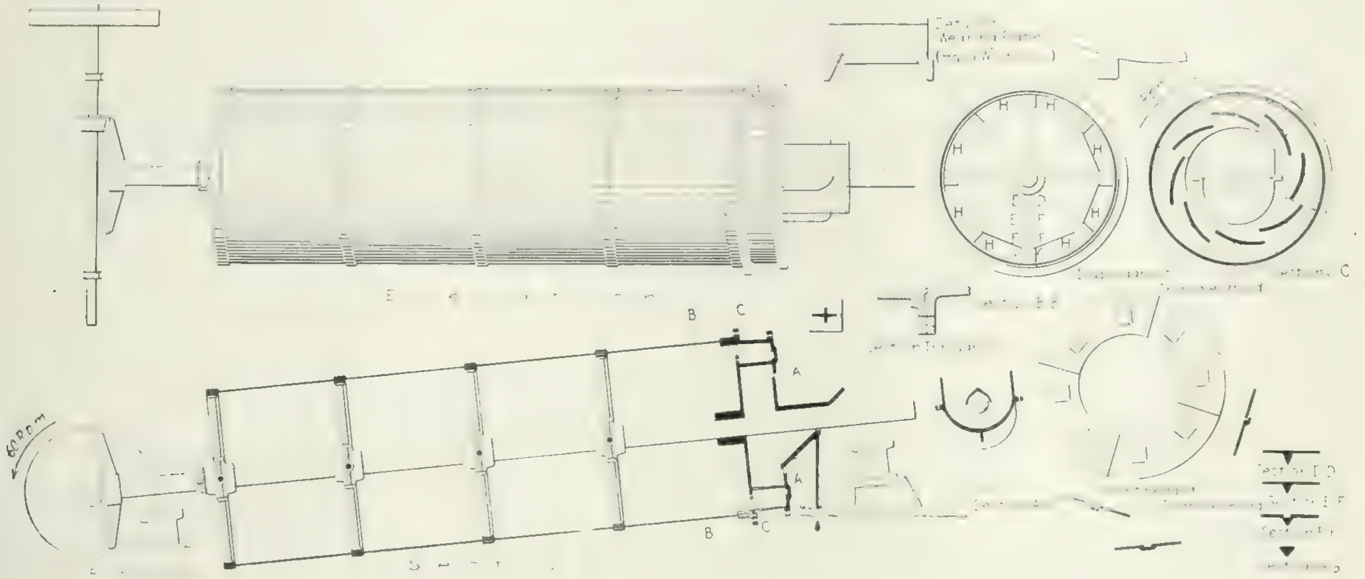
Copper Blast Furnace Settlers

Large settlers are now commonly used for receiving molten matte and slag from modern copper-blast furnaces. They are either round or oval in shape, the round ones often being 16 to 18 ft. in diameter and 5 ft. deep, while some of the large oval settlers are 22 ft. long, 14 ft. wide and 4 ft. deep. A better separation of matte and slag is claimed for the oval settler as the slag enters near one end and discharges at the other after traveling a distance of about 18 or 20 ft. These large settlers are lined with chrome brick with a backing of ganister or converter lining. Chrome brick is generally preferred to either fireclay or magnesia brick on account of its durability. It is practically unaffected by any of the slags or mattes met with in copper smelting although it is possibly not quite so effective in withstanding the chemical action of some mattes and slags as magnesia brick. But chrome brick will withstand variations of temperature without scaling off as magnesia brick is liable to do. A chrome brick which has given much satisfaction in copper work has an approximate analysis as follows: Silica, 3%; alumina, 24; ferric oxide, 16%; magnesia, 14%; chromic oxide, 40%.

In one of the best designed copper plants, consisting of three large blast furnaces, oval settlers are used 18 ft. long, 10 ft. 6 in. wide and 4 ft. 6 in. deep. They are placed between the furnaces and at each end of the line, making four in all. This arrangement permits of repairs to any furnace or settler without interfering with the work. The settlers are lined with chrome brick and are cooled externally when necessary by sprays of water running down the steel sides. The slags are noticeably cleaner than before, when smaller settlers were used.

Trommel for Coarse Dry Ore

Experience showed the management of the Doe Run Lead Co., that there had been considerable wear and tear on the front legs and the first section of the trommels used for screening the southeastern Missouri lead ores when handling the undersize from a 1-in. trommel, owing to the impact of the falling ore.



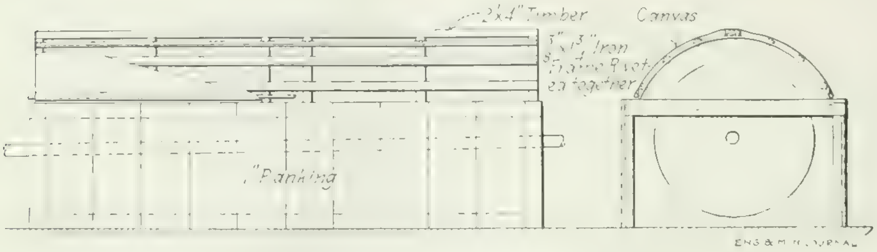
DOE RUN TROMMEL FOR COARSE ORE

On that account, H. R. Wahl, mechanical engineer of the Doe Run company, designed a trommel with a diaphragm hood with wearing plates as shown in the accompanying drawings. The feed hopper is carried on a pedestal. Around this and making a loose fit is the front head of the trommel hood. This annular front head, formed by bolting together four castings that overlap one another at the joints, is in turn fastened by bolts to a flanged separator ring or shell that meshes with a groove in the side of the diaphragm to which it is bolted. This diaphragm has reinforcing ribs raised on the back. The material between these ribs is cut away near the rim or flange to provide the holes *H*, through which the ore feeds to the trommel screen. Between the two heads of the hood are placed wearing plates held in place by square wings that fit into recesses in both heads of the trommel hood. These wearing plates have a slope in a direction opposite to that of the rotation of the trommel so that the ore as it feeds from the hopper or feed chute strikes the wearing shoes and slides gently down upon the shell of the trommel hood; in this way the life of the separator shell as well as that of the diaphragm or back head of the hood is greatly lengthened.

The only drawback to this form of hood is that the wearing plates are somewhat difficult to replace and the ore, if damp, tends to stick to them. On that account the trommels are now used with practically no wearing plates. It might be possible to arrange the wearing plates so that they would be held in raised grooves on the two heads, by bolts, and so could be replaced by removing the holding bolts instead of taking off the front head. They could be designed so as not to come quite so near the bottom.

The idea of the wearing plates, though, seems good. The ore is made to fall gently upon the bottom of the trommel, and excessive wear on the legs of the trommel spider as well as on the first section of screen is avoided. The hood diaphragm is also of service in preventing the scattering of dust through the mill. It has been found that the trommel is somewhat longer than necessary, as practically all the undersize is screened out on the first two sections; the third section prevents much undersize going over with the oversize to the recrushing rolls.

Escape of dust from the trommel through the perforations is prevented by carrying up from the floor on which the trommel is placed, a frame of 2x4-in. timbers with a casing of 1-in. planks. Over the top is placed a covering of canvas which is supported upon a framework of six, 1¾x⅜-in. iron bands, that spring from the side frames which are tied together with a wooden center rib and six straps of 1¾x⅜-in. iron as shown in the accompanying drawings. The two center bands are close together owing to the fact that the canvas covering is lapped at that point. This covering is held down on the canopy frame by ¾-in. rods that run through hems; one along each of the bottom edges. This makes it easy to lift up the covering and inspect the trommel at any time while escape of dust is prevented.



Hood Used on Doe Run Trommel

Manganese-steel screens are being tried on this trommel. They have openings 9 mm. in diameter. For a time it was impossible to get any company to undertake making screens of manganese steel. The manganese-steel screens have been used only a few months so that it is impossible to state what service they will give.

Slope of Launders

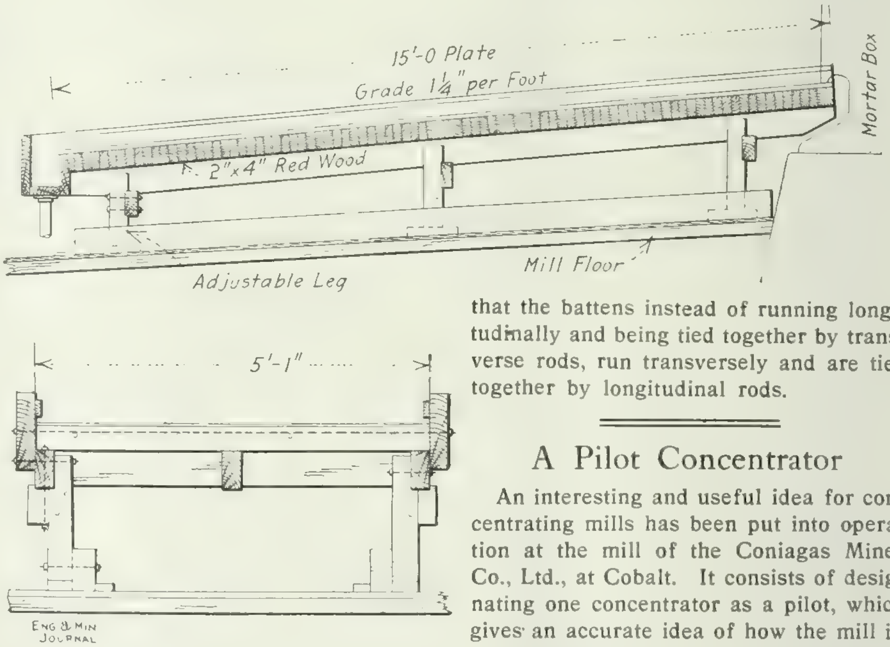
The accompanying table, containing data concerning the fall of launders for different classes of material, is taken from a description of the mill at the Lucky Tiger mine, El Tigre, Sonora, Mex., by D. L. H. Forbes (*Bull*, A. I. M. E., August, 1912.) Anyone who has been called upon to design a launder system will appreciate the practical value of this sort of information.

LAUNDER FALLS USED IN NO 2 MILL OF THE LUCKY TIGER MINE

Situation	Size width	Size hght	Dilution of Pulp S:L	Fall, Per Foot
	In	In.		In.
Stamps to classifier....	8	8	1:6	⅞
Classified coarse sand to Wilfleys	6	6	1:3	⅞
Classified fine sand to Wilfleys	6	6	1:3	¾
Slime to dewatering tanks	8	8	1:20	¼
Thickened slime to Deister tables	6	6	1:4	¾
Sand tailings from Wilfley tables	8	8	1:5	1
Middlings from Wilfleys to pan..................	4	4	1:2	1
Concentrates from Wilfleys to bin ...	4	6		1¼
Slime tailings from Deister tables	6	6	1:7	¾
Middlings from Deisters to 4th table	4	4	1:4	⅝
Concentrates from Deisters	4	6		1¼

Rand Amalgamation Tables

Since the advent of coarse crushing in practice in many of the mills on the Rand, amalgamation tables in front of the stamp batteries are not used, but shaking amalgamation tables are used in the tube-mill circuit. Before coarse crushing was adopted, however, stationary or movable amalgamation tables were used in front of the stamps. These tables were built, as shown in the accompanying illustration, of a series of transverse battens, held together by longitudinal tie-rods. The table thus formed was supported upon foundation posts and beams as shown in the illustration. The pulp was confined at the side, by the sideboards attached to the table bottom.



Type of Stationary Amalgamation Table Used on the Rand

Formerly it was the practice to use a number of copper plates on the table, the end of one overlapping the plate next below, but the later practice is to use but one sheet of copper on the table; this usually is about 12 ft. long and 4½ ft. wide, or slightly wider than the screen frame of the battery. In some mills the amalgamation tables are arranged so that they can be moved on rails a short distance from the mortar box, in order to gain access to the stamps, without interference from the tables. In other mills the supports of the tables were built upon wedges so that the grade could be made greater or less as might be desired.

The copper plates are turned up at the edges, in order to prevent leakage which would be liable to cause warping of the top of the table and distortion of the copper plate. A cleat or fillet of wood is nailed to the sideboard of the table to hold the copper plate in position. The plate is extended up underneath the discharge lip of the mortar. As the lip of the mortar box is equipped with a drip strip on the under edge, and the upper edge of the table is turned up, no leakage can take place.

This table is somewhat similar to the amalgamation table used at the Alaska-Treadwell mills described in the JOURNAL of Apr. 27, 1912; the notable difference is that the battens instead of running longitudinally and being tied together by transverse rods, run transversely and are tied together by longitudinal rods.

A Pilot Concentrator

An interesting and useful idea for concentrating mills has been put into operation at the mill of the Coniagas Mines Co., Ltd., at Cobalt. It consists of designating one concentrator as a pilot, which gives an accurate idea of how the mill in general is operating. A sample is cut automatically from the tailing as it goes to the dump and this sample is sent back to the pilot table where it is reconcentrated. If the mill is not doing the best possible work a further recovery is shown on this table, while if all the tables are doing good work the pilot will not show any additional recovery. Thus a glance at it will show at any time just how the mill is being cared for. The idea originated with Frazer Reed, mill superintenden for the Coniagas company.

At the Tom Reed mill, Oatman, Ariz., lime emulsion is added to the pulp as it flows from tube mills to thickeners, the amount being determined by alkalinity tests on the mill solution.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Shaft Sinking at Goldfield

The following figures show the cost of sinking a shaft 100 ft. deep during the early days of the Goldfield district in Nevada. All the work was done by hand and at the time wages and supplies were higher than at present.

The shaft was on leased ground and was started at a point where rock was encountered near the surface. All drilling was done by hand although augurs were used much of the time for putting down the holes, as the rock was soft. The sinking and timbering to 100 ft. required 60 days from the time ground was broken. Wages were $4.50 per shift of eight hours. All hoisting was by windlass.

The shaft was a double compartment one, each compartment being 4½x4½ ft. in the clear. The timber used was Oregon pine and it cost $40 per M., delivered on the ground. The shaft timbers were all 8 in. square, with the exception of the center side posts and the center crosspieces, which were 6x8 in. The sets, which were framed by hand, had 5-ft. centers and were solidly lagged with 2-in. plank.

COST OF SINKING 100-FT SHAFT AT GOLDFIELD*

	Total Cost	Per Foot
Labor	$1255.50	$12.555
Timber	542.34	5.425
Explosives	138.33	1.383
Tools and supplies	92.61	0.926
Other expense	9.75	0.097
Total	$2038.53	$20.384

When the work was completed the shaft was 106 ft. deep and timbered to 100 ft., this being in accordance with the terms of the lease.

Shattuck-Arizona

The annual report of the Shattuck-Arizona Copper Co., Bisbee, Ariz., for the year ended Aug. 1, 1912, states that the development work for the year amounted to 4942 ft., consisting of 2863 ft. of crosscuts, 938 ft. of raises, 108 ft. of winzes and 1033 ft. of intermediates. No stoping was done and the 2802 tons of ore produced were taken from development. According to this, the development produced one ton of ore for every 1.76 ft. of development work performed. The wet weight of the ore was 3094 tons, indicating 9.45% moisture. A smeltery has been planned to be erected at Douglas, and will have a capacity of 400 tons per day, the estimated cost is $400,000, which is equivalent to about $2.77 per ton of annual capacity. In the converter department of a neighboring smeltery, it is stated that a saving of 20c. per ton of ore smelted was effected by using basic-lined instead of acid-lined converters.

Las Dos Estrellas

The total cost of mining and treating ore during the year 1911, at the mines of the Cia. Minera Las Dos Estrellas was 10 pesos per ton, according to the official report of the company. This company operates mines in the Tlalpujahua district, State of Michoacan and in the El Oro district, State of Mexico, Mexico. During the year under review 479,723 metric tons of ore was mined, crushed in the stamp mills, one of which contains 130 the other 120 stamps, and cyanided. In addition 166 tons of rich ore was shipped to the smelters. The total cost of 10 pesos per ton was made up of the following items: Development, 1.35 pesos; mining, 4.13; crushing, 1.05; cyaniding, 1.92; asaying, 0.10; cost of selling products, 0.42; taxes and duties, 0.38; and general expenditures, 0.65 pesos.

The item of 4.13 pesos for mining includes the cost of breaking ground, 2.210 pesos; tramming from the stopes, 0.380 pesos; general haulage of ore in underground haulage ways, 0.191; maintenance of underground openings, 0.661; ventilation, 0.043; surface, 0.211; railroad transportation, 0.055; sampling 0.025 and general expense 0.354 peso per ton. In mining 8x8-in. or 10x10-in. timbers are used in square sets which are filled with material brought into the mine through the several adits and one of the shafts, and with the rock mined with the ore in the upper levels. In the upper levels practically all the ore is mined, while in the lower levels pillars of low-grade ore are left whenever the grade of the material is too low to pay the cost of its removal. All tramming in the mine is done by hand; the general hauling through the adits is done by nine electric locomotives of 15 to 25 hp. The hauling outside the mine is done by one 200-hp. electric and one steam locomotive. Natural ventilation through the numerous adits and shafts is supplemented to a great extent by two Geneste-Herscher aspirating fans of 65 hp. capable of removing 15,000 liters of air per minute. The cost of development for 1911 exceeded that of 1910, 1.35 compared with 1.125 pesos per ton, principally because of the necessity of working through a greater number of shafts as greater depths were attained.

The total cost of 1.05 pesos for crushing was made up of the following items: General expenses, 0.0377; breaking 0.1384; stamping, 0.4442; tube milling, 0.4283. The cyaniding cost of 1.92 pesos comprised: Labor and power, 0.7782; cyanide, 0.5153; lime, 0.1350; zinc, 0.1423; sundries, 0.1932; and filter pressing, 0.1586 pesos per ton of ore treated.

The consumption of cyanide was 0.6516 kg. sodium cyanide; of lime, 14.03 kg. and of zinc 0.479 kg. per ton of ore treated. In one mill 89.9% of the gold and 71.1% of silver in the ore was recovered; the corresponding figures for the 120-stamp mill were 88.9% and 52.6% respectively.

The traffic on the railroad amounted to 86,525 tons of ore and 50,193 tons of merchandise, fuel, lime, etc. The cost per ton moved was 0.388 peso. While the average number of employees was 5688, only 193 were injured in accidents and but 335 received medical treatment from the company's physicians. The company maintains three schools for the children of its employees, in which 231 students were enrolled.

Unit Costs at Ohio Copper

According to data supplied by Alfred Frank, general manager, the unit costs at the Ohio Copper Co.'s mines, Bingham Cañon, Utah, are as follows: A month's record shows that 59,000 tons of ore was mined, 55,000 tons coming from stopes and 4000 from development work. Mining is carried on by the caving system and as indicated by the tonnage record 93% of the ore mined comes from stopes and 7% from development. In mining this tonnage 3144 shifts of labor were employed, distributed as follows: Advancing in development, 277; mucking and tramming, development, 277; timbering, development, 40; mining ore, 1330; timbering, mining and general repairs, 260; miscellaneous men underground, 540; and surface men at mine, 390 shifts. The ore now being mined lies above the main tunnel and, after caving, is dropped through chutes to the tunnel. The rock is medium-hard quartzite and according to the figures stated the average output, including ore from development, secured per man per shift is about 19 tons for every man employed at the mines, 37 tons per man engaged in extracting ore, 995 tons per man employed in development, 1095 tons per man employed in miscellaneous work underground and 1510 per man employed on surface. Based upon the men employed in extracting ore and tons drawn from caved area, the average tons per man per shift was 34.6 tons per man mining and timbering or about 41.3 per man mining and 212 tons per man timbering. Based upon the ore secured from development and men engaged in advancing and mucking and tramming, approximately 6.8 tons were secured per man or 14.4 tons per man advancing and 14.4 per man mucking and tramming and 100 tons per man engaged in timbering.

The dynamite consumption in extracting ore was 12,500 lb. or about 4.4 lb. per ton of ore produced from stopes. Timber consumption was 25,000 bd.ft. for mining and general repairs or 1 bd.ft. for every 2.2 tons of ore from stopes. In addition to this 7000 bd.ft. were used in development, making a total consumption of 1 bd.ft. for every 1.84 tons of ore produced from development and stopes. The main drifts and stations are lighted by electric lights, the average candle consumption is four per man in 8 hr. In ore extraction 965 machine drill-shifts were run, indicating that 57 tons are secured per machine-shift. In development 235 machine-shifts were worked, making a total of 1190 shifts or about 44.6 tons of ore produced from development and stopes per machine drill-shift. About 540 lb. of drill steel is consumed per month or 1 lb. for every 109.5 tons of ore produced.

The drills in use at this property consist of Holman, Sullivan, Ingersoll-Rand and Waugh stopers. On an average of three large and seven small piston drills and 12 hammer drills are used per shift. In drifts an average of seven 3.5-ft. holes or 24.5 ft. are drilled in 8 hr., allowing for two set-ups of ½ hr. each. In the stopes in an 8-hr. shift an average of 39 ft. or six 6.5-ft. holes are drilled with Waughs and 50 ft. or five 10-ft. holes with 3.5-in. Sullivan drills. In long raises the machine man has to put in ladders and stulls and will drill a round of 5.5-ft. holes in 8 hr., while in short raises he will average two 4-ft. rounds, placing no ladders or stulls.

In the shop a Numa drill sharpener is used and two men working 9 hr. each sharpen on an average of 280 drills. The air to the forge is furnished by an electric-driven Ingersoll-Rand air compressor and 170 lb. of coke is consumed or about 0.67 lb. per drill sharpened. Lubricating oil for drills is consumed at the rate of one-half pint per shift on piston drills. In running a 6x7.5-ft. drift, one man will average 3 ft. advance per shift of 8 hr., drilling approximately five hours with air pressure at 80 lb. and timber being placed by the regular timber crew. This is at the rate of about 17 cu.ft. of drift per man-hour. In raising, one man, placing no timbers, will advance a 4x5-ft. raise 5 ft. in 8 hr., drilling about five hours per shift. This is equivalent to 12.5 cu.ft. of raise per man-hour. In loading cars no shoveling is done from a rock bottom. One man shoveling from a plat into a 2.15x2.4x4-ft. car and tramming 100 ft. will average 16 cars in 8 hr., which is equivalent to two cars or 41 cu.ft. of rock per man-hour. Loading from a chute and using the same size car, one man will tram on an average of 80 cars 150 ft., which is equal to 10 cars or 206.4 cu.ft. per man-hour. The average life of a mine car at this property is about four years.

Iron Mining on Western Marquette Range

The Western Marquette iron range is situated in Baraga County, Mich. The mines of this district are of no great importance, and as a whole, have been unprofitable to the operating companies. The Imperial mine of the Cleveland-Cliffs company is the most important mine of the district; the only other mines of any consequence are the Portland and Ohio, of the Niagara Iron Mining Co., and the Beaufort mine. The total reserves of the district were reported to be 2,064,000 tons, of which the Imperial was credited with 1,500,000 tons. During a five-year period, 1906-1910, inclusive, the above mines shipped only a little in excess of 650,000 tons of iron ore, and were operated at a loss of $98,555 to the operating companies. During this period the average cost of production and delivery to lower Lake ports was made up as follows, basing the average value of the ore at 100%: Mining, 52.5%; development and exploration, 8.2%; construction, shafts, machinery etc., 0.3%; general expenses, administration, etc., 2.5%; royalties, 7.1%; taxes, 0.3%; rail freights, 12.5%; lake freights, 23.2%; and commissions, 2.4%, making the total cost 109% of the average value of the ore.

New York Tunneling Bids

The bids of 20 different contracting concerns made public by the Public Service Commission for construction work on the new subway extensions in New York City for routes 11-B Section 1, 11-B Section 2, and 18-22 Section 1, disclose a wide difference of opinion as to the cost of performing the work.

The Degnon Construction Co., 60 Wall St., New York, was awarded the contract on the first two routes and John F. Stevens Construction Co., 55 Wall St., New York, on the last named route.

On route 11-B Sec. 1, of 14 bids the range in price was from $1,930,258 to $3,248,449, a difference of $1,318,191 or 68%. On route 11-B Sec. 2, of 16 bids the range was from $1,904,717 to $2,996,406, a difference of $1,091,689 or 57%. On route 18-22 Sec. 1, of 12 bids the price ranged from $2,253,281 to $3,271,542, a difference of $1,018,261 or 45%. In each case the contract was awarded to the lowest bidder.

It is interesting to note the wide difference in the bids for certain specifications. For excavating 176,500 cu.yd. of earth the bids were from $2.20 to $4.25 per cu.yd., three were for $2.75, one at $2.88 and two at $3 and the other five above $3 per cu.yd. On a 1000-cu.yd. job of earth excavation the prices ranged from $2.45 to $8 per cu.yd. Three were not above $3.50, while the remainder ranged up to $6 per cu.yd., except in the single instance—the $8 bid. On 189,000 cu.yd. of rock excavations the range in bids was from $3.15 to $5.75 per cu.yd., while the average bid was $4.44. On 41,500 cu.yd. of concrete masonry the bids were from $7.50 to $9.25 per cu.yd. The same differences occur in all the bids

East Butte

The annual report of the East Butte Copper Mining Co., Butte, Mont., for the fiscal year ended Mar. 31, 1912, states that 95,910 tons of ore were mined at a cost of $4.14 per ton, including development work. In addition to this tonnage, which assayed 5.62% copper, the company purchased and treated 47,135 tons of custom ore. The total metal production from all ore was 12,167,363 lb. of copper, 396,524 oz. of silver and 17,959 oz. of gold. The total value of these metals was $2,184,758. The average price received for the copper was 13.21c. per lb., for silver, 55.016 per oz., and gold $20 per oz., all delivered at New York. The total cost of mining, treatment, freight, selling and refining, and cost of custom ore purchased amounted to $1,728,563. Interest amounted to $148,234 and additions to equipment $51,318. After deducting these amounts, a profit of $256,643 was left, which makes a net profit of about 2.11c. per lb. of refined copper. The profit of 3.75c. per lb. given in the report refers to the operating profit. The 2.11c. profit is the profit appliable for dividends. With the average price received for copper at 13.21c. per lb., the above indicates that the actual cost, covering all expenses, was approximately 11.10c. per pound.

The development work consisted of 7865 ft. of drifts and crosscuts, which is equal to about one foot for every 12.2 tons of ore mined. Among the improvements added were a dust chamber and stack base, which were constructed almost entirely of blast-furnace slag at a saving of about 70% over the usual cost. A sintering plant, erected at a cost of $15,000 for the treatment of flue dust by the Dwight-Lloyd process, is claimed to be effecting a saving of about one-half in the cost of treatment of flue dust.

Iron Mining on the Mesabi Range

By A. L. Gerry*

The Mesabi district covers an area of 400 square miles. The hematite ore bodies are generally capped and underlaid by ferruginous chert. The range is practically covered with glacial drift, making prospecting difficult. Exploration was formerly by test pits but now is largely by drilling, the orebody being completely determined before mining is begun. Open-pit mines are in the majority; where underground mining is adopted the top-slicing system prevails.

The Mesabi district (Mesabi being the Chippewa Indian name for giant) is about 400 square miles in area. It extends from east of Pokegama Lake, in T. 142 N., R. 25 W., in a northeasterly direction to Birch Lake, about 110 miles distant. In width it varies from two to 10 miles.

GLACIAL DRIFT COVERS DISTRICT

Practically the whole region is covered with glacial drift, showing outcrops at few places. The average depth of the surface overburden is, perhaps, 100 ft. The range is mostly made up of granite of Lower Middle Huronian and Keweenawan age, and to a lesser extent of Archean igneous rocks. South of the igneous backbone or main ridge occur Lower Middle Huronian sedimentary rocks in places. South of these, or of the Archean, where Middle Huronian are lacking, are Upper Huronian sedimentary rocks, dipping south and underlying the southern slope of the range. All of the formations are separated by unconformities.

A generalized north-and-south section, taken across the range, is shown in the accompanying engraving. *A* to *B* represents the highlands, and *B* to *C* the southern slope. A complete and detailed description of the geology of this district is given in the U. S. Geological Survey, *Monograph* LII, by Leith and Van Hise, and the illustration is taken from it.

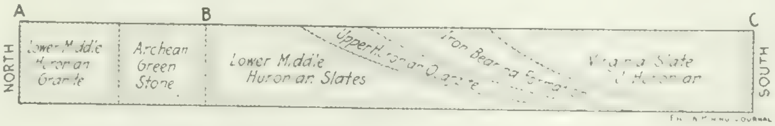
At intervals more or less frequent throughout the range, but with no apparent correlation, the orebodies of hematite are capped with taconite, or ferruginous chert and often underlaid with the same material. This underlying taconite is in turn underlaid with quartzite. It is common to find a stratum of altered slate called "paint rock" (soft red clay), from six inches to two or more feet in thickness, between taconite and ore.

Another occurrence commonly found is a thin layer of white siliceous material between ore and paint rock. So uniform is it in some instances, that when near the top of the orebody, the miners look for the white seam as an indication that the top of the orebody has been reached.

In general, it may be assumed that when the quartzite has been penetrated in drilling, the bottom of the orebody has been reached. This has been proved untrue, however, in several instances, one of which is shown by drilling in S. 33, T. 58, R. 20 W., where quartzite is found underlaid by ore, which is in turn underlaid by quartzite, showing two bodies of ore, or more likely the same orebody divided in two parts.

The presence of glacial drift is, of course, a hindrance to exploration, but the fact that the ore occurs so near the surface makes this work much easier than in other districts. Nowhere in the district is the overburden more than 500 ft. thick, the average being from 100 to 300 feet.

As early as 1890 some intelligent and successful exploration work was done by means of test pits. These pits were usually 5x5 ft. in section and lagged up in the old-fashioned, log-house style. For several years exploration was carried on in this manner and is employed even to the present day for exploring in open-cut workings. In ore, 2x4-ft. test pits are put down without lagging for about $1.40 per ft., by contract. Only test pits in surface material are lagged, those in ore being shallow (usually for exploration for the season's work), do not require lagging.



GENERALIZED SECTION ACROSS MESABI RANGE

Diamond drilling is the method of exploration now in use. Holes are put down vertically, usually 300 ft. apart, until the orebody is struck, when the holes are put down more frequently, as in 100-ft. squares or closer. From the data thus obtained, the mine is laid out on paper, before any work is done. This accurate determination of the orebody enables the attack on the orebody to be carried out systematically from the beginning of operations until the ore is completely mined out.

Contractors charge from $3 to $3.50 per ft. for churn drilling, and from $5 to $6 per ft. for diamond drilling. The cores, samples, etc., are saved and kept on file with their analyses and depth records. Churn drilling is resorted to until through the drift; the hole is then cased with pipe and a diamond drill used until through the taconite. The ore is usually churn drilled.

In determining the method of mining to be employed, the following considerations are essential. From drilling data the thickness of the overburden and also the thickness of the orebody are known. Taking a square foot for example, to the given overburden depth, gives *X* cubic yards of material to handle, at a cost of *B* cents per yard (from 14 to 30c.), depending on the material. We now have uncovered (theoretically) 1 sq.ft., times depth of ore, or *Y* tons of ore. The saving on handling *Y* tons of ore by open-pit methods (instead of by mining underground), is *C* cents per ton. If there is enough ore, so that $C \times Y$ is greater than $B \times X$, then stripping will pay. Plant equipment in both cases is, of course, figured in the above calculation.

OPEN-PIT MINING CHIEFLY USED

Open pits are in the majority on the Mesabi Range, and vary in size from the smaller ones of 20 acres to the Hull-Rust, Sellers and Burt (opened together) of about 400 acres extent and having many miles of track in the pit and to the dumps.

The track is nearly all of standard gage, and the steam shovels range from 60 to 120 tons, and are of all makes; the Bucyrus and Marion shovels being, perhaps, the predominant makes. Dippers are from 2½ to 5 cu.yd. capacity, four teeth being used in nearly all the stripping work. Some of the companies, however, use three teeth in dippers, when in the ore.

The open-pit mining is not especially different from any open-cut work. Ground is loosened up ahead of the shovel, if not clay, by gopher-hole blasting with black powder. Gopher holing is simply putting holes in the bank horizontally, with long-handled shovels, jumpers, etc.

The distance to which the hole is put in depends on height of bank, or depth of cut. The holes are fired with a battery, and it is considered good work if the blasted bank comes down to the loading track, but does not cover it. Some pits are worked in a series of spiral cuts, as shown in the accompanying halftone of the Mahoning mine, which is one of the largest in the district.

In general, stripping is done a season ahead of loading when possible, in order that pit grades may be conserved and that the pit will not be crowded. It is not considered good practice, when the pit is a small one as 40 acres, to commence shipping before stripping is completed, unless for some extremely urgent reason the ore is needed. Boulders are drilled by hand, and steam drills, blasted with dynamite (40 to 60%) and loaded by shovel with the dirt.

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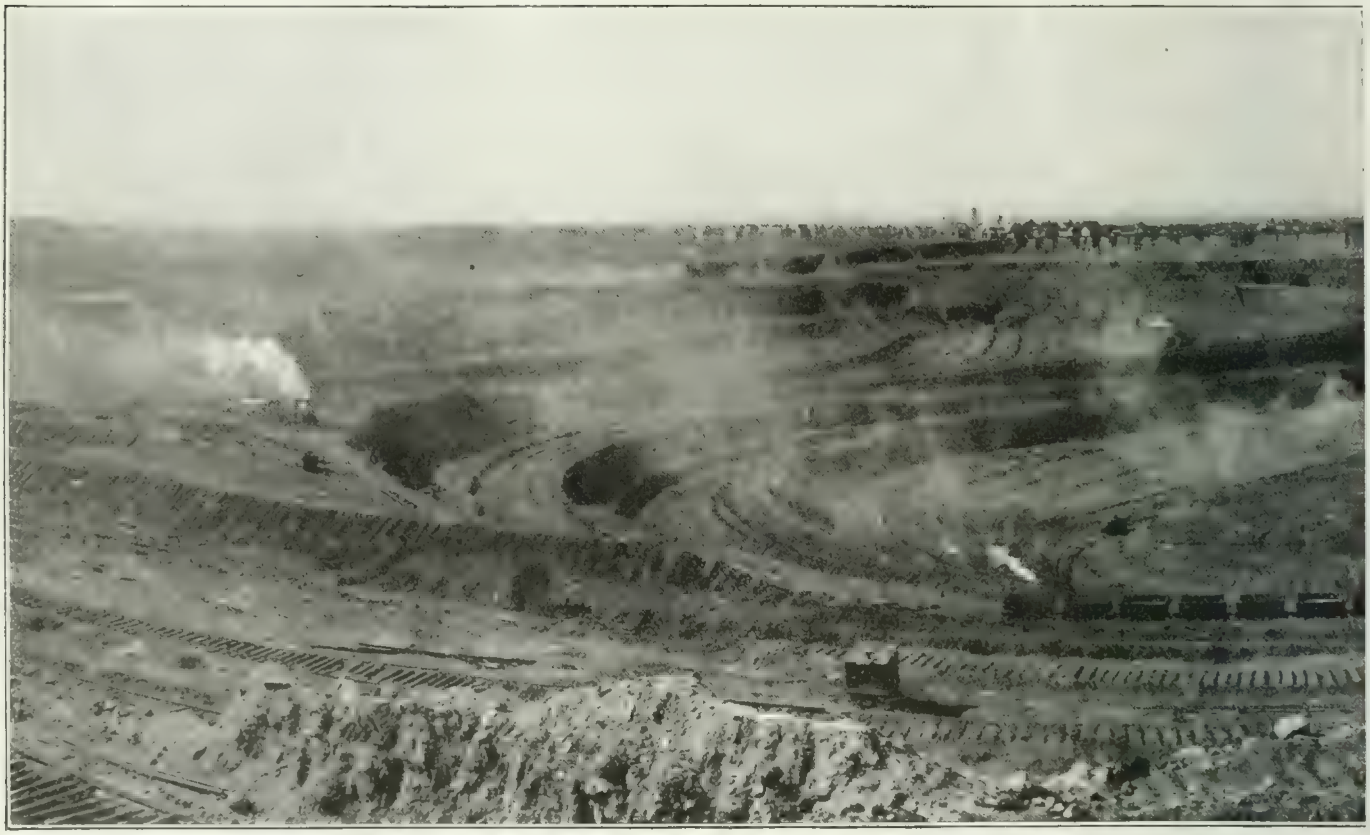
*Superintendent, Longyear Mine, Hibbing, Minn.

It is usual to have a crew of men laying track in the cut following up the shovel, so that when the shovel has reached the end of the cut it can be moved back without loss of time. This track is in turn used as a loading track. Cleaning at the top of the ore is done by teams and scrapers unless the contour of top of ore is regular.



Open Cut Workings at Mahoning Mine,

Hand- and air-dump cars are used. The latter, of course, do away with a great amount of labor, expense and delay in dumping; they can, therefore, get back to the shovel much quicker than the hand-dump cars. The air-dump cars used are 12- and 16-yd. cars, made by Western Wheel Scraper Co., and the Kilbourne & Jacobs Company.

Contractors do a large amount of the stripping on the range and costs of stripping vary from 14 to 30c. per yard, depending on the material, contractors' prices being about 30 cents.

To sum up, the successful operation of the open-pit method is, in a large measure, due to efficiently handled labor and outfit, and to the smooth working of transportation or railway systems in conveying excavated material to dumps.

Varied Surface Equipment for Underground Work

Surface equipment is of a varied nature, ranging from the old-fashioned massive wooden headframe, to the modern steel A-style shaft house, and other equipment of the same comparison.

The power plants are not much different from those in the other districts, with the exception that horizontal fire-tube boilers are the ones principally used throughout the district. Hoists are in general of the geared type, but of late, notably at the Morton and Scranton mines, first-motion hoists are installed.

Both of these mines have uptodate equipments, steel headframes, first-class power plants, etc. The hoists at both the Scranton and the Morton are first-motion hoists manufactured by the Wellman-Seaver-Morgan Company.

The Scranton has a battery of six 150-hp. boilers manufactured by S. Freeman & Sons, Racine, Wis. The steam pipes are carried in a concrete tunnel from the boiler house to the engine house and pipes are thus concealed below floor level, except for vertical goose-neck connections. A Ridgway dynamo, 125 kw., 455 amp. and 275 volts, operating at a speed of 250 r.p.m., is installed to furnish light and power for electric haulage. The compressor is an Ingersoll-Rand, class *C*, with air cylinders 14¼—33¼x30 inches.

The "drys" or change houses offer some novel ideas. The most modern are of concrete, or at least have concrete floors. They have individual steel lockers and are well ventilated. Some of the companies have gone so far as to have two lockers, one for underground clothes and one for street clothes. In connection with the lockers for underground clothes above mentioned is an artificial-draft system of ventilation, which does away entirely with the noxious odors common to drys. Two men use the two lockers in conjunction, having their suits of ordinary clothes in one locker and mining clothes in the other. Each man has his own wash basin. Between the rows of lockers and at right angles to them (the lockers being across the building) is a system of hot- and cold-water faucets, the piping running lengthwise of the building. Shower baths are also a feature of the modern dry.

The warehouses offer no new features except that the Bowser tank system of handling oils is in common use. While it is an expensive installation, it is undoubtedly a money saver in the long run. Steel water towers are the most common, being of the combination hemispherical cylindrical type. Cooling towers for condensing water do not seem to be prevalent on the range.

Top-slicing Usual Method

The usual and in fact the only method of underground mining used, to my knowledge, is the top-slicing method. The ore is removed in 8-ft. slices vertically (more or less depending on conditions) from the top of the orebody downward, the gob or surface material following the slices down, and resting on the ore yet in place (usually separated from it by boards, laid in the bottom of a room before blasting the supporting timbers). It is also removed in 8-ft. slices horizontally, retreating from the property or shore line, toward the shaft.

Pillars are usually about 50 ft. through, and no more crosscuts are driven than are absolutely necessary for ventilation, etc., in order that the orebody be cut up as little as possible.

The shaft is usually put down in ore as it is impracticable to put it in barren rock. In the best practice it is put down to the bottom of the orebody, permanent haulage ways, pump station, etc., being established. It is a great saving of time and expense to have this done once and for all.

One of the Largest on the Mesabi Range

Developing a Shallow-sloping Orebody

In the engraving on page 696 is shown a plan and side elevation of a method of working a shallow, sloping orebody, which is perhaps the most difficult kind to handle that is encountered on the Mesabi range. It involves handling the ore three times, and a small portion four times. This is actually done and the cost kept below a dollar per ton.

We will say, for instance, that the property consists of a 40-acre tract, 20 acres *ABCD*, as shown, and 20 acres south of line *CD*, but not shown. We will assume that the ore has a general pitch of about 9% south, and has an average thickness of 36 ft. *AB* is the north line of the property, and the thickness of the deposit is measured normally to the dip. We would probably sink a three-compartment shaft, 6x18 ft. inside dimensions, at the center of property. Main motor haulage way *EE* would be driven and at the same time raises put up to the top of the orebody at *F* as shown and crosscut *F* would be driven directly over *E*.

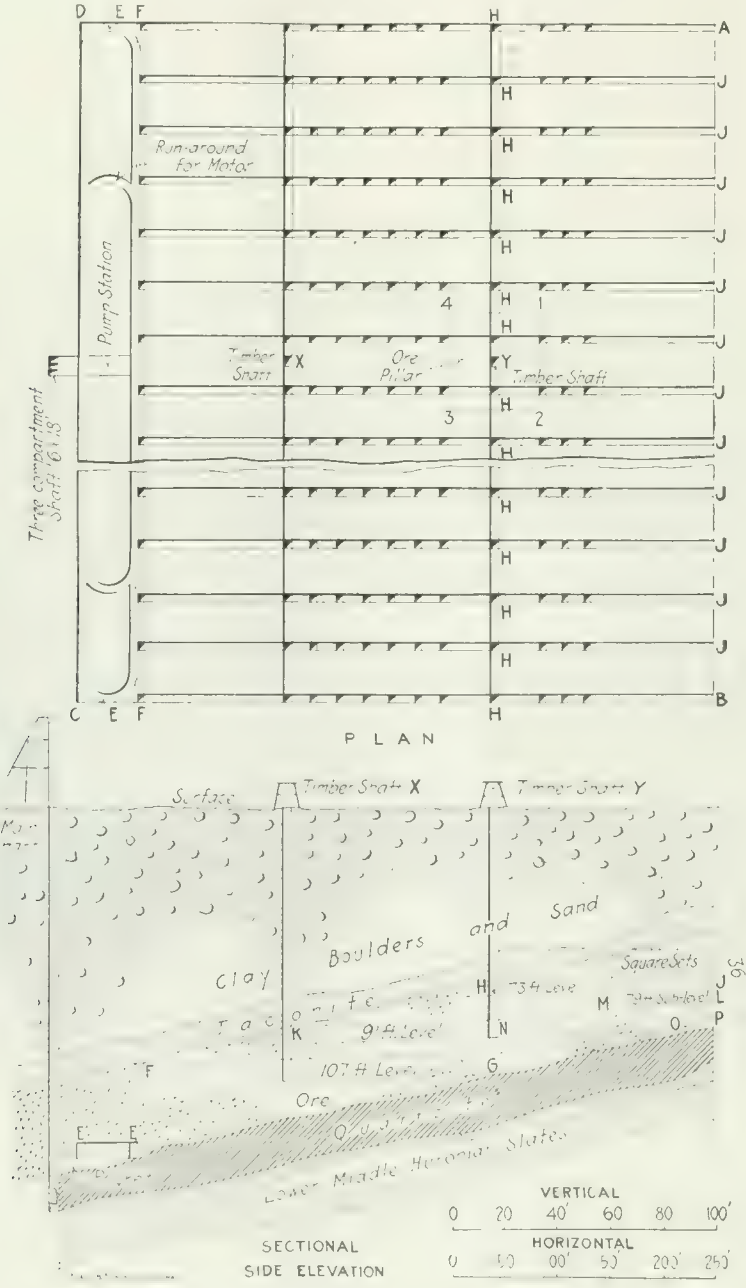
Drifts would be driven north from *F* to *G* and connections made as soon as possible with timber shaft *X* to get ventilation. Crosscut *F* and drifts *FG* could be driven without timber, even in the comparatively soft Mesabi hematite if dry. They would be 5x6 ft., and arched at the top. Perhaps in a few places one or two sets of timber would be needed. This system of drifting is employed at Monroe mine, at Chisholm, and at the Harold and Webb mines, at Hibbing.

The next step would be to drive inclined raises to the 73-ft. level and raise timber shaft *Y*. Drifts *HJ* would not need timbering if 5x6-ft. drifts. Square-setting would be started at property line on the 73-ft. level as shown, caving retreating toward *H*. When the back gets as low as 16 ft. the square sets could be abandoned.

In the meantime the 91-ft. level would have been driven to the property line without timber. The east side of the 91-ft. level drifts would be over the center of the 107-ft. level drifts for convenience in putting up raises. To assist the rapid development of the 91-ft. level it could be driven 4x5 ft. in section without timber, to a point somewhere beyond *N*, after which it would have to be widened out to 5x6 ft. to admit using sublevel cars. Wheelbarrows could be used for narrow drifting, the raises being put 25 ft. apart if necessary. The 91-ft. level drifts would now be timbered under the 73-ft. level cave and the 79-ft. sublevel started south under the 73-ft. level cave as *LM* in elevation. The drifting south on this level would be with 4x5-ft. drifts, and only fast enough to keep in advance of the caving in this sublevel. Work here would be with wheelbarrows, the raises being put up at 25-ft. intervals.

If pushed for ore, caving could be started from *N* toward *K*. This would not be advisable unless necessary, and not unless there was a good back of taconite capping. Pillars would have to be left as shown in plan by 1234 in 91- and 73-ft. levels to protect timber shafts until no longer necessary. Possibly larger pillars would be necessary depending on the ground, but 40-ft. pillars would be ample. In like manner caving would be started in the 91-ft. level, retreating from *P* toward *O* as soon as the caving had been started in the 79-ft. sublevel.

The development without timber is rapidly gaining in favor as it not only hastens development, but materially aids production during development stage, which is the period of small hoists and therefore high costs. An ascending grade of from 0.5% to 1% for drifts should be allowed, as with car work it is impossible for them to be driven without this grade.



Method of Working a Shallow Sloping Orebody on Mesabi Range

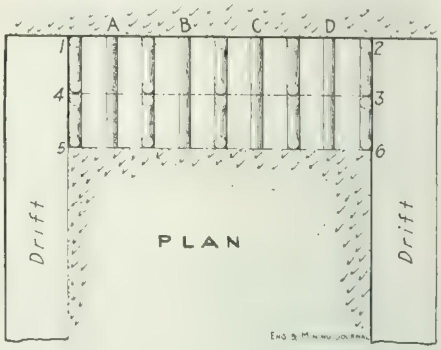
It might be well to point out that it is not possible to mine without timber, or better drift without timber, in all mines. Where this would be impossible timbering would not change the above laid out system in any respect. It might also be considered better practice to put timber shaft *X* down farther south on property as at *F* in elevation, and have the main-shaft pillar do for both the main shaft and timber shaft. If this were done *Y* would be continued down to the 107-ft. level, at the start. Timber shafts would be sunk through surface material and raised through ore, in order that ore hoisting be not impeded.

The south half of 40 acres would be mined in a similar manner. When a slice is worked out it is customary to lay boards on the floor and nail boards up on sides, to keep good ore and caved material separate when the worked-out slice is blasted in.

With this method it is claimed that a 99% extraction can be obtained, but 95% is probably nearer right. Ore is stockpiled in winter, end-dump cars being generally in use on the stock pile, and are handled by electric locomotives. Costs range from 60c. to $1 per ton, and there is at present a 60c. hauling charge from range points to the lake, and 60c. lake freight to the lower ports. Royalties range from 5c. to $1, late leases from 50c. to $1.

New Methods at Chisholm

A new method of timbering is in use at the Monroe and Elizabeth mines at Chisholm called by some the "sill" and by others the "three leg" method. In the accompanying engraving is given a sketch plan of two slices 8 ft. wide, from which ore has been removed, with timber standing. Posts are represented by small circles. Sills or caps as they will eventually be are placed in the bottom at *A*, *B*, *C*, etc., being sunk in ore level with the floor of the slice, and room 1265 blasted in. When the next slice below is started, the back of which is right up against the covering boards laid down in floor of 1265, the first slice starting under 1234 (now covered with caved material) has sills *A*, *B*, *C*, etc., already in place as caps, and the miners have only to put up posts under the cap. Not only is this so, but when slice under portion 1234 is cleaned up and the miners go under portion 3456 they only have to put in caps on the 56 side of the drift.



Sill Method of Timbering at Two Chisholm Mines

This sounds good in theory, but practically it is often necessary to put the fourth post under sill or cap. The cost of sinking the sill and the fact that the slices must come exactly under the one above more than offset the cost of extra post and labor of putting up caps by the old method. Opinions differ as to the practicability of this method, but many think that it will not gain in favor.

Austrian Potash Salts

The Austrian potash deposits in Galicia, reports Consul General Charles Denby, of Vienna, are not yet developed to the point of manufacturing or exporting the salts. There is a small amount mined for local use, but petty jealousies between the Galician government, owning one field, and local capitalists, owning the other, have prevented large-scale development.

The Principles of Blende Roasting—I

Hearth area determines roasting capacity only in connection with the manner of stirring, of supplying air, and of firing. The principles of roasting, the avoidance and production of zinc sulphate, and of zinc ferrite are discussed by W. Hommel.

Note—Translated by O. H. Hahn, from an article by Dr. W. Hommel, in "Metallurgie," May 8, 1912.

The means which practical metallurgy uses for carrying out its various processes do not generally change much in the course of years. If new apparatus or new methods are introduced it takes considerable time before they attain general application; but if they are once adopted they are soon elevated to the rank of a prototype and their peculiarities are made fundamentals with which new ideas are compared and measured.

HEARTH AREA DOES NOT DETERMINE CAPACITY

Such a fundamental principle is the "roasting area" or "hearth area" of a furnace, and frequently the attempt is made to determine the capacity of a new furnace construction by calculating the hearth area. Really hearth area considered by itself does not mean anything unless it is connected with a given type of furnace. By hearth area alone the capacity of a furnace is as little determined as is electric energy by merely the voltage. Besides the hearth area the following factors are decisive in determining the furnace capacity: (1) The manner of stirring or rabbling; (2) the manner of supplying air; (3) the manner of firing.

Many of present-day practitioners, if they talk of hearth area in blende roasting, evidently have in mind the conditions of a Hasenclever-Rhenania furnace. Just as evidently they apply the same conditions to other furnaces and by comparing the hearth areas endeavor to draw their conclusions in regard to the efficiency of the respective furnaces.

That this is wrong follows from the fact that in a Rhenania furnace 6.5 tons raw blende are roasted in two shifts in 24 hr., while with three shifts nine tons may be put through. The capacity of the furnace is, therefore, in this case approximately proportional to the working gang. Of course, this capacity has an upper limit which depends upon the construction of the furnace.

One man requires a certain time to work the blende through in the different stories. When a charge has been drawn the next one is shifted in its place and the balance of the content of the furnace is successively moved onward. To finish this work from five to six hours are ordinarily required, during which time each particle of ore travels one-tenth of the total way. Hence the ore requires from 50 to 60 hr. to pass through the whole furnace, which time is occasionally prolonged if a charge should have to remain longer in the furnace on account of being insufficiently roasted. This naturally retards the forward movement of the balance of the charges. The capacity of the furnace may then be raised by using a heavier bed of ore or by more vigorous rabbling of the ore.

In each case a large amount of labor will be required of the workman from which it follows that in a day of three shifts more work will be accomplished than in one of two because each workman has only a certain maximum amount of labor at his disposition. This accounts for the above results. The efficiency of the furnace can, with hearth area remaining the same, be increased by 50% by expending more labor; that is, by more vigorous rabbling. The analogous influence of air supply and of heat will be shown below.

EFFECT OF INCREASED RABBLING

When I was about to build my first mechanical furnace an experienced metallurgist told me that in such a furnace blende could not possibly be roasted to a finish because it took over 60 hr. to do so, while the blende only remained a few hours in the mechanical furnace. As my counter arguments did not avail and as the views of the practical man based on years of experience had more weight with my principals there was nothing left but to demonstrate the correctness of my ideas by experiment.

For this purpose I caused a charge of 400 kg. to be kept strictly separate from the other ore in course of roasting, from the moment it was charged on the top floor of a Rhenania furnace to the time it left the furnace. This was attained by keeping a free space of a hand's breadth to the right and left of the charge on the hearth. Otherwise this charge was treated just exactly in the same manner as the balance of the ore; it was passed through the furnace in the same way without receiving any special attention.

Previous to each rabbling a sample was taken with great care and tested for sulphur; the same thing was done immediately after the rabbling. For the first tests, now and then, a grab sample was taken at random, but this method was soon discarded as giving irregular and unreliable results. Subsequently samples were taken from all over the charge, thoroughly mixed and an average taken from the mixture. Furthermore, a tally was kept of the time the ore was at rest and the time it was rabbled. Measurements of temperature were also intended, but could not be carried out on account of the poor condition of the pyrometer available. In this manner 11 tests were made on different blende ores. From the results obtained I will pick out two which represent extreme conditions, as blende *A* is a pure ore, which practically contains no other gangue than quartz and does not frit in the highest heat, while blende *B* contains lead and on that account easily clots.

BLENDE ROASTS ONLY WHEN RABBLED

During the total duration of roasting of 50 to 60 hr. there are actually only five hours spent in rabbling, which is barely one-tenth of this time. For the balance of it the ore lies dead in the furnace and scarcely roasts. Only at the surface of the charge exposed to the air a diminution of the sulphur takes place while the interior remains unaltered. This is especially the case with caking blende because the crust formed on it renders the access of air impossible. But I even found that noncaking granular blende will do the same thing. This is but natural, for the roasting of blende takes place in an entirely different manner from that of pyrites where the catalytic action of the iron oxide formed renders the progress of desulphurization in the interior of the ore particles possible.

With blende the oxidation is limited to the surface and is effected in the furnace altogether by the decrepitation of the crystals. On a charge of leady blende, which had remained quietly at rest on the second floor for 12 hr., a crust 1 cm. thick had formed. An analysis of it showed 4.4% sulphur, while the granular interior contained 14%, the same as 11 hr. previously. In this sense all the figures given in the tables below must be taken; they represent the average between the almost unaltered interior and better roasted surface. Some slight irregularities in the decrease of sulphur recorded are attributable to this fact, as even with the greatest care exercised in sampling occasional mistakes will slip in.

SUMMARY OF ROASTING RESULTS

Roasting blende *A*, on first floor in 28 hr. 50 min. it lost 23.3% of total S; on second floor in 17 hr. 10 min. it lost 34.5% of total S; on third floor in 10 hr. 5 min. it lost 39% of total *S*.

Roasting blende *B*, on first floor in 24 hr. 30 min., it lost 20.7% of total S; on second floor in 21 hr. 35 min. it lost 30% of total S; on third floor in 15 hr. 5 min., it lost 41.5% of total S.

Reducing the desulphurization to the time unit of one minute there was expelled per minute: From blende *A*, on first floor, 0.0140%; on second floor, 0.0344%; on third floor, 0.0644%. In roasting blende *B*, there were expelled per minute: On the first floor, 0.0141% S; second floor, 0.0232% S; on the third floor, 0.0461% S.

Hence the desulphurizing capacities of the individual muffles of the Hasenclever-Rhenania furnace correspond to the following ratios: With pure blende as 1: 2.4: 4.6; with caking blende as 1: 1.7: 3.3; or, on an average as 1: 2: 4.

TABLE I—ROASTING BLENDE *A*

At rest		Time of rabbling		Percentage of sulphur	
Hr	Min	Hr	Min	before rabbling	after rabbling
On Floor 1					
0	0			23.2	
5	50		20	22.2	22.0
5	25		35	19.4	19.0
6	30		25	18.4	18.4
9	15		30	18.4	17.8
27	00	1	50	23.2	17.8
On Floor 2					
5	05		20	17.0	14.0
11	20		25	12.4	9.8
16	25	0	45	17.0	9.8
On Floor 3					
3	50	1	15	6.8	2.1
4	.	1		2.1	0.74
7	50	2	15	6.8	0.74
51	15	4	50	23.2	0.74

TABLE II—ROASTING BLENDE *B*

At rest		Time of rabbling		Percentage of sulphur	
Hr	Min	Hr	Min	before rabbling	after rabbling
On Floor 1					
0	0			24.2	
7			20	23.8	22.8
3	30		25	21.4	21.0
6	45		30	19.0	18.7
5	30		30	20.6	19.2
22	45	1	45	24.2	19.2
On Floor 2					
6			15	18.6	16.8
7	45		15	15.2	14.6
7	05		15	13.2	12.0
20	50	0	45	18.6	12.0
On Floor 3					
6	05	...	40	10.0	8.2
2	50	1		5.4	3.8
3	30	1		3.8	1.94
12	25	2	40	10.0	1.94
56	00	5	10	24.2	1.94

On the lowest floor of a three-story furnace there are then four to five times as much sulphur removed as on the topmost one and twice as much as on the second, although the "hearth area" is the same on all three floors.

This result appears to be somewhat surprising, especially if one thinks of the proverbial saying common with zinc metallurgists: "It is so hard to remove the last few per cent. of sulphur." According to my view it is no more difficult to remove these last few per cent. than the rest, if the conditions requisite for a dead roast are provided.

Three Conditions for High Efficiency

What is the much higher efficiency of the lowest muffle based on? In the first place, of course, on the more vigorous rabbling of the ore. But this alone does not offer a sufficient explanation, for we see from Table I that the rabbling times in the three muffles (from top down) are as 3: 1: 4. Yet in the second muffle twice as much sulphur was expelled as in the first one; and in the third one, twice as much as in the second. The ratio of desulphurization from muffle to muffle is, then, constantly as 1: 2, while the ratio of rabbling in the first case is as 3: 1, and in the second case as 1: 4. As a second factor the temperature of the muffle plays an important part. The comparatively low temperature of the topmost muffle partially explains its low desulphurizing capacity. It must be considered, however, that a charge has already reached the ignition temperature of blende (500° C.) a few hours after charging, and so would roast just as well and fast as a charge in the third muffle, if it was afforded the third factor in an equal measure.

This third factor is the supply of air. At the lowest muffle only pure air enters; it reaches the second muffle, charged with SO_2, and gets into the top one charged still more with SO_2. It is only when the working doors are opened that the upper muffles receive pure air. The well known formation of heavy clouds of SO_2 indicate an immediate increase of desulphurization. With the doors closed it is only the air coming from the lower muffles which gets into contact with the ore, and as this air is much rarified in regard to oxygen, desulphurization can only proceed slowly.

In further proof of the influence of these factors I made the following experiments into the lowest muffle: 280 kg. raw blende were charged and distributed over two working doors. As soon as the ore was heated up two men began to rabble it vigorously without intermission. When the men were tired two others immediately relieved them. At regular intervals samples were taken of the charge. Sulphurous acid was given off in thick clouds. The sudden disappearance of these clouds indicated that desulphurization had been completed. The result was the following: Content of the raw blende, 19.2% S; content after one hour's rabbling, 8.2%; content after two hours' rabbling, 3.56%; content after 2½ hours' rabbling, 2.04% S.

At this point the experiment was broken off as the muffle began to cool off rapidly owing to the excess of air rushing in. The experiment was twice repeated with the same result. Hence it was clearly proved that blende may be roasted to a finish in 2½ hours.

Conditions in the Hasenclever-Rhenania Furnaces

The Hasenclever-Rhenania furnaces cannot be said to fulfill the conditions for a rational roasting of blende. But it is obvious that, if the three other factors beside the hearth area could be equalized in all three muffles, their desulphurizing power would become the same, or, in other words, the capacity of the whole furnace would be multiplied. This is, however, an impossibility with these furnaces. In the first place, the working gang cannot be increased without the men interfering with each other in rabbling. Even if this were possible, a simultaneous working at the different muffles is impracticable as the hot gases coming from the lower muffles would be repelled by the cold air entering the upper muffles owing to the manner of admitting the air. Furthermore, continuous work in the lowest muffle is prohibited by the impossibility of preventing the entrance of an excess of air during rabbling by which the muffle would be rapidly cooled as soon as the percentage of sulphur in the blende falls below a certain limit.

I have not made mention as yet of the bogy of roasting plants, a bogy which preferentially hovers about metallurgical laboratories; that is: The formation of zinc sulphate and the alleged difficulty of its decomposition. Such a difficulty does not exist in a well conducted roasting establishment, for always supposing that the roasting process is properly conducted—a noteworthy formation of sulphate does not take place, or rather, the sulphate that may be formed never reaches the lowest muffle, but is decomposed previously. If such cases happen as Mostowitch mentions[1], in which a vendor of roasted blende had to stand a deduction from the agreed selling price on account of the sulphate content of the roasted blende, he should in his turn make a deduction from the wages of the roaster and there would soon be no more complaint.

Zinc Sulphate Not Difficult to Decompose

The zinc sulphate decomposes with the greatest ease as every one who has occasion to produce as much as possible for some purpose or other, will testify to. Even H. O. Hofman in his classic research on the decomposition of zinc sulphate has not succeeded, in roasting blende, in retaining more than a few per cent. of sulphate in the roast, and therefore felt justified in propounding a somewhat venturesome hypothesis to explain the method of leaching zinc at the lower Harz. He says in part: "Probably the sulphates (in fine *schlich*) are formed in this way, that the zinc sulphate which was produced in the interior of the roast heap is decomposed again and that the rising products of decomposition SO_3, SO_2 and O attack the fine *schlich* on the outside causing the formation of normal and basic salts or solely basic salts which are then partially decomposed again as the heat in the heap spreads."

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[1] Metallurgie., 1911, p. 763. cf. Eng. and Min. Journ., Mar. 16, 1912.

But Hofman in his investigation has overlooked one point; that is, he had, in all his experiments in the sulphate roasting of blende, exceeded the temperature of decomposition of the zinc sulphate from the start. The lowest temperature at which he roasted was 650° C.; that is, this was the external temperature perceptible at the pyrometer, which was the sum of the external heat plus the heat of combustion of the zinc sulphide. This heat of combustion gave rise to a locally higher temperature, which decomposed the nascent zinc sulphate as fast as it was produced.

Possibility of Sulphate Roasting

It is quite possible to obtain 60 or even 70% of the zinc in a blende as sulphate, especially if the latter carries iron, only the furnace temperature in roasting must not exceed 600° C. In order to attain this end, the external heat must be restricted as much as possible, the muffle should even be cooled down if it is desired to accelerate the process by an increased draft and livelier rabbling. In this manner I have treated zinc-lead ores high in iron (25% Fe) from Tasmania, in the reverberatory as well as in a Hasenclever-Rhenania furnace, and obtained roasted product which, when plunged in water after cooling, would raise its temperature to the boiling point.

In heap roasting the facts are just the reverse from what Hofman states them to be. The reactions in the interior of the heap rather resemble those met with in pyritic smelting. One part of the pyrite sulphur distills off and matte is formed. Only in the outside strata which are more accessible to air, a slow roasting with formation of sulphate takes place. The formation of matte in the core is just the reason for the necessity of the several successive roastings extending over a period of many months.

At which temperature does zinc sulphate decompose, then, in the roasting furnace? Of the numerous experiments which have been carried out those of W. S. Landis[2] appear to me as best meeting practical conditions. Landis gives the temperature of decomposition in the normal air current as 760° C. The first indications of decomposition became perceptible at 730° C. and at 760° C., all $ZnSO_4$ was completely and quickly decomposed. Doeltz and Graumann[3] also seem to have worked with ordinary air, hence air containing aqueous vapor, and their experiments agree pretty well with those of Landis, although, as may be inferred from their brief account, they worked in such a slow current of air that even at a high temperature (880° C.) the conditions for an equilibrium system $ZnO - SO_2 - O \rightleftarrows ZnSO_4$ could still exist. At any rate they showed that in heating to 800° C. practically all the zinc sulphate is rapidly decomposed. Hofman also worked apparently with a slow current of dry, pure air. His observations on the influence of the thickness of the charge on the time and temperature of decomposition are of great practical interest. He found that for complete decomposition at 836° C. 26 hr. were required if the charge was 5 mm. thick, while 12 hr. sufficed at a thickness of 2 mm., eight hours for a thickness of 0.5 mm. and 803° C., and 12 hr. at the same thickness and 770° Centigrade.

These are conditions which are still more plainly to be noticed in practice; they show how necessary it is to bring each particle of zinc sulphate in contact with air, and air in motion, too, which is capable of quickly removing the dissociation products. As long as the ore is piled up in a heap the decomposition of zinc sulphate progresses extremely slowly. In the interior of the heap conditions of equilibrium undeniably obtain as they were investigated by Wöhler and Plüddemann[4] for the system $ZnO - SO_3 - SO_2 - O \rightleftarrows ZnSO_4$, they were only disturbed when the heap was vigorously and thoroughly stirred.

These researches of Wöhler and Plüddemann have been incorrectly quoted by Thomas[5] in comparison with his own results from which he deduces the fallacy that he succeeded in decomposing zinc sulphate by using steam and carburetted hydrogen at a temperature nearly 100° lower. In fact, Thomas has shown nothing else than that the sulphate by his method—which, by the way, is worthless in actual practice for economical as well as technical reasons—decomposes at a temperature nearly 100° higher than in common roasting practice. Besides, his method takes so much longer. Mostowitsch[6] finds that zinc sulphate decomposes completely when heated up to 850° for one hour, and asserts that at 750° the decomposition proceeds 17 times slower. For the experimental conditions applied by him this may be undoubtedly correct, but the result must under no circumstances be referred to practical conditions.

Experimenters Do Not Follow Practical Conditions

Mostowitsch, and Hofman as well, and in a minor degree Doeltz and Graumann experimented under conditions exactly opposite to actual roasting practice. None of these experimenters had provided for a brisk draft as it is to be found in any good roasting furnace. Hofman and Mostowitsch even worked under pressure, a condition not to be thought of in actual practice, and although the above mentioned experiments of Hofman on the influence of the thickness of the charge clearly indicate the way to be taken, neither of them drew the logical conclusion that the material should be rabbled.

In the course of decomposition of the zinc sulphate, bubble-like coatings of gas particles are formed on the ore, which adhere strongly to them in consequence of surface tension. On this is based the well known phenomenon of the "running" of the blende in the furnace, the individual particles being disposed to dislodge one another. Only by energetic rabbling can these gas spaces be removed. I, therefore, take the view that results, useful in actual practice, can be obtained only when the experiments are carried out in a strong air current and by stirring the material.

Air Supply to Roasters Should Be Hot

For the first condition it would be necessary to use hot air to prevent the chilling of the material. Up to here I consider the experiments made by Landis, who conducts the air over the zinc sulphate by suction and thus creates a feeble vacuum over it, as decisive for practical conditions, particularly since I know that it is quite possible to prepare blende free from sulphate even if the furnace temperature does not exceed 800° C. The temperature of the furnace is usually rated much too high and the necessity of excessive heat on the lowest hearth of the Hasenclever furnace based upon a faulty air supply has given rise to the legend of the difficult decomposition of zinc sulphate.

I say "faulty" air supply, for it is obvious that under present conditions, as soon as the working doors are opened, a large excess of cold air rushes over the ore which, in consequence of an insufficiency of sulphur content, cannot protect itself from getting chilled. In order, then, to obtain the temperature necessary for the decomposition of zinc sulphate the ore should be overheated beforehand. Lessening the draft, perhaps, by inserting a special damper, does not do any good, for a strong current of air is absolutely required. What is the moral then? Heat the air before it enters the lowest muffle.

We now see the importance of a correct air supply and of the manner of heating. If it were not for these shortcomings in the Hasenclever furnace, which cause interruptions in the working of the charge, the desulphurizing capacity of the lowest muffle might be raised to three or four times its present desulphurizing capacity, so that it would have

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[2] Met. and Chem. Eng., Jan. 1910, p. 22.

[3] Metallurgie, 1906, p. 445.

[4] Ber. d. Deutsch. chem. Ges., 1908, I, 703.

[5] Metallurgie, 1910, p. 610.

[6] Metallurgie, 1911, p. 767.

12 times the desulphurizing capacity of the top muffle.

Faulty temperature makes itself known, too, in another way, by the formation of matte and ferrite in the roast. The former occurs when impure blende is left at rest, i.e., without rabbling, for any length of time on the second floor under a high heat and with insufficient draft. In this case a part of the pyrite sulphur (for all impure blende contains some pyrite) distills off and the remaining iron sulphide sinters together with the finest particles of decrepitated blende. It is mainly this agglomerate which renders roasting in the lowest muffle so difficult, especially when, owing to the presence of lead, lead matte is formed. But the blame is always laid on the zinc sulphate when there is any difficulty encountered in roasting. That zinc-iron sulphide remains in the roast to the last has been established already by Jensch.[7]

Zinc Ferrite Due to Faulty Working

Another undesirable case occurs when blende heavy in iron is strongly heated from the outside and briskly worked without a considerable excess of air. It may then happen that the whole of the iron present will combine with zinc forming zinc ferrite. In this way I succeeded, although against my intention, in rendering insoluble in sulphurous acid, 50 to 60% of the zinc content in a Tasmanian ore. The ore in question contained 30% Zn, 18% Fe and 10% Pb, and was roasted in a Hasenclever furnace under the above conditions.

It is noteworthy that after the largest portion of the sulphur had been removed at the lowest possible temperature, the ore could be exposed to the highest heat obtainable in a roasting furnace without any ferrite being formed. Since the ore represents such an intimate mixture of zinc, iron and lead that these ingredients cannot be separated mechanically even when crushed to the finest state all conditions would be eminently favorably for a formation of ferrite. That it does not take place, nevertheless, proves conclusively that the temperature of formation of the ferrite lies considerably higher than 700 or 750° C., as Mostowitsch[8] assumes. Indeed, it must lie considerably higher than 900° C., as Graumann[9] rightly anticipated.

Mostowitsch wants to explain the influence of ferric oxide on the decomposition of zinc sulphate by the formation of ferrite, and quotes a statement of Kohmeyer,[10] who refers to the appearance of magnetism at 700° C., alleged to have been observed by Hilpert,[11] as a criterion for the temperature of formation. But Kohlmeyer quotes wrongly because Hilpert's statement does not refer to zinc ferrite at all but to lead ferrite! Accordingly Mostowitsch's conclusion falls flat and we may be glad that this is so, for else a rational reduction of blende would not be possible as there would always be large quantities of ferrite forming in the roasting furnace when a large percentage of iron is present.

Conditions for Ferrite Formation

Formation of ferrite only then takes place in the roasting furnace when blende is heated excessively from the outside and when sulphur burns up under conditions favorable for the generation of a maximum of heat. In this case the temperature requisite for the formation of ferrite will always be locally produced. That this temperature lies above 1200° C. seems to follow from the experience had in zinc smelteries that, if well roasted ferruginous blende is distilled at too high a temperature great losses will result in consequence of ferrite formation in the muffle. In smelting Australian zinc concentrates at Seaton-Carew the observation was made that at too high a furnace temperature, over 20% more was lost of the total zinc than under normal conditions. The cause was the formation of a heavy solid crust on the charge containing zinc as ferrite from which it could not be recovered even by raising the temperature to the highest attainable limit. If the temperature was kept moderate from the start and was only raised gradually no ferrite was formed and the loss in zinc remained normal.

The admonitions of Lindt[12] have to be supplemented in this, that the zinc smelter will have to direct his attention not only to the zinc ferrite formed in the roasting furnace, but also to that formed eventually in the muffle. The attempt to decompose zinc ferrite by application of higher heat is futile. Only prevention can do good; after-treatment does not avail; it only increases expenses.

From the above we see that a faulty supply of heat can consist in a maximum as well as in a minimum. The same holds good in the supply of air. In regard to the latter there is one point of the utmost importance, to wit—the height of the muffle. If we draw a horizontal line indicating the height of the ore charge through a cross-section of the muffle, an ideal proportion will be when this line cuts the section into halves. The less of the total space the ore occupies in the muffle the worse will be the proportion because the utilization of the air and, therefore, the percentage of the roasting gases in SO_2, will be less. Only in the last muffle the proportion must be changed in favor of a considerable excess of air for reasons already discussed at some length. In the Hasenclever furnace there is this special drawback, that the last third or quarter of the lowest muffle, i.e., the space between the last two working doors, is totally unfit for a successful finishing roast. Here the air never sweeps completely over the spread-out charge, besides only cold air brushes against the ore whereby it is rapidly cooled and can only be worked for a short time. It is, therefore, advantageous not to move the ore to this place at all, but to do the finishing work from the two previous doors. The space behind the last two doors may then be filled with pieces of firebrick and the air may be admitted through special openings in the end of the muffle, so that it sweeps over the hot firebrick and comes hot in contact with the charge to be finished.

From the above it becomes evident that a good blende-roasting furnace must be so constructed that it will fulfill the following conditions: (1) The ore must be quickly brought to the temperature of ignition which is produced by external heat or by the hot roast gases; (2) the ignited blende must be deprived of most of its sulphur by vigorous rabbling and moderate draft, but without external heat; (3) the almost desulphurized blende must be brought in contact, at a temperature not exceeding 800° C., and lively stirring, with a heavy current of air without getting chilled; (4) the space occupied by the ore must be to the free space of the muffle as 1: 1, or as near this proportion as possible.

(To be concluded)

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[7] Zeit. f. angew. Chemie, 1894, p. 50.

[8] Metallurgie, 1911, p. 772.

[9] Metallurgie, 1907, p. 70.

[10] Metallurgie, 1910, p. 292.

[11] Ber. d. Deutsch. chem. Ges., 1909, p. 2251.

[12] "Metallurgie," 1909, p. 746.

Spanish Metal Exports

Exports of metals and minerals from Spain, seven months ended July 31, as reported by *Revista Minéra*, in metric tons, were:

Metals	1911	1912	Changes
Pig and mangt. iron	27,526	26,137	D. 1,389
Copper	8,924	13,484	I. 4,560
Copper precipitate	9,301	8,511	D. 790
Lead	93,972	109,883	I. 15,911
Zinc	1,158	1,366	I. 208
Quicksilver	1,480	1,470	D. [illegible]
Minerals			
Iron ore	4,671,897	4,926,584	I. 254,687
Manganese ore	20,912	19,936	D. 976
Copper ore	206,769	85,899	D. 120,870
Lead ore	1,837	2,086	I. 249
Zinc ore	84,279	68,931	D. 15,348
Pyrites	1,555,859	1,709,599	I. 153,740
Salt	342,220	403,171	I 60,951

Pyritic ores are now classed as pyrites unless they carry 2.5% or over in copper. Last year the dividing line was 1% copper.

Sale of Nitrate Lands

The government of Chile has announced an auction sale of nitrate lands, to take place in Santiago, Chile, on Dec. 2, 1912. Full details may be had on application at the Chilean Legation in Washington, or the Chilean Consulate in New York.

The Mexican Mill, Virginia City, Nev.

By Whitman Symmes*

At the Mexican mill on the Comstock Lode the ore is all-slimed and cyanided without preliminary amalgamation or concentration; an extraction of from 93 to 95½% is obtained. Gelatinous clay in the ore made impossible a clear overflow from Dorr thickeners. A new method of precipitating with zinc dust is employed.

The orebody now being worked in the Mexican mine lies in the hanging wall of the Comstock lode. On the 2500 level the ore has well defined clay walls, and occurs as a breccia of mineralized quartz, cemented by clay and some sulphides. Above that level it divides into forks and bunches, where the shearage which formed it, coming up from the main Comstock vein matter, dissipated its movement among a multitude of minor fractures of the hanging wall. The main, and richer portion of the orebody, between the 2400 and 2500 levels, was easily followed without special sampling, and part of it, averaging about $80 per ton, has been stoped and shipped to a smeltery. The water has not been reduced below the 2500 level since 1884.

The Mexican Mill, Virginia City, Nev.

All the ore now being mined must be sampled, round by round, before being broken. However, a face may sample $50 and the round broken may sample $2; or behind a face sampling $2 may be found a bunch or a knot of quartz stringers of sufficient value to make the round broken sample $50.

Ore Supply Erratic

On account of the limited size of the orebody above the present water level, and its uneven tenor, it has not as yet been found possible to supply the mill with ore of the same character or value, day by day. The ore sent to the mill consists of hard quartz, crushed quartz with clay, quartz stringers in hard diorite, quartz stringers in hard diabase, and quartz stringers in decomposed diabase. In spite of our best efforts, the head samples will some days average $15, and on other days $40. Sometimes the stamps will be crushing hard quartz or diorite at the rate of 60 tons per day, and at times they will be crushing soft clayey ore at the rate of 125 tons per day. These irregularities, which we have not yet been able to overcome, require constant attention, and militate against our obtaining the best results in milling and cyaniding.

A composite sample of ore from the main deposit between the 2400 and 2500 levels, analyzed as follows: Silica, 80.56%; lead, 1.57; zinc, 1.60; copper, 0.78; sulphur, 2.17; aluminum oxide, 5.92; ferric oxide, 3.78; calcium oxide, 1.05; magnesium oxide, 2.21; moisture, 0.36; gold, about 2.5 oz. per ton; silver, about 50 oz. per ton. The value of the ore averages about two-thirds in gold, and one-third in silver. In one part of the mine, 50% of the value is in silver, and in the smaller irregularities of the deposit the gold is in excess of the average. The silver occurs as sulphide. Gold is rarely visible in the ore, but the gold occurs free, and intimately associated with the lead and zinc sulphides. Stephanite is supposed to be one of the common silver minerals of the Comstock, but no antimony has been found by analysis, although the strongly reducing action of the ore in the cyanide tanks, and the difficulty of obtaining good precipitation, is constantly suggestive of it.

In order to devise the proper method of mill treatment, five lots of ore, from different portions of the deposit, were separately tested at the works of the

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*Superintendent, United Comstock Pumping Association; superintendent, Mexican Mining Co., etc., Virginia City, Nev.

California Ore Testing Co., in San Francisco. Tests of composite samples of the ore were also made. The work was ably directed by Abbot A. Hanks, manager of the above works, according to plans agreed upon with me from time to time. The tests comprised various combinations of crushing to different degrees of fineness, with amalgamation, concentration and cyaniding. Concentration was made upon both vanners and tables. In all methods of extraction tried, the finer the grinding the better were the results. When tube milling so that 96.5% passed a 200-mesh screen, 58 to 76% of the gold, and 8 to 33% of the silver were obtained as amalgam, and by amalgamation and concentration 82 to 89% of the gold and 66 to 69% of the silver were obtained. By further cyaniding the tailings, the total extraction was 87 to 97% of the gold and up to 94.6% of the silver. By prolonged treatment and exact work, the gold in the tails was reduced to 0.01 or 0.02 oz., and the silver to about two ounces.

Further tests were then made by tube milling and cyaniding without either amalgamation or concentration, and much to our surprise, this method promised the best results. When crushing so that 92% passed a 200-mesh screen, we obtained as low tails as by the other methods, and the cyanide consumed did not appear to be greater than when cyaniding the pulp after concentration. The cyanidation of a richer pulp, containing base sulphides, which would in time foul the solutions and lower their power of extraction, seemed warranted by the avoidance of concentration, with its accompanying costs for plant, treatment, freights and smelter deductions.

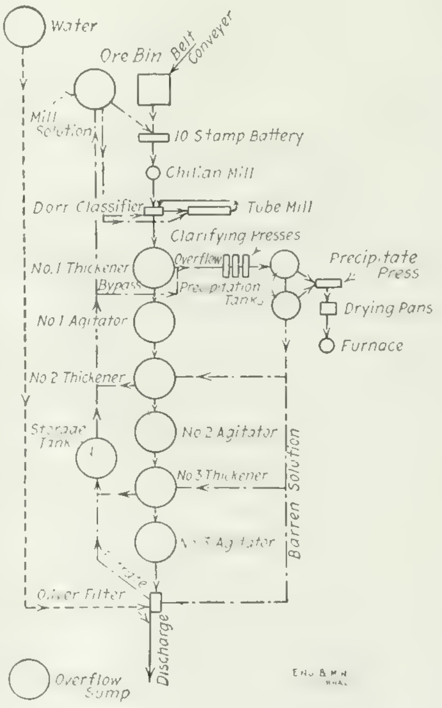
ORE CRUSHED AT UNION SHAFT

The ore is crushed at the Union shaft, which is 630 ft. from the mill bin, in a No. 3 McCully crusher. No grizzly is used, and the crushed ore falls on a 14-in. Robins belt conveyor, 321 ft. long. This delivers it to a 10x12-in. iron-lined chute, resting on the old waste-dump at an angle of 36°, and delivering into a storage bin, built into an excavation in the dump. From this bin a second 14-in. Robins conveyor, 188 ft. long, carries it to the mill bin. The ore is fed from bin to belt by a short 22-in. belt conveyor placed beneath the chute, and the lower conveyor is run only at such times as it is desired to fill the mill bin. These bins have flat bottoms, and capacities, without resorting to shoveling, of 70 and 150 tons, respectively. An 8x12-in. jaw crusher is installed on the first bin for crushing ore from open storage piles, at the side of the old dump, and ore can thus also be crushed and sent from mine to mill by rail in case of a breakdown of the gyratory crusher, or of either of the belt conveyors.

One man attends to the upper belt conveyor and the gyratory crusher on the afternoon shift, when most of the ore is hoisted. Ore hoisted on the other shifts is put through the crusher by the top carman of the Union shaft. Each car is weighed on a platform scale in the crusher house and under present conditions the installation of an automatic weighing machine would not pay for itself. The head samples are taken by hand by making cuts with a broad shovel through the stream of ore at the end of the lower belt conveyor, while filling the mill bin. Sampling of the battery feed was at first tried, but on account of the difficulties of obtaining an even mixture of the ore at that point, the assay results were too low.

MILL MACHINERY

The mill was first designed for a capacity of 70 tons per day. This was changed by increasing the weight of the stamps and leaving space for the installation, when desired, of a second tube mill, in the belief that the capacity could thus be increased to between 90 and 100 tons.



FLOW SHEET OF THE MEXICAN MILL

As at present constructed, the mill contains 10 stamps of 1250 lb. each, one Goldfield type chilean mill, one 5x18-ft. tube mill, one duplex Dorr classifier, three 14x24-ft. Trent agitators, three Dorr thickeners, (14x24 ft. and 14x26 ft.) one 11½x16-ft. Oliver filter, with vacuum pump, one 10x10-in. compressor for filter and air lifts, three clarifying presses, and two 6x20-ft. precipitation tanks. On the cleanup floor are a 5x7½-ft. steam pan, a filter press for the precipitate, a No. 525 Steele-Harvey furnace with blower, and a 40-hp. locomotive boiler for heating the mill and the solutions. Outside the mill building are four tanks for water and solution storage.

THE ORE IS ALL SLIMED

In the Mexican Mill cyanidation is continuous, and the flow sheet is simple. In order to cyanide $25 or $30 ore instead of $5 or $6 tailings, as would be done in a plant employing concentrators, greater dissolving power must be provided, and the dissolving power of the solutions must be maintained as high as possible by precipitation and other means. These conditions are found to be of the greatest importance in cyaniding the Mexican ore, on account of the base sulphides present, and their effect in lowering the extractive value of the solutions.

From the stamps the pulp passes to the chilean mill, without classification and thence it goes to a Dorr classifier. The sands are fed to a tube mill, and the tube-mill product is returned to the classifier. The slimes from the classifier flow to the cyanide department.

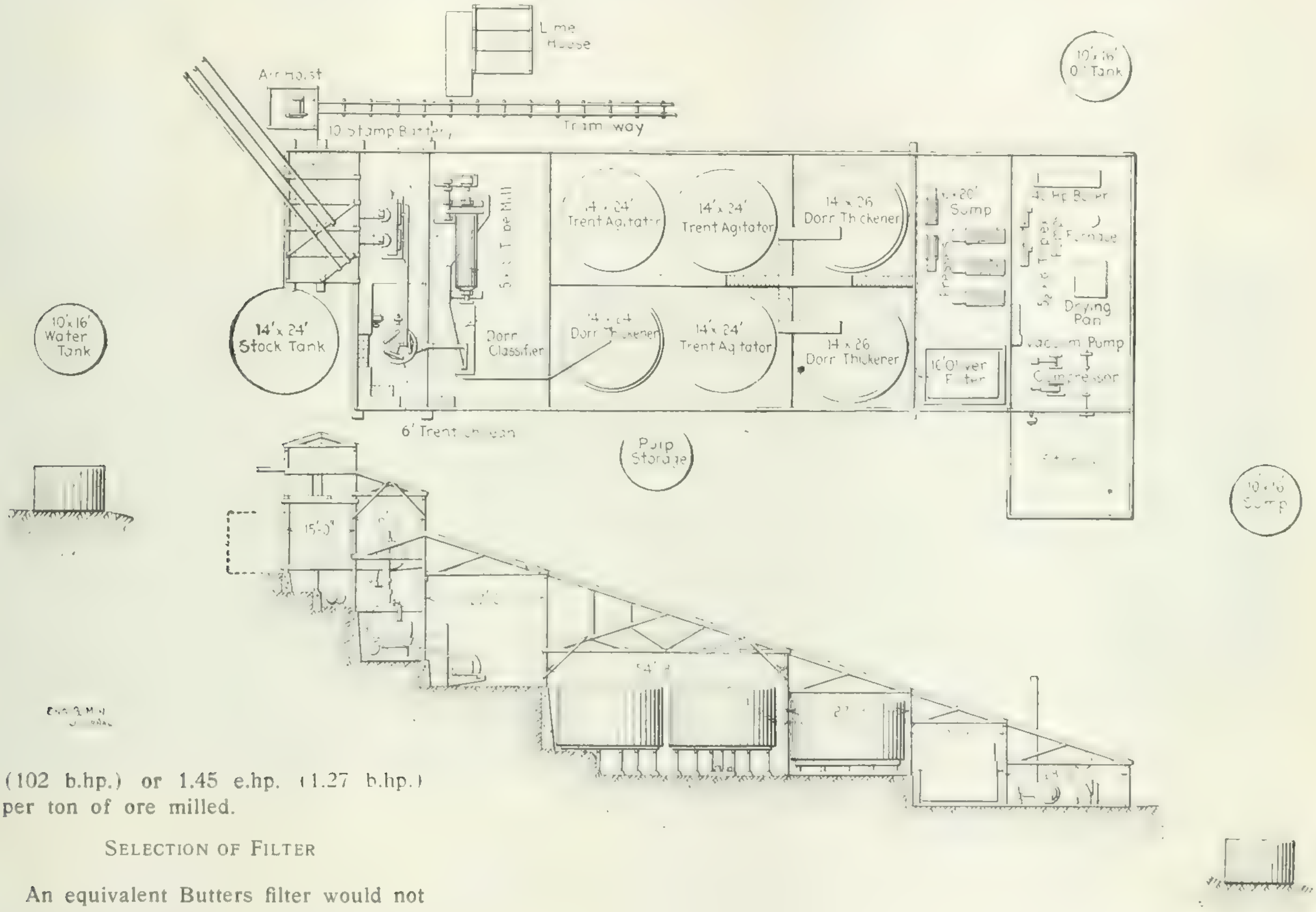
The pulp from the classifier, having a ratio of about eight of water to one of dry slime, flows into No. 1 Dorr thickener, where it is thickened to a ratio of 2:1. Thence it is delivered to No. 1 agitator, where it meets a stream of barren solution which dilutes it, on entering, to 4 or 5:1. It is then thickened to 2:1, and delivered to No. 2 agitator. The pulp from the latter is similarly diluted to 4 or 5:1, and thickened again in No. 3 thickener, from which it passes to No. 3 agitator and thence to the Oliver filters. In the latter it is further diluted and washed with barren solution, and is then washed with water.

The solution from the No. 1 thickener, having the greatest value, is pumped through the clarifying presses into the precipitation tanks. The overflow from No. 2 and No. 3 thickeners, and the filtrate from the Oliver are pumped up to the main storage tank to be used in the milling department. The barren solution from the precipitation tanks is used for diluting the pulp as it goes into the No. 2 and No. 3 thickeners, and for diluting and washing in the Oliver filter.

DESIGN ADAPTED TO MILL SITE

Slime is moved by a rubber belt-and-bucket elevator, which takes the tube-mill product back to the classifier, and by air lifts between the thickeners and agitators. Since the agitation is in tanks of the same height as the thickeners, the transfer from the thickener to agitator and from the agitator to thickener is easily carried out in the Mexican mill, and is the justification for the installation of flat-bottom agitators, instead of Pachucas. To have used Pachucas would have necessitated either carrying the thickeners on a high timber support, and separating the cyanide department from the mill, in order to obtain the proper elevations, or else doing an immensely increased amount of excavation, with construction of high retaining walls, for which the mill site was not well adapted.

The installation of 20 stamps feeding direct to the tube mills is an attractive alternative design, but stage crushing with 10 stamps and one chilean appears to have justified itself in the lower cost of renewals and the smaller amount of power consumed by the chilean. When crushing 80 tons per day so that 86% passes 200 mesh, the power consumed is as follows: Stamps, 32.1 e.hp.; chilean, 19.8; tube mill, 58.7; total, 110.6 e.hp. (102 b.hp.) or 1.45 e.hp. (1.27 b.hp.) per ton of ore milled.



Plan and Section of the Mexican Mill

Selection of Filter

An equivalent Butters filter would not only have cost more than twice that of the Oliver, but in addition we would have had to provide the necessary storage tanks and pumps with increased excavation, and a larger mill building. It would have required the employment of one more man on each shift, and taking into consideration the comparatively small capacity of the mill, this extra cost did not appear to be justified. The weak point of the Oliver filter is its inability to obtain a good wash, and therefore its inability to remove sufficient of the dissolved gold-silver content of the pulp, except when the solution in the pulp going to it is of low value. The late John B. Fleming told me that he took this feature of the Oliver as his starting point in the design of the Nevada Hills mill, and provided as much displacement is possible of the richer solutions by poorer ones, before sending the pulp to the Oliver filter. The system of displacement by dilution and thickening, described above, we believe to be essential to the continuous cyanidation of the Mexican ore, and is not used merely for the purpose of sending solutions of low value to the Oliver. But it leaves the solutions of such low value that some one of the filters that give a better wash is not necessary.

The stamps are driven by a 40-hp. Westinghouse back-geared motor. The chilean and tube mills are driven by silent-chain drives. The centrifugal pumps are driven by either silent chains or by direct motor connections, and except on the lower floor, at the Oliver filter, there are no countershafts worth mentioning in the entire mill.

On the afternoon and night shifts only two men are in the mill, one in the crushing department and one in the cyanide department. On the day shift there are employed, in addition, a mechanic, one man sampling and testing, and three men for general work, such as attending to clarifying presses, taking head samples, caring for the lower belt conveyor, handling supplies and assisting at the cleanup. Additional mechanics are also employed from time to time to make such changes in the mill as are found necessary for its improvement.

Finer Grinding Will be Inaugurated

The feed to the stamps is split, to better distribute the ore. The stamps are now dropping 6 to 6½ in., 104 times per minute, the outside stamps being given the shorter drop. The screens used are 4 mesh and the battery product contains 4 to 7% of material that will pass 200 mesh.

The pulp is fed to the chilean mill without classification. Most of the screens are "ton cap," 24 mesh (opening 0.018 in.). The flow through the chilean mill is regulated by using one or two screens of finer or coarser mesh, as required, and also by adjustment of coarse inside screens, which blind the discharge. About 43% of the chilean-mill product will pass 200 mesh.

The overflow from the Dorr classifier contains between 84% and 91% of 200-mesh material. We intend to grind finer in the near future. The tube-mill feed contains 17% of 200-mesh material, and 51% of the product will pass 200 mesh. Hard cast-iron ribbed liners, of our own design of local make, are in use, and have given excellent satisfaction. With these liners the speed of 26 r.p.m. appears to be ample. Contrary to the experience of others, we seem to obtain best results with a pulp containing 42% of moisture. The tube-mill product is returned to the Dorr classifier. Lime in solution is added at the classifier, and solid lime is also suspended in No. 2 agitator.

Dorr Thickeners Used

During the first few months of operation we encountered many difficulties, and one of the worst of these that we had to contend with, was the impossibility of obtaining a clear overflow from the Dorr thickeners. All possible proportions of lime were experimented with, without result.

The ore contains a small amount of gelatinous clay, which holds the air bubbles like a rubber sponge, and makes the clay float upon the surface of the thickeners. It crowds into the overflow launders, and soon chokes up the clarifying presses, where filtration ceases when the cake is ¼ in. thick and under 20-lb. pressure. The material shown in one of the illustrations is not foam, but contains above 40% of solids. We built a ring inside the circle of the launders, to hold some of it back, and tried sprays, without adequate result. Finally we decided greatly to increase our clarifying capacity, and take care of it in that way. It was not till the additional clarifying presses were installed that we were able to handle a fair tonnage or to average better than 90% extraction.

Agitators Give Trouble

We have had considerable trouble with the Trent agitators, the total time lost in operation of the mill being greater on their account than from all other causes put together. The same machines appear to behave well in the Tonopah Extension mill, which was the reason for our selecting them, but they are there used for intermittent and not for continuous work. In our mill if anything goes wrong with an agitator, the entire mill must be stopped for nearly a day or else the passage of the pulp through the mill must be unduly accelerated. In a foreign advertisement of the Trent agitator, it is stated that, "Cyaniding, formerly a complex nightmare, becomes a delightful experience." But in our climate the action seemed to be different. The nozzles are easily stopped up. A few small slivers of wood will soon bring the agitators to a standstill. At first we heated them by means of 2-in. steam pipes, as used in the mill of the Tonopah Mining Co., and kindly sketched for us by its superintendent, A. R. Parsons. But a cake of mud formed on the pipes, and if a little of it got knocked loose, it would choke the nozzles and stop the agitators. The nozzles cannot be blown out with compressed air because nearly all the air will boil up in the center of the tank, coming out through the central sleeve. We installed a slime pump for emptying the agitators, and when doing so, of course, we had to accelerate the cyanidation. The installation of an extra agitator would unduly complicate the pipe connections. By additional agitating devices in No. 3 agitator, we reduced the undissolved gold and silver by 30c. At present we are changing the agitators so as to obtain a stronger agitation, and so as to allow the parts to be removed for repairs without emptying the tank.

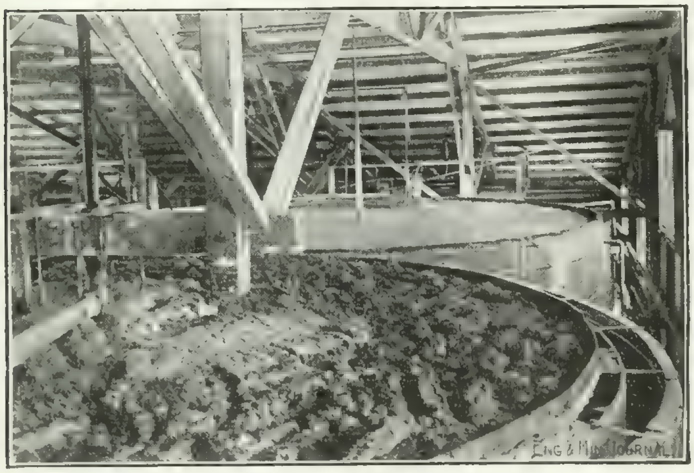
We have tried to retard the flow of the sulphides through the agitators as much as possible. It required considerable experimenting to obtain the proper point above the bottom of the tank at which to withdraw the pulp. If it was taken off too low down the sulphides were shunted through to the Oliver at a very expensive speed; and if the point was too high up, concentrates were built up on the bottom of the tank until they stopped the agitators. The proper point varies, of course, with an alteration in the thickness of the pulp.

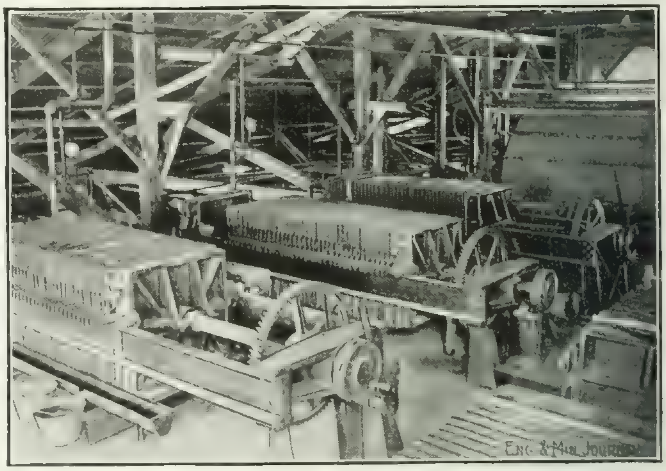
Operation of Oliver Filter

It took us a long time to obtain good results from the Oliver filter, and at first the dissolved gold and silver lost in the cake was from 40c. to 50c. per ton. We are now washing with 50 sprays, in addition to three perforated pipes, and are going to add more sprays. The sprays and pipes on the ascending side of the drum deliver barren solution, and those on the descending side deliver water. A large excess of barren solution is used, which runs down into the filter tank and dilutes the pulp from 2:1 up to about 4:1. With the two perforated pipes specified by the manufacturer for supplying the wash, the latter was unevenly distributed, the cake cracked badly, and nearly all the wash was drawn through the cracks. We cut down the side of the steel tank and placed sprays right down to the level of the pulp. We also added a second vacuum chamber, with a valve to suit, and we try to maintain a light suction on the portion of the drum immersed in the pulp, and a heavy suction on the portion that is being washed. Mr. Oliver states that he formerly supplied two separate suctions upon his filter for the purpose of keeping the cyanide solution and the wash solution separate, but that he discontinued doing so because nobody seemed to make use of the arrangement. Our double suction, however, does not separate the two grades of solution, but is for the purpose of decreasing the thickness of the cake while maintaining a maximum suction on the wash. The dissolved gold and silver lost in the cake now amount to only 8 to 10c. per ton, and often less. The discharged cake is washed away by a stream of water.

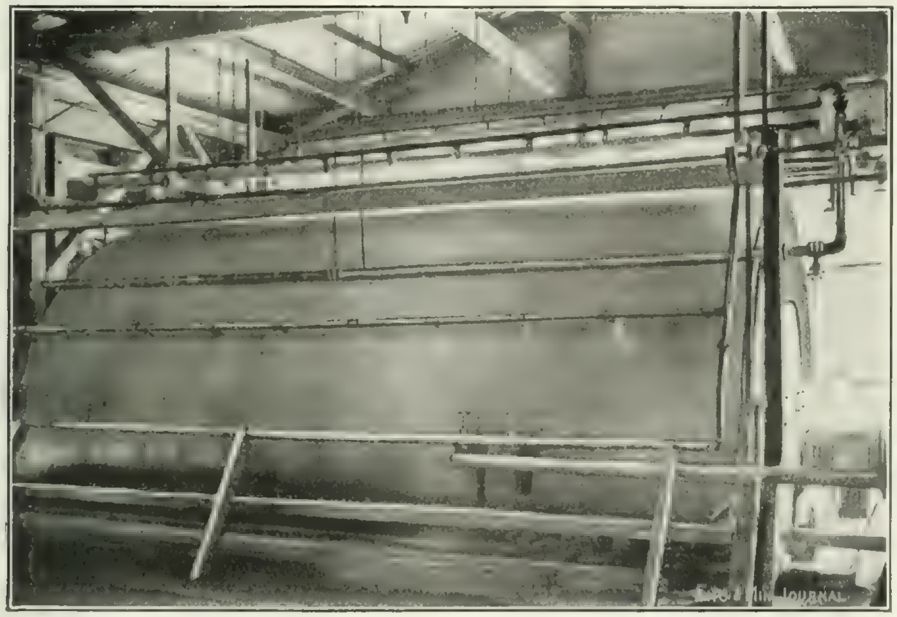
New Dust Precipitation Method

The clarified solution falls into the two 6x20-ft. sump tanks. These have filter bottoms built into them, upon which a layer of zinc dust is formed by hand. The solution to be precipitated is sucked through the zinc dust by a 5x8-in. triplex pump, which delivers it into the barren-solution pipe line. When the zinc dust in one tank shows signs of exhaustion, a fresh layer of zinc is charged into the other tank and the first tank is exhausted


Dorr Thickener Floating Slime 40% Solids


Clarifying Presses and Oliver Filter

and cleaned up. The precipitate is stirred up and pumped by a piston pump into a small filter press, whence it is dropped into the steam dry pan. We have tried the ordinary system of zinc-dust precipitation with a continuous feed of zinc, but did not obtain nearly as good results as by the above method. At first we had considerable difficulty with the new system, but since learning the proper details of manipulation, it has given great satisfaction. We do not have to trouble ourselves with automatic feeders that get stuck, nor do we have to change the rate of feed from time to time to correspond with the varying value of the solution to be precipitated. Patents upon the method of zinc-dust precipitation have been granted, or are pending in the principal mining countries, the patentees being W. E. Trent and myself. Where ample precipitating capacity is installed, so that time can be taken to almost entirely consume the zinc-dust layer, bullion can be obtained of almost any desired degree of fineness. Although our ore is quite base, one shipment of 1205 lb. of bullion, from the zinc-dust tanks, without acid treatment, averaged 899 fine.



Oliver Filter, Ascending Side, Showing Wash Pipes and Sprays

General Results

The extraction now being obtained is from 93 to 95½%. Thus far the bullion recovered has checked up quite closely with the apparent extraction, as shown by heads minus tails. The extraction would average better if we would stop our experimenting. When the mill was nearing completion, the president of one of the Tonopah companies complimented us on its compact and neat arrangement, and kindly remarked that he thought that we had worked out a very good design. I thanked him, but told him that we did not look at it just his way, because we expected to be designing that mill for the next two years. The last two ounces of silver from the Mexican ore cannot be extracted by the ordinary cyanide process, so that 94 to 96% is the maximum extraction that can be looked for. Most of our experiments are being made for the purpose of ultimately obtaining more practical operation, freedom from shutdowns, and lower operating costs. The cyanide consumption was originally about 3.25 lb. per ton of ore. This has been reduced to 1.25 lb. (100%), but the latter amount appears to be too small; extraction fell to 92%, and we are now increasing the amount somewhat.

JUNE TREATMENT COSTS AT MEXICAN MILL

	Estimated cost per ton
Milling	
Crushing and conveying	$0.116
Milling	0.022
General labor	0.117
Labor on repairs and renewals	0.060
Stamping	0.085
Chilean milling	0.222
Tube milling	0.176
Cyaniding:	
General labor	0.212
Labor on repairs and renewals	0.081
Cyanide	0.423
Lime	0.026
Lead acetate	0.021
Thickening	0.017
Agitating	0.053
Heating	0.150
Filtering	0.072
Clarifying and precipitating	0.184
Melting	0.074
Marketing bullion	0.314
Assaying:	
Labor	0.033
Supplies	0.021
Laboratory and testing:	
Special labor	0.027
Total	$2.506

The milling cost at first was $3.25 per ton. The net cost of operation for June, 1912, in the treatment of 2349 tons, is shown in the accompanying table: This cost does not include the cost of alterations and additions then being made. We are now installing a second tube mill, which will somewhat increase our capacity. It will probably be some months yet before a reliable statement of costs can be made up.

The problems encountered in the development and operation of the mill have been worked out jointly by Charles R. Morris, mill superintendent, and myself, and as the actual work has devolved upon the former, it is to him that most of the credit of bringing the mill to its present efficiency is due.

A Historic Blast Furnace

When Cedar Point furnace, Port Henry, N.Y., was blown out June 9, 1912, preparatory to being replaced by a new stack, what is believed to be the oldest original furnace shell in operation in the United States ended its long period of usefulness. This shell is credited with a life of 37 years and during the greater part of this period the furnace either was actively producing pig iron or was idle temporarily for relining and incidental repairs, according to the Cleveland *Iron Trade Review*.

In addition to being probably the oldest active furnace in the country, the plant also has the distinction of being historically notable. It was the first furnace to use the Whitwell hot blast stoves which were imported from England at a cost of over $100,000. These stoves were 29 ft. in height and 22 ft. in diameter. It was to equip this stack that Thomas F. Whitwell, the builder, invented bronze tuyeres, which he afterward patented. He also first made use of dynamite and of blow-pipes through the tuyeres for removing scaffolds. The managers of this plant were among the first to use a chemical laboratory to correct their mixtures, and it was the first blast furnace in the country which had a laboratory as a regular attachment to the works.

Cedar Point furnace was designed by Thomas F. Witherbee and was built during the boom period of 1872 and 1873, at a cost of about $700,000. It was blown in in the fall of 1875. At the time of its construction, it was considered the most uptodate blast furnace in the country. Its dimensions originally were as follows: Height, 69 ft., 3 in.; bosh diameter, 16 ft., and hearth diameter, 9 ft. It used anthracite as fuel, but later a mixture of anthracite and coke was adopted. It was first blown in on bessemer iron for the Troy Steel Works. The output was increased from time to time, and the furnace has made as much as 200 tons per day.

Considerable stone was used in the lining of the original furnace and this, quite remarkably, remained until 1903, when it was found necessary to remodel the stack. These improvements were accomplished in an interesting manner. The original shell was left standing and an inner shell was built, 3 ft., 8 in. inside of the former and 23 ft. above the mantel.

Vertical columns, 20 ft., 5½ in. long, were set upon the old mantel and the second mantel was set on top of them to hold the brickwork from this point. The inner shell was water-cooled by sprays. The lining from the top of the first mantel to the second mantel was 13½ in. thick. Above this point, 2 ft. 3 in. of new brickwork were laid and the space between the shell and the new brickwork was filled-in with old bricks. The dimensions of the furnace, when these improvements were completed, were: Height, 70 ft., hearth, 10 ft., bosh, 17 ft. and stock line, 11 ft. 6 in. The hearth jacket consisted of water-cooled plates fastened together by means of links shrunk in position with one large band at the bottom and another at the top. The bosh was constructed by similar water-cooled cast-iron plates bolted together with one large band at the bottom of the bosh and at the tops of the tuyere breasts, which were also of cast iron.

The blowing equipment of the stack, which is still intact, is of interesting design. The engine is of the walking-beam type, which was built by H. G. Morris & Co., Philadelphia, in 1872. It is practically an inverted beam engine. The air cylinder is 100 in. in diameter, the steam cylinder, 60 in. in diameter and the stroke, 96 in. The capacity is about 1200-hp. The steam and air cylinders are vertical and a pair of beams is disposed at either side of the main frame at the bottom. The engine had a pair of outside flywheels, similar to the old type beam engine. This engine is, probably, the only blowing unit of its type ever built. The original Morris engine, built for the plant, is still in serviceable condition and will constitute a part of the auxiliary blowing equipment of the new furnace, when completed.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie Canals in August was 10,852,852 short tons, an increase of 71,348 tons over July. For the season to Sept. 1, the total freight was, in short tons:

	1911	1912	Changes
East-bound......	21,100,586	31,315,627	I. 10,215,041
West-bound	10,387,737	10,169,299	D. 218,438
Total...	31,488,323	41,484,926	I. 9,996,603

The total number of vessel passages this year was 13,330, showing an average cargo of 3112 tons. Mineral freights included were as follows, in short tons, except salt, which is given in barrels:

	1911	1912	Changes
Coal.................	9,342,549	8,990,020	D. 352,529
Iron ore .. .	18,695,622	27,753,132	I 9,057,510
Pig and mfd. iron.	260,684	378,963	I. 118,279
Copper	71,078	60,772	D 10,306
Building stone	4,137	2,282	D. 1,855
Salt, bbl	382,896	405,112	I. 22,916

Iron ore was 66.9% of the total freight and coal 21.7% this year. The decrease in coal traffic was entirely in anthracite, bituminous being about even with last year.

The Estimation of Arsenic and Antimony

By Harley E. Hooper*

Having frequently to analyze arsenical concentrates, speisses, slags, mattes, etc., I have recently had occasion to test the accuracy of the current methods. Those which present the most attractive features, as regards ease and rigidity of working, are undoubtedly the methods by which the arsenic is got into solution by a fritting with zinc oxide and sodium carbonate, and afterward extracted with water as sodium arsenate. This, however, invariably gives uniformly low results, as compared with a method I shall describe, which I have proved accurate by using known quantities of pure antimony and arsenious oxide to compose a typical ore. The arsenious oxide in fritting always showed a loss.

For the purpose of comparison, a variety of samples were assayed by both methods, in most cases being run in duplicate. For convenience I have called the old one the "frit method" and the new one the "wet method."

Sample	Frit Method As%	Wet Method As%
Blanket concentrates, "A"	2.4	3.25
Blanket concentrates, "B"	3.4	3.8
Blanket concentrates, "C"	2.3	2.9
Roasted vanner concentrates	0.9	1.35
Raw vanner concentrates	8.7	9.5

A small nickel crucible with a cover was used for the frit determinations, but for the subsequent variations of the frit itself, no cover was used beyond a thick layer of the frit mixture. These were carried out on the last sample: Similar conditions to the last experiment, but no crucible cover, 7.9%; a No. 1 porcelain crucible used instead of the nickel, 5.8%; MgO substituted for ZnO in mixture, nickel crucible, 2.8%; MgO substituted for ZnO in mixture, porcelain crucible, 1.2%. The magnesium oxide was used with a view to determining the antimony in the water-leached residue. When this was tried with the former mixture it was found impossible to separate the large excess of zinc from the antimony when precipitating with hydrogen sulphide.

Varying temperatures were tried with the fritting method, and different rates of heating up to a bright red, but in every case low results were obtained, due, I assume, to a small quantity of the arsenic volatilizing. This was borne out by the loss being greater with an ordinary shallow porcelain crucible than with a comparatively deep nickel one. Large excesses of frit mixture over the usual amount prescribed (10 times the weight of the arsenic present) were tried, but without eliminating the loss. The arsenic in the water extract was in each case determined by the acetic-acid modification of Pearce's silver-arsenate precipitation.

Pearce's original fusion method was tried, but found wholly unsuitable, owing to the large amount of gelatinous silica precipitated after acidifying with nitric acid or acetic acid. The presence of sodium acetate either from this or the fritting method causes a fine white silky crystalline precipitate containing silver, to be thrown down, when silver nitrate is added to precipitate the arsenic. This occurs more particularly with samples carrying only about 1% arsenic; it is soluble on considerable dilution, but a large bulk of solution is inadmissible on account of the solubility of the silver arsenate. My wet method reduces the sodium salts present to a minimum.

Method Finally Adopted

The solutions required are, for arsenic: Ammonium thiocyanate, 7.6 grams of the pure salt per liter; 1 c.c. is equal to 0.0025 grams of arsenic; a strong solution of silver nitrate, to which a drop of ammonium hydrate has been added, the bottle shaken and the precipitate allowed to settle; this insures the absence of free acid; ferric-alum indicator, a strong solution of iron alum, about 1 c.c. being needed for each assay. For antimony: Iodine, about 10.6 grams of iodine in 20 grams of potassium iodide per liter. The iodine can only be weighed roughly and the strength of the solution is such that 1 c.c. is about equal to 0.005 grams antimony.

Take 0.5 to 2 grams of ore, place in a 4-in. casserole and carefully add 10 to 15 c.c. of concentrated nitric acid. Evaporate to complete dryness over a slow heat,, preferably a water bath. When dry, add 15 c.c. concentrated hydrochloric acid and allow to stand for a few minutes in a warm place (don't heat) until the solution of the antimonic oxide is effected. Stir, to break up any crust, and then swirl the whole into a 350-c.c. flask, fitted with leading tubes; wash any residue into the flask with concentrated hydrochloric acid from a wash bottle (no water may be used), warm to about 65° C, only, making up the bulk of the solution to about 50 c.c., and pass hydrogen sulphide until all the arsenic is precipitated and the supernatant liquor is clear. This takes place rapidly and requires little hydrogen sulphide, since flasks may be connected in series. Rewarm and repass hydrogen sulphide, if necessary, but never finish passing the gas unless the solution is cold. Filter cold through an S. & S. hardened 11-cm. No. 575 filter paper, washing three times with cold concentrated hydrochloric acid and then with dilute hydrochloric acid, and finally with water. The residue and filtrate are treated for arsenic and antimony respectively.

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*McKinnon Parade West, North Adelaide, Australia.

ARSENIC DETERMINATION ON RESIDUE

Wash into an 8-oz. beaker with as small a quantity of water as possible. Evaporate to just about dryness over a water bath and then add cautiously under the cover a few cubic centimeters of fuming nitric acid. Heat over a water bath until the red fumes and excess of nitric acid are driven off; take up with a little water, warm to dissolve any precipitate, dilute to about 100 c.c., add a few drops of phenolphthalein and then sodium hydrate until two drops past neutral. Add glacial acetic drop by drop until one drop just discharges the red color. Precipitate the silver arsenate by adding the strong neutral solution of silver nitrate, a small quantity at a time, stirring and frequently allowing to settle; the right amount is soon recognized by the precipitate settling rapidly and leaving a clear solution, which gives no further precipitate with a drop of the precipitant. Allow to stand a few hours, if convenient. Filter through an 11-cm. filter, wash thoroughly with cold water, and test the filtrate. Dissolve in dilute warm nitric acid by pouring the acid through the filter and titrate with the standard solution of ammonium thiocyanate, using 1 c.c. of the strong solution of ferric alum as an indicator. Standardize the ammonium thiocyanate with 0.2 grams of silver dissolved in nitric acid or its equivalent of recrystallized silver nitrate.

ANTIMONY DETERMINATION IN FILTRATE

Dilute largely with boiling water, upon which the antimony precipitates immediately. Pass hydrogen sulphide until it is certain that all the antimony is thrown down, filter through a hardened paper and wash with water; hydrogen-sulphide water should be used for fine work, but in ordinary rapid determinations no loss occurs through oxidation of the sulphide. Allow the filtrate to stand in case any doubt is felt as to the thorough precipitation of the sulphide. Wash the precipitate into one of the original flasks with a fine stream of warm concentrated hydrochloric acid, using about 40 c.c. of the acid, warm over a water bath until the antimony sulphide has completely dissolved. To get rid of any trace of hydrogen sulphide, for rapid work it is sufficient to dilute with water and boil for a few minutes, for exact work, however, it is preferable to draw a stream of air through the strong acid solution for about 20 to 30 min., by means of a filter pump using the tubes previously fitted. Add about one gram (according to the amount of antimony present) of tartaric acid prior to diluting, and when the hydrogen sulphide is got rid of, transfer to a large beaker and make up the bulk of the solution to about 200 c.c. Add solid sodium bicarbonate until about two grams in excess of neutrality. Titrate cold with iodine solution to the first appearance of a yellow color or add starch solution near the end and titrate to a blue color.

To standardize the iodine solution, take 0.2 grams of pure powdered metallic antimony, place in a flask with leading tubes and add 40 to 50 c.c. of concentrated hydrochloric acid and then two drops of a concentrated solution of potassium chlorate in nitric acid, and warm over a water bath. Agitate occasionally and add a few more drops of potassium-chlorate solution, if necessary, to dissolve the antimony. When solution is complete, pass hydrogen sulphide through the leading tubes until the antimony is all reduced, this being shown by the clearness of the solution, warm and repass if necessary. Pass air in the opposite direction to get rid of hydrogen sulphide; this point may be tested by plunging strips of filter paper, moistened with silver nitrate, into the flask. Dilute, neutralize and titrate as in assays.

INTERFERENCES

The nitric acid in the first dissolving does not, as a rule, effect complete solution of the ore, but this is immaterial since it is thoroughly and rapidly effected in the warm concentrated hydrochloric acid when a stream of hydrogen sulphide passes through it. This latter I have found a remarkably efficient solvent, particularly for any material like roasted concentrates or difficultly soluble iron ores; the former were little affected after being digested in hot hydrochloric acid or *aqua regia* for half a day, but dissolved in a few minutes, leaving a clean siliceous residue, after treatment with the hydrogen-sulphide solvent. The same material was little affected after fusion with alkalis, and had previously been considered most difficult to treat. That the oxides of antimony dissolve in the hydrochloric acid was proven by using metallic antimony and decomposing it with nitric acid.

If copper occurs in the ore in quantities under 10%, it may be held in solution by using a larger amount of hydrochloric acid in the first passing of hydrogen sulphide, taking care to keep the solution warm until saturated with the gas. It is then precipitated with the antimony when hot water is added, and is best separated by digesting the mixed precipitate in sodium hydrate and filtering off the copper sulphide. In case of a larger percentage being present and part coming down with the arsenic, it is easily filtered off, when the solution is rendered alkaline with sodium hydrate.

When the antimony sulphide is dissolved in hydrochloric acid a little effervescence takes place, as the acid is boiled down to a constant strength; this may easily be prevented by diluting with a few drops of water before heating, but desiring to obtain the full efficiency of the strong acid, a couple of experiments were performed, using 0.2 gram antimony in each case: With just sufficient water to prevent boiling, 0.198 gram found; with full-strength acid, 0.1992 gram. Hence the loss is negligible. When 0.2 gram of antimony were taken as before, air passed for half an hour gave antimony, 0.2001 gram, air passed for three hours, 0.1996 gram. This was confirmed as well in other experiments.

The hydrogen sulphide is boiled off before titrating with iodine. If the boiling is continued for long, a considerable loss results, whereas if not long enough, the hydrogen sulphide present gives high results, 0.2 gram of antimony, when diluted slightly and boiled for 1½ min., gave 0.198 gram.

Firedamp Proof Motors

European electrical manufacturers have developed and installed a number of so called, firedamp-proof motors. These motors are totally inclosed with the exception of ventilating openings which are closed with covers designed on the principle of the Davy safety lamp. However, where the motors are operating in an atmosphere of explosive gas, they frequently fail after repeated internal explosions resulting from ignition of the inflammable gas, drawn in through the ventilating openings, and the gas external to the motor is ignited. It is not usual for the ignition of the external gas to take place with the first internal explosion. The General Electric Co. has developed in connection with such motors, an automatic device, the function of which is to disconnect the motor from its line immediately an explosion takes place within the motor.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, eight months ended Aug. 31, are reported as follows, in long tons, except quicksilver, which is in pounds:

Metals	Imports	Exports	Excess	
Copper, long tons	86,824	37,148	Imp.	49,676
Copper, 1911	99,747	51,386	Imp.	48,361
Tin, long tons	27,658	30,476	Exp.	2,818
Tin, 1911	28,609	29,685	Exp.	1,076
Lead, long tons	138,651	35,799	Imp.	102,852
Lead, 1911	150,073	43,885	Imp.	106,188
Spelter, lg tons	100,176	6,222	Imp.	93,954
Spelter, 1911	95,891	6,607	Imp.	89,284
Quicksilver, lb.	3,338,867	1,472,163	Imp.	1,866,704
Quicksilver, 1911	3,219,665	1,833,404	Imp.	1,386,261
Minor met'ls, tons	5,038	17,497	Exp.	12,459
Minor, 1911	3,668	14,192	Exp.	10,524
Ores				
Tin ore and con.	[illegible]	...	Imp.	[illegible]
Tin ore, 1911	[illegible]		Imp.	[illegible]
Pyrites	[illegible]	...	Imp.	[illegible]
Pyrites, 1911	[illegible]	...	Imp.	[illegible]

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Minor metals include nickel, aluminum and the minor metals and alloys.

PERSONAL

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Thomas H. Leggett has gone to the Southwest.

J. Parke Channing is expected to return from Europe about the middle of this month.

B. H. Bennetts has returned to Tacoma, after being away on a mining trip for a month.

Howard W. Moore is superintendent of the Gigante Mountain Tunnel Co., at La Luz, Guanajuato, Mexico.

C. Colcock Jones, of Los Angeles, Calif., is in the northwestern part of Montana on professional business.

F. B. Lawson, chairman of the Mountain Copper Co., of California, left San Francisco recently on his way to Korea.

Dr. L. D. Ricketts has been in New York during the last fortnight. He expects to return to Cananea next week.

N. E. Linsley, of Spokane, Wash., has been examining some prospects in the Similkameen district, of British Columbia.

D. B. Browne, lately with the American Vanadium Co., is now metallurgical engineer of the Goldschmidt Thermit Co., New York.

Albert H. Fay, of the U. S. Bureau of Mines, has been transferred from Pittsburgh, Penn., to the Washington office of the bureau..

C. O. Mailloux has been appointed assistant to the president of the Granby Consolidated Mining Co., of Canada. This is a new position.

A. W. Davis, mining engineer for the Consolidated Mining & Smelting Co., of Canada, has returned to Trail, B. C., after examining prospects in the Skeena district.

William H. Nichols has been chosen president of the Granby Consolidated Mining, Smelting & Power Co., in place of G. M. Luther, who retires on account of ill health.

Dr. Francis W. Merchant, director of Technical and Industrial Education of Ontario, has gone on an extended tour to Europe to study the technical-school systems in operation there.

J. M. Turnbull, mining engineer for the Consolidated Mining & Smelting Co., of Canada, has been chosen a member of the first senate of the newly organized University of British Columbia.

C. N. Clarke, of New York, president of the Minnehaha Mining Co., recently visited the mine, situated in the Manitou Lake mining district, of Ontario, in connection with negotiations for its sale.

M. Adrienne Badin, president of L'Aluminium Francaise and of the Southern Aluminium Co., is in this country in connection with the business of the latter company, which is now building a plant at Whitney, N. C.

J. H. Cunningham, recently resident engineer, has been appointed superintendent of Extension colliery, in British Columbia, owned by the Canadian Collieries (Dunsmuir), Ltd. He succeeds Thomas Russell, resigned.

William and Wilfrid Donaldson, who have been prospecting in Ungava with a party of 21, in the interest of a Montreal syndicate, headed by John Black, have returned. They refuse to make public anything concerning discoveries before reporting to Montreal.

J. Frank Haig has been appointed purchasing agent of the Pennsylvania Steel Co., Maryland Steel Co., Spanish-American Iron Co., Penn Mary Coal Co. and Baltimoree & Sparrows Point R.R. Co. in place of Stedman Bent, resigned, with headquarters at the Morris Building, Philadelphia.

Arthur Hadley, managing director, and Bernard Price, chief engineer of the Victoria Falls & Transvaal Power Co., have arrived at New York from London, and will visit some of the big electric power plants in this country. They will be accompanied on their tour by Walter G. Clark, consulting engineer.

S. H. Brockunier has been appointed superintendent of the Pennsylvania Gold Mining Co., at Westville, Calif. He is also consulting engineer for the Erie Mining Co. He has been for some time superintendent of the Erie, and under his charge the oreshoot lost some time ago was relocated, and a 40-ton mill built.

Professors Adolf Martens and E. Heyn, of the Royal Material Testing Station, Charlottenburg, Berlin, left New York on their return to Europe on Oct. 3. They have taken a more extended trip than followed by the majority of the foreign participants, among whom they were included, in the recent International Congress for Testing Materials.

William H. Donner, of Pittsburgh, has been chosen president of the Cambria Steel Co., in place of Charles S. Price, resigned. He has been connected with the Union Steel, the National Tin Plate and other companies. J. L. Replogle, for several years assistant to the president, has been chosen vice-president, and will have direct charge of operations at Johnstown.

OBITUARY

William Horace Corbin, vice-president of the Joseph Dixon Crucible Co., died Sept. 25, at Jersey City, N. J. He had been connected with the company for a number of years.

Edwin C. S. Hunt, for some time past connected with the Hoyt Metal Co., and in charge of its St. Louis office, died in that city, Sept. 19. He was born at Bristol, England, and was 57 years old.

V. B. Sherrod died at Mexico City, Sept. 24. Mr. Sherrod has been identified with the mining interests of Mexico for the past eight or nine years, during which time he was connected in important capacities with the largest mining enterprises of the republic. His last work in Mexico was with the Real del Monte y Pachuca Co., at Pachuca, leaving there to take the management of the Gold Roads properties of the United States Smelting, Refining & Mining Co., in Arizona. Mr. Sherrod recently resigned his position with the Gold Roads Co. to return to Mexico, and arrived in Mexico City the day before his death.

S. C. Hazelton, general superintendent of the United States Smelting Co., Midvale, Utah, was killed in an automobile accident near Salt Lake City, on the evening of Sept. 6. The automobile was struck by a street car while endeavoring to avoid a collision with a carriage. Mr. Hazelton was unmarried, and had been identified with the smelting industry since graduation from Lehigh University, late in the 80's. He was connected with various smelting plants that later came under the control of the A. S. & R. Co., such as the smelting works at Monterey and El Paso, and the Germania and Sandy smelteries in the Salt Lake Valley. He took charge of the U. S. Smelting Co.'s copper-smelting plant, at Bingham Junction (now Midvale), shortly after it was completed. He later inaugurated this company's lead-smelting operations in Utah, and except for a year spent in Peru for affiliated interests, he remained at the plant which he had built and in which he had a deep personal interest.

Societies and Technical Schools

American Society of Mechanical Engineers—The local meeting in New York, Oct. 8, was devoted to the question of "Smoke Abatement," considered not only as to its effect in cities, but also as to its results as affecting vegetation and other conditions in the country. At this meeting the discussion was opened by George H. Perkins, head of the Engineering Department of the Lowell Textile School, who attended the International Smoke Abatement Exhibition and Conference held in London in March, as the representative of the society and of the City of Lowell, and his address was not only his report, but also a masterful statement of the whole subject. Authorities from other cities were present to discuss the subject. The question of health, as affected by smoke, was also discussed. One point the society is particularly striving for is the bringing out of data to support the contention that smoke abatement is an economical advantage to the coal consumers.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 3—The new No. 10, all-steel, 15-cu.ft. dredge of the Natomas Consolidated Co., made the preliminary run on Sept. 29. The boat operated as smoothly in the trial digging as any new dredge could. This is the first all-steel placer dredge to be built and operated in California. No. 8 dredge, of the same construction and type, is rapidly nearing completion.

The concentrator employed by the Placer Gold Co., operating in Kern County, for the extraction of gold and tungsten from the placer gravel, near Randsburg, and owned chiefly by Sidney Coburn, of Los Angeles, is to be supplanted by an improved plant, to consist of five steel sluice boxes, each 20 ft. long, and ranging in width from 14 to 22 in. The 14-in. sluice will be installed at the hopper, to which the gravel will be elevated; the others extending from the first in the order of width, the widest at the bottom end of the sluiceway. Three percolating tanks will be installed between the sluice boxes to save the larger particles of gold and tungsten. A revolving screen will be placed at the end of the sluiceway for the removal of the tailings or waste. The fine gold and flour tungsten will be recovered on three concentrating tables provided with cocoa matting below the sluice boxes. These concentrators are to be 8, 10 and 12 ft. wide, each to be provided with a percolating box at the bottom and extending the full width of the concentrating table. The sluice boxes are to be of double-run type, to facilitate the removal of concentrates without stopping the flow of gravel. The gravels have a depth of 9 to 22 ft. High-grade scheelite is said to be recovered in various sizes from small colors to nuggets of large size.

Denver

Oct. 4—The La Plata region of Colorado, which is now assuming prominence as a gold and silver producer, has just made another stride to the fore, inasmuch as the long-drawn-out litigation between the two richest mines of the district, the May Day and Idaho, has been settled by the owners out of court, and about $80,000, the proceeds of ore and which was tied up in a Pueblo bank, will be divided. A. E. Reynolds, of Denver, the principal owner of the May Day, is on the ground with his superintendent and starting work, and Thomas Welborne, superintendent of the Idaho, is doing the same. The gold output of the La Platas will now be increased.

The production of the Cripple Creek district for September, as given by the mills and smelteries, is 72,955 tons of ore of a gross value in gold of $1,121,780. Three new mills just started are working full time. The Colburn-Clancy process mill, 3000 tons per month capacity, is scheduled to start Oct. 10. The deep drainage tunnel continues to do its work in a satisfactory manner. The total flow from the portal, as measured Sept. 16, was 9750 gal. per min. In the Gold Coin shaft, which is more than 1½ miles from the tunnel, the total subsidence of the water has been approximately 178 feet.

The City of Denver thinks that 4c. per ton-mile for hauling coal 20 miles, from the northern coal fields, is out of all reason, and strenuous efforts are being made to have the charge reduced. The mayor has notified the Union Pacific that if it does not reduce the rate from 80c. to 40c., the permit for the free use of Blake St. for its tracks will be revoked.

The case of the Consumers' League vs. the Colorado Southern is being tried in the district court. The league is composed of heavy coal and other shippers operating in northern Colorado. It was organized for the purpose of combating the efforts of the Union Pacific, Colorado & Southern and Burlington railroads to oust the state railway commission, and later a suit by the railroads, questioning the right of the commission to fix rates. The decision of Judge Whitford, declaring the commission unconstitutional, was reversed by the supreme court, following which the league appealed to the commission for a reduction in coal rates from northern fields to Denver. The commission cut the rate on lump coal from 80c. to 55c. per ton; mine-run from 70 to 50c., and slack from 60 to 45c. The railroads then brought suit before Judge Whitford, in May, 1910, and secured a decision declaring that no authority was vested with the commission to fix rates, and that a clause in the act creating it, providing that railroads operating over short lines of 20 miles be exempt from the general provision of the act, made the action of the commission null. The act was changed at the extra session of the legislature in 1910, eliminating the 20-mile clause, and Judge Whitford's second decision was reversed by the supreme court.

Butte

Oct. 2—The joint scale committee of the coal miners and coal-mine operators agreed to lay the wage-scale provisions agreed upon by the committee before a delegation of the miners. These were accepted under the condition that a referendum vote should be allowed by the members of the union. As the scale was to go into effect Oct. 1, the coal miners were called out, pending the result of the referendum vote to be taken Oct. 4. The increase in wages will be from 10 to 25c. per day, and especially affects the lower-paid positions.

The Alex Scott company is shipping daily to the East Butte smeltery, about 250 tons of ore, averaging between 5 and 6% copper, with some silver. The 1900-ft. level is being opened and mining is being done below the 900-ft. level. The property consists of only about five acres, but is in one of the richest portions of the Butte district, adjacent to the Leonard mine of the Anaconda company. In view of the fact that the company's holdings in Butte are so small the Moffat copper property in the Bear Gulch district, Madison County, has just been purchased. The vein has been traced for 3000 ft. on the surface and proved to be highly mineralized. On one of the claims a tunnel has been driven 500 ft., opening a wide vein of copper ore. The company will begin operations at once.

Salt Lake City

Oct. 3—Mining has been stimulated throughout the state by the rise in the price of metals. The month of August shows that ore handled by the railroads from Utah mines amounted to 738,806 tons, a gain over August, 1911, of 194,282 tons, or 36%. While more ore is being actually mined, a study of the freight figures shows that there has been an increasing production from old dumps and slag piles. At the Ontario mine, in Park City, a leasing company has built a mill for treating the dump ore and old stope fillings. This mill is being tried out at present. The zinc ores at Tintic are being mined at a good profit, now that the reduced freight rate has gone into effect. The Yankee has met expenses from the sale of dump ore for some time, and the Horn Silver, in Beaver County, is shipping a large tonnage monthly of ore from second-class dumps. The capacity of the mills at Garfield had been largely increased, and during August the output of Bingham was over 13,000,000 lb. of copper in addition to its lead, silver, zinc and gold. Increased activity is noticeable in the Tintic district, the output being 20 or 25% greater than last year.

Negaunee, Mich.

Oct. 2—The Oliver Iron Mining Co. has procured the Country Club, near the old Goodrich mine, three miles southwest of Ishpeming, and has made the place into a "Rest Farm." The institution is for the convenience of employees and their families who desire a vacation, and will be in charge of the visiting nurse of the company. A similar undertaking was previously inaugurated by the Cleveland-Cliffs Iron Company.

Toronto

Oct. 4—An interesting development in connection with the plans of the Dominion Iron & Steel Co., is shown by the purchase by this company of its first coal lands in western Canada. The property referred to is known as the Ford, and consists of 12,000 acres on High River, south of Calgary. The Dominion Coal Co.'s output for September was approximately 380,000 tons. This is somewhat below the figure for August, but is the best September showing that the company has had in its history. At the present rate of production, the output for the year should amount to 4,500,000 tons.

The output of the Nova Scotia Steel & Coal Co. for September, is as follows: Coal mined, 67,889 tons; coal shipped, 87,789; pig iron produced, 7490; steel ingots, 6722; iron ore mined, 57,913; and shipments of iron ore, 61,800 tons.

Sudbury, Ont.

Oct. 5—The season now closing has witnessed important progress and expansion in the nickel industry. The Canadian Copper Co. has enlarged its smeltery at Copper Cliff so that it will soon be able to treat about 5000 tons of ore daily. The work of opening the new No. 3 mine, formerly the Frood, is well under way. One inclined shaft is being sunk to a depth of 1000 ft. vertically and another will soon be begun. Elaborate underground development is planned and modern devices for cheaply handling ore have been adopted. The mining equipment will include electric underground haulage and the ore will be taken from the surface veins by gravity into the cars in which it will be hauled six miles to Copper Cliff over an extension of the company's railroad, now built. The mine will be operated by electricity furnished from the company's hydro-electric plant. The ultimate capacity of the equipment for the No. 3 mine will be about 10,000 tons daily. The ore developed by drilling is reported to exceed 60,000,000 tons. Much of this is mixed ore and lower than average grade. The Canadian company is still operating the Creighton, Copper Cliff, and Crean Hill mines, the chief supply coming from the Creighton. In the early summer the company took options, mostly on a drilling basis on large areas chiefly on the North Range but later they were all relinquished except the one on the Strathcona, in Levack township, on the North Range. This property is now being drilled.

The Mond company is still engaged in the erection of its new smeltery at Coniston, about eight miles east of Sudbury, on the Canadian Pacific and Great Northern railroads. This installation will not be completed before next summer. It will have a capacity of 1000 tons of ore daily, about three times that of the company's present plant at Victoria Mines, west of Sudbury on the "Soo" line. The Victoria plant will be abandoned when the new one is in commission. It was expected that the Victoria mine owned by this company would be worked out by now, but at depth new orebodies have been disclosed according to report. The company is extensively operating its Garson mine, east of Sudbury, and development is disclosing large bodies of mixed ore. The company recently began reopening its North Star mine, near the Creighton. The Blue Lake lots were drilled last winter, but the option has been relinquished, as was also the option taken two years ago on the Worthington and Blezard properties.

The Dominion Copper & Nickel Co., controlled by John R. Booth, of Altoona, and M. J. O'Brien, of Montreal, is actively drilling its recently acquired properties on the South Range. These include the Murray, purchased from the Virrain estate, of Swansea, and the Gertrude and Elsie mines, acquired from the Lake Superior Corporation, together with the Victor on the North Range. The company is sinking on its Whistle mine in the northeastern part of the district, and is exploring, under option, the Blue Lake, Kirkwood, and some other properties. It is announced that the company will erect a smeltery next year near the Murray mine. This company has in the last five years spent about $250,000 in drilling.

Some new companies have been interested in the district during the summer, but as far as is announced there has been no commitment by any of them. British interests have renewed negotiations for the Levack group and other properties on the North Range, and the Guggenheims, have been making investigations for several months and are reported to have a number of options. However, there has been little exploration or development work done by any of the owners of nickel prospects outside the large companies. Much new ground has been located on the eastern end of the "contact" and on the North Range, so that now practically all of the 100 miles of contact is located.

Porcupine

Oct. 4—Much has been written lately of an irresponsible nature regarding the rate at which the Porcupine mines are producing bullion. Due to the reticence of the companies, it has been difficult to obtain authoritative information, and, as a consequence, the public has been treated to a series of wild guesses, all of them naturally being overestimates. As a matter of fact, Porcupine is at the present time producing at the rate of approximately $4,500,000 per year, and there is not much probability of an increase until the present plants are enlarged or until other mills are in operation.

At the Hollinger, strenuous efforts are being made to make a good showing for the first six months of operation, and also in order to enable the company to pay a dividend before the first of the year. At present, about 310 tons of ore per day is being treated, but when the other 10 stamps are in commission, this amount will be materially increased.

At the Dome, another tube mill and slime press have been ordered, and more leaves will also be added to the present slime presses. This will raise the capacity of the plant to nearly 450 tons per day. The primary plates before the stamps are being taken out and only amalgamating plates following the tube mills, will be used. The mine is in excellent shape and there will be no difficulty in supplying any increased ore needed.

With regard to future production, a greater output may be expected from both the Dome and the Hollinger within six months. The Dome Lake mill will also be in operation by next spring and the output from this mine and the increased capacity of the McIntyre should add materially to the camp's production. Small mills are also being considered for the Hughes, Pearl Lake and McEnaney. The Jupiter and Plenaurum are also considering the installation of a mill to treat the ores of both properties.

Rossland, B. C.

Oct. 2—The Rossland miners' union, following the advance in wages in Butte, Mont., recently demanded an increase in wages of 50c. per day for all men employed in and around the mines. As the Rossland mines are benefited but little by the advance in the price of copper, the demand for so large an increase in the wage scale, based as it was on the rise in the price of copper, could not be allowed without serious losses to the companies operating in this camp. The difference in the conditions existing here, and in camps where copper is the principal product, was explained to the men, and a proposition covering a raise of 25c. per day for all men working underground was made and accepted. On Sept. 1, the increase went into effect.

The Mining News

The Current History of Mining

Alaska

Bonanza Gold—This company has taken over the Good Hope property. A stamp mill, concentrator, compressor and drills have been ordered, and will be installed as soon as they arrive. Frank A. Iverson, Seattle, is president of the company.

Arizona

Gila County

Miami—Three 8-ft. Hardinge pebble-mills are in transit, which will replace the chilean mills in the second unit, making four of the six units that will be thus equipped. At the No. 4, or main shaft, foundations are being laid for the new change house, the new machine shop is being equipped, and the new office is being finished. The construction of the Miami-Inspiration hospital is well under way. About 1000 men are employed.

Inspiration Consolidated—The main east shaft was 305 ft. deep Oct. 1 and the main west shaft 435 ft. deep; sinking continues steadily. Development work is confined to opening the first haulage-level and 3800 ft. was driven in September as compared with 4900 ft. in August, the decrease being due to the fact that much of the September work consisted in widening and timbering the drifts previously driven. At the Live Oak mine, drifting from No. 2 shaft on the 570-ft. level continues, No. 1 shaft is being sunk, and the Sulphide tunnel is being widened for electric haulage. McArthur brothers are using a steam shovel in grading for the railroad.

South Live Oak—Churn-drill hole No. 4 has been started about 1000 ft. west of hole No. 3 in silicified, copper-stained schist and is now down more than 50 feet.

Southwestern Miami—Churn-drill holes, Nos. 4, 7 and 8, are respectively 640, 1267 and 1020 ft. deep. The last two holes are reported to be in chalcocite-bearing schist. Hole No. 7 is being reamed, preparatory to drilling deeper. It is not stated whether the material disclosed in holes 7 and 8 is commercial ore.

Gibson—Five cars of chalcopyrite ore were shipped to the Old Dominion smeltery in September. T. Henderson superintendent.

Superior & Boston—John Gibson, who is leasing on the Black Oxide vein of this mine, corresponding to the Buckeye vein of the adjoining Buckeye mine of the Old Dominion company, has shipped to the Old Dominion smeltery three cars of ore from stopes above the tunnel level and is loading a fourth.

Mariposa County

Relief Gold Mining Co.—This company will erect a cyanide plant for treating the tailings dumps and low-grade ore from the mine 12 miles north of Glendale.

Slocum Copper Mining Co.—This company will soon begin shipping ore from the Slocum and Cottonwood group north of Phœnix.

Tip Top—The concentrator will be started in the near future. The ore contains silver and tungsten minerals.

Arizona-Vermont—In driving a crosscut a stringer of high-grade copper ore was recently found.

Santa Cruz County

The deposit of onyx found in the caves near Greaterville, near the north line of Maricopa county, are being worked with regularity. The grade of onyx is said to be good, but some of the best pieces recovered, slake when exposed to the outside air and fall apart; the owners are seeking a remedy for this. The demand for the product is good, and the profits are enough to warrant a continuance of shipments.

World's Fair—This silver producer for a dozen years or more, has been turned over to the engineers for the Copper Queen Mining Co., for systematic development work. The owners have made no effort to open the copper ore in the mine, but have shipped the richer silver ore. The mine is about four miles from the R.R.R. mine.

Bland—This copper mine in the Santa Rita range, is under option to M. A. Brickson, representing Colorado men. He is also considering other mines in the neighborhood, with the idea of building a central custom mill.

Alum Gulch—A. S. Henderson, of Patagonia, reports having optioned this mine to Boston men.

Royal Blue—Thomas Fraser, a mining contractor, who is now taking out ore from this mine reports a new strike in the drift on the 150-ft. level. He is mining about three tons per day of $40 ore. Owing to lack of teams, he has been unable to ship it.

Connecticut—This mine has been leased by R. R. Richardson, of Patagonia to Hogan, McCutcheon & Bohlinger, the last being the miner who made the big strike on the R.R.R. The lessees have timbered the upper tunnel, put in track and are now stoping ore; the ore is chalcopyrite carrying some gold and silver.

American Boy—Another shipment has just been made from this mine, an interest in which has been bought by James B David, who is now driving a 400-ft. drift on the lower tunnel level.

Oro Blanco—Ore shipments to the Pioneer smeltery continue.

Montana—McDermott and Powell have opened a large shoot of ore, and have raised a good tonnage, which at present lies on the dump. Treatment problems have to be solved before this ore can be utilized, and as the hauling charge is excessive, the owners are considering a plant on the ground to treat this and ore from surrounding mines.

Guija—Max Junghandel is working the tungsten-bearing claims he recently bought from Bent & Sampson; Charles Bent, Jr., is in charge of the work.

Ivanhoe—Small shipments of rich silver ore are being made from this mine. The ore is made up of native silver and unusual silver minerals like stromeyerite, proustite, polybasite and polyargyrite. The F. J. Hobson Co., of Nogales, is taking most of these small lots, as well as most of the lead ore now being mined in the county.

California

Amador County

Keystone Consolidated—The state supreme court has reversed the superior court which gave judgment for $20,000 to Edward Lynch. The plaintiff was attorney for the company and claimed the amount sued for under an agreement for salary and bonus. The supreme court held that the contract did not state a specific time for payment and that the amount should be paid out of the proceeds of the mine. The property is in the development stage, being an old mine reopened. It is now known as the Keystone Mines. C. R. Downs is manager.

Lincoln Consolidated—The south drift has, in the last three months, been extended 857 ft., making a total length of 1988 ft. This drift is toward the Wildman-Mahoney and is 450 ft. lower than the 1300-ft. Wildman level. It is between good walls and has passed through several bunches of quartz and has ore in the breast. The west drift on the 1200-ft. level has been extended 152 ft. The east crosscut from the 1950-ft. level is now in 802 ft., passing from gray to black slate. No work has been done on the 800-ft. level in the last quarter, but driving on this level will be resumed as soon as additional transformer capacity is secured. A long term contract has been made with the Pacific Gas & Electric Co. for power and water. New gear and pinion, and cable have been installed. The quarterly report for the period ended Sept. 15 shows receipts of $15,794, including a balance of $2703 from the preceding quarter, and expenditures of $12,666 with a balance of $3128 on hand. W. J. McGee, of Sutter Creek, is general manager.

Hardenberg—The owners have decided to install a 20-stamp mill, for which nearly all the contracts have been placed. This decision is the result of encountering a vein from 4½ to 7 ft. wide in the crosscut from the 1078-ft. level of the vertical shaft, a distance of 215 ft. west of the shaft. The average assay is $5.58 per ton. The power equipment is equal to the demands of 40 stamps. H. Malloch and John Martin, of San Francisco, are the principal owners; N. S. Kelsey, of Jackson, is superintendent.

Butte County

Gold Bank—The remodeled 20-stamp mill is completed and a cyanide plant has been ordered. The extraction and crushing of ore will begin probably with the present or next week.

St. Francis—A breaker and a new Bryan mill are being installed at this mine, near Enterprise, about five miles northwest of Forbestown.

Calaveras County

Fifteen new mining claims have recently been located, including gold, copper and asbestos prospects. The districts are Albany Flat, O'Neils Creek, Copperopolis, Glencoe, Railroad Flat, Mill Valley, and Murphys.

Morgan—This property, near Mokelumne Hill, has been bonded to C. A. Rice. The 140-ft. tunnel is said to be in good ore. Frank W. Peek and Frank Mondani are owners.

Eldorado County

Cambrian—It is reported that J. B. Bernardi, of Reno, is contemplating reopening this mine near Lotus. The property was worked in early days, but has been idle for several years. The holdings embrace 800 acres of land.

Landecker—S. C. Ames, of San Diego, has recently purchased this gravel mine, and it is reported that he will reopen it within 60 days. The property is equipped with a barrel mill. N. H. and B. E. Burger, of Placerville, were formerly owners. Ames also owns the Helper, the Tin Cup and the Margaret claims in which other San Diego men are interested.

Humboldt County

Ruby Copper Co.—Good ore is reported in this company's property on Horse Mountain in a tunnel at a depth of 300 ft. E. A. Walters, of Eureka, is president.

Monterey County

Foreign Mine Development Co.—An auto-truck train of four ore trucks, drawn by a 150-hp. motor, has started from San Diego for Borax Lake, to be used for hauling the soda product to Searles, on the Nevada & California R.R., a distance of about 35 miles, for rail shipment. The motor and trucks were shipped from the factory of the Daimler Motor Co., Coventry, England, about five years ago, and have been in storage at San Diego.

Los Burros Mining Co.—A gasoline hoist is to be installed at the mine, in Reliz Cañon, in the Los Burros district, near Salinas.

Green Monster—O. H. Lawrence, of Park City, Utah, has taken a bond and lease on this mine, near Citrus, about 10 miles east of Independence. It was operated in the early seventies and shipped copper ore. The ore contains gold and silver also. A wagon road is being built to the mine, and loading chutes will be installed. Julius Roper, of Independence, is owner.

Shasta County

Afterthought—S. E. Bretherton, manager, who returned recently from New York, is preparing specifications for the installation of a reduction plant of daily capacity of 50 tons, for the recovery of zinc and also the gold, silver and copper contents of the ores that are blocked out and ready for extraction. Should this plant prove successful, it will be enlarged by one or more units, increasing the daily capacity to 200 tons, by the time the California, Shasta & Eastern R.R. is completed.

Tuolumne County

Dutch—The full 40 stamps have been dropping steadily since May, and crushing about 180 tons per day, resulting in about 87% recovery. At the time of increasing the stamps from 20 to 40, the mill was equipped with Johnson concentrators, built by the Union Iron Works, which are reported by the manager to be giving satisfaction. The shop has been equipped with a Word drill sharpener, lathe and other machinery; and a 150-hp. electric motor has been installed for operating the compressor. A 225-hp. General Electric motor is being installed for operating the hoist; the steam-hoist engine will be retained as an auxiliary.

Colorado

Clear Creek County

Vindicator—The crosscut tunnel on this property, on Chicago Creek, has been advanced to a length of 1000 ft., and a drift has been driven 60 ft. north on the vein. In the drift the vein is 4 ft. wide and contains a 7-in. streak of smelting ore. At present the development will be continued by hand, but in the near future a compressor plant and machine drills will be installed. J. J. Hoban, of Idaho Springs, is manager.

Clear Creek Tunnel—This 8x8-ft. crosscut tunnel has been advanced to a total length of 550 ft. The company contemplates continuing development throughout the winter.

Franklin—This property, in Gilson Gulch, is being developed by lessees. The shaft will be sunk to a depth of 150 ft The operators report that a 10-in. vein of silver-lead ore is paying the cost of sinking.

Harris—A new oreshoot has been opened in this property, in East Argentine. The vein is 14 in. wide and high assays in silver have been obtained.

Bellevue-Hudson—It is reported that a 12-in. vein has been opened. Three carloads have been shipped. Mr. Boyce is manager.

Scott—This group, in the Daily district, is being developed under the management of W. A. Pruntz.

Duluth & Empire Tunnel Co.—This tunnel is being steadily advanced. Frank Brady is manager.

Marshall-Russell—It is reported that this company contemplates consolidation with the Gold Dirt, and Empire Tunnel Co. It is the intention of the owners to develop the combined properties through one of these two tunnels, with the view of reducing operating costs. At present Mr. Rockwell is manager of the Gold Dirt mines and Mr. Marihugh is manager of the Marshall-Russell Co. The development work under consideration will involve the installation of considerable additional mining equipment and an increase in the working forces.

Stanley—During September, the fifth level west heading was advanced 101 ft. to a total length of 1445 ft. The breast is in 4 ft. of ore.

Denver County

Western Chemical Co.—This company's four-story warehouse was destroyed by fire, Oct. 3. The building contained equipment for the manufacture of sulphuric acid and a large supply of chemicals. The company's ammonia and hydrochloric-acid plants were saved. The preliminary estimate of damage is $100,000, about two-thirds of which is covered by insurance.

Lake County-Leadville

Fryer Hill, which has been actively mined for 33 years, is still sending out a big tonnage, this being chiefly due to the discovery of zinc-carbonate ore. The lessees on the Chrysolite are cutting a working station at the 210 level whence they will drive out to the ore, and the shipments of zinc and iron will be increased. Lessees on the Amie are raising to the high-grade ore found in the level above. The Little Chief has resumed shipments and a carload of good-grade zinc ore has been sent out. From the Matchless, shipments of a fair tonnage of siliceous ore is being sent out.

Starr Placer—The season's cleanup, just made, gives each of the four men who have been at work since the middle of May $5 per day for the days worked. This was accomplished with old-fashioned sluice boxes.

Siwatch Tunnel—Manager Morner is driving two laterals and shipping low-grade ore.

New Monarch Mining Co.—Manager Watson is still shipping from the Cleveland dump and sampling other dumps for shipping ore.

Gold Basin—Regular shipments of low-grade ore are being made by lessees in the Gold Basin shaft, Breece Hill.

Favorite—The production by lessees, J. F. Johnson & Co., on this mine in South Evans, gulch is about 60 tons per month of sulphide ore carrying gold and silver.

Mineral County

It is just reported that a strike of rich manganiferous silver ore, has been made in the Happy Thought block of the Creede Mining Co. It was found in a crosscut from the 800 level. Important discoveries of lead and zinc ore have also been lately made in the Amethyst and Last Chance, both on the same vein, this work being done by the Creede Triune Mines Company; W. S. De Camp, superintendent.

Pitkin County

C. H. Coberly, superintendent of the Montezuma mine, is authority for the statement that about 4000 tons of $40 ore is now blocked out between levels and this will be leased in blocks at 15% royalty.

Teller County-Cripple Creek

Stratton's Independence — During August 2872 tons of ore averaging 13 dwt. 12 grains per ton, was produced, and 11,000 tons of low-grade mine and dump ore was milled. The net working profit was $12,000, less $1120 for special development work.

Elkton—At this mine on Raven Hill the 11th or bottom level is being developed and the oreshoot has been drifted on for 800 ft. with 500 ft. more to be opened. The Raven and Beacon shaft is down 244 ft. and 3½ ft. advance is being made per day.

San Juan District

Tomboy—Preliminary arrangements have been completed for the construction of the new tramway from the Ophir tunnel to Pandora. The Bleichert system will be installed. The equipment will be supplied by the Trenton Iron Co. An attempt will be made to complete the installation this autumn. The tram will have a total length of about one and one-quarter miles and a fall of about 2000 ft. It is estimated that a substantial economy will result in the transportation of mill products to the railroad and supplies for the mines. At present all freight and concentrate is hauled in six-horse teams on a wagon road having a grade of from 12 to 16 per cent.

Idaho

Coeur d'Alene District

Bunker Hill & Sullivan—A dispatch states that a fire broke out in the mine, Oct. 7, and that up to the following day, fire fighters, equipped with oxygen helmets, had not gained control of the flames. One man is reported overcome by the smoke.

Tamarack & Custer Consolidated Mining Co.—It is announced that this company has leased the Rex mill, on Nine Mile Creek. It is the intention of the management to hasten preparations for active mining and milling. The property will probably enter the list of shippers within a few weeks. With the lease of the mill, the Tamarack company secures the use of the aërial tramway formerly used by the Rex. This will be changed at once to connect with the property of the leasing company and will allow rapid completion of operating plans. The Rex mill has a capacity of 400 tons per day.

Idaho County

American Eagle—The Rio Tinto Mining Co., of Hamilton, Ontario, which has an option on this property, has begun work on the mine under the management of J. McDermid. The development work mapped out consists of sinking a new 500-ft. shaft and connecting tunnels Nos. 1 and 2 by a raise. Numerous improvements will be made in a general way about the property. A force of about 20 men is at work. A. W. Boyd is mine superintendent.

Mascot—The new mill was started Sept. 20. It is a 3½-ft. Huntington driven by water power under 120 ft. head. The first ore run through the mill came from the St. Lawrence mine about 1000 ft. from the mill. The property is owned and operated by the Massam brothers.

South Fork—The mill has started up again after a five-days shut-down for repairs. The mine is in good condition, one shift keeping the mill supplied with ore. The new No. 4 tunnel is progressing rapidly, opening up a new oreshoot.

Brown Bear—The company is building a wagon road to connect its camp with the county road. Development work in the east tunnel has progressed satisfactorily, opening up a good body of ore.

Michigan

Copper

Superior—Railroad connections are being made to afford transportation from this property and also the Isle Royale to the Lake Milling, Smelting & Refining Co. mills, at Point Mills. The west lode tributary to No. 1 shaft is being opened and put in shape for stoping, it being advantageous to do this mining before mining the No. 1 Superior lode.

Wolverine—The exploratory shaft on the Osceola lode is bottomed at a depth of about 500 ft., but sinking will probably be resumed in the near future. At the fourth level drifts are being driven in both directions; driving is also being done on the No. 3 of a series of three lodes that were exposed by the crosscut driven from the 24th-level drift toward the Old Colony boundary.

Ahmeek—This company is finding a large quantity of mass copper in fissure veins. A drift has been driven on one of these veins for a distance of about 50 ft. from the shaft with good results, and considerable copper is being developed.

New Arcadian—This company's shaft, which is down about 150 ft., is being sunk on the lode, which lies between two other similar formations that were revealed in drilling. It is planned to sink to a depth of about 1500 ft. and then start lateral openings on the three formations, driving crosscuts east and west to reach the other two lodes.

Winona—This company has succeeded in obtaining additional labor, so that production can be increased. About 700 tons are being shipped to the mills daily, where the two heads are in operation part of the time. During the next few weeks this company will probably be in shape to handle about 1000 tons daily. Extensive experiments are being carried on at the concentrating end of the mill in hopes of bettering the savings.

Iron

Oliver Iron Mining Co.—This company has completed the installation of safety devices at its ore-crushing plant, at Escanaba, where the hard ores from its Menominee Range mines are crushed. The cost of safeguarding the machinery is reported to be $5000. The safety committee from the company's Marquette Range mines, where the installation of safety devices was finished some time ago, inspected the work at the ore-crushing plant.

Cleveland-Cliffs Iron Co.—Options have been taken in the Crystal Falls district in Sec. 12, 42-33, between the Dunn mine and the Mastodon. The land will be tested by sinking pits before drilling is started, as the surface is not excessively deep. The options were secured from Doctor Carpenter and Benjamin Neely. The company has no mines in the Crystal Falls district.

Florence Iron Co.—This company is hurrying development work at its Ernst mine, in Commonwealth, Wis., and at its Bates mine, in the Iron River district, and will equip both properties with modern electrical machinery. The Bates mine, which has been flooded with water for several months, due to inadequate pumping facilities, has been delayed in development on account of lack of proper machinery. Lowe Whiting is in charge at the Bates mine. The company will try to make each property a shipper by next season.

Verona Mining Co.—An Ingersoll-Rand electrical air compressor has been purchased for the Bengal mine, in Stambaugh. The machine is similar to the one recently installed at the Davidson mine, and is of 2500 cu.ft. per min. capacity. The Bengal will be one of the big mines of the Iron River district.

Ravenna—At this M. A. Hanna exploration at Crystal Falls, it is planned to sink a new shaft, about 300 ft. southwest of the present shaft, for ventilation purposes. Machinery and buildings from the old Hollister mine, now closed down, are being moved to the Ravenna, including boilers, compressor and an office building.

Minnesota

CUYUNA RANGE

Cuyuna-Mille Lacs—It is expected that tracks from the Cuyuna Northern R.R. will be laid to this property in the near future, whereupon shipments from the 4000-ton stockpile will be made at once. Ore is now being hoisted through the 135-ft. shaft at the rate of 50 tons per day. A 1000-gal. pump has been installed in the pump station on the 126-ft. level, and a drift has been started. The ore contains much manganese, the amount of which appears to increase as the shaft is sunk; the assays from the shaft are higher than those from the drill holes.

MESABI RANGE

Oliver Iron Mining Co.—This company has cancelled many mining leases on property at the west end of the range, near Grand Rapids, Minn., exploration work has been done and royalties have been paid on this property for three years. No reason for the cancellations has been given.

Scranton—Loading from the stockpile at this mine has been resumed after a cessation of several weeks, while repairs were being made to machinery. Three trains per day are being loaded at the stockpile and two at the Leonard pit. The average is now 275 cars of ore shipped per day.

VERMILION RANGE

Consolidated Vermilion & Extension Co.—Test pits on a part of this company's property, more than one mile from the shaft, have shown that the ore comes to within a few feet of the surface. The face of one drift is in good ore and a small tonnage is being raised and placed upon the stockpile.

Montana

DEER LODGE COUNTY

Hidden Lake—Preparations are being made to start operations on a large scale next spring at this property in the Georgetown district. The last carload of ore recently shipped from the mine gave returns somewhat higher than average shipments have been of late.

GRANITE COUNTY

Big Bill—A wide vein of gold ore has been opened on the 50-ft. level of this mine in the Red Lion district, and preparations are being made to operate during the winter. G. W. Gordon, one of the owners of the property, is superintending the construction of new quarters for men.

Sunday—Paul Scott and W. P. Scott, of Phillipsburg, who have been working the tailings dump of this property on a lease since early in July, have made their last cleanup for the season. The tailings were worked by the cyanide process. The Sunday mine is owned by the Corey Estate, of Butte. It was operated through a tunnel.

Lost—A narrow stringer of decomposed quartz and porphyry has recently been opened in this claim in the Red Lion district. Some rich gold ore in kidneys has been discovered, one lump weighing six pounds bringing returns of $649.95.

JEFFERSON COUNTY

Boston & Corbin—During the year ended July 31, $91,514 was expended by this company in development and construction work at its property in the Corbin-Wickes district. The company ordered the erection of a 200-ton concentrator, and to provide funds sold 10,000 shares of stock which netted $7.50 per share, and this, added to the amount in the treasury, gave an ample amount to carry the work through. Work upon the mill has begun, the machinery has been contracted for, and it is expected that the mill will be in operation in February 1913. During the year a new vein was opened on the 1200-ft. level and drifted upon for a length of 33 ft., both faces being in ore of good width and value.

Nevada

COMSTOCK LODE

Mexican—The plans for sinking a winze in the northern portion of the mine have been changed, it being originally intended to continue the winze, started more than a year ago on the 2500-ft. level, in the rich ore, which was stopped on account of water being encountered, as well as other difficulties. The projected new winze will be started north of the stope, and close to the north boundary, as a winze there will also enable Union Consolidated to explore its ground readily from the winze at greater depth. Another fact in favor of the new site is that it will be possible to sink in more solid ground that in the ore vein. A large ore recovery was made in a recent week, 463 tons being hoisted from the mine, the total assay value of which was $18,500. Nine bars of bullion, valued at $25,000, were shipped from the mill.

Crown Point—Ore shipments have been resumed at the Yellow Jacket mill, recently overhauled, and the plant is being operated at full capacity. The ore recovery during a recent week was 500 tons of low grade. The new incline winze below the sill floor of No. 1 stope, on the 1400-ft. level, is in ore.

C. & C. Shaft—The north compartment has been cleared for the installation of the second vertical pump, which is to be placed opposite No. 1 pump at the 2500-ft. level. The latter is giving satisfactory service, being the first electrically driven pump to be used in the sump.

Ward Shaft—The water is being lowered from the 2150 to the 2475 level by bailing, in an effort to recover the Scranton pumps.

ESMERALDA COUNTY

Goldfield Consolidated Mines Co.—The estimated September production is as follows: Total tons mined, 29,460; gross value recovered, $390,000; operating expenses, $190,000; and net realization for month, $200,000. The tonnage is low at the mill on account of repairs; shipping ore low on account of Grizzly Bear shaft work.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Sept. 28, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,650	130,419
Tonopah Belmont	3,300	91,500
Montana-Tonopah	1,027	40,300
Tonopah Extension	1,057	38,891
West End	1,025	29,147
Midway	50	520
MacNamara	465	11,150
North Star		170
Mizpah Extension		40
Jim Butler	300	1,900
Totals	10,874	347,037
Estimated value	$271,850	

Montana-Tonopah—The annual meeting was held at Tonopah, Oct. 1, the secretary's report showing cash in hand amounting to $230,945. During the fiscal year the company paid $160,000 in dividends and invested $191,391 in the purchase of the controlling interest in the Commonwealth mine at Pearce, Ariz.

Tonopah-Belmont—The Mizpah fault vein has been opened on the 12th level and is five feet wide. The usual quarterly dividend of 25c., per share, amounting to $375,000, has been declared.

Tonopah Extension—Four feet of rich ore has been opened on the 400-ft. level of the North vein. The oreshoot on the 500-ft. level of the South vein has now been proved for a length of 750 feet.

Tonopah Merger—The west drift on the 980-ft. level is 135 ft. in the vein. Shipments to the old Belmont mill will be commenced shortly.

Jim Butler—The crosscut on the 600-ft. level has penetrated a width of 60 ft. of vein matter filled with streaks of ore. A winze is being sunk on one of these three feet wide and assaying $30 per ton.

West End—The mill capacity has been increased to 150 tons daily by crushing through a coarser screen and running the tube mills at greater speed.

White Pine County

The principal mines of the Ely district are idle as a result of the efforts of President Moyer, of the Western Federation, who induced the miners to go out after the voluntary advance in wages by the Nevada Consolidated companies had been practically accepted by the steam-shovel men, carpenters, machinists, millmen and smeltermen. The company had offered an advance of 25c. per day to those receiving $3 and over, and 20c. advance for those receiving less than $3. The Steptoe concentrator ran for several days after mining ceased and the smeltermen are still at work; there is about two weeks' supply of concentrates and secondaries at the smeltery. The miners are standing out for a 50c. increase and recognition of the union. The officials of Nevada Consolidated, the principal operator, are stated to be unalterably opposed to recognition of the Western Federation of Miners.

New Mexico

Socorro County

Ernestine Mining Co.—Thirty stamps are dropping, resulting in increased bullion shipments.

Mogollon Gold & Copper Co.—Work has been started on the properties adjacent to Mineral Creek; 200 tons of ore was recently mined from the Little Charlie tunnel.

Deadwood Mines—Recent development has opened new ore on the 400 level. Both drifts are being advanced on the 500 level. The new sampler has been placed in commission; 620 tons of ore was treated in a fortnight, resulting in the production of five bars of gold and silver bullion and 40 sacks of concentrate.

Socorro—September's mine developments were satisfactory and the mill is running steadily on good-grade ore.

Oaks Co.—The best ore yet encountered in the development of the Pacific mine is coming from the bottom of the South shaft at a depth of 190 ft.; 165 tons was produced from the Pacific and Johnson mines in two weeks and good ore is being mined on the Mother Lode.

Trilby—Five prominent New Mexico men have taken a bond and lease on this group and active work will be started as soon as machinery can be installed.

Deep Down—The shaft was sunk 25 ft. in two weeks, yielding 75 tons of good milling ore.

Oregon

Lane County

West Coast—This property is being developed by a deep tunnel, and the management reports striking some good ore. The mill is kept running part of the time; 20 of the 30 stamps being in operation. There is an abundance of free-milling ore of good grade blocked out in the upper workings of this mine.

Treasure—Charles Phelps, of Los Angeles, Calif., has taken charge of this property, which is owned by Portland, Ore., men, and he will put in some new amalgamating machinery, manufactured by the Gold & Platinum Extraction Co., of Los Angeles. A promising new vein has recently been uncovered.

Green Rock—This company is considering building a 50-ton mill in the near future on the property, in the Bohemia district. H. H. Bergeson, of Seattle, is president.

Utah

Juab County

Tintic shipments for the week ended Sept. 27 amounted to 213 cars.

May Day—It is stated that net earnings for September will be between $12,000 and $15,000, this coming from the sale of zinc ore. A large tonnage of zinc ore has been developed, and October shipments are expected to equal or exceed those of September.

Swansea—During the year just ended, there were produced 10,700 dry tons of ore on company account and 181 dry tons of lease ore. The metal content was as follows: Gold, 452 oz.; silver, 129,276 oz.; lead, 97,885 lb. Receipts, from ore sales and royalties from lease ore amounted to $62,825; and assessments amounting to $29,576, were levied which, with smaller receipts, gave a total of $92,624. Disbursements were $92,624. It has been the management's policy to keep up operations as long as expenses were met, so as to prospect for ore of a better grade. A total of 2427 ft. of development was done, the work being confined to the 800-, 850-, and 940-ft. levels. Most of the ore came from the vein on the latter level four to five feet wide and 145 ft. long. A new four-drill electric compressor has recently been installed in connection with the electric station pump on the 940-ft. level.

Chief—A third 150-hp. boiler has been installed, thus affording a total capacity of 450 hp. Shipments for the week ended Sept. 27 amounted to 23 cars.

Dragon Consolidated—Shipments of iron ore will be resumed, so as to provide funds for continuing development south of the Iron Blossom in search of silver, lead and copper ores.

Mammoth—A dividend of 15c. per share, or $60,000, has been declared, bringing the total of dividends paid by this company up to $2,250,000. The output for the week ended Sept. 27 was 18 cars.

Salt Lake County

Utah Consolidated—At the end of 1911, there was 23,785 tons of lead ore in sight, averaging 15.44% lead, 3.01 oz. silver, 1.04% copper, with some gold, and 12,000 tons of concentrating ore carrying 6.8% lead, 0.35 oz. silver, 1.04% copper, with some gold. The output of copper ore for the first six months of 1912 was 100,808 tons, however, as compared to 162,522 tons for the whole of the year preceding, showing a largely increased production, much new copper ore being developed at the same time, and the tonnage of lead ore in sight being slightly increased.

Columbus Consolidated—This company recently shipped 34 tons of concentrates from its mill, which has been operating during the summer. There are rumors of a proposed consolidation between this company and the Columbus Extension adjoining.

Michigan-Utah—The new tramline is bringing down ore, which has accumulated.

Summit County

Park City shipments for the week ended Sept. 28 were 2,500,700 lb., the shippers being the Daly West, Daly-Judge, Silver King Coalition, New York Bonanza, Little Bell, Barry-Coxe.

Thompson-Quincy—Drifting is being done by the Daly West company from the 900-ft. level toward the limestone-quartzite in the Thompson-Quincy, where ore was recently discovered. The drift will be 900 ft. long, and has 800 ft. more to go. It is progressing at the rate of 10 ft. daily. The work will afford better facilities for the development and extraction of ore, improve drainage and furnish better air in both properties, as well as opening up new ground in the Daly West.

Revelator Consolidated Mining Co.—The two John The Revelator claims and the West St. Louis are to be consolidated under this name. The new company is to be capitalized for 600,000 shares par value 50c., 100,000 shares to remain in the treasury. The claims are near the summit of the divide between the Snake Creek and Bonanza Flat sections. The Revelator claims have been developed by means of a tunnel and 147-ft. incline. There is a body of ore at the bottom of the incline, from which shipments of good-grade ore carrying lead, silver, and gold have been made during the year. A tunnel will be driven by the new company to develop this ore at depth.

Washington

FERRY COUNTY

Surprise—Extensive operations are being carried on at this mine, owned by the Republic Mines Corporation, Republic. The ore is of excellent grade and is being treated in the company's mill.

STEVENS COUNTY

Iron Gap—Preparations are being made for developing this mine by L. D. Peters and associates, of Chewelah, owners.

Wisconsin

PLATTEVILLE DISTRICT

Three local drilling companies were recently organized at Platteville to develop the Hibernia lease just north of the city and the Goke and Schroeder farms four miles south of the city adjacent to the Cruson mine.

East End—At the end of the first week's milling this new property is turning out $1000 worth of ore per day, making 18 tons of zinc and three tons of lead concentrates in eight hours, the zinc concentrates assaying over 50% zinc. The property was recently bought by the Wisconsin Zinc Co. for $75,000.

Gruno—This company, at Mifflin, is sinking a new shaft on the Bainbridge land.

Tripoli — This company, at Mineral Point, has made a valuable discovery on the old range half a mile from the mill and is making a connection by tramway. The mine is an old producer but has been idle for several years.

M. & D.—This company, at Cuba City, has struck the Jarrett range again by churn drilling and will re-open the mine.

Cleveland Mining Co.—This company has taken over the Midway and Henrietta leases near Cuba City; both are equipped with concentrating plants which have been idle for several years.

Wyoming

ALBANY COUNTY

Utopia—Preparations are being made for active work at this mine west of Centennial. The lower tunnel is now in ore of fair grade and it is expected that shipments of ore can be made soon.

Free Gold—This property is under option to the American Mineral Development Co. Some high-grade ore is being taken out.

CARBON COUNTY

Four properties in the Snowy Range district are now shipping ore and from six others ore is being mined that can be milled or concentrated at a profit. The shippers are the Fram, Klondike, Cable and Switzerland. The first three are owned by Class, Stewart and Smelzer; the Switzerland is owned by these men and Charles Olsen. A four-foot vein has been opened on the Cable claim and assays of the ore range between $50 and $150 in gold. Much silver-lead ore carrying gold, has been found in this region.

Canada

BRITISH COLUMBIA

Consolidated Mining & Smelting Co.—The concentrator at the Le Roi mine, in the Rossland district, recently fitted with a 30-ton Elmore oil-vacuum process unit to treat experimentally the siliceous ores of the Le Roi mine, is now running.

NOVA SCOTIA

Nova Scotia Steel & Coal Co.—The output for September was; coal mined, 67,889 tons; coal shipped, 87,789; pig iron, 7490; steel ingots, 6722; iron ore mined, 57,913; iron ore shipped, 61,800 tons.

Dominion Coal Co.—The output for September was approximately 380,000 tons. At the present rate of production the total output for the year will be 4,500,000 tons.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Oct. 4, and for the year to date, were:

Bailey	21.57	21.57
Beaver	24.26	299.38
Buffalo	61.81	926.38
Casey Cobalt	.	212.15
City of Cobalt		887.99
Cobalt Lake	....	683.45
Cobalt Townsite	29.00	1,384.95
Chamb.-Ferland		362.33
Coniagas	158.54	1,673.95
Crown Reserve	17.56	368.66
Drummond		383.05
Hudson Bay		538.47
Kerr Lake		560.22
La Rose	76.85	2,732.88
Lost and Found		15.00
McKinley-Darragh	...	1,963.78
Nipissing		1,704.50
O'Brien	43.23	496.54
Penn.-Canadian	.....	29.70
Provincial	...	22.22
Right of Way	.	242.82
Timiskaming	66.75	863.76
Trethewey		381.54
Wettlaufer		265.74
Colonial		63.14
Dominion Reduction Co		56.64
Totals	499.57	17,140.81

Four claims staked by Jordan and Bruce in the Gillies Limit have been sold to Frank M. Perry, of Toronto.

Kerr Lake—Reserves are estimated at a total of 6,660,091 oz. of silver. Of this, 2,829,100 oz. is in the form of high-grade mine ore, 1,490,561 oz. in mill and dump ore. The rest, 2,781,400 oz. is under the lake and not at present available.

King Edward—H. E. Jackman who has a lease on this property, is making arrangements to resume work.

Crown Reserve—In crosscutting north from No. 24 vein on the 150-ft. level a new vein has been struck, at approximately 800 ft. from the shaft. The vein has never been encountered on any of the other workings and contains high-grade ore. The crosscut will be continued in the hope of finding other veins.

Bruce—On these locations, which adjoin the Mann properties in the Gowganda district, a good vein carrying native silver was uncovered Sept. 28. A Buffalo syndicate headed by A. M. Sechrest, has bought a controlling interest in the property and will shortly begin development.

ONTARIO-PORCUPINE

Crown Chartered—Pending the result of the special stockholders' meeting, the mine has been closed and the pumps taken out, with the result that the underground workings are flooded. The affairs of the company appear to be practically settled by an agreement whereby Messrs. Henault and Heffernan agree to do their part in the reorganization by taking stock at 25c. per share to liquidate their claim of $140,000. The old board of directors will also resign and a new board will be elected.

Porcupine Townsite—The power plant is nearing completion. The underground operations which will have to be carried on largely under the lake, will soon be started.

Plenaurum—A good discovery is stated to have been made near the line between this property and the Jupiter.

Dome Lake—The ore encountered on the 180-ft. level is richer than was indicated by the diamond-drill cores.

Boissoneault—These claims, in the new district of Gauthier, which lies northwest of Swastika, are under option to a Montreal syndicate for $150,000. The ore consists of small quartz stringers in a quartzite formation. Many of these stringers show free gold, but a great amount of work will be necessary before any idea of the value of the property can be obtained.

Asia

CHOSEN

Oriental Consolidated Mining Co.—The cleanup for September is $122,000, according to manager's cable dispatch.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Oct. 9—Coal-trade conditions are practically unchanged. Business in the West is active and strong. Car shortage and slow transportation are the only limiting factors. The same state of affairs exists in the seaboard bituminous trade. The West Virginia strike also is still a disturbing element.

The anthracite trade is still much behind on orders, but is gradually catching up. There is no occasion for the scare which some of the dealers in Eastern cities are trying to work up among consumers.

The Pennsylvania Railroad Commission has decided to investigate the rates charged on anthracite to Philadelphia, on complaints made that such rates are unreasonable and discriminatory.

Anthracite shipments in September fell below those for August, being 5,876,406 long tons. For the nine months ended Sept. 30, the total was 51,376,379 long tons in 1911, and 44,835,219 in 1912; a decrease of 6,541,160 tons, or 12.7%, this year.

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, eight months ended Aug. 31, long tons:

	1911	1912	Changes
Coal	41,831,040	39,672,864	D. 2,158,176
Coke	617,294	583,034	D. 34,260
Briquettes	1,117,783	990,258	D. 127,525
Total exports	43,566,117	41,246,156	D. 2,319,966
Steamer coal	12,665,440	11,608,744	D. 1,056,691
Total	56,231,557	52,854,900	D. 3,376,657

Imports of coal for the eight months were 16,147 tons in 1911, and 181,721 in 1912; increase, 165,574 tons.

Iron Trade Review

New York, Oct. 9—The general activity of the market continues, specifications on contracts and new orders coming in freely. Prices are firm and here and there have been advanced, the general tendency being upward.

It is almost the general expectation that there will be a shortage of material all along the line this winter, with a car shortage predicted at the same time. It is claimed that the large steel interests are endeavoring to prevent a runaway market, and that what is being done is straight business, without any speculation on the part of buyers, but the number of those who doubt such claims is growing from week to week.

Reports that the Pittsburgh mills have made a straight advance of $1 a ton on bars, plates and shapes, under date of Oct. 5, cannot be confirmed from the mills themselves. It is observed, however, that they are accepting less business in bars at 1.35c. and that the price of 1.40c. on plates and shapes has disappeared entirely, the Steel Corporation having been the only seller really quoting this figure for a fortnight or more. It appears that the mills wish to minimize the importance of market advances, and as it is a sellers' market entirely they are treating each inquiry on its particular merits, covering their regular customers and turning down other business. An exception should be made of the smaller plate mills, which do not make contracts, and are now selling plates at prices ranging from 1.60c. on up to perhaps 2.00c. for early delivery.

Based on the rate specifications as now being received on this year's contracts, and the contracting that has been done for first quarter, the mills as a rule are sold up through first quarter, and pretty well into second quarter. Any serious disturbance in trade, of course, would shut off business now considered as certain to be specified, and change the aspect of affairs, but it can still be said that the mills have a larger tonnage of absolutely sound business on their books than ever before.

The pig-iron market again shows much strength and advancing prices. More merchant furnaces are going into blast, but the question of ore and coke supplies is quite a serious one.

Complaints continue to come in of scarcity of labor at various points; also of slow railroad transportation, which delays the deliveries on contracts.

Pig Iron Production—The blast furnace statistics collected by the *Iron Trade Review* show that on Oct. 1 there were 261 coke and anthracite stacks in blast; an increase of seven over Sept. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in September was 2,463,800 long tons; for the nine months ended Sept. 30 it was 21,512,425 tons. Of this total approximately 15,856,400 tons, or 73.7%, were made by stacks owned and operated by steel works.

Baltimore

Oct. 7—Exports for the week included 2,241,100 lb. steel rails and 455,252 lb. miscellaneous iron and steel to Cuba; 8,016,814 lb. miscellaneous iron and steel to Panama; 867,300 lb. pipe to Antwerp; 1490 lb. selenium and 57,200 lb. iron pipe to Hamburg. Imports included 5937 tons pyrites from Huelva, Spain; 22,700 tons iron ore from Cuba.

Birmingham

Oct. 7—Pig-iron prices in Southern territory have advanced to $14 per ton, No. 2 foundry, as a minimum, delivery either during the last quarter of this year or the first three months of 1913. Furnace companies are not showing any willingness to sell beyond the first quarter though it is reported that $15 per ton might tempt trading. There is still much apprehension on the part of consumers because of the railroad car shortage and immediate delivery on old orders is being requested. In some instances furnace companies have come to the assistance of other companies by supplying the trade. One or two companies are still out of the market on certain grades of iron while others are selling very carefully on lower grades because of the large quantity already sold. The cast-iron pipe manufacturers are melting more iron right now than at any time heretofore. There will be no interruption whatever in the pipe make this winter.

A few shipments of pig iron from this section on foreign orders are still to be noted. With ocean freights at command, it is stated that considerable more foreign business could be booked.

Steel activities are unchanged. The car shortage has been felt at the steel plants at Ensley and Gadsden. Some shipments have been delayed.

The strike of the iron molders for shorter hours and better wages is still felt at several of the shops in this district.

Cleveland

Oct. 7—Wild boats for ore are still in demand, 10 or 15c. over contract rates being paid.

Pig Iron—The market is active and orders are coming in freely. Prices are again firmer and some desirable brands have been advanced. Current quotations, Cleveland delivery, are $15.90@16.40 for bessemer, $16@16.50 for No. 2 foundry, and $19.55 for Jackson County silvery.

Finished Material—Quotations are firm on all lines. Buyers are urging deliveries as much as possible.

Chicago

Oct. 8—The iron market continues firm, with the demand large for finished materials and pig iron selling in small but widely distributed lots. Few melters are figuring now on large requirements; the tendency is toward holding off as at frequent periods in the last year. Yet a fair aggregate tonnage is being sold each week, chiefly for needs within the first half. An occasional sale is made to piece out requirements of the last quarter.

Northern No. 2 foundry iron brings $17@17.50, at the furnace, which means about $17.50@18, Chicago. Southern of corresponding grade sells for $13.50@14, Birmingham, which means $17.85@18.35, Chicago. Some furnace agents hold out firmly for the higher prices named and perhaps the greater part of the iron sold is at their figures. Lake Superior charcoal iron brings $18.75@19.25, Chicago, and is in very good demand.

The market for finished products is active, contracts for first-half needs being freely made in nearly all lines, and the demand being strong. Rail contracts are large and the demand for all lines of railroad supplies is large. Structural material is steadily in demand for construction work over a large territory and contracts for delivery are held back by the difficulty of forcing a greater output. Bars are actively in demand and prices are strong, bar iron bringing 1.50c. and soft-steel bars 1.53c.; contracts are being made freely for first-quarter needs. Plates and sheets are in very good demand and minor lines show activity, the whole situation being one of great strength.

Philadelphia

Oct. 9—The pig-iron market continues active. Material for fourth-quarter delivery is scarce, and stocks have practically disappeared. Pipe makers are picking up their grades of iron wherever they can find them. No. 2 X foundry is quoted at $17.25@17.40; gray forge at $16.50@16.75. Basic is still in demand and $16.50@17 is quoted. With an unusually good demand $21.50@22 has been paid for low phosphorus iron.

Billets—The market is bare of openhearth billets for early delivery. Some first-quarter business has been taken at $28, with $32 for forging billets.

Bars—Iron bars are in demand and 1.45@1.50c. at mill is now quoted. Steel bars are unchanged.

Sheets—Sheets are strong at the higher prices. It is hard to get early deliveries.

Plates—Demand continues heavy and people who want early delivery have to sit down and wait.

Structural Material—No large business has been placed this week, but some big orders are in sight. Mills are not hunting business, having all they want for the present.

Pipes and Tubes—Continued activity is reported, and early deliveries call for premiums.

Scrap—Heavy steel-melting scrap is a little slow, but other kinds are in demand. Dealers are picking up all they can get.

Pittsburgh

Oct. 8—Throughout the iron and steel market the news indicates greater activity and a stronger tone. Buying of finished steel products for next year is now on a large scale, particularly in bars, plates, shapes and sheets. In bars, plates and shapes quotations are advancing, 1.40c. having disappeared entirely as to plates and shapes, leaving the market at 1.45c. for plates and shapes and 1.35c. for bars. These are minimum prices, with considerable tonnage being placed at $1 a ton higher. The most strenuous times, however, are in cruder materials, unfinished steel, pig iron and coke. Consumers are scouring the country for billets and sheet bars for this year's delivery, and paying almost any price to secure deliveries. Steel-making iron has advanced sharply again, with free buying for first-quarter delivery, and at new high prices, $16.25, Valley, for basic and $17 for bessemer. Connellsville furnace coke for prompt shipment has sold at $3.25, ovens, a total advance of a full dollar a ton in 60 days, and the market shows signs of going still higher.

Pig Iron—Bessemer has advanced 50c., there having been sales of 25,000 tons, 1000 tons and 750 tons at $17, Valley, chiefly for first-quarter delivery. Basic has sold above $16; last week's price, 5000 tons at $16.10 and afterward 10,000 tons at $16.25, at which the market is now quotable. A large steel plant which has not lately been a buyer has figured prominently in these transactions. The Standard Sanitary Manufacturing Co. has purchased about 15,000 tons for first quarter and 10,000 tons for second quarter, of foundry and forge grades for its Allegheny and New Brighton plants, paying on the basis of $16 at furnace for No. 2, which has lately been the minimum of the market. It has also bought southern iron for its Louisville plant, paying on the basis of $14, Birmingham. Alice furnace at Sharpsville, Penn., went into blast last week, Sharpsville furnace at the same point went in yesterday and Ella at West Middlesex will go in before the close of the week, the first named on basic, the other two on bessemer. We quote: Bessemer, $17; basic, $16.25; No. 2 foundry, $16; malleable, $15.50@16; gray forge, $15.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—English makers who were quoting $56.50, Baltimore, on contract have advanced to $61, while those who had previously advanced to $59.50 hold this quotation, and we therefore quote the contract market at $59.50@61, Baltimore, with freight to Pittsburgh $1.95; and prompt at $61@65, Baltimore.

Steel—The market is practically bare of material for this year, while for next year mills are not yet making any quotations. Consumers are inquiring for small or large lots for early delivery and some of them seem ready to pay almost any prices. We repeat last week's quotations, although they are largely nominal: Bessemer billets, $25; bessemer sheet bars, $25.50; openhearth billets, $26; openhearth sheet bars, $26.50; forging billets, $32. Rods are quotable $1 higher, at $28@29 at mill.

Sheets—This morning the American Sheet & Tin Plate Co. advanced its price on blue annealed sheets $1 a ton, or from $1.55c. to 1.60c. Several of the independent mills had already been quoting 1.60c., being able to make somewhat earlier delivery than the leading interest. At 1.55c. a considerable tonnage has been sold for first quarter. Black and galvanized sheets have been moving freely for that delivery, but some of the independent mills are practically refusing to sell, being amply filled for this year and expecting an advance before they need to sell for next year. Premiums are frequently obtained for early delivery. We quote: Blue annealed, 10 gage, 1.60@1.65c.; black, 28 gage, 2.15@2.25c.; galvanized, 28 gage, 3.30@3.40c.; painted corrugated, 2.35c.; galvanized corrugated, 3.35c. per pound.

St. Louis

Oct. 7—There has been an increase in demand and inquiry, with good sales and advancing prices. Southern No. 2 foundry is selling up to $14, Birmingham, or $17.75, St. Louis, though some sales at $13.75, furnace, are reported. Northern No. 2 brings $17.75, with $18 asked on first quarter. Business in finished iron and steel is active.

Coke is again higher and irregular, with early deliveries hard to get.

Iron Ore Trade

Notwithstanding some drawbacks to navigation, the movement of iron ore down the Lakes in September reached a total of 7,287,230 tons. The total movement for the season to Oct. 1 was 24,837,137 tons in 1911, and 36,338,382 in 1912; an increase of 11,501,245 tons, or 46.3%, this year.

British Ore Trade—Imports of iron and manganese ores in Great Britain, eight months ended Aug. 31, long tons:

	1911	1912	Changes	
Iron ore	4,526,377	4,335,025	D	190,352
Manganese	262,267	211,762	D	50,505

German Foreign Trade—Imports and exports of ores in Germany seven months ended July 31, metric tons:

	Imports	Exports	Excess
Iron ore.....	6,862,749	1,320,444	Imp 5,542,305
Manga'se ore	257,576	5,910	Imp 251,666

Imports of iron ore are chiefly from Sweden and Spain. Exports are chiefly of minette ores from Luxemburg to France and Belgium.

Foreign Iron Trade

British Foreign Trade—Exports and imports of iron and steel and of machinery in Great Britain, eight months ended Aug. 31, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel	£29,896,894	£8,062,227	Ex. £21,834,667
Machinery..	21,181,719	4,506,817	Ex. 16,674,902
Hardw're, etc.	7,912,086	5,230,430	Ex. 2,681,656
New ships....	3,712,249	....	Ex. 3,712,249
Total..... ..	£62,702,948	£17,799,474	Ex. £44,903,474
Total, 1911..	59,259,286	15,549,318	Ex. 43,709,968

Increase in exports, £3,443,662; increase in imports, £2,250,156. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports.............	1,168,164	1,251,716	I. 154,036
Imports.............	1,168,164	1,251,716	I. 83,552

Exports of tinplates to the United States decreased from 12,554 tons in 1911 to 1163 tons this year.

German Foreign Trade—Exports and imports of iron and steel and of machinery in the German Empire, eight months ended Aug. 31, metric tons:

	Exports	Imports	Excess
Iron and steel..	3,890,500	446,632	Exp. 3,443,868
Machinery.....	329,567	58,726	Exp. 270,841
Total..........	4,220,067	505,358	Exp. 3,714,709
Total, 1911.....	3,769,306	452,302	Exp. 3,317,004

Increase in exports 450,761 tons, or 12%; increase in imports, 53,056 tons, or 11.7%, this year.

METAL MARKETS

New York, Oct. 9—The metal markets continue active and generally strong.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January....	110	111	July	112	114
February..	115	109	August	117	120
March......	112	111	September	111	127
April.......	114	115	October .	112	....
May	118	118	November.	111	..
June........	115	117	December.	110	....

Year 1909, 115; 1910, 115, 1911, 112.
Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The movement from London to New York has temporarily ceased. The Bank of France is reported to be hoarding gold on account of the disturbed political situation.

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Aug. 1912..	$ 2,498,472	$ 5,576,900	Imp. $3,078,428
" 1911..	480,799	4,105,331	Imp. 3,624,532
Year 1912..	43,159,972	34,589,111	Exp. 8,570,861
" 1911..	15,910,449	40,473,010	Imp. 24,562,561
Silver			
Aug. 1912..	5,574,644	3,952,279	Exp. 1,622,365
" 1911..	4,869,359	3,653,329	Exp. 1,216,030
Year 1912	45,834,920	32,652,869	Exp. 13,182,051
" 1911..	44,587,570	29,534,724	Exp. 15,052,846

Exports from the port of New York, week ended Oct. 5. Gold, $150,190, largely to Panama; silver, $1,168,875, chiefly to London Imports Gold, $315,225, from Mexico, South America and Australia; silver, $210,337, mostly from Central America.

Platinum—Business is good and the market is reported firm both here and abroad. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes under date of Sept. 26, that the market and the prices remain generally unchanged. The demand for considerable quantities of platinum became higher, but business has not been closed. From Ekaterinburg it is reported the area of the platinum mines has largely increased in comparison with last year. A large stock of platinum is in the hands of speculators, but they are buying the metal offered by the starateli. The quotations are: In St. Petersburg, 37,300@37,500 rubles per pood; at Ekaterinburg, 9.80 rubles per zolotnik; for crude metal, 83% platinum —equivalent to $36.65 and $36.85, respectively.

Iridium—The supply of this metal appears to be short, and prices have advanced sharply. The present quotations are $67.50@70 per oz., New York.

Silver—The market continues steady with only slight variations. There does not seem to be any important change in sight at present. The announcement of the China loan for £10,000,000 imparted strength to the market at the time, and it continues steady at 29½ to 29⅝d. in London.

SILVER AND STERLING EXCHANGE

Oct.	3	4	5	7	8	9
New York....	63⅞	64	64⅛	64	64⅛	63⅞
London .	29½	$29\frac{9}{16}$	29⅝	$29\frac{9}{16}$	29⅝	29½
Sterling Ex.	4.8555	4.8555	4.8550	4.8535	4.8545	4.8560

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver 0.925 fine

Exports of silver from London to the East, Jan. 1 to Sept. 26, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India...	£6,062,800	£7,551,200	I. £1,488,400
China........	989,700	933,500	D. 56,200
Total	£7,052,500	£8,484,700	I. £1,432,200

The Indian currency return of Sept. 24 shows a decrease of 22 lakhs of rupees in coin held, but an increase of 58 lakhs in silver bullion under coinage.

Gold in the United States Oct. 1, as estimated by the Treasury Department: Coin and bullion held by Treasury against gold certificates outstanding, $1,065,408,169; gold coin in Treasury, $166,063,940; in banks and circulation, $609,910,326; total, $1,841,382,435; an increase of $8,298,871 during September.

Sales of gold bars by the New York Assay Office for use in the arts amounted to $2,673,008 in September.

Copper, Tin, Lead and Zinc

NEW YORK

Oct.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
3	17⅝ @17⅞	17.40 17.50	50½	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
4	17⅝ @17⅞	17.40 17.50	50⅜	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
5	17⅝ @17⅞	17.40 17.50	50½	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
7	17⅝ @17⅞	17.35 17.45	50⅛	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
[illegible]	17⅝ @17⅞	17.30 17.40	49¾	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
9	17⅝ @17⅞	17.30 17.40	50	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has been extraordinarily dull, demand either from Europe or from manufacturers at home having been inconsequential. The Balkan trouble appears to have disturbed business abroad, while on this side the statistics published on Tuesday showed that manufacturers had previously overbought. The statistics were unfavorably received. Even the producers admitted that they killed any idea of an advance in price. The larger agencies are still holding at the peg price of 17¾c., delivered, etc., but others have offered freely at 17⅝c. and that price could be shaded materially.

LONDON

Oct.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
3	78¼	79¼	83½	229¼	228	21⅛	27½
4	78	79	83½	230	228¾	21⅜	27⅝
5	..	....	...	.	..	..	..
7	77 11/16	78⅝	83	228½	227¼	21⅜	27⅝
8	77½	78 7/16	83	227¼	226	21½	27⅝
9	77⅛	78⅛	82½	228½	227½	21⅜	27⅝

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ±£25 = 5.44c.; £70 = 15.22c. Variations, £1 = ±21¾c.

The supply of Lake copper being more narrowly held, there are not yet any cheap offerings of this kind and the market is nominal.

At the close, Lake copper is quoted 17⅝@17⅞c.; electrolytic in cakes, wirebars or ingots 17.30@17.40c.; casting copper is quoted nominally at 17.20@17.25c. as an average for the week.

The standard market has been quiet and weakish, due principally to the Balkan disturbance, which caused some rather heavy selling of Rio Tinto shares. On Oct. 3, spot was £78 5s. and three months £79 5s. On Oct. 4, both positions were 5s. lower. On Oct. 7 spot was down to £77 13s. 9d. three months to £78 12s. 6d. The market closes on Oct. 9 at £77 2s. 6d. for spot and £78 2s. 6d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 6453 long tons. Our special correspondent gives the exports from Baltimore at 2865 tons for the week.

Tin—The London market which moved in a desultory fashion during the past week, became firmer at the end of last week, only to decline again the beginning of this week. The reason for these fluctuations is to be found solely in speculative operations, as no developments became known that might otherwise account for it. The market again closes firmer at £228 10s. for spot and £227 10s. for three months.

No change has been noticed in the attitude of domestic consumers, who, in accordance with their requirements, have purchased prompt material somewhat more liberally. They were so much better able to do this, as the premium for spot tin has disappeared, due to large shipments from London, which are on the way. There was also some material sold at below the importation point by second hands, who were anxious to liquidate their holdings. The market closes steady at 50c. for October.

Straits shipments of tin in September are cabled at 5440 tons, an increase of 322 tons over last year.

Lead—The market is unchanged with a fair business doing at last prices, 5.10c., New York, and 4.90@4.95c., St. Louis.

The London market is somewhat firmer, and at the close Spanish lead is quoted £21 7s. 6d. with English lead 2s. 6d. higher.

Spelter—The market is unchanged. There is a fair demand, but buyers have covered their near-by wants and are not disposed to buy ahead; on the other hand, there is no particular pressure to sell. St. Louis is quoted 7.30@7.35c.; New York, 7.45@7.50 cents.

The London market is slightly firmer, good ordinaries being quoted £27 12s. 6d., specials £27, 17s. 6d. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b., La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—Business is active but prices have been variable. We quote 25@26c. per lb. for No. 1 ingots, New York. The foreign market is firm.

Antimony—Demand is good and the market is active. Prices are firmer, Cookson's being quoted at 10@10¼c. per lb.; Hallett's at 9¼@9½c.; while 9@9¼c. is named for Hungarian, Chinese and other outside brands.

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets[1]

Joplin, Mo., Oct. 5—The high price of zinc sulphide ore was $65, the base per ton of 60% zinc $57@62. Zinc silicate was $32@36 per ton of 40% zinc, with greater competition. The average price, all grades of zinc, $58.02. Lead ore sold up to $68, on a base of $64@66 per ton of 80% lead, the high level of prices being maintained on the recently adopted plan of buying on the net weight of the metal contents. The average price, all grades of lead, is $65.22 per ton.

During the past month the reserve stock, though practically unchanged around 3000 tons, has been changed from ore purchased in advance to ore held for higher prices, since the weaker tendency of the ore market has been manifested. The high average price of the week on zinc ore is occasioned by the strong prices of silicate, a large part of which sold up to $40 per ton.

SHIPMENTS WEEK ENDED OCT. 5

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,240,060	. .	940,580	$157,299
Joplin	2,879,180	. .	357,020	101,680
Galena	1,457,840	.	122,970	49,128
Alba-Neck	1,023,210	.	.... .	31,719
Duenweg	988,990		60,870	31,616
Granby	229,000	976,210	8,740	25,740
Cave Springs	536,300	. .	. ....	17,160
Oronogo	449,270	......	63,420	13,674
Jackson	455,520		.. ..	13,665
Miami	353,930	.... .	85,970	12,660
Spurgeon	118,860	392,540	.. ..	10,393
Springfield	324,910	....	......	10,325
Carl Junction	248,690	.	9,720	8,390
Wentworth	127,200	104,510		5,337
Carthage	124,980	.....		3,498
Quapaw	124,400	....		3,483
Aurora		188,270		3,390
Sarcoxie	120,600	. . .	....	3,376
Totals	13,802,940	1,661,530	1,649,290	$502,533
40 weeks	426,561,300	27,262,520	71,676,430	$13,787,745

Blende val., the week, $416,888; 40 weeks, $11,337,437
Calamine, the week, 31,851; 40 weeks, 427,428
Lead value, the week, 53,794; 40 weeks, 2,022,880

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41 85	$44.90	$40 55	$43.54	$55 68	$58.92
February	40 21	45.75	39.16	43 31	54 46	52 39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38 88	52.00	37.47	50.36	56 37	54 18
May	38.25	55.30	36 79	53.27	55.21	52.45
June	40 50	55 88	38.18	54 38	56 49	55.01
July	40.75	58 85	38 36	56 59	58.81	58 83
August	42 50	55 13	41 28	53.27	60 74	57 04
September	42 63	59 75	41 29	57 07	59 33	61.26
October	42.38	......	40.89	......	54.72	......
November	45.40	......	43.25	......	57 19	......
December	44.13	....	40.76	......	62.03	......
Year	$41.45	.....	$39.90	......	$56.76	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold

Platteville, Wis., Oct. 5—The base price paid this week for 60% zinc ore declined from $62 to $58. The base price paid for 80% lead ore was $62@64 per ton.

SHIPMENTS WEEK ENDED OCT. 5

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	670,900	. .	272,500
Mineral Point	662,200	. .	....
Galena	453,900		. ....
Benton	429,200	....	425,000
Hazel Green	340,000	... ...	....
Shullsburg	316,000	66,000	.. ...
Highland	262,600	.... .	....
Cuba City	160,000	81,000	297,940
Harker	85,860	....	. . ..
Rewey	84,000	.	.
Montfort	74,000	. . .	..
Linden	60,080	. ..	......
Total	3,598,740	147,000	995,440
Year to date	155,237,550	6,351,660	27,210,650

Shipped during week to separating plants, 1,789,880 lb. zinc ore.

Other Ore Markets

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60% of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less. These prices are delivered.

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price, delivered at smelting works in Kansas and Oklahoma, is for the zinc contents, less eight units at the St. Louis price for spelter; with a deduction of $16 to $18 per 2000 lb. of ore.

Ferro-alloys—The Primos Chemical Co. has rebuilt the recently burned portion of its works at Primos, Delaware County, Penn., and the plant is in full operation again. It was entirely rebuilt of brick and iron and is fireproof. This company manufactures tungsten, molybdenum, ferrovanadium, ferrotungsten and ferromolybdenum.

Chemicals

New York, Oct. 9—Increasing activity begins to be apparent in the general market and business is in fair shape.

Arsenic—The market is firm. Spot arsenic is scarce, though more Mexican deliveries are promised. Quotations are $5@5.12½ per 100 lb. for spot and nearby deliveries. Futures are quoted at $4.50, but are rather neglected.

Copper Sulphate—Business is good and sales are increasing. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is steady. Quotations are 2.55c. per lb. for spot and November; 2.57½c. for later deliveries.

Petroleum

The monthly statement of the *Oil City Derrick* gives the following statement of oil wells completed in September, not including California: New York, Pennsylvania and West Virginia, 545; Lima-Indiana, 78; Kentucky, 39; Illinois, 105; Kansas-Oklahoma, 628; Texas-Louisiana, 83. In all the divisions there were 1479 wells completed with a new production of 48,613 bbl. Of the completions 251 were failures and 147 were gas wells. The total number of oil producing wells was 1081 against 1272 in August, 1092 in July, 1148 in June and 981 in May. There were 46 fewer wells completed in September than in August, but the production was 919 bbl. more than in the previous report. This increase comes wholly from the Gulf Coast districts, where the production was practically doubled.

At the close of August there were 562 rigs up and 1370 wells drilling, an increase of 75 rigs and a decrease of 41 drilling wells.

MINING STOCKS

New York, Oct. 9—On Oct. 3, the Exchange was much more active and prices advanced. On the Curb, coppers were rather quiet, but firm. The feature in other mining stocks was Tonopah Merger, of which 74,700 shares were sold at advancing prices.

Oct. 4 there was some weakness developed on the Exchange, in sympathy with the European markets. On the Curb there were heavy sales of Tonopah Merger, Butte & New York and Diamond Black Butte. The copper stocks were irregular, both as to demand and prices.

Aug. 5 the Exchange was depressed by some heavy sales of stocks for foreign account, but quickly recovered. On the Curb the Cobalt stocks were firm, and there was a fair demand for other mining stocks. Coppers were irregular.

Oct. 7 the Exchange was still heavy and had not taken up the large quantity of stocks offered. The Curb was more active with good business in the Cobalts and the Nevada gold stocks. Coppers were rather weak.

Oct. 8 and 9 the Exchange was irregular and dealings were rather small. The Curb was more active, sales of mining stocks being fairly large. Cobalts and gold stocks gained, and copper shares showed only small changes in price.

Boston, Oct. 8—Despite the fact that the Copper Producers' figures showed an increase of stocks in September, stock-market prices maintained a firm tone, although the present market is one of specialties. A report, although not authenticated, is that there is to be a merger of some of the Butte mines. North Butte's action in the market reflects this, although at the same time reports from the property state that the richest ore ever encountered is now being mined at depth.

The price of North Butte is up $6.25 for the week to $39.50, which would indicate that there was something in the wind out of the ordinary. In this connection East Butte is mentioned and the price of this specialty has risen $1.62½ to $16.87½. It is known that there is something brewing in this company's affairs, but nothing definite has come out as yet.

Granby is another stock which is prominent. The price has risen $6.50 to $64.50. The annual report was a favorable document, and it is only a short time before it is believed that dividends will be resumed. The so called Dow stocks, although not active, are firm. Committees of Stock Exchange members, as well as of stockholders of these companies, are probing into the acts of the late president, S. R. Dow.

Prices on the Curb have been firm in the main, but activity is in spots. Alaska Gold touched $10.25, but is slightly

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	July	August	Sept.
Alaska shipments.	2,224,441	1,242,836	1,726,715
Anaconda.... ..	23,000,000	25,250,000	24,500,000
Arizona Ltd. .	3,200,000	3,260,000	3,340,000
Copper Queen......	7,708,147	8,040,424	9,103,861
Calumet & Ariz. ..	4,748,000	4,514,000	4,462,000
Chino.	2,945,000	3,437,309	3,372,[illegible]
Detroit...	2,194,090	1,882,289	1,881,668
East Butte.	1,261,304	1,410,500	1,250,000
Mammoth	1,818,738	1,802,590	...
Mason Valley... ..	1,500,000	...	..
Nevada Con... .	6,084,274	.	. ..
Ohio	617,500	. .	.. . .
Old Dominion	2,543,763	2,597,896	2,223,000
Ray	2,985,965	2,888,095	.
Shannon	1,446,000	1,400,000	1,142,000
South Utah	142,555	224,855	. .
United Verde*	2,500,000	2,500,000	. .
Utah Copper Co....	10,602,000	11,248,992	. .
Lake Superior*....	19,500,000	21,000,000	..
Non-rep. mines*...	8,970,000	8,970,000	.
Total production	105,991,687	.	.
Imports, bars, etc..	25,586,735	...	....
Total blister.....	131,578,422	..	.
Imp. in ore & matte	7,748,392		
Total American..	139,326,814	.	
Miami†......... ..	3,027,710	3,048,750	2,949,150
Brit. Col. Cos.:			
British Col. Copper	1,026,006	941,364	
Granby	1,802,753	1,970,388	
Mexican Cos.:			
Boleo†	2,386,480	.	.
Cananea	4,000,000	4,044,000	3,500,000
Moctezuma	3,094,016	3,229,839	771,844
Other Foreign:			
Cape Cop., S. Africa	......	. .	. ....
Kyshtim, Russia...	1,325,000	.. .	
Spassky, Russia....	795,200	902,720	
Famatina, Argen..	... ...	....	
Tilt Cove, Newf'd..	.. ....	. .	.
Exports from:			
Chile	8,960,000	8,512,000	.
Australia	8,288,000	8,064,000	....
Arrivals in Europe‡	14,114,240	20,200,320	.. ....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911........	115,588,950	57,311,584	50,824,011
X .	118,255,442	64,068,307	60,084,349
XI .. .	111,876,601	68,039,776	67,049,279
XII............	122,896,697	65,988,474	79,238,716
Year ..	1,431,938,338	709,611,605	754,902,233
I, 1912........	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III............	125,694,601	67,487,466	58,779,566
IV............	125,464,644	69,513,846	53,252,326
V.......	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII....	137,161,129	71,094,381	60,121,331
VIII..........	145,628,521	78,722,418	70,485,150
IX....	140,089,819	63,460,810	60,264,796

VISIBLE STOCKS

	United States	Europe	Total
X, 1911 . . .	140,894,856	191,945,600	332,840,456
XI.............	134,997,642	176,825,600	311,823,242
XII .	111,785,188	164,281,600	276,066,788
I, 1912.........	89,454,695	158,323,200	247,777,895
II....... ...	66,280,643	154,851,200	221,131,843
III...	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V............	65,066,029	134,176,000	199,242,029
VI............	49,615,643	117,801,600	167,417,243
VII...........	44,335,004	108,186,000	152,521,004
VIII...........	50,280,421	113,299,200	163,579,621
IX.............	46,701,374	113,568,000	160,269,374
X..............	63,065,587	107,408,000	170,473,587

below that now. Laramie and Boswyocolo, Van Horn stocks, are being liquidated because of the financial difficulties of certain of the management. It is reported that the Nevada Douglas will shortly start dividend payments at the rate of 50c. per annum.

Assessments

Company	Delinq.	Sale	Amt.
Andes, Nev.	Sept. 26	Oct. 17	$0.05
Black Bear, Ida.	Sept. 26	Oct. 26	0.01
Black Horse, Ida.	Oct. 18	Nov. 8	0.01
Black Jack, Utah	....	....	0.01½
Bullion, Nev.	Oct. 16	Nov. 6	0.03
Columbus Extension, Utah.	Sept. 30	Oct. 23	0.02
Eagle Mt., Ida.	Sept. 23	Oct. 23	0.00½
Eastern Star, Ida.	Oct. 12	Nov. 12	0.002
Empire, Ida.	Sept. 23	Oct. 23	0.002
Exchequer, Nev.	Oct. 30	Nov. 20	0.03
Great Eastern, Ida.	Sept. 28	Oct. 28	0.002½
Hale & Norcross, Nev.	Oct. 3	Oct. 24	0.05
Hypotheek, Ida.	Oct. 14	Nov. 4	0.01
Indiana, Mich.	Oct. 16	....	1.00
Michigan Cop. & Gold, Utah	Oct. 2	Oct. 22	0.00½
Oneco, Mich.	Oct. 10	....	1.00
Savage, Nev.	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev.	Oct. 4	Oct. 25	0.02
Sierra-Nevada, Nev.	Sept. 25	Oct. 16	0.05
Snowshoe, Ida.	Sept. 30	Oct. 30	0.005
Temple, Ida.	Sept. 30	Oct. 30	0.002
Union Con., Nev.	Oct. 15	Nov. 6	0.15
Wabash, Utah	Sept. 16	Oct. 10	0.05
Wasatch, Utah	Sept. 27	Oct. 16	0.01
Yellow Jacket, Nev.	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	..	25.596	24.594	.
November	55.635	55.719		25.680	25.649	.
December	54.428	54.905	..	25.160	25.349	.
Year	53.486	53.304		24.670	24.59[illegible]	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	..	12.370	....	55.170	
November	12.616	.	12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.97[illegible]	

New York cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.18[illegible]	43.923	October	41.18[illegible]	
May	43.115	46.053	November	43.125	
June	44.636	45.815	December	44.655	
			Av. Year	42.281	.

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.53[illegible]	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265		4.139	...	15.332	
November	4.298		4.181	.	15.821	
December	4.450	.	4.332		15.648	
Year	4.420	.	4.286	..	13.970	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	..	5.951	....	27.256	....
November	6.380	.	6.223	....	26.795	....
December	6.301	...	6.151	....	26.849	....
Year	5.758	.	5.608	.	25.281	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	......	13.44	......	14.34	..
November	14.92	..	13.30	.....	14.25	.
December	15.15		13.10	....	13.90	..
Year	$15.72		$13.94		$14.49	..

STOCK QUOTATIONS

COLO SPRINGS Oct. 8

Name of Comp.	Bid.
Acacia	.04
Cripple Cr'k Con	.01½
C. K. & N.	.18
Doctor Jack Pot	.06
Elkton Con	.65½
El Paso	1.16
Findlay	.05
Gold Dollar	.18½
Gold Sovereign	.02
Isabella	.19
Jack Pot	.05
Jennie Sample	.06½
Lexington	.007
Moon Anchor	.007
Old Gold	.03
Mary McKinney	.72
Pharmacist	.01
Portland	1.05
Vindicator	.87
Work	.01

SALT LAKE Oct. 8

Name of Comp.	Bid
Beck Tunnel	.09
Black Jack	.08¼
Cedar Talisman	.01¼
Colorado Mining	.10
Columbus Con	.10
Crown Point	.02
Daly-Judge	‡5.80
Grand Central	.60
Iron Blossom	1.20
Little Bell	‡.20
Lower Mammoth	.06
Mason Valley	11.75
May Day	.14
Nevada Hills	1.75
New York	‡.02½
Prince Con	1.65
Silver King Coal'n	2.95
Sioux Con	.04½
Uncle Sam	‡.10
Yankee	‡.12

TORONTO Oct. 8

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.45	Foley O'Brien	.20
Hudson Bay	63.00	Hollinger	14.60
Temiskaming	.37	Imperial	.03½
Wettlaufer-Lor.	.34	Pearl Lake	.23½
Am. Goldfield	‡.50	Porcu. Gold	.21
Apex	.02½	Preston E. D.	.03
Crown Chartered	.06½	Rea	.25
Dobie	‡.20	Standard	.01
Dome	23.50	Swastika	.10½
Dome Exten.	.13½	West Dome	.15

SAN FRANCISCO Oct. 8

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.05
Belcher	.25
Best & Belcher	.04
Caledonia	1.27½
Challenge Con	.05
Chollar	.02
Confidence	.40
Con. Virginia	.37
Crown Point	.25
Gould & Curry	.01
Hale & Norcross	.12
Mexican	‡2.42½
Occidental	.70
Ophir	.52
Overman	.70
Potosi	.03
Savage	.10
Sierra Nevada	.20
Union Con.	.37
Yellow Jacket	.24

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	9.96
Jim Butler	.74
MacNamara	.22
Midway	.53
Mont.-Tonopah	2.27½
North Star	.40
West End Con.	1.65
Atlanta	.16
Booth	.06
C.O.D. Con	.08
Comb. Frac.	.12
Jumbo Extension	.35
Pitts.-Silver Peak	.90
Silver Pick	.08
St. Ives	‡.30
Tramp Con	.09
Argonaut	2.00
Bunker Hill	‡4.50
Central Eureka	.25
So. Eureka	‡2.90

N. Y. EXCH. Oct. 8

Name of Comp.	Clg.
Amalgamated	90⅞
Am. Agri. Chem.	59
Am.Sm.&Ref.,com	87⅞
Am. Sm. & Ref., pf.	108½
Am. Sm. Sec., pf. B	86¾
Anaconda	46⅛
Batopilas Min.	1¼
BethlehemSteelpf.	79
Chino	43¼
Federal M. & S., pf.	48⅞
Goldfield Con.	2⅝
GreatNor.,ore.,ctf.	49¾
Guggen. Exp.	58½
Homestake	99
Inspiration Con.	20
Miami Copper	29½
Nat'nalLead,com	67⅛
National Lead, pf	109
Nev. Consol.	22½
Phelps Dodge	215½
Pittsburg Coal, pf.	96½
Ray Con.	22⅝
RepublicI&S,com.	34
Republic I & S. pf.	91¾
SlossSheffi'd,com.	57
Sloss Sheffield, pf.	95¼
Tennessee Copper	44⅝
Utah Copper	65
U. S. Steel, com.	78¼
U. S. Steel, pf.	115½
Va. Car. Chem.	47

BOSTON EXCH. Oct. 8

Name of Comp.	Clg.
Adventure	‡7
Ahmeek	345
Algomah	3
Allouez	46
Am. Zinc	34½
Ariz. Com., ctfs.	4⅝
Bonanza	‡.40
Boston & Corbin	7¼
Butte & Balak.	3⅝
Calumet & Ariz.	82
Calumet & Hecla	595
Centennial	22½
Cliff	4½
Copper Range	59¾
Daly West	4
East Butte	16⅜
Franklin	8½
Granby	63¾
Hancock	28
Hedley Gold	20
Helvetia	.75
Indiana	14½
Island Cr'k, com	56
Island Cr'k, pfd.	88
Isle Royale	35½
Keweenaw	2¼
Lake	35¾
La Salle	5⅜
Mass	7
Michigan	1¾
Mohawk	68
New Arcadian	‡3
New Idria Quick	7¾
North Butte	38¼
North Lake	3⅞
Ojibway	4⅜
Old Dominion	63½
Osceola	114
Quincy	88½
Shannon	15¼
Shattuck-Ariz.	28
Superior	46⅛
Superior & Bost.	1⅝
Tamarack	46
Trinity	4⅛
Tuolumne	$2\frac{11}{16}$
U. S. Smelting	49¼
U. S. Smelt'g. pf.	52
Utah Apex	2
Utah Con	12½
Victoria	‡2¾
Winona	5¼
Wolverine	79
Wyandot	‡2

N. Y. CURB Oct. 8

Name of Comp.	Clg.
Barnes King	‡.78
Beaver Con	.40
Braden Copper	7
B. C. Copper	4¾
Buffalo Mines	1⅞
Caledonia	.40
Con. Ariz. Sm.	⅝
Davis-Daly	2⅛
Diam'field-Daisy	.07
Ely Con	.21
Florence	.78
Giroux	4¾
Gold Hill Con.	$\frac{5}{16}$
Greene Cananea	10½
Greenwater	.04
Internat. S. & R.	‡124
Kerr Lake	2¾
Keystone	1⅞
La Rose	$2\frac{7}{16}$
McKinley-Dar-Sa.	$1\frac{15}{16}$
Min. Co. of A. new	3
Motherlode Gold.	‡$\frac{15}{16}$
Nev. Utah M. & S.	‡.01
Nipissing Mines	8½
Ohio Copper	$1\frac{11}{16}$
Pacific Sm. & M.	$\frac{9}{32}$
South Live Oak	2
South Utah M. & S.	$\frac{11}{16}$
Standard Oil (Old)	1110
Stand'd Oil of N.J.	398
Stewart	1⅜
Tonopah	$6\frac{9}{16}$
Tonopah Ex.	$2\frac{11}{16}$
Tonopah Merger	$1\frac{3}{32}$
Tri-Bullion	⅞
Tularosa	⅞
Union Mines	‡$\frac{3}{16}$
United Cop., pfd.	10
Yukon Gold	$3\frac{7}{16}$

LONDON Oct. 9

Name of Com.	Clg.
Camp Bird	£1 8s 0d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 18 3
Mexico Mines	7 0 0
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 7 0

BOSTON CURB Oct. 8

Name of Comp.	Last
Alaska Gold M.	9½
Bingham Mines	5¼
Boston Ely	1⅛
Boswyocolo	.01½
Butte Central	7½
Cactus	.10
Calaveras	2[illegible]
Chief Cons.	$1\frac{7}{16}$
Corbin	.23
Cortez	.75
Crown Reserve	3½
First Nat. Cop.	1⅞
Majestic	.45
Mazatan	‡¼
Moneta Porc.	‡.03
Nevada-Douglas	$3\frac{11}{16}$
New Baltic	2
Oneco	$1\frac{5}{16}$
Raven Copper	½
Rhode IslandCoal	‡.10
San Antonio	‡3
Smokey Dev.	2[illegible]
S. W. Miami	5[illegible]
South Lake	7
Trethewey	.35
United Verde Ext.	.41

‡Last quotation.

Mining Companies—United States

Name of Company and Situation		Shares Issued	Shares Par Val	Dividends Total to Date	Dividends Latest Date		Dividends Latest Amt
Acacia, g	Colo...	1,438,989	$1	$129,618	Jan	'11	$0.01
Adams, s.l.c.	Colo...	80,000	10	778,000	Dec	'09	0.04
Ahmeek, c	Mich....	50,000	25	700,000	July	'12	5.00
Alaska Mexican, g	Alas....	180,000	5	3,039,381	Aug	'12	0.35
Alaska Treadwell, g	Alas....	200,000	25	12,510,000	Aug.	'12	0.75
Alaska United, g	Alas....	180,200	5	1,072,190	Aug.	'12	0.50
Am. Zinc, Lead & Sm..	U. S....	165,300	25	855,680	July	'12	0.50
Anaconda, c..........	Mont..	4,332,500	25	65,171,250	July	'12	0.50
Argonaut, g..........	Cal...	200,000	5	1,200,000	June	'10	0.05
Arizona Copper, pf....	Ariz...	1,426,120	1.20	2,003,394	May	'12	0.047
Arizona Copper, com...	Ariz....	1,519,896	1.20	14,691,796	July	'12	0.30
Bagdad-Chase, g., pf...	Cal ..	84,819	5	202,394	Jan.	'09	0.10
Baltic, c..............	Mich.....	100,000	25	7,050,000	June	'11	5.00
Bingham N. H., c	Utah....	228,690	5	294,219	July	'12	0.10
Bonanza Dev., g	Colo..	300,000	1	1,425,000	Oct.	'11	0.20
Bunker Hill Con., g....	Cal	200,000	1	646,000	Aug	'12	0.07½
Bunker Hill & Sul., l.s..	Ida.....	327,000	10	13,715,550	Sept.	'12	0.20
Butte & Ballaklava, c..	Mont.....	250,000	10	125,000	Aug	'10	0.50
Caledonia, l.s.c.	Ida...	1,300,000	1	52,000	June	'10	0.01
Calumet & Arizona, c..	Ariz......	596,353	10	15,478,118	Sept.	'12	1.00
Calumet & Hecla, c....	Mich.....	100,000	25	118,850,000	Sept.	'12	12.00
Camp Bird, g.s.	Colo..	1,100,000	5	8,383,562	July	'12	0.24
Centen'l-Eur., l.s.g.c.	Utah..	100,000	5	3,450,000	Apr.	'12	1.50
Center Creek, l.z......	Mo...	100,000	10	440,000	July	'12	0.05
Champion, c..........	Mich..	100,000	25	7,300,000	Sept.	'12	1.00
Cliff, g	Utah..	300,000	1	90,000	Feb.	'12	0.10
Cliff, g	Alas...	100,000	1	140,000	May	'11	0.25
Colo. Gold Dredging....	Colo..	100,000	10	150,000	Aug.	'12	0.25
Colorado, l.s.g....	Utah..	1,000,000	0.20	2,570,000	June	'12	0.03
Columbus Con., g.s.....	Utah..	285,540	5	226,832	Oct.	'07	0.20
Commercial Gold.......	Ore...	1,750,000	1	43,750	Dec.	'10	0.00½
Con. Mercur, g	Utah..	1,000,000	1	3,415,313	July	'12	0.03
Continental, z.l.	Mo ..	22,000	25	275,000	July	'12	0.50
Copper Range Con., c..	Mich..	393,445	100	12,709,988	July	'12	0.50
Daly Judge, s.l.	Utah...	300,000	1	360,000	July	'12	0.15
Daly West, s.l...	Utah...	180,000	20	6,538,000	July	'12	0.30
Doctor Jackpot, g......	Colo..	3,000,000	0.10	90,000	Mar.	'11	0.00½
Doe Run, l.....	Mo...	65,782	100	3,139,176	Sept.	'12	1.50
Elkton Con., g.....	Colo..	2,500,000	1	2,991,960	May	'12	0.01
El Paso, g	Colo..	490,000	5	1,548,295	June	'12	0.01
Fed. M. & S., com	Idaho.	60,000	100	2,708,750	Jan	'09	1.50
Fed. M. & S., pf.......	Idaho.	120,600	100	7,391,250	Sept.	'12	1.50
Florence, g ..	Nev....	1,050,000	1	840,000	Apr.	'1[illegible]	0.10
Frances-Mohawk, g....	Nev......	912,000	1	546,000	Jan.	[illegible]	0.05
Free Coinage, g......	Colo..	10,000	100	180,000	Dec.	'09	1.00
Fremont Con., g...	Calif..	200,000	2.50	158,000	Sept	'12	0.02
Frontier, z............	Wis...	1,250	100	141,272	Sept.	'12	2.00
Gemini-Key'ne, l.g.s...	Utah....	5,000	100	2,130,000	Oct	'11	6.00
Gold Chain, g.	Utah .	1,000,000	1	40,000	Sept.	'12	0.02
Gold Coin of Victor.....	Colo..	1,000,000	1	1,350,000	Feb	'09	0.02
Gold Dollar Con........	Colo..	2,500,000	0.10	87,500	Sept.	'12	0.00½
Gold King Con., g.....	Colo..	5,750,370	1	1,407,319	Dec	'11	0.03
Golden Cycle, g.......	Colo...	1,500,000	5	2,100,000	Sept	'12	0.02
Golden Star, g..........	Ariz...	400,000	5	140,000	Mar	'10	0.05
Goldfield Con., g........	Nev...	3,558,367	10	22,771,322	July	'12	0.30
Grand Central, g.......	Utah..	500,000	1	1,445,750	Aug	'12	0.05
Granite, g	Colo..	1,650,000	1	253,000	Dec.	'10	0.01
Hazel, g	Cal	900,000	1	864,000	July	'12	0.01
Hecla, l.s...............	Idaho..	1,000,000	0.25	2,560,000	Sept.	'12	0.05
Hercules, l.s...........	Idaho..	1,000,000	1	3,650,000	July	'11	0.06
Homestake, g.......	S. D...	218,400	100	28,522,040	Sept.	'12	0.50
Horn Silver, l.s.z.......	Utah..	400,000	25	5,662,000	Sept.	'07	0.05
Iowa, g.s.l.............	Colo...	1,666,667	1	200,166	June	'11	0.00½
Iowa-Tiger Leasing g.s..	Colo...	12,655	1	13,921	Jan	'12	0.10
Iron Blossom, s.l.g......	Utah....	1,000,000	0.10	1,270,000	July	'12	0.10
Iron Silver, s.l.g........	Colo...	500,000	20	4,500,000	Jan	'12	0.10
Jamison, g..............	Cal....	390,000	10	378,300	Jan.	'11	0.02
Jerry Johnson, g....	Colo...	2,500,000	0.10	150,000	Aug	'11	0.01
Kendall, g	Mont...	500,000	5	1,375,000	Jan.	'12	0.02
Kennedy, g..............	Cal....	100,000	100	1,831,001	Apr.	'10	0.03
King of Arizona, g ..	Ariz....	200,000	1	396,000	Aug	'09	0.12
Klar Piquett, z.l.........	Wis....	20,000	1	147,500	Sept.	'12	0.25
Knob Hill, g............	Wash...	1,000,000	1	45,000	May	'12	0.00½
Liberty Bell, g....	Colo...	130,551	5	522,093	Oct.	'10	1.00
Little Bell, l.s	Utah....	300,000	1	75,000	Mar.	'11	0.05
Little Florence, g.......	Nev....	1,000,000	1	430,000	Jan.	'08	0.03
Mammoth, g.s.c ...	Utah....	400,000	25	2,220,000	Mar.	'08	0.05
Mary McKinney, g......	Colo...	1,309,252	1	959,826	July	'12	0.02
May Day, g.s.l	Utah....	800,000	0.25	108,000	Sept.	'08	0.01½
Mexican, g.s............	Nev......	201,600	2.50	20,160	Aug	'11	0.10
Miami, c	Ariz......	664,993	5	664,993	Aug	'12	0.50
Modoc, g.s.............	Colo...	500,000	1	275,000	Dec.	'11	0.01
Mohawk M. Co.........	Mich...	100,000	25	2,675,000	Aug.	'12	2.50
Monarch-Mad'a, g.s.l...	Colo...	1,000,000	1	40,000	May	'11	0.01
Montana-Tonop., s.g....	Nev.....	921,865	1	430,000	Jan	'12	0.10
Mountain, c............	Cal....	250,000	25	4,216,250	May	'08	0.44
National, g.............	Nev.....	750,000	1	570,000	May	'11	0.10
Nevada Con., c..........	Nev....	1,999,394	5	8,977,870	Sept	'12	0.37½
New Century, z.l........	Mo	330,000	1	237,600	Oct.	'09	0.01
New Idria, q.	Cal....	100,000	5	1,600,000	July	'12	0.30
North Butte, c	Mont....	410,000	15	10,248,000	July	'12	0.50
North Star, g	Cal ...	250,000	10	3,661,989	Sept	'12	0.30
Old Domin'n, M. & Sm.	Ariz...	162,000	25	2,351,000	July	'12	1.25
Ophir, s.g	Nev....	201,600	3	2,068,360	Jan.	'12	0.10
Opohongo, g.s.l.	Utah...	898,978	0.25	44,948	July	'12	0.02
Oroville Dredging....	Cal	700,000	5	1,383,036	Dec.	'09	0.12½
Osceola, c ...	Mich....	96,150	25	10,593,200	July	'12	6.00
Parrot, c.. ..	Mont...	229,850	10	7,114,942	Aug.	'12	0.15
Pearl Con., g...	Wash...	1,909,711	0.05	181,422	Dec.	'10	0.02
Pharmacist, g........	Colo...	1,500,000	1	87,500	Feb.	'10	0.00½
Pioneer, g	Alas....	5,000,000	1	4,041,526	Oct.	'11	0.03
Pittsburgh-Idaho, l.....	Ida....	803,000	1	184,690	Aug.	'12	0.01
Pittsburgh Silver Peak, g	Nev...	2,900,000	1	288,000	July	'12	0.16
Portland, g	Colo...	3,000,000	1	9,097,080	July	'12	0.02
Quilp	Wash....	1,500,000	1	67,500	Feb.	'12	0.01
Quincy, c.............	Mich...	110,000	25	20,363,000	Sept.	'12	1.25
Republic, g............	Wash...	1,000,000	1	85,000	Dec.	'10	0.01½
Rochester, l.z............	Mo....	1,900	100	188,396	Dec.	'10	0.50
Round Mountain, g	Nev....	866,426	1	328,404	Sept	'10	0.01
Seven Troughs Coal. g	Utah	1,500,000	1	37,500	July	'12	0.02½
St. Joseph, l........	Mo	1,000,000	10	8,408,357	Sept	'12	0.15

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Shares Par Val	Dividends Total to Date	Dividends Latest Date		Dividends Latest Amt
Shannon, c...........	Ariz...	300,000	$10	$450,000	July	'07	$0.50
Shattuck-Arizona, c...	Ariz..	350,000	10	1,050,000	Jan.	'11	1.00
Silver King Coal. l.s...	Utah.	1,250,000	5	1,659,885	Jan.	'10	0.15
Sioux Con., s.l.g......	Utah.	745,389	1	872,097	July	'11	0.04
Skidoo, g..............	Cal...	1,000,000	5	275,000	May	'12	0.02½
Smuggler, l.s.z........	Colo..	1,000,000	1	2,235,000	Nov.	'06	0.03
Snowstorm, c.g	Ida ..	1,500,000	1	1,034,655	July	'12	0.02
South Eureka, g.......	Calif..	299,981	1	366,881	Apr.	'12	0.07
Standard Con., g.s.....	Cal...	178,394	10	5,229,809	Jan.	'12	0.10
Stratton's Ind., g	Colo..	1,000,000	0.60	364,500	Apr.	'12	0.06
Success, z.	Ida...	1,500,000	1	835,000	Sept.	'12	0.03
Superior & Pitts., c...	Ariz .	1,499,793	10	3,089,574	Sept.	'12	0.30
Tamarack, c..........	Mich.	60,000	25	9,420,000	July	'07	4.00
Tennessee, c...........	Tenn..	200,000	25	3,106,520	Aug.	'12	1.00
Tomboy, g. s........	Colo...	300,000	4.85	2,843,100	Dec	'11	0.24
Tom Reed, g..........	Ariz......	909,555	1	736,824	Aug.	'12	0.05
Tonopah Belm't, s.g..	Nev......	1,500,000	1	3,218,003	July	'12	0.25
Tonopah Ext., g.s. ...	Nev.....	943,433	1	306,615	July	'12	0.02½
Tonopah of Nev., s.g.	Nev......	1,000,000	1	9,250,000	July	'12	0.40
Tri-Mountain, c......	Mich.....	100,000	25	950,000	Dec.	'10	1.00
Tuolumne, c..........	Mont.....	800,000	1	360,000	Aug.	'11	0.15
Uncle Sam, g. s. l.....	Utah....	500,000	1	495,000	Sept.	'11	0.05
United Cop. Min., c..	Wash.	1,000,000	1	20,000	Sept	'12	0.01
United (Crip. Ck.) g..	Colo	4,000,100	1	440,435	Jan.	'10	0.04
United Globe, c........	Ariz ..	23,000	10	667,000	July	'12	4.50
United Verde, c........	Ariz...	300,000	10	30,997,000	Sept.	'12	0.75
Utah, s.l...............	Utah..	100,000	10	325,000	Dec.	'10	0.02
Utah, c................	Utah..	1,562,599	10	15,057,453	Sept.	'12	0.75
Utah Con., c..........	Utah..	300,000	5	7,200,000	May	'12	0.50
Valley View, g.	Colo..	1,060,000	1	240,000	Dec.	'10	0.04
Victoria, g.s.l.........	Utah..	250,000	1	207,500	Mar.	'10	0.04
Vindicator Con., g....	Colo..	1,500,000	1	2,542,500	July	'12	0.03
Wasp No. 2, g........	S. D..	500,000	1	351,966	Sept.	'12	0.02
Wellington Mines, g. .	Colo..	10,000,000	1	200,000	July	'12	0.00½
Wolverine, c..........	Mich....	60,000	25	7,140,000	Apr.	'12	5.00
Work, g	Colo..	1,500,000	1	172,500	July	'08	0.00½
Yak, s.l	Colo	1,000,000	1	1,417,685	Oct	'10	0.04
Yankee Con., g.s.......	Utah....	1,000,000	1	182,500	July	'07	0.01½
Yellow Aster, g	Cal...	100,000	10	1,081,789	Jan.	'12	0.05
Yellow Pine, g.........	Nev...	950,000	1	47,500	Aug.	'12	0.02
Yukon Gold, g.........	Alas...	3,500,000	5	4,210,000	Sept.	'12	0.07½

Coal, Iron, Industrial and Holding Companies

Name of Company and Situation		Shares Issued	Shares Par Val	Dividends Total to Date	Dividends Latest Date		Dividends Latest Amt
Amalgamated, c.......	Mont.....	1,538,879	$100	$69,734,840	Aug.	'12	$1.00
Am. Sm. & Ref., com..	U. S. ...	500,000	100	23,208,333	Sept.	'12	1.00
Am. Sm. & Ref., pf....	U. S.	500,000	100	41,708,333	Sept.	'12	1.75
Am. Smelters, pf. A....	U. S.	170,000	100	6,855,000	July	'12	1.50
Am. Smelters, pf. B....	U. S.	300,000	100	10,232,000	July	'12	1.25
Cambria Steel..........	Penn.....	900,000	50	15,647,500	Aug.	'12	0.62½
Consolidation Coal.....	Md......	190,247	100	20,533,894	July	'12	1.50
Greene Cananea.......	U. S.	2,471,314	25	1,237,656	Aug.	'12	0.25
Guggenheim Expl.	U. S......	207,933	100	14,170,153	July	'12	2.50
Inter'l Nickel, com....	U. S......	115,826	100	6,296,671	Sept.	'12	7.00
Inter'l Nickel, pfd.....	U. S.	89,126	100	3,609,500	Aug.	'12	1.50
Inter'l Sm. & Ref.	U. S.	100,000	100	2,500,000	Aug	'12	2.00
Lehigh Coal & Nav.	Penn.....	482,956	50	22,052,156	Aug	'12	1.00
National Lead, com....	N. Y.	206,554	100	7,021,650	Sept.	'12	0.75
National Lead, pf	N. Y.....	243,676	100	25,429,765	Sept.	'12	1.75
Old Dominion, c.......	Ariz......	293,245	25	2,846,735	July	'12	1.00
Phelps, Dodge & Co...	U. S.	450,000	100	20,459,304	Sept.	'12	2.50
Pittsburgh Coal, pf....	Penn ...	297,010	100	15,137,583	July	'12	1.25
U. S. Steel Corp., com.	U. S......	5,083,025	100	168,988,726	Sept.	'12	1.25
U. S. Steel Corp., pf..	U. S......	3,602,811	100	313,549,063	Aug.	'12	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,320	50	4,255,538	July	'12	0.50
U. S. Sm., R. & M., pf	U.S.-Mec.	351,105	50	10,837,575	July	'12	0.87½

Canadian, Mexican and Central American Companies

Name of Company and Situation		Shares Issued	Shares Par Val	Dividends Total to Date	Dividends Latest Date		Dividends Latest Amt
Ajuchitlan, g.s.........	Mex.....	50,000	$5	$187,500	July	'12	$0.25
Amparo, g.s...........	Mex...	2,000,000	1	860,000	Aug.	'12	0.03
B. C. Copper..........	B. C.	591,709	5	437,886	July	'12	0.15
Beaver Con., s.........	Ont....	1,996,490	1	289,901	July	'12	0.03
Buffalo, s	Ont.. .	1,000,000	1	1,480,000	Aug.	'12	0.05
Cobalt Townsite, s....	Ont...	1,000,000	1	150,000	May	'12	0.05
Conagas, s	Ont...	800,000	5	3,800,000	Aug.	'12	0.30
Crown Reserve, s	Ont....	1,768,814	1	4,333,595	Sept.	'12	0.05
Crow's Nest Pass C. Co.	B. C.....	248,506	25	2,182,864	Mar.	'11	0.25
Dominion Coal, com...	N. S...	150,000	100	5,400,000	July	'12	1.00
Dominion Coal, pf.....	N. S.	50,000	100	1,915,000	Aug	'12	3.50
Dos Estrellas, g.s......	Mex......	300,000	0.50	7,030,000	Sept.	'12	2.50
El Oro, g.s............	Mex.....	1,147,500	4.85	8,576,406	July	'12	0.24
Esperanza, s.g	Mex.....	455,000	4.85	10,835,127	June	'12	0.36
Granby, s.l.c..	B. C...	148,496	100	4,197,111	Dec.	'10	1.00
Greene Con., c.......	Mex......	1,000,000	10	7,194,400	Aug.	'12	0.40
Guanajuato D., pf., s	Mex......	10,000	1000	274,356	Jan.	'11	3.00
Hedley Gold........	B. C. ..	120,000	10	684,000	Sept.	'12	0.30
Kerr Lake s..	Ont...	600,000	5	4,170,000	Sept.	'12	0.25
La Rose Con., s....	Ont...	1,498,407	5	2,951,851	July	'12	0.12½
Le Roi No. 2, g..	B. C.	120,000	[illegible]	1,428,840	July	'12	0.24
Lucky Tiger Com., g...	Mex.. ..	715,337	10	1,482,202	Sept.	'12	0.05
McK.-Dar. Sav. s.....	Ont..	2,247,692	1	2,607,320	July	'12	0.10
Mines Co. of Am. (new)	Mex..	1,700,000	10	*877,500	Jan.	'12	0.15
N. Y. & Hond. Ros....	C. A	150,000	10	3,082,500	Mar.	'12	0.15
Nipissing, s..	Ont.	1,200,000	5	8,640,000	July	'12	0.37½
Peñoles, s.l.g..........	Mex ...	80,000	25	5,910,688	Sept.	'12	1.25
Peregrina M. & M., pf.	Mex ...	10,000	100	328,656	Sept.	'10	3.50
Pinguico, pf., s........	Mex. ...	20,000	100	600,000	Oct.	'11	3.00
Right of Way Mns†...	Ont ...	1,685,500	1	202,260	Dec.	'11	0.02
Rio Plata, s...........	Mex.....	373,437	5	354,990	Mar.	'12	0.10
San Rafael, g.s........	Mex......	2,400	25	1,437,624	Jan.	'12	2.00
San Toy, g.s..........	Mex......	6,000,000	1	360,000	Dec.	'11	0.10
Sopresa, g.s...........	Mex......	19,200	20	1,517,438	Jan.	'11	34.00
Stand'd Silver-Lead....	B. C.. ..	2,000,000	1	275,000	Sept.	'12	0.02½
Temiskaming, s	Ont.....	2,500,000	1	1,159,155	July	'12	0.03
Tem. & Hud. Bay, s...	Ont....	7,761	1	1,659,854	Aug	'12	3.00
Trethewey, s	Ont...	1,000,000	1	861,998	July	'12	0.10
Wettlaufer-Lorrain, s...	Ont...	1,416,590	1	424,977	July	'12	0.05

*Previous to reorganization, $5,258,881

†Previous to January, 1910, $324,944

INDUSTRIALS

The Pequest Co., Buttzville, N. J., have ordered a second dryer from the Ruggles-Coles Engineering Co., 50 Church St., New York, for drying iron ore.

The Chas. A. Schieren Co., 30 Ferry St., New York City, are putting out a solid bronze desk pin tray as a souvenir. They announce that any mining engineer can have one for the asking.

J. W. Stonehouse, Victor, Colo., has installed his enameled steel signals in a large number of mines recently and it is reported that this new way of doing an old thing is greatly appreciated by the users.

The D. T. Williams Valve Co., announces that they are just putting out a new gate valve, the "Cino," at a moderate price. It is said to have a wide range of uses in mining work up to 100 lbs. pressure.

The Denver Fire Clay Co., Denver, Colo., has just issued a cloth-bound catalog for 1913, consisting of 530 pages, fully illustrated. Assayers and chemists will value the book for reference purposes. This company has also issued a bulletin on Case Gas Furnaces for assaying and smelting and the proper heat treatment of metals.

The Western Electric Co. reports that its earnings continue to run close to the forecast of the showing for this year made soon after the new year began. It was then figured that 1912 ought to yield a gross business of something like $67,000,000. Returns for the eight months ended with August give an indicated gross business for the year of approximately $68,000,000.

Walter B. Snow, publicity engineer, 170 Summer Street, Boston, Mass., has added to his staff Chester R. Ross, who will act as manager of the addressing and mailing department. Mr. Ross brings to this position an extended experience covering three years with the Griffin Wheel Co., four years with the Boston Transcript, and a considerable period as salesman in various lines of industry.

The Braden Copper Company of Chili has given the Hardinge Conical Mill Company an additional and repeat order for twelve more 8-foot Hardinge Pebble Mills, making a total of sixteen now on hand or on order for this company. Also that the Teziutlan Copper Company has placed an order for four similar sized Hardinge Mills. These mills are for semi-fine grinding, i.e., to pass about 60 mesh.

The George M. Newhall Engineering Company are in receipt of an order from the Pennsylvania Railroad Company for 10 wrecking cranes, 120 tons capacity each, with special features specified by the railroad company. Cranes to be manufactured by the Industrial Works of Bay City, Mich. This is said to be the first order for equipment of this character placed by the Pennsylvania Railroad Company for several years.

A new advertising firm has been formed in New York City under the name of Wightman & Richards, Technical Department of Jos. A. Richards & Staff, General Advertising Agents, Tribune Building. This firm represents the association of Joseph A. Richards, Lucius I. Wightman, and Paul Morse Richards. The association is formed in recognition of the fact that advertising is salesmanship and that the most efficient marketing of any product demands a unifying, rather than a separation, of advertising and selling efforts.

The new firm should do much to advance the cause of profitable advertising, by carrying out the plans they have mapped out.

Lockwood, Greene & Co., architects and engineers for industrial plants, have removed their Boston offices from 93 Federal Street to 60 Federal Street, where they occupy the seventh, eighth, and ninth floors of the new First National Bank Building. The new offices will provide better facilities for handling the increasing business of this concern, including the design of industrial plants, investigation and design of water power developments, steam, water and electric power plant tests and the valuation and reorganization of existing plants, as well as acting in the capacity of permanent consulting engineers for many industrial concerns.

The Rateau Steam Regenerator Company has been awarded an order by the Inland Steel Company for a complete equipment of Rateau Steam Regenerators. The regenerator equipment will handle the exhaust steam from two mill engines at the Indiana Harbor plant of the Inland Steel Company, and will deliver the steam to two low-pressure turbines of 2000 kw. each. The Rateau Steam Regenerator Company has granted a license to the Ingersoll-Rand Company to manufacture the patented Rateau regulator for mixed flow turbines. The General Electric Company, the Southwark Foundry & Machine Company and the Ridgway Dynamo & Engine Company have been for some time manufacturing under a similar license from the Rateau Steam Regenerator Company.

The Wells-Lloyd Co., Menominee, Mich., has a machine at work for the manufacture of steel tubing, patents for which were issued on the 28th of May last. It is said to be the first automatic machine for the manufacture of steel tubing in the world. The metal as produced from the mills in flat form is placed on one end of the machine in the form of a roll. The machine forms the stock into round, square or other shapes, fuses the metal together, or welds with oxygen and acetylene gases, draws the welded tube to exact size and perfect shape, straightens it, and finally cuts it to any desired length, without stopping the movement of the tube through the machine. In other words the tube is finished from flat stock ready to be shipped, without the intervention of a human hand.

The Dodge Manufacturing Company has opened a branch store and warehouse at 14th and Lovejoy Sts., Portland, Ore., where a complete stock of Dodge power transmission machinery and appliances will be carried in stock. The branch will be under the management of Charles A. Barnard, formerly vice-president of the Barnard & Leas Manufacturing Company, Peoria, Ill., and an engineer of wide experience in mill equipment. Besides the Dodge line, the Portland branch will have the northwestern sales agency for the well known line of flouring mill machinery manufactured by the Wolfe Company, Chambersburg, Pa., Mr. Barnard's long experience in the design and manufacture of flour mill machinery, elevating, conveying and power transmission machinery insures to the mills and other power using plants of Oregon and Washington a real service in an engineering capacity on their requirements in these lines. This makes the tenth branch opened by the Dodge people and Portland is added to the list in pursuance to a demand. Branches are now maintained at Minneapolis, Philadelphia, Pittsburgh, Chicago, St. Louis, Atlanta, Cincinnati, New York, Boston, and in connection with these several hundred dealers throughout the country carry the full line in stock.

The Taylor Iron & Steel Company announces the acquisition of the Wm. Wharton Jr. & Co., Inc., at Philadelphia, Penn. with works at Philadelphia and Jenkintown, Penn., and its subsidiary corporation, the Philadelphia Roll & Machine Company. The Taylor Company and the Wharton Company have both had a successful history of more than fifty years. During the past eighteen years the business of each company has been largely supplemental to the other in the manufacture and application of manganese Steel. The Taylor Iron & Steel Company has in recent years devoted itself to the manufacture of steel castings of a special high-grade nature. Of these specialties, TISCO Manganese Steel is the principal one. The Wharton Company manufacture switches, crossings, special rails and track parts for steam and street railway. Its specialty is the application of TISCO Manganese Steel to these parts. The relation of the Taylor Commany and the Wharton Company have been so close that a unity of interests has been deemed advisable. The Taylor Iron & Steel Company will maintain the corporate indentity of the Wm. Wharton Jr., & Company, Inc., and the Philadelphia Roll & Machine Company, and on October 1, 1912, the Taylor Iron & Steel Company will change its corporate title to the Taylor-Wharton Iron & Steel Company. The organization of the Taylor Iron & Steel Company will become the organization of the Taylor-Wharton Iron & Steel Company, namely: President, Knox Taylor; vice president, A. E. Borie, Prof. H. M. Howe, V. Angerer; secretary & treasurer, W. A. Ingram.

TRADE CATALOGS

Independent Powder Co., Joplin, Mo. Catalog. Dynamite. Illustrated, 156 pages, 5½x7½ inches.

A. S. Cameron Steam Pump Works, 11 Broadway, New York. Booklet, Pumps. Illustrated, 16 pages, 3¼x5½ in.

Merrill Metallurgical Co., 143 Second St., San Francisco, Cal. Catalog, Filters, Illustrated, 106 pages, 7½x11 in.

The Hayward Co., 50 Church St., New York. Pamphlet No. 594. Buckets and digging machinery. Illustrated, 8 pages, 6x9 in.

The Curtis & Curtis Co., Bridgeport, Conn. Catalog, Pipe Cutting and Threading Machinery. Illustrated, 32 pages, 7½x10 in.

Sprague Electric Works, 527 W. 34th St., New York. Bulletin No. 902. Electric grab bucket cranes. Illustrated, 24 pages, 8x10½ inches.

Crocker-Wheeler Co., Ampere, N. J. Bulletin No. 149, Form H. Direct current motors and generators. Illustrated, 8 pages, 7½x10 in.

C. W. Hunt Co., West New Brighton, N. Y. Catalog No. 12-1, Industrial Narrow Gauge Railways. Illustrated, 80 pages, 6½x9¼ in.

S. Flory Mfg. Co., Bangor, Penn. Catalog. Hoisting engines, dredging, logging, slate working machinery. Illustrated, 180 pages, 9x12 inches.

Albert J. Kelting, 459 Carroll St., Brooklyn, N. Y. Catalog. Positive pressure blowers, vacuum pumps, exhausters. Illustrated, 6x9 inches.

The Engineering and Mining Journal

Vol. 94 OCTOBER 19, 1912 No. 16

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Sec'y
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7

Walter Renton Ingalls, Editor

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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*Illustrated.

The Butte Report

The vein system at Butte, Mont., is one of the most complex, if not the most complex, of occurrences of ore deposits in North America. The jumbling of its sections of veins by intersecting faults is kaleidoscopic and the genesis of their ores is not yet a matter of definite knowledge. These conditions led the Anaconda Copper Co. to inaugurate and maintain a geological study that probably is more complete than any other mining company has ever done in its own behalf. The necessity for this was recognized by Mr. Brunton, when he was at the head of the company, and now we think it is recognized by the company that it could not mine successfully without it.

Possessing this organization and knowledge, we conceive that it was a matter of indifference to the Anaconda company whether the report of the U. S. Geological Survey came out five years late, or 10 years, or not at all. However, there are other mining interests at Butte, untested possibilities, and moreover this is our greatest copper-mining district, still in the halcyon days of its productiveness, about which the scientific world is desirous of having accurate knowledge.

In reviewing (at our request) the recently issued report of the Geological Survey, elsewhere in this issue, Mr. Sales, as the head of the geological department of the Anaconda, speaks with singular authority. It will be noted that he is decidedly adverse to the value of this report, and the force of his criticisms is enhanced by their temperateness. His conclusions are the more to be regretted, because Doctor Weed is a geologist of note and was capable of a better study than evidently he gave to his subject. He left the Geological Survey before his work at Butte was completed and apparently then lost interest in it, or never found the time to give to it that he ought to have done.

We hope that this will be the last of the long-belated reports of the Geological Survey. We have no doubt that its executive officers deplore certain recent delays just as much as we do, and the mining industry in general. We suggest to the director that hereafter he make it a stipulation in engaging members of his staff that they may not honorably leave the survey until they have completed pending work.

Needs of the Institute

The recent controversies in the American Institute of Mining Engineers have had the beneficent result of arousing interest in it, if nothing else. Any organization that is worth fighting about is manifestly worth while. Nobody fights over a dead horse. We think, however, that in the recent discussions of the affairs of the Institute the prime question has not been brought to the front. We consider this to be its conversion into an active factor in the professional lives of its members.

The Institute had become but little more than an incorporated subscription list. Membership in it was of no professional value or meaning. Even as a publishing agent it was of only moderate interest, it having been displaced in this respect to a large extent by the engineering press. Hence there had developed a feeling of dissatisfaction among the members, which was tersely expressed by the remark: "Membership being of no particular value, why should we pay $10 in dues for a $3 volume?" When it was proposed last January to require members to pay $15 instead of $10, objections were raised that crystallized into an insurgent movement which obtained a big following. Eventually the proposed increase in dues was withdrawn, but the insurgent leaders failed to recognize the desires of the members supporting them and missed an opportunity to propose and consummate a constructive, rejuvenating program. However, such will no doubt be developed in another way.

We consider the great need of the Institute to be plans to increase its usefulness to its members. Accomplishing that, its membership will so increase that there will be no necessity for raising its dues. Its usefulness will be increased by making it a more active agent in professional and industrial matters. The mere publishing of papers will not do that. Any member will better appropriate his dues to subscriptions to two good engineering papers that he does not already take, for he will thus get more value for his money. In publishing, the Institute ought to aim for papers that the press cannot so readily secure. We mean that under the direction of committees or delegates it ought to draw out contributions and discussions that would develop the best technical practice and systematically illuminate uncertain points. Committees ought to be appointed to lead the way in the study of certain problems. Consideration should be given to economic, social and political questions affecting the mining industry. Of course, we know that such things have heretofore been touched upon in the transactions of the Institute, but they have not been in any organized, systematic way. In short, by directing its attention too narrowly to publishing, the Institute has failed to maintain professional and industrial leadership. Let it resume the exercise of that function and there will be enough of interest among its members.

We think that it may also well pursue the plan of sectional meetings that has already been inaugurated and the further plan of linking with itself the minor societies. Thus if the members of the Institute were enabled to obtain all of the papers of the Lake Superior Mining Institute, the Colorado Scientific Society and others, and *vice versa* as to the members of those societies, there would be a material gain. The organization of sectional meetings must, however, be carefully studied and controlled in order that they may not impose undue financial burdens upon some groups of members.

There is also the question of professional *esprit de corps*, the establishment of a professional society in which membership of itself has a meaning. This has heretofore been deprecated in the Institute on the ground that its purpose was purely educational, that any restriction would be snobbishness, or something like that. Yet that idea was certainly wrong. There is nothing more snobbish in engineers seeking to maintain high professional ideals than there is in the medical profession. No one can rightly consider the American Society of Civil Engineers to be an undemocratic organization, yet we see there a body of men who scrutinize their membership and are proud of it.

We may as well call a spade a spade and say that membership in the American Institute of Mining Engineers is meaningless and in spite of any recent raising of the standard no real reform can be effected inside of 20 years, because no existing member can be deprived of his membership. It has been proposed to get around that by creating a class of "fellows," who will be the members of superior professional standing, but that will be rather ridiculous and probably will excite friction.

Anyway, it was the shortcomings of the Institute in the matter of membership, failure to promote professional intercourse, and failure to attend to public functions that led to the organization by some of its members of the Mining and Metallurgical Society about four years ago. This society has thriven, has been in good financial condition, and has been an organization of unflagging interest among its members. From time to time there have been projects to amalgamate it with the Institute, but these have come to naught because the Society has insisted on the preservation of its organization. Granting that, we have but little doubt that a union could be effected, which certainly would produce professional unanimity of interest in society matters. However, we do not think that the Mining and Metallurgical Society would be likely to join the Institute under the enabling amendment to the constitution of the latter proposed at the meeting on Oct. 7.

In previous articles we have spoken of the need in the Institute for reorganizing itself under a sensible system of government and putting the latter into the control of its membership, abolishing official slates, etc. Undoubtedly there ought to be the introduction of a letter-ballot system, and probably there ought to be an abolition of proxy-voting, which has grave dangers as must have been apparent recently to thoughtful members.

Copper Production and Consumption

The statistics for the first nine months of this year, taken by quarters and as a whole, enable us to form an opinion respecting production and consumption that is not confused by erratic figures in monthly reports.

The deliveries by American refiners, by quarters, have been as follows:

	Domestic	Foreign
I.	186,059,735	202,095,516
II.	208,362,352	184,187,971
III.	213,277,609	190,871,277
	607,699,696	577,154,764

The production of refiners and smelters has been as follows:

	Refiners	Smelters (a)
I.	361,068,163	403,220,779
II.	374,517,720	402,644,330
III.	422,879,469	421,324,841
	1,158,465,352	1,227,189,950

(a) Partly estimated.

The smelters' figures should be reduced by about 7,500,000 lb. for the nine months to allow for smelters who report blister copper rather than the copper content thereof, and also for the copper that goes into bluestone, recovered as a by-product.

The figures presented above show that there has been but little increase in the basic production of copper during 1912; none at all until the third quarter. The refiners marched behind the smelters for six months, then began to get ahead.

The domestic deliveries during nine months averaged about 67,500,000 lb. per month; the foreign about 64,000,000; a total of about 131,500,000. Domestic deliveries increased quarter by quarter; the foreign did not. Apparently Europe early in the year reached the point of its maximum demand upon us, for the present. In the last quarter American deliveries were about 71,000,000 lb., foreign 64,000,000, total 135,000,000.

The present requirement of Europe and America from American refiners is probably between 132 and 135 million pounds per month. The present supplies to American refiners are about 139-140 million pounds per month.

The openhearth steel furnaces at the new Saucon plant of the Bethlehem Steel Co. are to use coke-oven gas for fuel. This economy has been practiced at several works in Germany, but its first application in this country will be at Saucon. Any step toward reducing the great waste of coke-oven gases which now goes on in this country should be commended.

By The Way

Apropos of the recently inaugurated enterprise of Thomas F. Cole, east of the Butte & Superior, at Butte, Mont., John D. Ryan has stated openly to his friends that he has no participation in this undertaking.

Dr. L. D. Ricketts, in behalf of the mining companies that he represents, last week bought of H. W. Hardinge the patent rights to the Hardinge conical mill in the State of Arizona for $100,000 in cash and other considerations.

They do things queerly in England. The directors of the Rio Tinto Co., Ltd., issue a circular to the stockholders telling what has been done in the preceding half-year, and head the circular "To the proprietors." Whoever thought that a stockholder anywhere had rights that a civilized director was bound to respect?

The Ingersoll-Rand Co. is shortly going to bring out a new drill, to be called "The Bull Moose," which strikes us as being a very good name for a hard-slugging rock drill. While we are on this subject of nomenclature, it will be interesting to note that the Mexican miners call the jack-hammer drill the *chicharra*, the cricket. The operator is coming to be known as the *chicharrero*.

Recent advices from Tokyo state that considerable sales of pig iron from India have been made in Japan. This iron takes the place of British pig on account of its lower price; it also replaces Chinese iron, the deliveries of which have been interrupted by the troubles in that country. The Mitsui company has been a large buyer of Indian pig, both for its own use and for the government foundry at Wakamatsu.

Winston Churchill, in a recent political speech, made some references to the friendship between Mr. Taft and John Hays Hammond, the connection of the latter with the Guggenheim Exploration Co., and of the Guggenheims with Alaska. This led Mr. Hammond to write a letter to Mr. Churchill, declaring that he has not been connected with the Guggenheim Exploration Co. since 1907. Moreover, the Guggenheims, he states, never had anything to do with the Alaska coal deposits.

We note in the last report of the Kerr Lake Mining Co. that, "It was thought wise, in order to conserve the resources of the company, to reduce production." Those amateur economists who have argued that the sooner a mine can be worked out the better for the shareholders are all wrong; that is evident. Or have the directors discovered how to make 1 oz. grow into two? And if so, what is the recipe? Or have the directors been given the foresight to see that the present high prices of silver are just the foothills of the elevations to come?

A mineral company with $3,000,000 capital is about to be incorporated, whereof the promoter telegraphs as follows: "Company owns 15 acres of minerals, such as lead, silver, amalgam, bluestone; above minerals nearly pure; also potash running 12 to 33%; phosphoric acid, 32.70%; three different kinds of marble and other valuable minerals; lead deposit covers 200 acres and averages 20 ft. thick." Pretty good, especially the 200 acres of lead on 15 acres owned.

Judge Mayer, in the Criminal Branch of the Federal District Court, Oct. 10 refused to postpone the trial of Julian Hawthorne, set for Nov. 4 next before Judge Hough. Hawthorne and his co-defendants are charged with using the mails to defraud investors in the stock of the Hawthorne mining enterprises in Canada. The adjournment was asked in the interest of Josiah Quincy. He said that Dr. Robert Bell, at one time head of the Geological Survey in Canada, an important witness for the defense, was at present in France and would not return until December.

Much was said a year or two since about the anemic condition of mining in Colorado, and the idea has been prevalent that business was not so good in that section of the county as in some others. As evidence, however, of the prosperity in the West, one of the oldest machinery houses in Denver, the Hendrie & Bolthoff Manufacturing & Supply Co., has announced to its employees that a straight increase of 10% in salaries will be made next month. It is manifest that a flat increase of this sort would not be made in times of slack business, and as this company enjoys a trade throughout practically the entire West, it may be taken as an indication that "good times" have really arrived.

Beginning with October, the well known German technical journal, *Metallurgie,* will be divided into two independent journals. The one, *Metall und Erz,* will deal with mining, concentration and metallurgy of ores, except those of iron, and will be edited by the new Gesellschaft Deutscher Metallhütten-und Bergleute. The other journal will be known as *Ferrum,* and will treat of the metallurgy of iron and steel, mechanical testing, metallography of metals and alloys, etc. This journal will be edited by Dr. Wüst, of the Königlichen Technischen Hochschule, of Aachen. While *Metallurgie* has won a well deserved place in technical literature, the two new journals will doubtless be of more direct value to their readers in the specialized fields.

A competitive examination is to be held by the U. S. Civil Service Commission in various principal cities for a mineral technologist for the U. S. Bureau of Mines, Field Service, Denver, Colo., at a salary of $3000 per annum. Applications (Form 765) must be filed with the commission by Nov. 8. The duties of the position will include a study of the occurrence, mining and separation of the rare minerals or materials containing the rarer metal and earths. There is also to be filled, by civil-service examination, the position of mine sanitary engineer for the Bureau of Mines, Field Service, the salary for which ranges from $1800 to $2400 per annum. The duties of this position will be to study the sanitary and water-supply conditions in mines and mining towns, with a view to their improvement as affecting the welfare of the miners.

A mining-machinery salesman recently walked over to a city rock pit where rock for making roads was excavated and crushed. He gave the superintendent a cigar and began talking rock drills. The drills in use there were manufactured by the company he represented, but were apparently of extremely antique pattern. The young salesman with characteristic enthusiasm and fresh from talking with mine superintendents, began to tell the city official of a very efficient one-man drill that was making records for itself. He claimed that if the city would install the improved type, at least one-half the present force of men could be dispensed with. At this point the city official spoke up; "Young man," he said, "if you can give us a drill that will require more men to operate and make more jobs that aren't too hard, we'll be interested, but this new machine's not in our line." The salesman retreated. It was too close to election time.

A story of how six American women remained in a mine tunnel for 2½ days during the attack by Mexican rebels on the mining camp of El Tigre, in Sonora, was contained in Los Angeles dispatches, quoting J. W. Malcomson, consulting engineer of the El Tigre Mining Co. When the surrender of the camp, demanded by the rebel general Salazar, was refused, the wives of the company officials were placed in the tunnel with provisions to last several days. They were accompanied by a guard of Americans, who had 30 rifles and 5000 rounds of ammunition. When Salazar entered the camp, after a 30-hr. bombardment, he told the Americans he knew rifles and ammunition were secreted in the tunnel, and demanded them. Five rifles and 500 rounds of ammunition were brought out, and the rebel general was not curious to learn if more were concealed. After the rebels evacuated upon the approach of Federal reinforcements, the women returned to daylight, none the worse for their experience. Recent dispatches tell of the approach of a rebel band proposing to attack El Oro. They were met at Palizada by a volunteer band of Englishmen and Americans and departed after a few volleys.

Heinze - Barnes - King Litigation

A verdict has just been given the Assets Collecting Co., assignee of the claim of Arthur P. Heinze, against the Barnes-King Development Co., for $75,000, and the moneys of the Development company attached to secure payment. The facts appear to be as follows: The Barnes-King Mining Co. was chartered in Delaware in 1906, with a capital stock of 12,000 shares. Mr. Campbell, attorney for the Marcus Daly estate, and Mr. Lalor, secretary of it, obtained an option on all of this stock, which was deposited in the First National Bank of Great Falls. Campbell and Lalor, and H. Carroll Brown & Co., and others proceeded to promote the mine.

It was agreed to organize a Montana corporation, capitalized at 400,000 shares at $5 each, to which all the stock of the Barnes-King Mining Co., and $400,000 cash should be turned over. All the stock of the new company was then to be turned over to the syndicate, of which the managers were H. Carroll Brown, son-in-law of Marcus Daly, Julian M. Girard, also related by marriage to Daly, and one Harkness, employed in the offices of the Daly estate.

The syndicate offered the stock, for which they are said to have given Campbell and Lalor $4 per share, at public subscription at $5 per share. There was a prospectus issued, headed Barnes-King Development Co., a corporation to be organized to develop and equip the Barnes-King Mining Co.'s properties. The circular was not signed, nor did it give any price paid for the stock acquired in the Mining company.

Heinze alleges that on the basis of this circular he purchased 25,000 shares through one Fisher, who paid $62,500 on Nov. 28, 1906. The corporation was organized in November, 1906, according to one story, on Dec. 3, 1906, according to another. Fisher assigned his receipt and rights to Heinze, who made second payment in April, 1907.

As to the financing of the new company, the stock was oversubscribed, and it does not appear that the syndicate managers ever put up any money, but took $400,000 for their profit in the matter. It does not appear that Lalor and Campbell ever put up any money, but paid for the Mining company's stock little by little, issuing and distributing the Development company's stock in the same way. According to a statement attributed to King, of the original company, the original stockholders altogether received $960,000. That is, it is alleged that the Development stockholders' money paid for the stock of the Mining company, the working capital and the promoter's profit. This was not brought out in the trial.

The ore reserves of the company had been grossly misstated in the prospectus, and the crash came soon after it began its career. The Assets Collecting Co. then sued, alleging misrepresentation and fraud.

It was claimed by the defense that the syndicate had a *bonâ fide* existence apart from the corporation, and was not acting as agent of the company. The defense also claims Heinze cannot retain his stock and yet sue the company through the Assets Collecting Co.

On these grounds the defendants have appealed. Ferdinand and Emilie Bullowa represent the plaintiff, Chadbourne & Shores the defendant. In the meantime the syndicate managers are also being sued as individuals.

Allis-Chalmers Reorganization

The reorganization committee of the Allis-Chalmers Co. has just reported on results for the first eight months of the year. Profits and losses, after charging all costs of operation, maintenance and depreciation, but not deducting interest on bonds, have been:

	Profits	Losses
January	....	29,620
February		22,258
Mar 1 to Apr 6		38,783
Apr 7 to May 31		1,555
June	25,642	
July	66,984	
August	48,471	
Eight months	$141,097	$92,216

The unfilled orders at various dates have been: Dec. 31, 1911, $3,453,085; May 31, 1912, $3,689,506; Aug. 31, 1912, $5,195,669. The deposits of securities under the plan and agreement of reorganization have been:

	Deposited	Outstanding	Per Cent
Bonds	$10,411,000	11,148,000	93.4
Preferred Stock	14,077,600	16,050,000	87.7
Common Stock	17,184,600	19,820,000	86.2

The committee states that additional deposits under the plan of reorganization are promised.

Stratton's Independence

Denver Correspondence

The 1150-ft. level of Stratton's Independence mine is now drained after submergence for eight years. At the conclusion of an extensive development scheme, which resulted only in cutting water courses and draining surrounding mines, the company decided to pull the pumps in the autumn of 1904. The water speedily rose to within 60 ft. of the ninth level, around which it has fluctuated for the last eight years. Now, however, resulting from the driving of the deep drainage tunnel, the 11th level is available for operation without pumping. The Washington vein, in which a strike of rich ore was made last year on the 900 level, will now be opened on the 1150, and the Independence vein will also be prospected at that level. The face of the drift going north on the Independence vein is about 100 ft. south of the property line, and some ore that was valueless eight years ago can now be stoped and milled at a profit. The Portland, which adjoins Stratton's Independence, has sunk to a new level, and it is reported that rich ore has been discovered in a crosscut from the station.

Du Pont Reorganization

The E. I. du Pont de Nemours Powder Co., following anti-trust litigation against it, on Oct. 9, 1912, issued a statement to the holders of its 4½% 30-year bonds, defining the reorganization plan. This statement is, in part, as follows:

> Under the terms of the final decree entered by the Circuit Court of the United States in the suit of the United States against the E. I. du Pont de Nemours Powder Co. and others, it has been necessary to create two new companies as follows:
>
> The Hercules Powder Co., a Delaware corporation, whose total assets will aggregate approximately $13,000,000. This company will issue $6,500,000 par value 6% 10-year gold bonds, redeemable at 102% and interest. The estimated earnings of the company are equal to three times the annual interest charge on the proposed issue. The entire interest will be guaranteed by the E. I. du Pont company.
>
> The Atlas Powder Co., a Delaware corporation, whose total assets will aggregate $7,000,000. This company will issue $3,000,000 par value of 6% 10-year gold bonds, redeemable at 102% and interest. The estimated earnings of the company are equal to three times the annual interest on the proposed issue, which is guaranteed by the E. I. du Pont company.
>
> The trust agreements under which these bonds will be issued may be inspected at the office of the Guaranty Trust Co. of New York as soon as the forms of bonds are approved by the court.
>
> The decree requires that both the $6,500,000 of Hercules Powder bonds and the $3,000,000 of Atlas Company bonds shall be delivered to the E. I. du Pont de Nemours Powder Co. in part payment for the properties transferred by the latter to these two new companies. The decree further requires that one-half of these bonds or the proceeds shall be distributed.

Prussian 1911 Mineral Production

The mineral production of Prussia for 1911 is officially reported as follows: Bituminous coal, 141,012,103 metric tons; lignite, 46,642,997; asphalt, 19,956; petroleum, 98,611; salt, 359,102; kainit, 2,456,680; other potash salts, 191,658; iron ore, 4,944,928; zinc ore, 696,900; lead ore, 123,787; copper ore, 857,517; nickel ore, 9608; arsenic ore, 4476; manganese, 86,902; pyrites, 202,136 metric tons. In the case of coal, these are the effective commercial productions, mine consumption being deducted. Among byproduct productions of the Prussian works in 1911 we note 42,575 kg. of cadmium and 500 kg. of selenium.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Practical Accuracy

I have been interested in reading in the JOURNAL of Sept. 28, 1912, a letter from James G. Horton, of Colorado Springs, in which he expresses disagreement with the substance of your editorial on the subject of "Practical Accuracy." It appears to me that the critic has hold of the wrong end of the subject, for an operation is not more perfect, when performed in an imperfect way, simply because the operator happens to know the way to perfection. I suppose no one will question the fact that methods of assaying have reached a state of perfection such that gold and silver can be estimated with accuracy when the desire is to do so. These methods are "absurdly easy, both in principle and practice," when one knows how, which almost every assayer does, but that fact does not save the operator from being "medievally imperfect" when he deliberately uses a method which he knows may be misleading. Perhaps the fault is not with the assayer, and if I remember correctly, your editorial did not say it was, but if not he, then someone else is responsible for it, and it is none the less imperfect.

The whole point of the argument lies in the fact that mill operators want to know what they are doing, and depend on the assay to let them know the facts. When reduction processes claim to be recovering 95, 97 and 98% of the original ore content, as many of them are, then something more than an "inexpensive approximation" is necessary to justify their claims. Suppose a mill were operating on $10 gold ore, and many of them have less than that to work on, and getting a tailing supposed to contain anything from 10 to 50c., is a tailing assay made on ½ a.t. worth anything at all as a basis of calculation? I think it is not, because the resulting button is too small to be accurately weighed and is more than likely to be guessed at and called a "trace" or some other small figure which may or may not be correct. In view of the practice of assayers to operate on such small quantities of pulp, there is little wonder that calculated extractions and bullion recoveries so often fail to coincide. The above mentioned reasons are outside of the fact, which is well recognized, that a large quantity of pulp is far more likely to be a fair sample than the minute quantities often used for assay.

It appears to me that doing faulty work on account of the extra cost of accurate assaying is rather unreasonable. In this day, when huge sums of money are being spent on accurate mechanical sampling and weighing plants, it is poor policy to balk at the comparatively insignificant cost of accurate tailing assays. Of course, there are many instances where accurate assays are not necessary, such as reconnaisance work in mines, etc., but where calculations of critical importance are based on a comparatively few tailing assays, as in mill work, these assays ought to be correct, as near as it is humanly possible to make them, and if they are not, then they are likely to be incorrect and ought not to be offered as proof of what is being done in a mill.

REZONGADOR.

Toronto, Oct. 2, 1912.

Feed Gate for Coarse Ore

I read with interest the illustrated article in the JOURNAL of July 13, 1912, on "Feed Gates for Coarse Ore." Being the originator of these gates over nine years ago while with the St. Louis Smelting & Refining Co. as assistant superintendent, I, of course, took careful note of the comments in the article, especially the suggestion of the writer to operate these gates with an air cylinder. The salient feature of this gate, of course, is that it is undercut and boulders can in no way interfere with its operation. Before deciding upon the manner of control I gave various power devices due consideration.

Compressed air being available at all mining operations no doubt would cause air control to suggest itself to many. My previous experiences with air cylinders used for similar purposes had not been satisfactory; being unsteady in their action in overcoming loads of varying resistance, they cause severe shocks to apparatus of this character. In most mining communities the freezing weather in the winter months prohibits the use of air for such purposes and when ore containing much water freezes solid in these gates nothing but a positive and slow acting device like the worm and worm gear employed would meet such conditions effectively. At two of the outlying shafts at this property each of the storage bins was equipped with 14 gates of this design, but smaller, and I have seen railroad cars loaded in three minutes, which would hardly signify that the action is too slow. The main point is these gates may be operated *always*.

Since I have not patented this gate and since the public is free as to its use I am naturally anxious that those who desire to use them get the highest satisfaction therefrom, which may be obtained I believe only by the slow acting but always ready and positive combination of worm and worm gear, which automatically locks itself in any and all positions of its movement. J. O. BARDILL.

Herculaneum, Mo., Sept. 23, 1912.

Bolivian Tin Mining

In the article on Bolivian tin mining, published in the JOURNAL of Aug. 10, 1912, Mark R. Lamb states: "A proof that classification is faulty is the fact that mill tailing is successfully washed by hand without further grinding."

My experience is, that two other facts have a more important influence on the quantity of free cassiterite in mill tailings of Bolivian tin ores, viz., the high content of the ores in tin, and the inefficiency of Bolivian labor. I can prove this by the following: In the concentrating mill of the Cia. Minera de Oruro at Machacamarca the classification is now exclusively done by Richards-Janney classifiers, which do excellent work; yet the mill tailings are concentrated by hand at a profit. There is no doubt that with the improved classification the amount of free cassiterite in the tailing decreased considerably as compared to the time when the pulp was classified in spitzkasten.

It is not at all uncommon in this country for the milling ore to run as high as 15% tin. To make tailings of this kind of ore so poor that there is no cassiterite left in them which can be recovered by hand washing at a profit, it is necessary to build complicated mills, in which the tailings and middlings of the apparatus that treat the fresh ore, are retreated several times. In the mill to which I referred, tailings from the jigs, after recrushing in Huntington mills and classification, are concentrated on Humboldt tables. Even if the classification is perfect, the tailings from these tables will contain as much as 1% tin in extremely fine cassiterite.

Owing to the scarcity of labor in Bolivia, one has to use any available laborers as tablemen. Some of them will soon get an idea about the work, but the majority are almost useless through their lack of observation. Middlings may run for hours on the mill floor, or into the wrong launder, or the spigot of a classifier may discharge outside of its own pipe or launder, but the Bolivian tableman pays no heed to this and only occupies himself with making the concentrates run into their box—and even this he sometimes neglects. I believe that leakages and such accidents have the greatest influence on the high tin values of the tailings of Bolivian concentrating plants.

Mr. Lamb observes that Bolivian youths of the better classes are educated in European countries, where to work is a disgrace. In the first place, the Bolivian youths that go to Europe for their education are few and far between; the countries they generally go to are France, England and Germany, and I certainly do not think that it is an acknowledged fact that work is looked upon as a disgrace in any of these countries.

M. G. F. Söhnlein.

Machacamarca, Bolivia, Sept. 9, 1912.

Alumina in Slags

Referring to the abstract of the paper by H. C. Bellinger on alumina in slags, in the Journal of Aug. 17, 1912, p. 321, I wish to call attention to the following analysis of a slag I have just seen: SiO_2, 37.4%; FeO, 24.6; CaO, 15.3; ZnO, 9.0; BaO, 5.8; Al_2O_3, 6.4; CuO, 0.4; S, 0.8; total, 99.7%. The matte carried 38% Cu. (It seems murderous metallurgy to waste 11% of zinc to save 4% of copper, but that is what was being done.)

This slag behaved like an acid slag when a bar was dipped into it, and gave threads several feet long, when drawn rapidly. The 4½x20-ft. furnace smelted 360 tons per day, with 19,000 cu.ft. of blast per min., and 8.3% of coke. It would be interesting to have an authoritative guess, whether the Al_2O_3 here is an acid or a base.

Also, is this slag a Monalisa silicate or a polyphase compound full of dried currents and short circles, and would it be more profitable to have more ROX on the charge?

The zinc does not cause any trouble providing there is enough oxidation in the furnace to give a matte of over 38% Cu, but if the matte gets down to 30% or less, the zinc then present in the matte to the extent of over 12% will separate as a mush and freeze up the tap holes in furnace and settlers.

In this raw or pyritic smelting the grade of the matte and furnace oxidation is regulated by: (1) By the amount of coke; (2) the height of the furnace; (3) the quantity of blast; (4) by placing the coarse pieces of charge near the walls, and the fines in the center of the furnace.

Personally I prefer to rely on the bar test for the acidity or basicity of a slag, rather than to some hypothetical behavior of some of the ingredients, or a volume of symbols.

H. B. F.

Mexico, D. F., Oct. 5, 1912.

Park City Record

The report of the Park City district, recently published by the U. S. Geological Survey, as Professional Paper No. 77, and referred to in the Journal's editorials of Aug. 3, and Aug. 24, 1912, but without technical criticisms, has been received in Utah. The report, as is well known, has been delayed a number of years in publication, the field work having been completed in 1904. Efforts have been made at various times by Utah mining men and especially by people interested in Park City to hasten the publication.

Opinion among the Utah men with whom I have talked regarding this report is rather mixed, but the general sentiment seems to be that Mr. Boutwell does not do himself or Park City justice, as compared to his earlier work in Bingham.

There are, of course, things in the report which are of value, such as the working out of the stratigraphy of the district, the distribution of igneous rocks, and mapping of the principal faults, etc. There is a large amount of detailed information concerning the district, such as the history, production and description of the 45 ore minerals, etc. There are inaccuracies in regard to the milling and treatment of the ores, for which Mr. Boutwell is to be pardoned, as these are out of his line. While the report is generally regarded as a "has been," there is a large amount of data, which will be made use of by Park City operators.

Operators.

Park City, Utah, Sept. 2, 1912.

Illuminating the Cross Hairs in Mine Surveying

The methods described in the Journal of Sept. 28 and Oct. 12, 1912, under the title "Illuminating the Cross Hairs in Mine Surveying," are both good. I have used the tracing cloth between the plumb-bob string and the light in Pennsylvania bituminous-coal mines with good results, but it has the disadvantage of getting dirty and wet, which renders it useless.

The following method, by Charles A. Cadwell, formerly professor of mining, Case School of Applied Science, gave good service with our students in mine surveying at Case. It consisted of a lantern 5 in. square by 8 in. high, with a ventilator on top and a hook for carrying it; a socket was soldered in the middle of the bottom for holding a miner's candle; three of the sides were closed by panes of plain glass 5x8 in., set in vertical slots in the frame; the fourth side was a pane of ground glass of the same size as the others; the frame itself was made of tin and the whole lantern cost about 50 cents.

In using this lantern, the ground glass was placed behind the plumb-bob string and the light of the candle was thus diffused, so that a good clear sight could be obtained, even though working in a strong air current, as the candle being inclosed was unaffected. As the lantern is bulky for ordinary use, I would suggest mounting a piece of ground glass in a tin or wood frame with a hook attached for carrying. This, with an acetylene lamp behind it, will give good results, and the glass can be rubbed or washed when dirty..

Hugh D. Pallister.

State College, Penn., Oct. 14, 1912.

Fine Grinding of Ores

Many of our assayers have carried the subject of fine grinding of ores too far and the tests described on page 446 of the Journal of Sept. 7, 1912, ought to serve as a warning and a guide to the advocates of extremely fine grinding.

There is a perfectly natural explanation of the low results obtained in assaying the very finely ground samples in these tests. Fine grinding promotes fusion, but if the fusion take place too rapidly, the particles of reduced lead sink through the charge to the bottom of the crucible too soon and become practically inert as gatherers of precious metal, before all of the gold and silver in the ore has had an opportunity to alloy with the lead. Unless the particles of reduced lead are held in suspension in the melting charge a sufficient length of time, the results are bound to be low.

If one is obliged to assay very finely ground ore, it might be well to add to the charge a small amount of fusion-retarding material, such as 100-mesh bone ash, finishing the fusion at a slightly higher temperature than usual. This explanation is applicable to other conditions in ore assaying and in my judgment too rapid fusion, by whatever cause produced, is responsible for many differences in assay results.

Frederic P. Dewey,
Assayer, Mint Bureau.

Washington, D. C., Oct. 9, 1912.

Selenide of Gold

In the treatment of copper containing 0.4% selenium, I find there is a considerable loss of gold in the fire processes, that is to say, in melting for anodes, and in fire refining of electrolytic slimes to bullion. The slimes contain 15% selenium.

Is selenide of gold very volatile and have any of the Journal readers experienced like losses in anode furnaces and in the refining of slimes?

Selenide.

New York, Sept. 17, 1912.

Review of Butte Geological Report

By Reno H. Sales[*]

> **The field work for the Butte report was concluded by Walter Harvey Weed in 1905, but seven years elapsed before the publication of his results by the U. S. Geological Survey. The value of the report is further lessened by inconsistencies in the text and by inaccuracies in the illustrations. The important question as to whether chalcocite is a secondary or primary formation is but superficially treated.**

The long looked for report on the geology of the Butte ore deposits has at last appeared. The study of the geology of Butte was undertaken in 1896. This work was shortly followed by the publication by the U. S. Geological Survey of the Butte Geologic Folio in 1897. Rapid and extensive mine development soon permitted of a more thorough and comprehensive study of these interesting deposits, so that in 1901 W. H. Weed was detailed to make an exhaustive study of the district. The field work was carried on more or less intermittently until its completion in 1905.

Delay in Publishing Report

A period of nearly seven years has elapsed from the time of completion of the field work and the publication of the results of the author's work. Needless to say, both the author and the officers of the Survey will receive a goodly amount of well deserved criticism for this inexcusable delay. A lame apology is offered by the author in his statement that "owing to the magnitude of the task and the pressure of other investigations, it was not completed until the autumn of 1905. The work of assembling, platting and checking the mass of detail collected has been very great, hence the completion of the report has been delayed. The chief cause of delay, however, is the litigation that has been in progress in the district and the assurance given that the report would not be published in time to be used by either litigant." The Survey officers offer no apology for the tardiness of the report, the reader being left to infer that the excuse of the author is deemed by them as sufficient.

The U. S. Geological Survey and its investigators have many times been severely criticized, and rightly too, for their indifference and neglect toward, not only the interested public, but those who gave them the freedom of their properties and works for the purposes of scientific investigation, and who are entitled to the earliest possible economical advantages to be gained through the publication of the facts thus secured.

As long as the officers of the Survey permit either "private examinations" or "other investigations" by the members of the field staff, just so long will the curse of "delayed reports" cling to an otherwise extremely important, and efficient branch of our Interior Department.

The "litigation" mentioned by the author was brought to a definite close on Feb. 13, 1906, hence the statement that the "chief cause of the delay is the litigation" has no foundation in fact. Somebody has been grossly negligent, and there is no valid reason why the report should not have appeared as early as 1906, or even prior to that date. Again, the report might have been made infinitely more valuable by a short re-examination of the district, bringing the essential features up to date.

Early History

The text deals with the early history of the district, followed by a description of the geology of the ore deposits and the surrounding district. Placer mining began in the early 60's followed by quartz mining, the first location being made in 1864; while some of the most important copper veins were located as early as 1864, they were taken up as silver veins, and not as copper veins. The silver mining reached its zenith in the late 80's and practically ceased in 1893, following the drop in price of silver. Copper mining began in earnest in the early 70's and has continued almost uninterruptedly to date. The district passed through a period of bitter and costly litigation from 1896 to 1904, the cessation of which was brought about by consolidation of the various warring companies. Up to 1906, Butte had produced a total of 3,961,000,000 lb. of copper; 194,000,000 oz. of silver and 971,000 oz. of gold.

The ore deposits are essentially fissure-vein deposits. The rocks are all igneous, the ores occurring principally in granite or quartz-monzonite. The granite has been intruded by aplite and rhyolite porphyry, both prior to the veins in age. Later rhyolite eruptions took place, forming the volcanic plug known as Big Butte, and covering the northwestern portion of the district with rhyolite lavas, tuffs, etc. That the rhyolite is subsequent to the oldest vein formation is proved in numerous instances, where the rhyolite may be seen cutting off the veins.

The granite of the Butte veins is a part of a large granite mass 64 miles long and 15 miles wide, reaching from Helena on the north to the Highlands on the south. This great granite body is termed the Boulder batholith. It made its appearance probably immediately after the Rocky Mountain building period, at the close of the Cretaceous times. It was preceded by rather extensive bodies of andesite and andesitic lavas. The batholith itself has been intruded by one or more large bodies of dacite-rhyolite, and many minor rhyolite intrusions. No sedimentary rocks occur in the immediate vicinity of Butte.

Two Classes of Fissure Veins

Locally in the Butte district the granite and rhyolite porphyry have been much fissured. The author has classified these fissures into groups or systems, mainly according to age, or perhaps, in part, according to trend in direction. Two general classes are first given; namely, those formed before the rhyolite eruptions, trend either (a) east and west, or (b) northwest and southeast; the second, accompanying or following the rhyolite intrusions. Still later northeast fracturing occurred cutting orebodies. As fissure systems, these general groups are divided into five distinct systems, which are again grouped as vein and fault systems, according to age, as follows: Vein systems: (1) The Anaconda (east-west or quartz pyrite) system; (2) the Silver Bow or High Ore system; (3) the Blue vein or northwest system; (4) the Steward system. Fault systems: (1) The Mountain View system; (2) Rarus Fault system; (3) Post-Rarus Fault Fractures.

Anaconda System Most Important Commercially

The Anaconda system includes the oldest veins geologically and they are the most important commercially. Included in this system are the Anaconda, Syndicate, Colusa and other important producers. In the Anaconda system the fractures are continuously mineralized, exhibiting remarkable uniformity in width and mineralogical character. They are heavily mineralized with quartz, pyrite, chalcocite, bornite, enargite, with sphalerite and tetrahedite in places. The orebodies have resulted from the mineralization of fractures or shear zone, having but slight displacement. The country rock has been more or less replaced adjoining these fractures, so that the line of demarcation between ore and country rock is often indefinite.

The Silver Bow system includes a number of important veins having a northwest and southeast strike. They appear to be old quartz-pyrite veins, pos-

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Note—The Geology and Ore Deposits of the Butte District, Montana. By Walter Harvey Weed. 9x11½, pp. 262, illus.; 40 plates; cloth. Professional Paper 74, U. S. Geological Survey sibly of the Anaconda system, along which more or less strike faulting has occurred, giving them an intermediate position between old quartz-pyrite veins and the typical fault veins of the Blue system. The author, however, does not make clear these age relations, and from his descriptions one is led to doubt the advisability of separating the Silver Bow veins from the Anaconda or east-west system.

The Blue veins are mineralized fault fissures, regularly spaced, which intersect and displace the veins of the Anaconda system. The ore, which occurs in great lenses or shoots, is somewhat similar to that of the Anaconda veins, excepting that it is higher in silver, and the minerals are more typical of the silver veins. The vein filling is usually zinky near the surface, changing to copper ore at a few hundred feet depth. The principal minerals are sphalerite, tetrahedrite, rhodochrosite, fluorite, galena, pyrite, chalcopyrite, bornite and enargite.

The Steward fissures are less mineralized than the earlier veins. They cut and displace the older veins and often form strike faults along them. They contain remarkable shoots of conglomerate ore, composed of fault breccia, fragments of older veins, and later formed ore. The Steward veins, in general, carry more enargite contrasted with older veins, and carry also minerals typical of the silver veins.

The Mountain View, Rarus and Post-Rarus fault systems do not carry ore other than fragmental ore broken from older intersected veins. The Mountain View faults are breccia faults having slight displacements, and are believed to have resulted from shrinkage, or contraction in the granite.

Zinc and Copper Minerals in Veins

The minerals forming the great bulk of the vein filling of the district are quartz, pyrite, sphalerite, chalcocite, enargite, bornite, and chalcopyrite, with varying amounts of tetrahedrite, covellite, rhodochrosite, fluorite, etc. As mined, a large portion of the ore is composed of worthless altered granite which forms "horses," bands, separations, etc., within the vein boundaries.

The great bonanzas of chalcocite are the result of secondary-enrichment processes. The old quartz-pyrite veins are unworkable, except where they have been faulted or fractured, and later enriched by the addition of large quantities of chalcocite brought from the oxidized zone by downward-seeping surface waters. In the principal veins of the old quartz-pyrite series, enargite appears only in the deep workings, specifically, from the 2000-ft. level downward.

Generally enargite is later than the oldest quartz-pyrite vein filling and occurs either in fault veins or filling fractures in the old veins. But little, if any, of the enargite in the district is regarded a product of descending surface waters, because the author states that chemical analyses showed but a trace of arsenic in the primary pyrite, hence the secondary derivation of enargite from the primary vein filling was not within the range of possibility. To the reader this seems a startling statement, considering that the text describes many examples of large rich enargite orebodies, extending upward to the oxidized zone, with no oxidized minerals of copper or arsenic remaining in the oxidized portions of the veins. To one unfamiliar with these deposits, it would appear that the existence of large bodies of secondary enargite might well be expected to explain the disappearance of both the copper and arsenic from the oxidized zone.

Granite Altered Near Veins

In and along the veins the granite has suffered intense alteration. Solfataric waters and gases rising through the fissures have converted the iron of the granite into pyrite, and enormous quantities of sericite have been developed. The altered granite near the veins is found to be composed almost entirely of sericite and quartz. This sericitized granite plus the newly formed disseminated pyrite is termed "pyritized" granite.

The portions of the vein nearest the surface have been oxidized to a depth of 20 to 400 ft. There is but little indication of copper in the vein outcrops, and the typical iron gossan is entirely absent. It is believed by the author that the present oxidized zone is the result of the oxidation of enriched portions of the veins, and not the oxidation of the primary or original quartz-pyrite vein filling which would yield a much greater quantity of iron oxides than are found in the existing outcrops.

Separating the district into vein groups or areas, the author proceeds to describe the veins and faults in great detail. In this method of attack, however, there results considerable confusion in the mind of the reader, because the relative positions of these described areas are not made clear in the beginning. Further difficulties of understanding are met when a given vein is described under separate general headings resulting in needless repetition and confusion.

A meritorious feature of the book is the excellent descriptions of the veins and ores. During his wide experience as a field observer and as a writer upon the subject of ore deposits, the author well learned the art of sifting out essential facts from a great mass of detail.

Problem of Chalcocite Formation Unsolved

One of the most important problems of this district, or perhaps of the whole subject of copper deposits is that relating to the matter of formation of chalcocite. Butte has been often referred to as the classic example of secondary chalcocite, and it is often cited as a remarkable example of secondary sulphide enrichment.

Recently certain geologists have expressed the opinion that the Butte chalcocite is largely primary, and that only the sooty chalcocite deposits of the relatively higher levels, are known to be secondary. Dr. Weed, however, practically dismisses the subject by the general statement that the chalcocite is largely secondary, but in part primary.

Not much weight can be attached to the author's argument, that all the existing mine water of the district is descending and of atmospheric origin, because in a newly opened drift in a deep level, water was observed dripping from the roof while the bottom of the drift was dry. A further search might have found a drift bottom wet with the roof dry, since the author is emphatic in his belief that the descending waters find their way to great depths through fissured crackled veins which are more or less definite channels or water courses.

The author's detailed descriptions of the veins and ore fail to mention a single example of chalcocite which he believes to be primary. No evidence is offered in support of his belief that this mineral is in part primary. This problem is one of vital importance, and it should not be lightly passed over when a most remarkable opportunity is offered for study.

Other matters of highest importance, and of the greatest interest to those concerned in the study of ore deposits, are but scantily treated. The question of rock alteration as related to ore deposition is only barely touched upon. When viewed in the light of comparison with the brillant and masterful work of Lindgren on the Morenci district, the reviewer feels but a sense of pity that such exceptional opportunity has been lost to the author of the Butte report.

Many Inconsistencies in Report

The labor required to digest the great mass of material gathered in the field will be well appreciated by those who read this report, yet it will not be easily understood how so many inconsistencies crept into the text, especially after the author states that the work of "assembling and plotting was very great," resulting, in fact, in the delay of the publication. No attempt will here be made to enumerate all of them; a few, however, will be given.

On p. 63, it is definitely stated that the Clear Grit silver vein fissure cuts and displaces the Steward vein, and with it all earlier veins. This statement is supported by Plate XIX, which distinctly shows a marked displacement of the Steward Fault fissure by the Clear Grit vein. The author deals at length with the evidences tending to support this conclusion. On p. 114, the following statement appears: "The evidence in the Steward mine shows that the Clear Grit vein cuts and displaces the north branch or north vein of the Steward mine, which is regarded as the old vein, but is itself cut off by the Steward fault vein." This statement is corroborated by further statements and by actual sketches illustrating the age relations (see Figs. 53, 54 and 55, p. 149). And again, in support of this position, Plate XXIII may be cited, showing a positive cutoff and displacement of the Clear Grit by the Steward vein. The confusion in this instance has undoubtedly arisen through the misuse of the name Steward, which is used generally throughout the report to designate a series of northeast faults of the same age as the Steward fault. On the plan maps the old quartz-pyrite vein of the Steward mine is at one time called the "Steward" vein, and at another the "Old Steward" vein, while in the text this vein is termed the Acquisition vein, the name "Steward" being used only to designate a later fault fissure.

Another instance might be cited tending to show confusion of ideas or a careless presentation of facts on the part of the author. On p. 106, in his classification of copper-vein systems, there is included within the Silver Bow system, the High Ore, Wild Bill and others, which system is described as being older than the Blue fault veins. In the Blue system is included the Covellite and others, all typical fault fissures. In general discussions throughout the report, the Wild Bill vein is placed in the Silver Bow or High Ore systems, yet on p. 179, the reader is confronted by the statement that "it (the Wild Bill) is a typical fault vein" and again on p. 186, the statement, "As already shown (p. 179), the Wild Bill is a fault vein belonging to the Covellite group."

Apparent discrepanices of this nature might be many times multipled. A notable one occurring on plates XXVIII and XXV, the former showing a marked displacement of the Blue Jay fault by the Blue vein, while the latter shows the Blue Jay cutting and displacing the Blue. There seems to be no plausible excuse for the representation upon plates XXV, XXVII and XXXVII of the rhyolite dikes cutting through and displacing portions of the Anaconda veins near the St. Lawrence shaft, when it is so clearly shown that the porphyry antedates the Anaconda vein.

Forgetting for the moment these discrepancies between text and maps, the maps themselves (plates XIX, to XL are neat and clear illustrations, and convey to the reader a far better understanding of the vein structure of the copper district than can be conveyed by description. In one respect the legend is deficient. The blue coloring for faults and veins does not always mean "unmineralized veins and faults," and furthermore, "unmineralized vein" is not in accordance with good usage at the present day. While the blue coloring of the legend infers "unmineralized fissures," many of those colored blue on the map are mineralized and are big ore producers.

An accurate cross-section map reaching north and south through the whole district colored to conform with the plan maps, would add much to the general understanding of the vein structure as a whole.

Of the map denoted Plate X, the less said the better. The reader of the monograph will not seriously attempt to further his knowledge of the complicated structure of the copper deposits by means of this wretched exhibit purporting to be a map upon which, quoting from the author, "the outcrops of the mineral bearing veins have been platted with great care by the aid of a plane table. . . . It is, however, deficient in some respects and should be checked by comparison with the maps showing the veins and geologic features developed by mining and reduced to a definite horizontal plane." It is unecessary to state that, had the author himself performed the task above suggested, Plate X would have taken on a decidedly different complexion regarding vein and fault structure.

No Map Showing Continental Fault

In the first place, it is unfortunate that the map does not cover the eastern portion of the district, embracing the property of the Pittsburgh & Montana Co., and also the region of the Continental fault. It is well known (see lower left-hand corner of map Plate X) that a special enlarged edition of the Butte sheet was published years ago, covering all of the district and extending as far eastward as the top of East Ridge, four miles from Butte. The position of the Continental Fault, which is accorded much prominence in the text, is, therefore, necessarily left largely to the imagination of the reader.

As an outcrop map, the sheet is most unattractive with its littering of city streets, buildings, railroads and the like. A serious blunder was committed when contour lines and copper vein outcrops were given the same color. The vein colorings on the map are entirely inconsistent with the descriptive matter of the text. For example, the Edith May, Jessie, Gem, and many other veins, are described as being immense copper producers, yet they are given the silver-vein color on Plate X. The most talked of error of the outcrop map of the Butte Geologic Folio, namely, the displaced segment of the Windlass vein, by the Rarus fault to the south, is intensified on the present map by the careless handling of the printer's ink.

The publication of a map of this character can have no justification. The author calls it a revision of the economic sheet accompanying the Butte Special Folio, published in 1897. A comparison of the two will show that the old map is neater, more attractive, just as accurate in detail, and by far, a more creditable piece of work.

Errors in Illustrations

Several errors are to be noted in woodcut illustrations throughout the text. On p. 64, in Fig. 6, the large cross fault marked "Blue Vein" should read "Rarus Fault." The Blue vein does not intersect the St. Lawrence workings as shown. The illustration on p. 201, Fig. 89, does not represent a truncated segment of the Mountain View South vein, but the faulting of a vein of the Blue system lying many hundreds of feet north of the Mountain View south vein. Compared with plates XIX to XL in pocket, Fig. 77 is an incorrect representation of the position of the Bell fault. The Bell fault is not intersected either by north or south crosscuts from the Gray Rock shaft.

It is to be much regretted that the Geological Survey did not see fit to have a full revision of Dr. Weed's work before permitting it to go to press. Enormous development has taken place in the Butte district in the last six years, and many of the perplexing problems met with prior to the time of Dr. Weed's work have been cleared up. No doubt many new facts relating to structures and ore deposition are now available. In fact it is well known that the whole area is extensively opened up laterally and to considerable depths, so that a present-day exhaustive report would, in all probability, need but slight revision, if any, in the future.

Mount Morgan Gold Mining Co.

The report of the Mount Morgan Gold Mining Co., for the year ended May 31, 1912, shows 351,858 long tons of ore treated, from which were produced 7440 long tons of fine copper, and 134,575 oz. of gold. Total revenue amounted to £989,714, and expenses to £731,715. Dividends of £150,000 (15%) were paid.

Four new blowers have been installed in the reduction works, and four furnaces are now being run there. Experiments have been made on the treatment of the "mundic" ore in the blast furnaces, and, as a result, three out of eight "mundic" furnaces were closed down, and the other five will be closed soon.

Friends of this old company will be pleased to see that a redetermination of the auriferous copper-ore reserves shows

3,526,000 long tons, as compared with 2,809,000 long tons estimated in 1906, and after 995,000 long tons have been extracted.

Kerr Lake Mining Co.

The report of the Kerr Lake Mining Co. for the fiscal year ended Aug. 31, 1912, shows a silver production for the year of 1,855,495 oz., of which 1,741,804 oz. were produced from high-grade ore and 113,691 oz. from milling ore. The net profits were $703,209, of which dividends called for $690,000. Production costs per ounce of silver were: Mining, 12.1c.; shipment and treatment, 5.55c.; administration and general, 0.65c.; total, 18.3 cents.

The first-class ore, 850,007 lb., carried 1,451,993 oz.; second-class, 489,407 lb., 85,350 oz.; jig and table concentrates, 324,088 lb., 203,253 oz.; beside which the bullion from the metallics carried 11,208 oz., and mill ores 113,691 oz. Silver in ore reserves is estimated at 2,829,100 oz. in high-grade mine ore, and 1,049,591 oz. in mill and dump ore available, while 2,781,400 are under the lake, making a total of 6,660,091 oz. The general comment is made, "In considering the available ore, it is necessary to take into account that the time has gone by when production could be made by comparatively few cars of ore taken from wide veins containing in places, nearly solid metallics, from small stopes within easy reach of the track, or simply from development. The veins now available for working, although still rich and capable of regular production if rightly worked, are in general narrower, and have their working faces more inaccessible than formerly. Much more waste or low-grade rock must be handled to obtain the same number of ounces, and more time is needed to mine the ore."

Missouri Mine Tailings

During the last few years the chats or tailings produced in the Joplin and the Flat River districts in Missouri have become a considerable article of commerce. They are used for railroad ballast by the railroads running through those districts; for road material, and to some extent for making concrete. The Missouri Geological Survey estimates the quantity thus used for three years past as follows, in tons:

	1909	1910	1911
Railroad	[illegible]	1,009,533	865,011
Commercial	[illegible]	610,789	638,592
Total.	[illegible]	1,620,322	1,503,603

During 1911 there were approximately 1,015,800 tons shipped from the southwest zinc district, while the southeast lead district shipped approximately 487,000 tons.

It is believed that the commercial use of these tailings could be largely increased. H. A. Buehler, state geologist, comments on this use of chats for concrete aggregates as follows:

> No tests have been made as yet to determine the value of chats as compared with other materials for concrete aggregate. Occasionally one hears some complaint about the use of tailings in which there is a rather high percentage of marcasite or pyrite. Apparently the oxidation of these minerals affects the strength of the concrete which is probably due to the fact that through oxidation a portion of the sulphur forms sulphuric acid which would readily dissolve the cement binding. However, where the tailings are free from these minerals they are well adapted for commercial purposes, and their use could be greatly extended in commercial work.

Palmaer Bicalcic Phosphate

Prof. W. Palmaer proposes to transform the Canadian apatite deposits into commercial fertilizers. Before the International Congress of Applied Chemistry, Professor Palmaer described his bicalcic-phosphate manufacture, a portion of the process for utilizing low-grade phosphates. It was proposed long ago to produce bicalcic fertilizers by leaching phosphate rock with hydrochloric acid, and precipitating the solution obtained with calcium hydrate. However, owing to the high price of hydrochloric acid, the process has only been used commercially as a byproduct reaction in the manufacture of glue, i.e., the mineral portions of fresh bone are dissolved in dilute hydrochloric acid, and this solution is later treated with lime, obtaining valuable bicalcic phosphate.

In the Palmaer process the hydrochloric acid is replaced by perchloric acid, which is electrolytically regenerated. The cost then becomes a function of the cost of electric power. The process consists in electrolyzing sodium perchlorate in a diaphragm cell, producing perchloric acid and sodium hydrate. (Or sodium chlorate may be used initially and the chloric acid will be oxidized at the anode during electrolysis, after which the process becomes the same.) The weak anode solution is then used to leach phosphate rock. The leach is then drawn off and brought down to faint acidity with about one-half the cathode alkali solution, after which the bicalcic phosphate precipitates as a fine crystalline powder which can be washed.

In the meanwhile, the other half of the cathode liquor is converted to carbonate by passing flue gas through it. This is added to the filtrate from the bicalcic precipitation, and the lime in solution is thrown down as carbonate, regenerating pure sodium perchlorate.

Dr. Hjalmar von Feilitzen read a paper before the section on Agricultural Chemistry, in which he gave tests of the "palmaerphosphate" on peat lands, which were highly favorable to the new fertilizer. The process allows the production of a fertilizer containing 35 to 38% of citrate-soluble P_2O_5 from low-grade rock. It is also stated that there is no tendency to "revert," even in the presence of large amounts of iron and alumina. A small plant is now working at Tröllhattan, Sweden.

California Oil Dividends

Dividends paid by California oil companies during the month of September amounted to $602,764, says the San Francisco *Chronicle*. Not many quarterly dividends were paid, but in October there will be several that will make the total larger. The following is the list:

Amalgamated	$1 00	$50,000
American Petroleum pfd..	0.005	8,756
American Petroleum, com.	0.001-3	39,607
Caribou	0.001-3	8,070
Central	0.0075	7,500
Claremont	0.01	5,000
Columbia	0.01	9,992
Del Rey		3,000
Euclid		1,750
Home	0.01	5,000
Midway Premier	0.01	5,000
Monte Cristo	0.025	12,500
Mount Diablo	0.015	7,500
New Pennsylvania	0.005	5,000
Pacific Crude	0.10	60,000
Paraffine	0.01	3,000
Record	0.01	5,000
Rice Ranch	0.015	4,500
S. F. & McKittrick	0.01	5,000
Sauer Dough	0.0075	2,992
Section Twenty-five	0.50	20,000
State Consolidated	0.01	5,000
Traders	0.006	9,000
Union Oil	0.006	184,744
Union Provident	0.006	91,402
United Petroleum	0.006	48,451
W. K.	0.02	10,000
Western Union	0.005	5,000
Total California companies		$602,764

Potash from the Salines of the United States

J. W. Turrentine, of the Bureau of Soils, reported a great number of potash determinations on brines from various sources to the International Congress of Applied Chemistry, and then stated that his conclusions were as follows:

From theoretical considerations it appears improbable that the known deposits of rock salt in the United States east of the Rocky Mountains are associated with potassium salts other than small amounts occluded and absorbed during crystallization of the sodium chloride. In no cases do the artificial or natural brines or their concentrates contain sufficient potash to make them of commercial value. Certain Western desert-basin brines suggest interesting possibilities of these. Searles Lakes, San Bernardino County, Calif., and Railroad Valley, Nevada, are the best, showing over 6% of K_2O content in the total salts. The sea-water bitterns, when evaporated, give commercially valuable manure salts, but the amounts of the mother liquors are too small to make a production comparable with the country's total consumption.

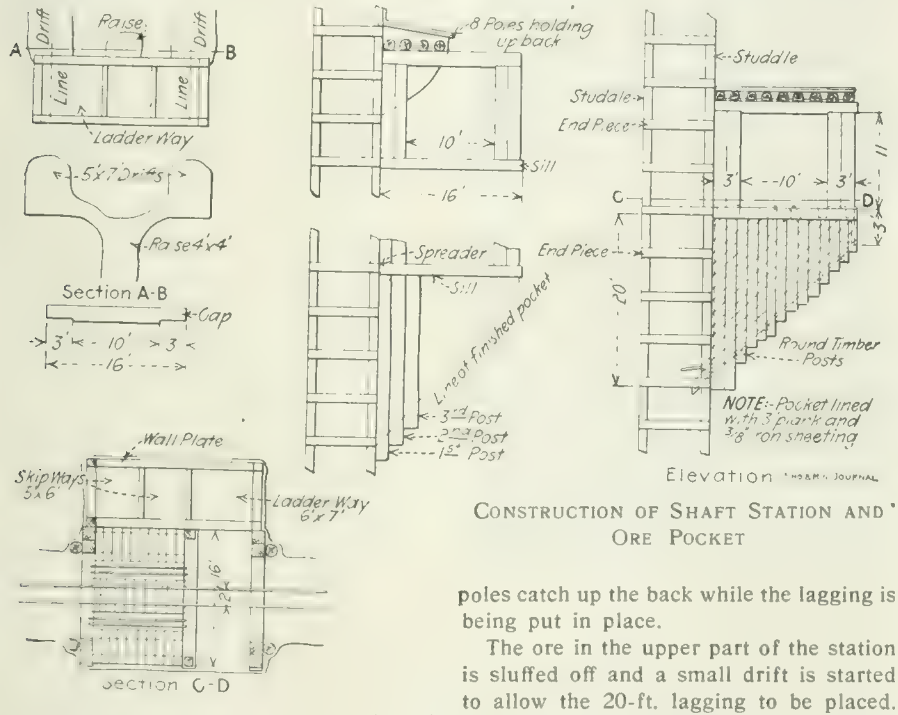
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Cutting a Station and Pocket in Ore

By L. D. Davenport*

In preparing for the cutting of a station and pocket in an orebody, lines for two small drifts are set on the wall plates 1 ft. inside of the studdles. Two 5x7-ft. drifts are started on these lines, and at the same time, a small raise is started at a distance of 20 ft. below these drifts. A temporary chute is built at the bottom to direct the ore into the bucket in the shaft. This raise runs up along the shaft, and as the blocking and wedges are encountered, they are removed, and the laths are nailed in place against the wall plates. The drifts run in 16 ft. from the shaft, and when the raise is up on a level with their bottom, holes are knocked through. This raise is used as a chute while the station and pocket are being cut.



Construction of Shaft Station and Ore Pocket

When the drifts are in 16 ft. from the outside of the shaft, sills are laid perpendicular to the wall plates and the ends butt against the studdles. The tops of the sills are made flush with the top of the wall plate and the sills wedged tight against the shaft.

The backs of the drifts are taken up to about 15 ft. to allow caps to be put in place. There are four 18-in. posts 11 ft. long put under each cap. The caps are 2 to 2½ ft. in diameter, and 10 ft. between the shoulders. The shoulders are cut in about 2 inches.

The posts next to the shaft are placed against the studdles, and those at the further end, are wedged in place. Each cap is also wedged against the shaft. To put the 20-ft. lagging in place (12-in. round timber), a cut is made about 2 ft. higher than the caps, and run in about 8 ft. from the shaft. Small poles are placed parallel to the caps with one end resting on the wall plate, and the other in a hitch cut for that purpose. These poles catch up the back while the lagging is being put in place.

The ore in the upper part of the station is sluffed off and a small drift is started to allow the 20-ft. lagging to be placed. Two thicknesses of boards are placed over the lagging with the joints broken, and the back is blocked up above the boards. The remainder of the upper part of the station is taken out, and the rest of the 20-ft. lagging is placed and boarded up. Poles are used as before to catch up the back, one end resting on the lagging already in place and the other in a hitch. This 20-ft. lagging, 8 or 10 pieces, is equally spaced and small blocks are used to keep them apart. The lower part of the station is then taken out, and a third sill is placed between the others at the ladderway divider. A "taking-up set" is placed on this sill.

The sills are 2-ft. timber hewed flat on two sides, and the "taking-up set" is 14x14-in. square timber. The pocket is then cut down next to the shaft, and posts are set under the sills and stand against the studdles. These posts are set in hitches about 2 ft. below where the bottom of the finished pocket will come.

The pocket is next cut back, and other posts are placed against the first under the sills. These posts are wedged tightly into place and a spreader or cross-sill 6x12 in. is placed between the 16-ft. sills, and against the wall plate to keep the 16-ft. sills apart. Another spreader 12x12 in. is placed at the other end of the 16-ft. sills and four more cross-sills are placed between. Two of these support the rails and are "let into" the 16-ft. sills. The four cross-sills are 16x16-in. square timber. The two wall plates in front of the station are cut off against the studdles, and raised up even with the caps. The pocket is lined with 3-in. plank and ⅜-in. sheet iron. Quarter-pans are placed in the skip-ways.

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*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

Safety Inspection at Cleveland-Cliffs Mines

One of the papers read at the meeting of the Lake Superior Mining Institute, at Houghton, Mich., dealt with safety inspection in mines. This was presented by William Connibear, of Ishpeming, head of the safety department of the Cleveland-Cliffs Iron Co. The subject was further emphasized at the meeting by remarks by Dr. J. A. Holmes, director of the Bureau of Mines, who urged coöperation of the mining companies in giving publicity to new methods of safety inspection and prevention of accidents.

Mr. Connibear described the methods used by the Cleveland-Cliffs Iron Co., which has had a safety department for 18 months. As one means of assisting its employees to exercise safety precautions, the company has published a book of rules, issued in two forms, one for superintendents and foremen, and one for all other employees. The first is printed in English, the second in English, Finnish and Italian. Every employee receives a book and signs a receipt agreeing to study and obey the rules. This agreement is filed in the central office of the company. Within a reasonable time he must satisfy his foreman that he is familiar with the rules of the company. The first violation of the rules may be sufficient cause for a suspension of six days or longer, and a second is usually followed by dismissal from the company's service.

The safety department is in charge of a safety inspector, whose duty it is to inspect all places where men are working or through which they are obliged to travel. His reports are submitted to the central office, where they are given careful attention. A proposed inspection of a mine is not announced and no opportunity is given the men in charge to make changes that may be necessary to meet the requirements of the rules.

In addition, safety inspections are made periodically by a committee of mine foremen, consisting of three members selected from different mines of the company. Each committee makes one inspection of all mines, and submits a report to the central office through the safety inspector, who accompanies them in capacity of secretary.

It is a trait of human nature that whenever rules and regulations are formulated, which affect a body of men as individuals and as a whole, a curiosity is evinced to know how the other fellow is obeying them. Thus it has been found that the foremen serving on the inspection committees have gladly accepted the opportunity, and have always been impressed by the fact that the safety rules, that they hitherto have known only in one mine, are but a part of a system in vogue at all the mines. They then conclude that the movement has come to stay and that it behooves each one individually to fall into line and keep up with the other fellow.

To win the confidence and coöperation of the workmen, there is a workers' safety committee, which operates similarly to the foremen's committee, except that each mine is inspected by a committee of its own workmen, while one foremen's committee makes an inspection of all mines. Workmen of different nationalities are chosen; it is interesting to observe the curiosity which fellow workmen exhibit when one of them is selected for the committee. The workmen's committee inspects all workings that might be dangerous, the handling of explosives, etc., and makes suggestions by a written report through the safety inspector.

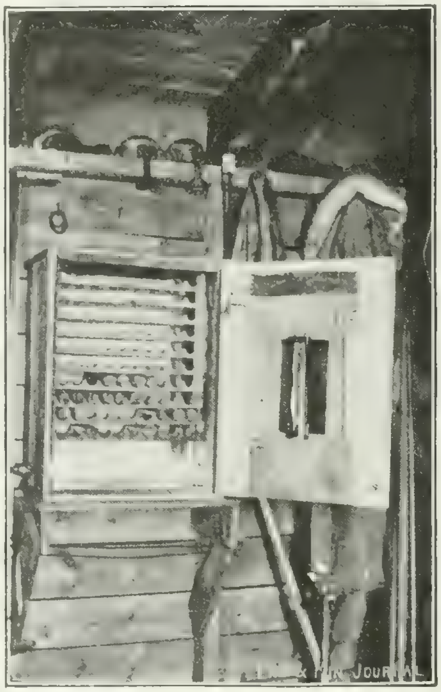
To legislate on recommendations of the foremen's and workmen's committees, there is a central safety committee composed of the company's mine superintendents of Marquette County, the head mining captain, the master mechanic, the assistant auditor, the secretary of the pension department, the safety inspector, and the agent or general superintendent.

In addition to the above precautionary measures, the company has established three mine-rescue stations, equipped with oxygen helmets, electric portable lamps, pulmotors, etc. A man is delegated to look after each station and train men at all mines assigned to his station. Employees familiar with the mine are chosen as members of the corps, such as foremen, timbermen and trackmen. Each corps is drilled at least once a month, and a record forwarded to the central office. Also, at each mine is maintained a corps of five men consisting of surface and underground workers, trained in first-aid-to-the-injured; drills are held each month, and demonstrations in which all teams participate are held as soon as the teams become proficient. Treatment of broken bones, electric shocks, drowning and gas fatalities are included.

Electric Powder Warmer

By J. N. Esselstyn*

An effective powder warmer can be constructed wherever electric lights are available, by using a zinc-lined fuse case, fitted with a suitable rack inside to hold the powder and having an air-tight door.



Electric Powder Warmer

Pieces of heavy cloth tacked about the edges of the door will help to make it air-tight. Close to the bottom of the case on each side are placed two 16-cp. incandescent lamps with the switch keys on the outside of the case. In the door is a small glass window and a thermometer hangs in the case in such a position as to be visible through the window. Sufficient space should be left between the lamps and the bottom of the rack to prevent overheating the powder nearest the lamps. The warmer shown in the accompanying photograph holds 100 sticks, 50 lb., of 1⅛-in. powder. Powder taken from the magazine at a temperature below 32° has been raised to a temperature of 90° in two hours. The thermometer is an important feature of the warmer, as one or both lights can be turned off as the temperature reaches the thawing point. By means of a mercury-cup contact, battery and magnet, the lights can be made to work automatically at any desired temperature.

Federal Cage and Skip

The accompanying drawings show the details of the cage and skip that are used at the No. 1 shaft of the Federal Land Co., in southwestern Missouri. There is a top deck which can accommodate a car and on which men can be handled while under it and from the same frame is swung the deck that carries the self-dumping skip. This skip holds 5.4 tons of ore.

There are several interesting features in the design. The shoes or runners, that follow the guides, are the channels that form the main members of the cage and skip frames. To these runner channels four shoe channels are riveted, which extend out farther on the guides, two on the frame that carries the skip, and two on the frame that carries the deck for the men and car. The two frames are bolted together by means of a splice plate as shown in the drawings. These main channels are bent over at the top and spliced together by strap *A2*, through which passes the drawbar *A1*. Under the two runner channels and bolted to them is the drawhead casting *B1*. This is contracted at the center so as to be straddled by the clevis-shaped drawbar *A1*, which comes down and straddles the shock spring and shock-spring base *B2*. The spring, of course, foots against the drawhead casting. This whole mechanism is inclosed by cover plates fastened to the channels. One plate is riveted while the other is fastened by bolts so that it can be easily removed. On the draw pin *A3* is a sleeve over which fits the clevis by which the cage-and-skip frame is fastened to the rope shackle.

The chains leading down to the safety-dog levers fasten to eye-bolts, through which the pin *A3* passes. The safety dogs, which are toothed castings, are held together by the spring *S*, which connects with the two lever arms *B*, which in turn are keyed to the dog shaft. The safety dogs are held away from the guides by the pull on the drawbar, which is transmitted to them by the chains connecting with the levers *A*, which are also keyed to the dog shafts. The rest of the cage follows the ordinary lines of construction.

On the lower platform of the cage, it will be noticed that there are two pivot shafts for fastening the skip body to the frame. This is to allow the skip to dump in either direction. Formerly it discharged into a pocket on the opposite side of the shaft from that now in use.

A peculiarity of the skip is the use of horns *H* to right it after dumping. The tripping is accomplished by the skip rollers following out on a double runway, as can be seen in the drawing

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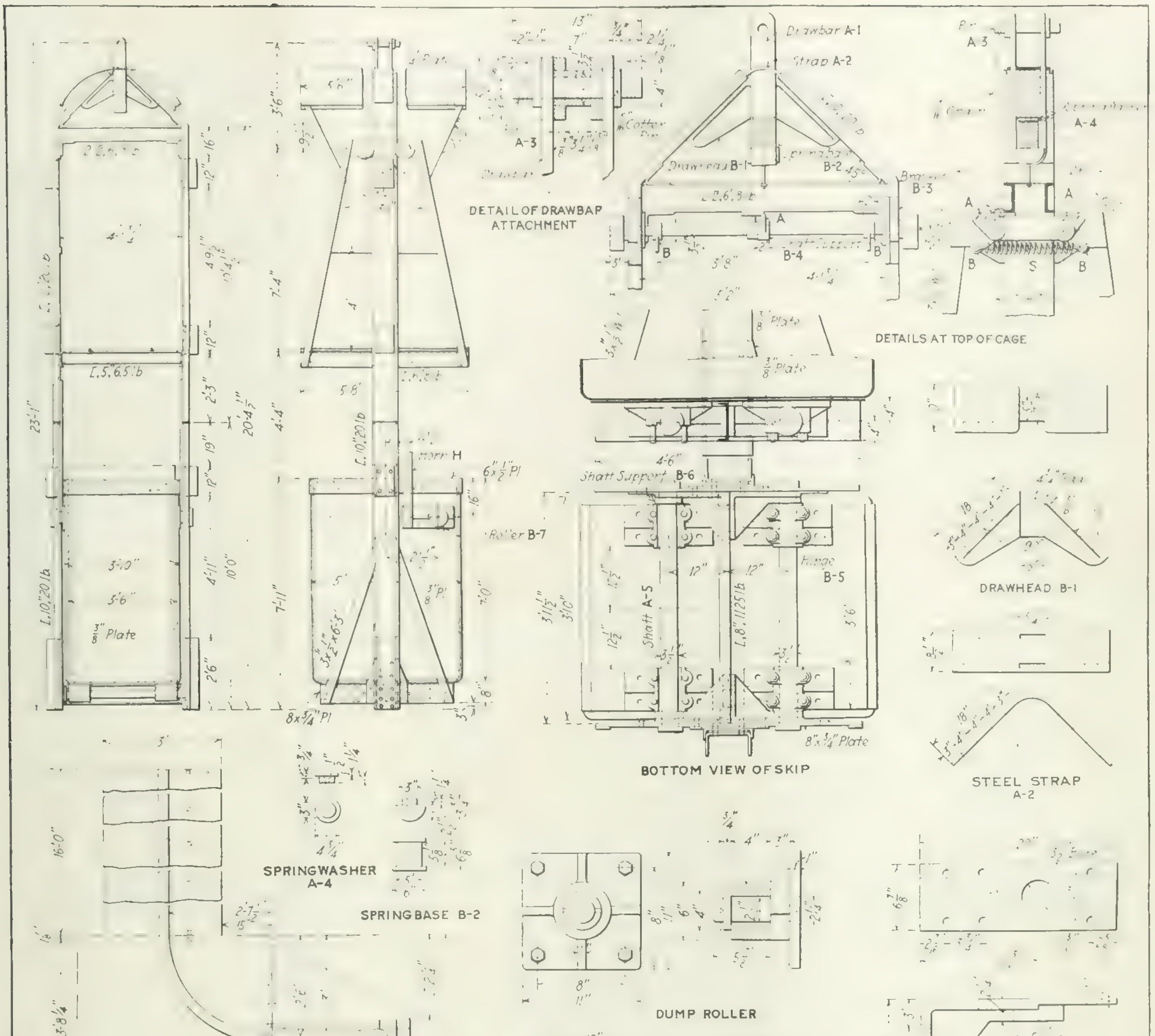
*Mining engineer, Sugar Loaf, Colo.

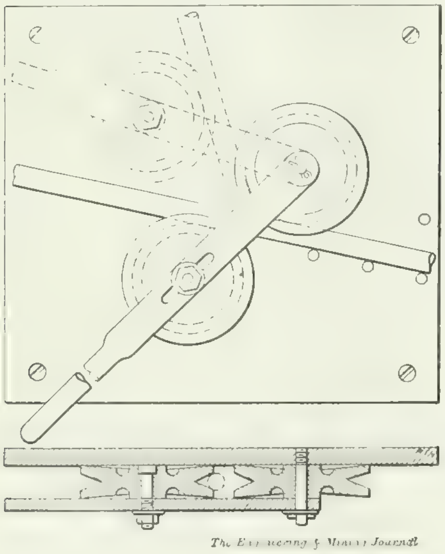


Cage and Skip at No. 1 Shaft of Federal Lead Co. in Southeastern Missouri of the dump, the upper runway, however, has only the bottom track. On coming down after dumping the skip rollers run forward, following the guide runners until at the point of the dump tracks, the horns engage with the nose rollers of the dump, and the body of the skip is given a push upward, bringing it back into an upright position on the skip frame. This same dumping arrangement is extensively used at the iron mines in the vicinity of Ishpeming, Mich. The other features of the skip do not need mentioning, as they follow the ordinary lines.

Device for Bending Pipe

For bending pipe without flattening it, the device here shown is suggested by a correspondent of *Engineer*.

The wheels are made of cast steel and bear on the pipe top and bottom, thus keeping it from flattening. By this means 1-in. pipe has been bent to a radius of 5 in., and by a little practice it is possible to bend ½- to 1½-in. pipe to almost any shape.



Bending Pipe without Flattening

Settling Pond Arrangement

As it is frequently necessary to use surplus mine water in the boilers, care must be taken to remove any sediment in order to reduce the quantity of scale. The most common method of accomplishing this is by the use of settling ponds.

In order to diminish the accumulation of slime in the pond as much as possible the overflow should be near the point of inflow. A current is then developed which tends to remove any excess water before it has had time to deposit much of its suspended sediment in the pond. The supply for the boiler should, of course, be drawn from a point as far distant as possible from the inflow.

At the No. 6 shaft of the Desloge Consolidated Lead Co. in southeastern Missouri, a three-sided concrete well is provided for cleaning out the pond. In the bottom of the well is a large drain pipe which is always left open. The open side of the well faces the pond and is closed by means of two-inch planks. These planks are arranged at such a height that any excess water entering the pond overflows across their top, down into the well and is then discharged through the open drain pipe.

In cleaning the pond the planks are all removed and the water from the pond is allowed to rush into the well and out through the open drain pipe. It is found that most of the slimes in the pond are carried out along with the water. With the use of such a well having an open discharge or drain pipe no valves are necessary. When an ordinary discharge pipe fitted with a valve is used, slime frequently accumulates in front of and around the valve, plugging it and rendering its operation difficult.

Starting a Long Idle Plant

It frequently happens that engineers are called upon to reopen mine plants that have been idle for a considerable period. The following simple and obvious precautions, described in *Power*, should be taken before starting the power plant:

Make hammer test and if necessary renew all defective boiler connections in each instance back to the first stop valve, and see that try-cocks and water-column connections are clean of any scale or sediment and all stop, check and safety valves are in good working order. Have the steam gage tested. Clean out furnaces and back connections and remove all soot from smoke uptakes and flues and from the base of the chimney. Make internal and external inspections of boilers and settings. Examine water supply and overhaul feed pumps and injectors. Examine whether blowoff connections are open to their place of discharge. After boiler and connections are cleaned and put in safe working order, fill boiler and with a slow wood fire examine setting and stop any air leaks and repair them. Then slowly getting up steam, note any leaks and repair them, but not while under pressure. Make a light hammer test of heater and connections.

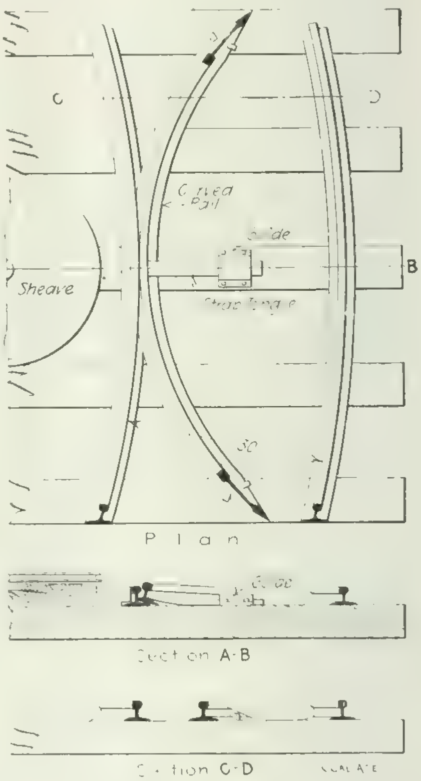
Remove engine-cylinder head, clean out grit and dirt from all steam passages by blowing steam through them and have cylinder perfectly clean before replacing the head. Repack stuffing-boxes and inspect valve setting and all governor connections.

Trace out all engine connections and examine valve setting. Uncover and clean all bearings and flush them with clean thin oil. In starting the engine, use plenty of lubricant. Before putting steam in the engine follow up all transmission connections to see that they are in safe running order, and in starting up run slow and have the load laid on gradually.

Guiding Ropes on Curves

A rope incline which contains many curves sometimes occasions trouble by the rope catching under the rail head, when rounding the curve, and thus being thrown off the sheave. Joseph Daniels proposes an ingenious method of avoiding this trouble in *Coal Age*, Aug. 24, 1912. It is as follows:

A section of rail, usual weight 30 lb., has its ends tapered to a wedge and is bent into a curve having a middle ordinate of 5 in. in a chord of 6 ft. This rail is placed so that its center touches the main rail at one point and its ends are then spiked to the ties, leaving this middle point free to move. A piece of strap iron is fastened to the rail flange at the middle point and slides in a guide which is also spiked to the tie as shown.



Sketch of Guide Arrangement for Use on Curves

The action of this arrangement is as follows: The cars going up or down the incline spring the curved rail away from the point of contact, thus permitting the trip to pass and immediately spring back to place after the last wheel flange has passed.

The rope at this time is approximately in the middle of the track, but its tendency will be to side over toward the short chord of the adjacent curve. In doing so it is carried from the middle of the track over the wedge point of the curved rail past the main rail to the sheave. In this way the rope is prevented from getting underneath the head of the main-track rail.

Details of Metallurgical Practice

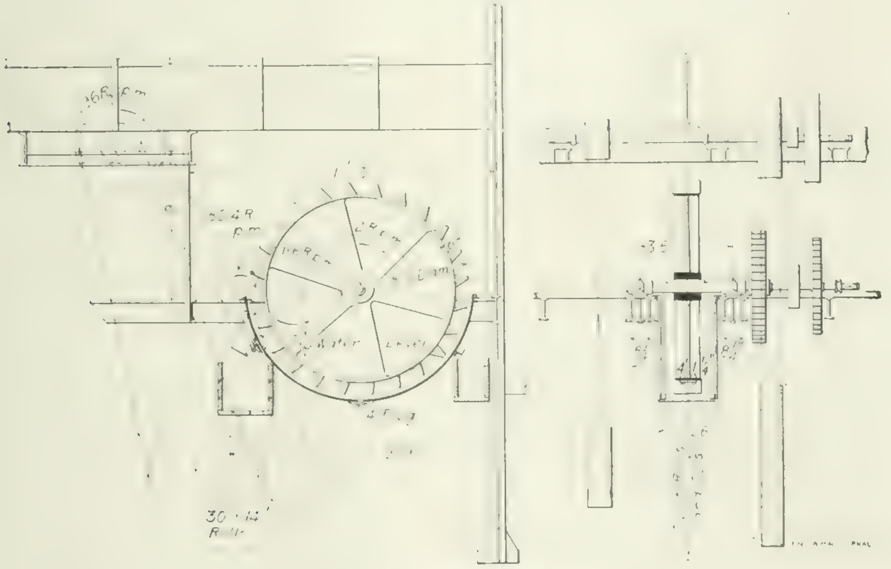
Records of Experience in Ore Dressing, Cyaniding and Smelting

A Cheaply Made Dewatering Wheel

By Claude T. Rice

The dewatering wheel, which has recently found favor in the milling practice of this country is said to be an old German device. One of the first used in the United States was installed at the Daly-Judge mill, Park City, Utah, by the late J. B. Fleming. This wheel was not over four feet in diameter at the tips of the blades, which were curved away from the direction of rotation so that the action was shoving rather than scooping.

The design was somewhat modified by David Cole, of the Greene Consolidated Copper Co., at Cananea, for dewatering the pulp fed to regrinding rolls, and a wheel resulted with its diameter at an angle of 45° to the horizontal and with its blades curved toward the direction of rotation. Wheels of this or similar design are used by the U. S. Smelting Co., at Midvale, Utah, for dewatering jig tailings before regrinding in tube mills; by George Waddell, of the Nevada Consolidated Copper Co., for dewatering the feed of the fine-grinding rolls at the Steptoe mill and by G. A. Overstrom in a Flat River, Mo., mill for dewatering jig tailings before crushing in rolls. Allis-Chalmers have also put this wheel on the market.


Doe Run Dewatering Wheel

In the Cole dewatering wheel the distance that the pulp is scraped and the time that it is given to drain is so small that there is trouble in obtaining a dry product. Moreover, on account of the wheel being placed somewhat on its side, too much floor space would be required if its capacity were increased greatly.

For the last three years the dewatering wheel has been used in the lead district of southeastern Missouri for dewatering tailings before they are stacked by the belt conveyors. Large capacities are therefore required and there are some points in the design that warrant a brief description. The wheels were introduced by O. M. Bilharz, the general manager of the Doe Run Lead Co., at the new mill at Elvins, Mo., and they have since been adopted at the mill of the Federal Lead Co. Mr. Bilharz returned to the old German idea of a vertical wheel and backward sloping blades that lift the pulp up along a semicircular bottom. In this way a machine capable of handling up to 1500 tons a day was obtained.

Dewatering wheels are cheaply made and their upkeep is small. An accompanying drawing shows the driving pulley of an old set of rolls converted into a dewatering wheel for feeding middling rolls at the plant of the Doe Run company.

This driving wheel is seven feet in diameter, and has a face 10½ in. wide, to which a series of shovel blades were fastened. The blades have a slight pitch backward so that they scrape instead of shovel the coarse particles out of the box. In order to facilitate draining the water from the coarse sands, the shovel plates are perforated. The front of the blade is straight across and is not scoop-shaped as are those on the main tailings wheels. The blades are cast with a flange by which they are bolted to the rim of the old driving pulley and are reinforced by a raised rib on the back.

The box in which the wheel rotates is made so that the dewatered product is discharged about six inches above the overflow; the feed comes in at the side. The box as seen is made with a rounded bottom. A narrow box with a flat bottom would probably be better, as the coarse material would build up its own floor, and in case a shoe should break or work off it would be less liable to break other shoes than when it is wedged against an unyielding bottom. Moreover, such construction would be cheaper in first cost and in maintenance. Any of the product that is too large to be kept in suspension is shoved ahead, on the bottom of the tank by the rotating blades, carried up the side of the tank and discharged over the lip at the other end. In this way the coarser particles are washed free from the finer grains, and a fairly coarse, dewatered product is obtained. The fines that come to the dewatering wheel are kept well churned up, and the overflow must be treated by some other device. The shovel wheel is only intended for handling coarser sizes of pulp. The shoes are 12 in. wide and extend out from the rim six inches in a roughly radial direction. They are cast about one inch thick with their blades about ¾ in. thick. In case half of a blade is cracked off, as occasionally happens, a piece of iron plate can be bolted to the remnant and the scraper blade made practically as good as new.

Altering Blueprints

By Clarence M. Haight*

There are many operations which require uptodate blueprints at frequent intervals. In many cases the major part of the print remains unchanged; yet after one or two erasures, the tracing will have to be duplicated on account of wear. By using a tracing partly in ink and partly in pencil, much more service may be obtained from one tracing than if it had been drawn entirely in ink.

All the details which will remain unchanged are drawn in ink on the shiny side of the tracing cloth. Those details that are of a changing nature are drawn with a soft pencil on the rough side. On one side the drawing will have to be reversed as in a mirror. Which side to choose for this reversing will, of course, depend on the nature of the work. Printing backward is perhaps more difficult than any other part of the work and so the printing may determine this choice. A convenient way to make this reversed work is to draw it correctly on another sheet of tracing cloth, then turn the drawing over and place the original tracing on this, also turned over, and trace the work. A glass topped drawing table will be found convenient for this. While the pencil work will not print as clearly as the inked portions, it will be clear enough for most purposes. The great value of this method is in the saving of time which it accomplishes through not having to duplicate tracings.

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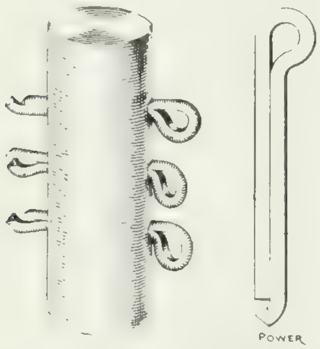
*Mining engineer, Hibbing, Minn.

The Campbell Cotter Pin

To obviate the bother of spreading the tips of a cotter pin after inserting and the usual trouble incident to its removal, an improved design has been patented by Andrew C. Campbell, of Waterbury, Conn. (*Power*, Sept. 10, 1912).



Operation of Campbell Cotter Pin

The pin, as shown, is made from a piece of half-round wire, bent so as to provide an offset eye at one end and have two limbs of unequal length with the flat sides adjacent. The tip of the longer limb is bent at an angle across the tip of the shorter limb. Hence, when the eye is given a blow, the shorter limb is driven over the longer one, and the engagement of the tips causes a separation of the limbs.

To remove the pin a screw driver or other tool having a sharp flat end, such as the tang of a file, is inserted in the eye, and by twisting it so as to expand the flattened eye, the short limb of the pin is drawn back to its original position and the pin may be withdrawn easily.

The top pin in the illustration is merely inserted in the hole; the middle one has its limbs spread by a blow on the eye; and the bottom pin is about to be extracted.

The entering point being on one limb only, this pin is easier to insert in the hole than an ordinary cotter pin. Moreover, the latter must be spread on the side of the hole opposite from that in which it is inserted, while this new pin is inserted, locked and removed from the same side, making its use possible in places difficult of access.

Troublesome Battery Shoes

By Lyon Smith*

Frequently in a large stamp mill a shoe becomes detached from a boss head and for a few minutes is not detected by the man on shift. The shoe may lodge in the mortar box in such a manner that the boss head drops on the shank of the shoe, tending to form a projecting ring on the inside of the opening into which the shoe fits. This is especially true when the shank of the shoe comes in contact with the inside periphery of the boss head, and is more likely to happen if the shoe is new and correspondingly heavy; for an old and lighter one would in most cases soon become dislodged from such a position.

Often it is impossible to drive the shoe on again as the projecting ring of metal tends to cut the wedges to pieces. If the shoe is picked up in an attempt to drive it on, it is generally but a few hours before it becomes dislodged again. Shooting the boss head from the stem and substituting a new one may be resorted to, but the usual practice is to chip out the boss head. This is an awkward job and necessitates hanging up the battery from two to three hours.

A good way to obviate this prolonged hangup is to open the mortar box, remove the detached shoe and substitute an old and lighter shoe, decreasing the height of drop of this particular stem to about four inches, slightly less than the length of the shank of the shoe. Wooden wedges should not be used in driving on this shoe as a metal-to-metal contact is desired. The mortar box should then be closed and the five stems dropped as usual.

The battery should be run a few hours, taking care to feed closely, when it should be hung up and the old shoe driven off. By this procedure the projecting ring of metal will be almost or entirely removed, and the new shoe can then be driven on in the usual way.

Sodium vs. Potassium Cyanides

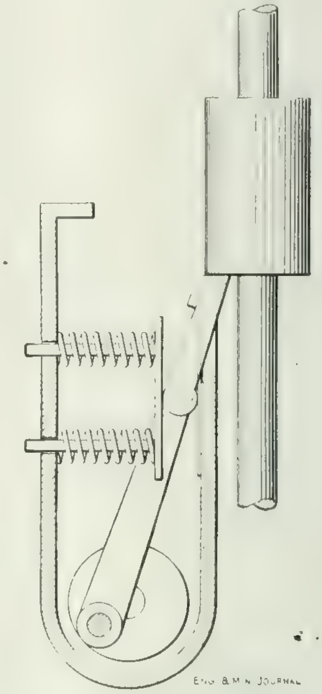
The Roessler & Hasslacher Chemical Co. is calling attention to the various grades of cyanide it now puts on the market, and makes some calculation on their relative efficiencies. The results will doubtless be of interest to cyanide operators:

Compound	Commercial Name	CN %	Price c. per lb.	Cost of CN, c. per lb.
Sodium cyanide	129%	52		51.25
Sodium cyanide	100%	40	20½	51.25
Mixed cyanides	98-99	39.5	21	53.16
Potass. cyanide	95-96	38.4	24	62.50

The sodium cyanide is packed in 100- and 200-lb. cases. There is, of course, a freight saving on the higher grades also.

Stamp Lifting Device

Hans Charles Behr, of Johannesburg, South Africa, has patented (U. S. pat. 1,012,187) a means of lifting stamps in which the lifting itself is done by a dog driven by a shaft, instead of by the usual method of a cam mounted directly on the shaft. Suitable means of release are provided by which the dog is withdrawn to allow the stamp to fall. There are several mechanical variations of the idea, one of which is shown in the accompanying illustration.



Behr Stamp Lifter

Relieving Cyanide Sores

The irritation from cyanide sores on the skin, says *Foundry*, October, 1912, can be relieved by applying camphorated oil. Add 3 oz. of camphor to 1 pint of olive oil and dissolve by slow heat. It occasions some pain when first applied but will soon afford relief. In mild cases the following will be beneficial: Zinc oxide, ½ oz.; zinc carbonate, 30 grains; glycerin, ½ oz.; lime water to make ½ pint.

For sores which do not heal use: Pure lard, 5 oz.; olive oil, 5 oz.; white wax, 2½ oz.; spermaceti, 2½ oz.; powdered gum benzoin, ½ ounce.

A desirable solution for rendering textiles fireproof is stated by *Le Mois Scientifique* to be : Alum, 60 parts; borax, 20; sodium tungstate, 10; water, 1000 parts. Sodium tungstate is also sometimes recommended to make baghouse bags resistant to acid fumes.

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*Elko, Nev.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Some New Phosphides

Pierre Jollibois describes the preparation of some new phosphides of tin, nickel and zinc (*Proc.* Inter. Assoc. for Testing Materials, Vol. 2, No. 10). The phosphides of tin were prepared by fusing red phosphorus and pure tin in tubes of Jena glass, which had been evacuated. The compound produced, Sn_4P_3, was isolated by connecting the product as anode in a concentrated solution of sodium sulphide, to which had been added 5% of its weight in sulphur. The tin dissolves, the phosphide remains unchanged, and corresponds to the formula Sn_4P_3.

If a phosphor-tin containing over 16% of phosphorus be treated alternately with concentrated hydrochloric acid and with potassium hydrate, a product SnP_3 is obtained. These phosphides are attacked readily by halogens, and with hot caustic solutions give PH_3. SnP_3 is pyrophoric.

If an alloy of 5% Ni and 95% Sn is phosphorized as above, in Jena glass, using such an amount of phosphorus that there is an excess of tin, and then the product treated with concentrated hydrochloric acid, NiP_2 remains. If the phosphorus be increased until there is no excess of tin, we have

$$3\,Ni + 4\,SnP_3 = 3\,NiP_3 + Sn_4P_3$$

The ingot contains NiP_3, Sn_4P_3 and an excess of SnP_3. The SnP_3 is dissolved out in concentrated hydrochloric acid, and the residue is heated to 360° C. *in vacuo*. This transforms the Sn_4P_3 to SnP_3 and tin. These are then leached out with hydrochloric acid, leaving NiP_3 behind.

The compound Zn_3P_2, already known but not isolated, can be prepared by pouring fused zinc on red phosphorus, and separating the excess of zinc by volatilization *in vacuo*, or dissolving the zinc in fuming nitric acid at 0° C., which dissolves the phosphide less energetically than the pure metal.

Vanadium and Uranium Extraction

In discussing the processes of vanadium and uranium extraction from carnotite ores, Siegfried Fischer says (*Met. and Chem. Eng.*, August, 1912), that acid processes are unsatisfactory because the precipitated metallic vanadates are gelatinous and almost impossible to wash clean. In the extraction of the metals by alkaline solutions, the cost will be prohibitive, owing to reactions between the alkali and the silica gangue. If, however, the ore can be concentrated first, the vanadium and uranium may be extracted almost quantitatively, and the consumption of alkali, when referred back to the original ore, is not heavy.

The concentrate is mixed with the alkali-leaching solution to a pasty consistency, then evaporated to dryness, finishing at a temperature of 200° to 300° C. It may be necessary to repeat this process to get a high extraction. The mass is then extracted in a steam-jacketed stirring tank, the solution neutralized with sulphuric acid, and the vanadium precipitated as ferrous vanadate. The residue is then available for uranium extraction.

Alumina from Clay, Childs' Process

David H. Childs, of Alfred, N. Y., has patented a process (U. S. pat. 1,036,454) for the production of alumina from aluminum silicates, by volatilization of the silicon as silicon tetrafluoride. Approximately four pounds of aluminum fluoride are required for each pound of silica present. The finely powdered substances are mixed, for example, aluminum fluoride and kaolin, and heated in a suitable oil or gas furnace, to a temperature of from 1600° to 1800° F. The temperature must not exceed 2500° F. and lies well before the fusion temperature of the mixture. The reaction is facilitated by adding water by means of a steam jet during heating. The silicon is driven off as silicon tetrafluoride, and if a pure aluminum silicate (such as kaolin) has been used, a pure alumina is left behind.

The aluminum fluoride is prepared (U. S. pat. No. 1,036,453) by conducting silicon tetrafluoride over a compound of aluminum, preferably kaolin, which is kept moist by a steady flow of water. The water takes up the gas.

$$SiF_4 + 4H_2O = SiO_2.2H_2O + 4HF$$

$$2SiF_4 + 4H_2O = H_2SiF_6 + SiO_2.2H_2O + 2HF$$

The acids thus formed attack the compounds of alumina present. For instance, if kaolin is used, the equations are as follows:

$$6HF + Al_2O_3.2SiO_2 = Al_2F_6 + 2SiO_2 + 3H_2O$$

$$H_2SiF_6 + Al_2O_3.2SiO_2 = Al_2F_6 + 3SiO_2 + H_2O$$

Eventually a strong solution of aluminum fluoride is formed, which can be drawn off, evaporated, and crystallized. The aluminum fluoride thus obtained can either be used by heating with kaolin, or can be calcined to produce alumina.

$$Al_2F_6 + 3H_2O = Al_2O_3 + 6HF$$

It should be noted that hydrofluoric-acid gas can be used in the same way that silicon tetrafluoride is used, for the production of aluminum fluoride from kaolin.

Liquefied Products from Natural Gas

Natural gas may be divided into two great classes, a so called "dry" gas, the natural gas of commerce, and a gas containing many easily liquefiable vapors, known in the vicinity of the oil fields as "wet" gas, say I. C. Allen and G. A. Burrell (*Tech. Paper*, No. 10, Bureau of Mines). The latter class forms the basis for the "natural gasoline" industry.

By fractionating natural gas, during or after liquefaction, four products may be obtained: The natural gas of commerce; a semi-liquid, known as the new "wild" product, which should be used only as a liquefied gas and held in steel containers; a light liquid, for blending with heavy naphthas; and ordinary high-grade gasoline.

As early as 1904, commercial gasoline was procured near Titusville, Penn., by Pasenmeyer, by collecting the condensation in gas mains. The yield was increased in 1905 by chilling the pipes with cold water, and still later by using small compressor plants. The general practice was to obtain a liquid product by compression in single-stage compressors operated at 150 to 300 lb. per sq.in. This liquid was then run into open tanks and "weathered," i.e., the lighter portions allowed to volatilize spontaneously and escape until the boiling away had ceased, which process involved an absolute waste of 25 to 50% of both the product and the labor of obtaining it.

The next step was to give the gases from the first compressor a higher degree of compression, getting a "wilder" gasoline, which was run back and mixed with the first liquid. The mixture was then exposed to the wasteful "weathering. Recently, however, the second-stage gasoline has been kept separate and used to enrich heavy refinery naphthas.

However, the authors believe that it has been a great mistake in the gas-gasoline industry not to recognize the gaseous nature of the product and handle the product in steel containers just as other commercial liquid gases are handled. The gasoline obtained by them working at 400 lb. pressure and artificial cooling, developed a vapor-tension of 755 lb. per sq.in. at 133° F., which shows that handling such products even at high summer temperatures is not impossible. Such gasolines consist mainly of ethane, with a little propane and butane, and still less of the higher hydrocarbons.

The liquefied gas was used for heating, in internal-combustion engines, and for illumination, and was satisfactory for all purposes, although in the last field it is not satisfactory for direct burning with lava tips.

Melting Points of Salts

The melting points of various salts is of great interest to the metallurgist and chemist, so that we reprint the following table from the *Brass World*, which compiled it from "Carnelly's Table of Melting Points."

Substance	Melting Point Deg C
Barium Fluoride	1000
Calcium Fluoride (Fluorspar)	1000
Potassium Fluoride	790
Lithium Fluoride	801
Magnesium Fluoride	908
Sodium Fluoride	902
Strontium Fluoride	734
Silver Chloride	451
Aluminum Chloride	180
Barium Chloride	860
Calcium Chloride	720
Cuprous Chloride	434
Cupric Chloride	498
Ferric Chloride (Iron Perchloride)	300
Potassium Chloride	730
Lithium Chloride	600
Magnesium Chloride	708
Sodium Chloride (Common Salt)	770
Lead Chloride	500
Strontium Chloride	825
Zinc Chloride	262
Boron Trioxide (Boric Acid)	570
Sodium Nitrate	300
Potassium Nitrate	340
Potassium Carbonate	830
Sodium Carbonate	814
Lithium Carbonate	695

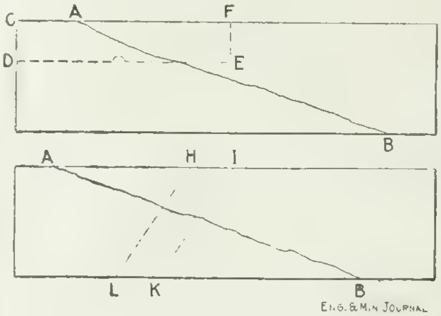
In connection with the melting points of substances, it should be understood that a mixture of two salts usually melts at a lower temperature than either. For example, a mixture of potassium carbonate and sodium carbonate melts at a lower temperature than either of the salts, and as a rule the lowest melting mixture of two substances is when they are in equimolecular proportions.

Boronized Cast Copper

In discussing the use of boron for making copper castings of high conductivity, before the American Institute of Metals, Dr. E. Weintraub states that boron suboxide is produced by reducing boric anhydride with magnesium, aluminum, or an alkali metal, and purifying the product chemically. However, for copper castings it is unnecessary to purify the product. Of the reduced mixture, known as boron-suboxide flux, about 0.75 to 1.0% of the weight of the copper must be added, equivalent to about 0.08 to 0.1% of boron suboxide. Any mixture containing boron in the reduced state will do in this work, e.g., carbide of boron, or any mixture of carbon and boron. While the electrical conductivity obtained may be as high as 97%, Mathiessen standard, ordinarily it is unsafe to guarantee over 90%. The mechanical properties of a typical sample are given as follows: Tensile strength, 24,350 kg. per sq.in.; elastic limit, 11,450 kg. per sq.in.; elongation, 48.5%; reduction in area, 74.49 per cent.

Strength of Welds

That the apparent strength of welds under ordinary tests, and their numerous failures under working conditions, is due to taking the sample to be tested in an incorrect manner is urged by C. Fremont ("New Method of Testing Welds," *Proc.* International Association for Testing Materials, June 28, 1912). That is, if the line *AB* be the approximate weld, a test piece is ordinarily cut out as shown by lines *CDEF*. If, however, a nicked test piece be cut out as shown by the lines *HIKL*, and submitted to impact test, the weld usually cleaves open under a slight blow, and exhibits only 2 or 3% the strength of the plate.



Bad and Good Methods of Testing Welds

His conclusions are: The static strength obtained in testing forged scarf-jointed welds is equal to the static strength of the metal only when the welded surface is sufficiently large to compensate for the lower elementary strength per unit surface, just as in a brazed joint. Autogeneous welds are weaker than forged welds. Forged welds (even when successful, of which there is no proof in practice) are always weaker than the metal, the weld being merely a more or less perfect adhesion only, which explains the number of weld fractures in service. Hence welding should not be allowed, unless the accidental fracture of the article will not be dangerous.

Treatment of Nickel-Copper Mattes

A wet process of treating nickel-copper mattes that have been blown free of iron, is patented by McKechnie and Beasley (Brit. pat. 15,850, of July 8, 1911). They are heated with sulphuric acid in a closed vessel to a temperature exceeding 100° C., at a high pressure. The nickel sulphide is dissolved and the liberated hydrogen sulphide, under the high pressure which prevails, precipitates any copper which has also gone into solution. There thus results a solution containing all the nickel, and free from copper. It is preferable to roast the matte slightly before treatment with acid, in order to increase its porosity. If, however, such roasting leaves insufficient nickel sulphide to cause the precipitation of all the copper which is also dissolved, additional matte, preferably unroasted, may be introduced in order to make good the deficiency.

Vertical Copper Converters

For many years, there has been considerable difference of opinion among metallurgists as to the relative advantages of the barrel and vertical types of copper converters, says the *Salt Lake Mining Review*. The barrel type has perhaps been in more general use, the Boston & Montana plant of the Anaconda Copper Mining Co., at Great Falls, Mont., being almost the sole representative of the vertical type. The size of converters at this plant has been steadily increased, and most comprehensive experiments have been carried out. Finally a large type has been perfected, which is being rapidly adopted, and seems to be the most economical. The Greene-Cananea Consolidated Mining Co. has installed one at Cananea, Mexico; the Calumet & Arizona Mining Co. will install five in its plant at Douglas, Ariz.; and the Copper Queen, three. The smeltery of the Arizona Copper Co., at Clifton, Ariz., will have three, and the United Verde, at Jerome, expects to install some. The Arizona smelteries will use the size which is 19 ft. high and 12 ft. in diameter. The latest practice at Great Falls favors even larger sizes.

Removal of Phosphorus from Iron

Discussing the removal of phosphorus from iron, before the International Congress of Applied Chemistry, A. E. Greene laid great stress on the importance of temperature control. Thus under 1450° C. the phosphorus in pig iron has more affinity for oxygen than has the carbon in the pig iron, but it has less than solid carbon. Over 1450° C., phosphorus has less affinity for oxygen than has the carbon in the pig, and calcium phosphate is slowly reduced. Silicon will decompose $Ca_3(PO_4)_2$ at all working temperatures, forming calcium silicate and setting free phosphorus. As to the oxide of iron in the slag, solid carbon forms a more efficient reducing agent than does the carbon in the bath. However, by complete control of reducing and temperature conditions it seems possible to eliminate phosphorus from the iron, and iron from the slag.

Native Placer Mining in Colombia

By R. D. O. Johnson*

Native placer mining in Colombia is carried on in river beds which can be worked only in the dry seasons. Tops of shifting bars are washed in bateas. Artificial bars are formed, pits are sunk and parts of the river beds are cut off by crude wing dams in order to make the gravel on bedrock available for washing.

The equipment of the native placer miner in Colombia is secured from the forest or jungle adjacent to his operations. Beyond the ubiquitous machete he needs no assistance in the way of tools from the outside world.

A knowledge of the tools, devices and methods evolved out of the necessities of the isolated native's way, well serves the needs of the prospector or miner who finds himself far from his base of supplies and with no means at hand for drawing upon a stock of modern appliances. Moreover, it is not unfrequently found that the native tools and appliances are better adapted to the work for which they were developed than any that are listed in the catalogs of mining-supply houses. Upon his advent into this country, the American prospector discards the gold pans he has brought in his kit for the *batea*, and falls as naturally into the use of the *almocafre* (Fig. 5), as though he were born to it. This instrument, which originated with the aborigines in prehistoric times, combines the virtues of the pick and hoe without the faults of either and with many virtues of its own.

Spaniards Exhausted High-bench Gravels

It is probable that before the advent of the Spaniards into South America, the placer-mining operations of the aborigines were confined to the washing of the *aventaderos*, or high bench gravel that could be made to yield their gold by the employment of simple methods, such as ground sluicing. The adventurous and energetic Spaniards promptly turned their attention to whatever was left of these easily worked deposits, the product of which for many years kept filled the coffers of Spain. The exhaustion of these deposits led to the working of other but less favorably situated ground, until today there remains the rich river beds and the water-filled playas, or river bottoms, which latter have baffled the best efforts of the Spaniards and their home-made apparatus.

The river beds can only be worked during long continued dry seasons. A few tropical downpours puts a stop to native river mining. The gravel in the beds of many of these rivers is rich, estimated in some cases at from $4 to $10 per cu.yd. That these gravels are rich is evident from the yield, considering the primitive methods employed in their working and the small quantities actually washed.

Women Expert Operators

When the dry season is well advanced and the waters of the rivers have fallen to a low point, the peons and their women flock to the river sides. They proceed to construct rude shelters with palm-leaf roofs and to "camp on the job." At such times the supply of labor for mining and agricultural purposes runs low, and wages must be raised to match the lure of the river.

The women as well as the men are expert operators with the *batea*. The women generally work independently of the men, employing in their washing operations the large spoon *batea* with the handle, as shown in Fig. 1. These *bateas* seem not to be made to any standard dimensions, the bowls varying in length from 3 ft. to 6 in., in width from 20 to 28 in. and in depth from 4 to 6 in. Handles are from 12 to 14 in. in length. Like all other *bateas*, these are cut from the solid wood, some artisans acquiring great reputations for their skill in making them. Armed with these huge *bateas*, the women wade out into the river, usually selecting as the place for the operation a point at the up-stream end of a bar or a raise in the river bed, such a point being thought the most favorably situated for the deposition or concentrating of the moving gold. It is not an unusual sight to see from six to a dozen women in a line across the central part of a gold-bearing river up to their waists or arm-pits scooping up the gravel from the bottom with these great wooden bowls.

Gravel Washed Down to Black Sand

The *batea* is employed as a shovel in digging up gravels, the convex side being invariably turned up-stream. In washing the gravels, the *batea* is floated on the water surface and given a peculiar rocking, swashing movement that rapidly and effectively concentrates the charge to the black-sand contents. The movement allows water to enter the bowl over one edge, and after having completed the circuit, to escape near the point of entrance, washing overboard the lighter parts of the charge. The washing is completed, so far as this operation is concerned, when black sand only remains. This is washed into a small gourd (Fig. 2), that is fastened to the waist by a string and held in front.

At the end of the day the contents of the gourd are cut down in a small *batea* of the pattern as shown in Fig. 3. The gold obtained by this washing process is fine, the gravel treated being taken from the tops of shifting bars. The quantity actually handled per day probably does not exceed seven or eight cubic feet. The returns vary from 20c. to $2 per day, depending upon the locality. When it is considered that the prevailing wage for women is from 10 to 15c. per day, the return of the washing operations are properly regarded as magnificent.

Natives Form Artificial Bars

A somewhat more ambitious method of treating the river gravels and getting at those lying on bedrock, is known as the *sombre* method. This is generally undertaken by the men, two, four or more working together. A line of eight or 10 stout stakes, spaced from 18 to 24 in. apart, are driven at the point selected, the direction of the line being at right angles to the direction of the river current. The stakes are from eight to 10 ft. in length and are driven through the bed of sand and gravel into the decomposed granite bedrock. The stakes are braced on the downstream side by inclined stakes. These are bound to the vertical stakes by *bejucos*, a kind of stout though soft and flexible vine. The vertical stakes stand above the water about 18 in., and on each side of these stakes near the top a horizontal pole is bound. These two poles serve as a platform from which the shovelers work. In a vertical position on the up-stream side of the vertical poles, is placed a mat made of palm leaves. This mat is adjusted in position so that its lower edge stands but a short distance above the top of the bed of sand and fine gravel that usually overlies the coarser and more compacted stratum of gravel on bedrock. The sweep of the water underneath the mat carries off the lighter sand and gravel and piles them up in the more quiescent water below the *sombre*, as the poles and mat are collectively called. The women are always anxious to wash these artificially formed bars. When a sufficient amount of coarser gravel has been uncovered, the mat is moved down to obstruct the flow of water as much as possible and shoveling commences. The shovels are provided with handles 10 or 12 ft. in length. Not infrequently the natives employ in the place of shovels a kind of wooden scoop provided with a long handle.

Bedrock Not Thoroughly Cleaned

The amount of gravel that can be raised by two or three shovels is washed in a large *batea* (Fig. 1). Sometimes six shovelers and two washers may be seen

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*Mining engineer, Apartado 110, Medellin, Colombia.

working at one *sombre*. Usually the gangs consist of three or four men. This method yields much higher returns for the labor than simply washing the upper stratum of sand and gravel. The shovelers frequently, though not always, reach bedrock, but it is impossible for it to be thoroughly cleaned by this method. Only a narrow strip of gravel, perhaps two or three feet in width, is uncovered by the water flowing under the mat and made available for shoveling. So energetically has this kind of mining been pursued in some rivers that the water flows through forests of stakes.

The method of driving the stakes is unique. The stakes are green hardwood and would split and be rendered useless long before they had penetrated the bedrock if driven by a maul or sledge hammer of usual pattern. Since iron rings or ferrules are unavailable or unknown, the natives devised a scheme of their own that is entirely satisfactory. The stakes are pointed at both ends, the upper end being rather blunt. The maul (Fig. 4) is made of tough, gnarly wood and is provided with a conical pocket into which the end of the stake fits. In driving, the blunt pointed end of the stake enters the conical pocket, the effect being to drive the fibers of the wood together and thus to prevent splitting.

Pits Sunk during Dry Season

During long continued droughts, many of the lower river bars are exposed. These exposed bars are favorite places for the carrying out of another class of river mining. In these are sunk pits 12 to 14 ft. sq., they are first excavated to a depth of one foot and a frame of heavy round timbers is put in. Outside of this frame stakes are driven separated by spaces of three or four inches. Excavation then proceeds, the gravel and sand being carried out in hand barrows.

As the stakes are exposed, the long grass-like leaves of the *caña brava* are laced in behind, presenting a tight and effective screen against the influx of sand. In these bars there is frequently, not to say usually, encountered a kind of fine clayey sand or *mole* which, when filled with water, as it generally is, presents the most difficult problem the native placer miner is called upon to solve. This *mole* is found also in thick strata in the playas always below water level.

It is the presence of this treacherous material that is largely responsible for the fact that there exists today many promising playas awaiting exploration by Americans with modern machinery. When the native encounters *mole*, it is a question as to whether or not he will succeed in excluding it and get to the "pay" below. He depends upon fern leaves and the leaves of the *caña brava* laced in between and behind the stakes. If the bed is heavy, the influx from below may be so strong as to compel the abandonment of the pit. However, if he succeeds in conquering the *mole* and the flow of water is not too great, the remaining part of his work is comparatively simple. The *cinta* or stratum of gold-bearing gravel lies just below the *mole*. It is loosened by the *almocafre*, shoveled into hand barrows and carried up the runways, made of logs flattened on top, to a long tom, or short sluice, where it is washed.

In shoveling the place presents a peculiarity that is viewed with scant patience by the American miner, particularly if he has absorbed some notions of scientific management. If the hand barrow sitting on the runway is at an elevation slightly above the shoulder of the shoveler, he declines to make the effort to raise the material, but insist upon having the assistance of another peon at his elbow, the duty of this auxiliary being to hold a small *batea* into which the gravel is shoveled. The auxiliary peon then raises the *batea* with the shovelful of gravel and dumps it into the hand barrow. As the shoveling point is 10 ft. away from the hand barrow, two auxiliaries are employed to pass the *batea*.

The Native Pump

Water is removed from the pits by means of hand pumps constructed from materials found near at hand. Within their range these pumps are effective. The tube is made from the trunk of a particular kind of palm tree. The soft, pithy interior is scooped and bored out by means of an instrument resembling the spoon or earth auger of the Empire drill. The interior diameter of the tube is between three and four inches, the length from 10 to 14 ft. The valve end of the tube is bound tightly with strands of native rope placed in circular grooves. This is to prevent splitting the tube when the valve plug is driven in. The valve plug, 12 to 14 in. in length, is bored hollow for half its length and an opening is cut to communicate with the outside. The wood-capped leather valve is nailed on the end of the valve plug that is inserted in the tube. The lower and solid part of the valve plug serves as a foot for the pump keeping the intake opening above the sand and gravel of the bottom.

Pump Is Adaptable to All Circumstances

Perhaps the most unique feature of the pump is the plunger, piston or bucket (Fig. 6) though none of these names defines it. A pole four to five feet in length and having a diameter of one to 2¾ in. is fitted with a cross handle like the handle of a gimlet. The other end of the pole is cut to a smaller diameter for a distance of 1½ in. from the end, leaving a shoulder. This part of smaller diameter is passed through a hole of equal diameter in the center of a disk of green or thoroughly soaked rawhide. The diameter of this rawhide disk is from six to eight inches, depending upon the diameter of the bore of the tube. To the outer edge of this disk and equally spaced are fastened six rawhide straps about six inches in length and three-fourths of an inch in width. These straps are nailed or tied to the pole at such a distance above the shoulder as to allow the soft disk to form a pocket or sack, the outer diameter of which, when expanded by the pressure of the water, will be sufficient to permit a more or less tight fit in the working barrel of the pump tube. The flexibility of the plunger allows it to fit all the irregularities of the interior of the palm stalk crudely fashioned as it usually is. Riveted sheet-iron pipes of four, six, or eight inches in diameter may be readily converted into hand pumps by the use of such valves and plungers. The rivet heads inside of the pipes seem to have no effect upon the working efficiency of pumps thus constructed, so great is the adaptability of the flexible rawhide plungers.

The pumps in their working positions stand at angles from 35° to 50° from the horizontal and raise water from six to eight feet in vertical height. One lift is usually sufficient for pits sunk in the sand bars of the rivers. Where one lift is not sufficient, one side of the pit is cut down and a shelf is formed. The water is raised by one series of pumps from the bottom to the shelf and by another series from the shelf to the surface. As depth is gained and the flow of water increases the pumping keeps pace by increasing the number of pumps. In extreme instances as many as 20 pumps have been used to keep a 12x14-ft. pit free of water. As the work of each pump operator is equal to that of every other, and as the pay is equal, the boss of the pit insists on synchronous movement. If all keep time with the pacemaker no one is loafing.

Parts of River Cut Off by Dams

The most ambitious of all the native engineering projects for reaching the gold in the river bottoms is known by the name of the *tapado*. The *tapado* might be defined as a wing dam that bends back to the bank inclosing and cutting off a part of the river bed. The dam is constructed by driving stakes close together in a double line and filling the space between the lines with clay, well tamped in. The lines of stakes are separated by a space of about four feet. The stakes are fastened together by binding all to horizontal poles placed near the top. These horizontal poles are then bound to cross poles placed about every four or five feet. Vines, *bejucos*, from the jungle are used for the binding. Previous to filling in with clay, palm leaves are placed inside and against the stakes. When the *tapado* has been completed, the water is pumped from behind the dike and mining proceeds. At points near riffles or cascades, the *tapado* dam may be run out from the bank above, and terminate at a lower level, going down the riffle. If the fall is greater than the depth of the water outside of the upper end of the *tapado*, The lower end is left open and no pumping is required, as the space inside drains itself.

At most of the large mines on the Porce River, where the playas are being worked by means of hydraulic elevators, the operators take advantage of a protracted dry season to put large *tapados* into the river, thus making accessible considerable additions to their workable territory. Since the borders of the playas adjacent to the river are almost without exception the richest parts, the areas thus added are highly remunerative.

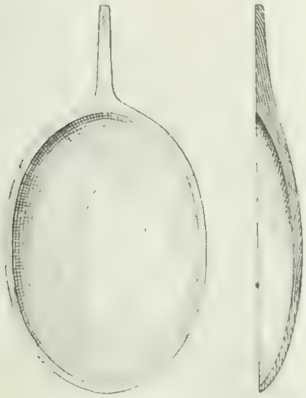


FIG. 1

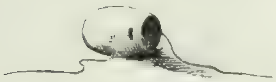


FIG. 2

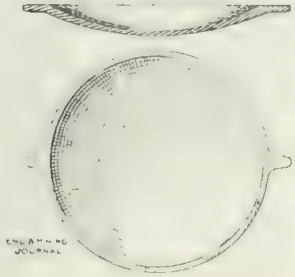


FIG. 3

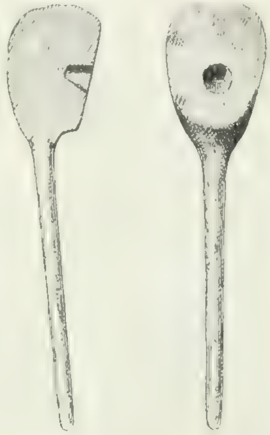


FIG. 4

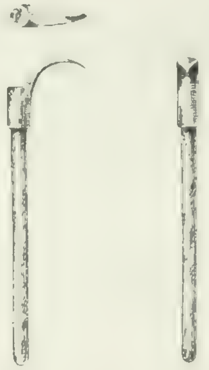


FIG. 5

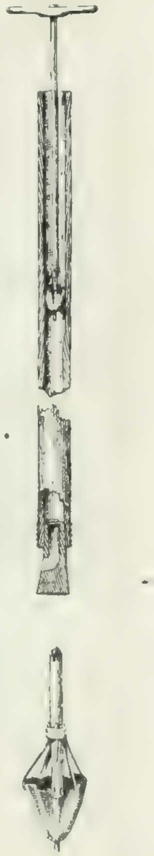


FIG. 6

Native Colombian Placer-mining Tools

Leasing System Popular

The river workers generally consume so much time in building their *tapados* that little is left of the dry season for the work of getting at the bedrock. Partly for this reason and partly from the fact that the natives find it the usual thing to do, the *corte* system consists in leasing small *cortes*, or areas within the mine or *tapado*, for a percentage of the product. This percentage depends upon the expected total yield and upon the liveliness of the competition for the opportunity to work a *corte*. If the mine or *tapado* has the reputation of being rich and competition is active, the owner may demand and get as high as 50 or 60% of the gold produced. On the other hand, he may not be able to secure leasers unless he concedes to them 80% of the product.

Wages Depend on Amount of Gold Recovered

The river workers are aways required to pay 20% of their gross washings to the owners of the mines. The river miners have unlimited opportunities for concealing the amounts of gold they actually wash out, and their incessant shifting from one mine to another makes it a hopeless task for the owners to keep track of them. It is safe to say that a portion much smaller than 20% gets into the pockets of the owners.

The owners of the *tapados* keep out the water, receive, weigh and sell the gold. The lessees frequently sublet their privileges. The peons sometimes receive their food and lodging only and are promised a proportional division of one-half of the gold that falls to the share of the lessee or sublessee after he has paid his percentage. Sometimes the peons prefer to board themselves, particularly if they have families. Since they invariably live from hand to mouth, they must have some pay. In that event, their employer contracts to pay them one-half of the ruling wage and promises a proportional division of one-quarter of his share of the gold to complete their pay.

At other times the peon receives something less than the ruling wage and is promised by his employer a *pinta* as a final settlement. This is the product of a *batea* full of gravel taken from the bedrock. On the Porce River, 95% of all the gold is on bedrock or within a foot of it, so this method is sometimes higly satisfactory. The peon is always ready to take a gamble in a small way.

Gravel Carried from the Pits

The operating force for each *corte* usually consists of one shoveler, rarely more, *batea* passers, hand-barrow carriers and washers, who wash the gravel and attend to the sluices. The lessee or sublessee generally acts as *capitan* or boss. Each pair of hand-barrow carriers will carry the loaded barrows a distance of only 25 or 40 ft., depending upon the steepness of the runways. As many as four to seven pairs of carriers are employed for each *corte*, where the runs are from 200 to 300 ft. in length. The transportation of the gravel for such distances is not infrequent at the playa mines, in which the gravel is from 40 to 50 ft. in depth.

As stated elsewhere, the wages of the pens are higher during the dry seasons, so that the cost for each peon (wages and food) will not be far from 70c. per day. During the wet seasons plenty of good peons may be employed at a total cost of 50c. per day each. The hand-barrows as loaded hold from 1 to 1¼ cu.ft. From 3 to 5 cu.yd. of gravel are removed from each *corte* per day at a cost of from 80c. to $2 per cu.yd. It takes good ground to stand such costs and to produce a profit. The *corte* system has been defined as the one designed to distribute the product of the mine to the greatest number of Colombians.

Bedrock Never Thoroughly Cleaned

Within the last 18 months the native miners have learned a lesson from the Americans, who are putting in hydraulic elevators for the purpose of working the deeper water-filled gravels of the playas. The depth of the gravels range from 12 to 55 ft. Up to the present, these more progressive miners seem to have been so inadequately supplied with capital that their elevator equipments are too small to do more than serve as pumps and keep the pits fairly clear of water. These water elevators are so far superior to the old-time overshot water wheels used for driving four to six pumps, that the latter are now being but little employed. These ponderous slow-moving contraptions were never more than partially successful and enabled the miners to reach only the highest portions of the bedrock. The same ground formerly mined by natives with the aid of these water-wheel-driven pumps, has since been washed by Americans, using hydraulic elevators with most satisfactory returns. The mining done by the Americans developed the fact that the natives of former times had succeeded only in cleaning up the ridges of the bedrock, whereas the best of the gold was found in the depressions.

Consolidated Mining & Smelting Co.

The Consolidated Mining & Smelting Co. of Canada, reports that for the fiscal year ended June 30, 1912, its profit was $310,346, or 5.35% on the outstanding stock. The Trail smeltery smelted 296,458 tons of ore, and produced 2,914,181 lb. of copper; 26,072,074 lb. of lead; 1,765,992 oz. of silver; and 129,789 oz. of gold.

During the year the company acquired the property of Le Roi Mining Co., in Rossland, and the Virginia mine. Since the close of the fiscal year the Abe Lincoln and the Iron Horse have also been purchased, all in the Rossland district. An option was taken during the year on the Hudson Bay group, near Salmo, but was dropped, and the Silver Dollar, also near Salmo, is still being investigated. Options were also taken on a number of properties in the Ainsworth camp.

The Snowshoe mine has been closed, which accounts for the lowered copper production, and the St. Eugene has been practically closed during the year. Phœnix Amalgamated was not operated, Number Seven only for a time, and only a small tonnage was produced from the Richmond Eureka. Developments were good in the War Eagle, Molly Gibson and in the properties of the Ft. Steele Mining & Smelting Co., that ship ore to Trail. A considerable amount of the stocks and bonds of the Ft. Steele company are held by the Consolidated.

A water-operated compressor plant was put in near the Sullivan mine (Ft. Steele company), and an additional one for the Molly Gibson. A new flue was built in the copper smeltery, and a matte-handling plant installed. Additional electrolytic lead tanks were put in, and the lead samplery altered extensively.

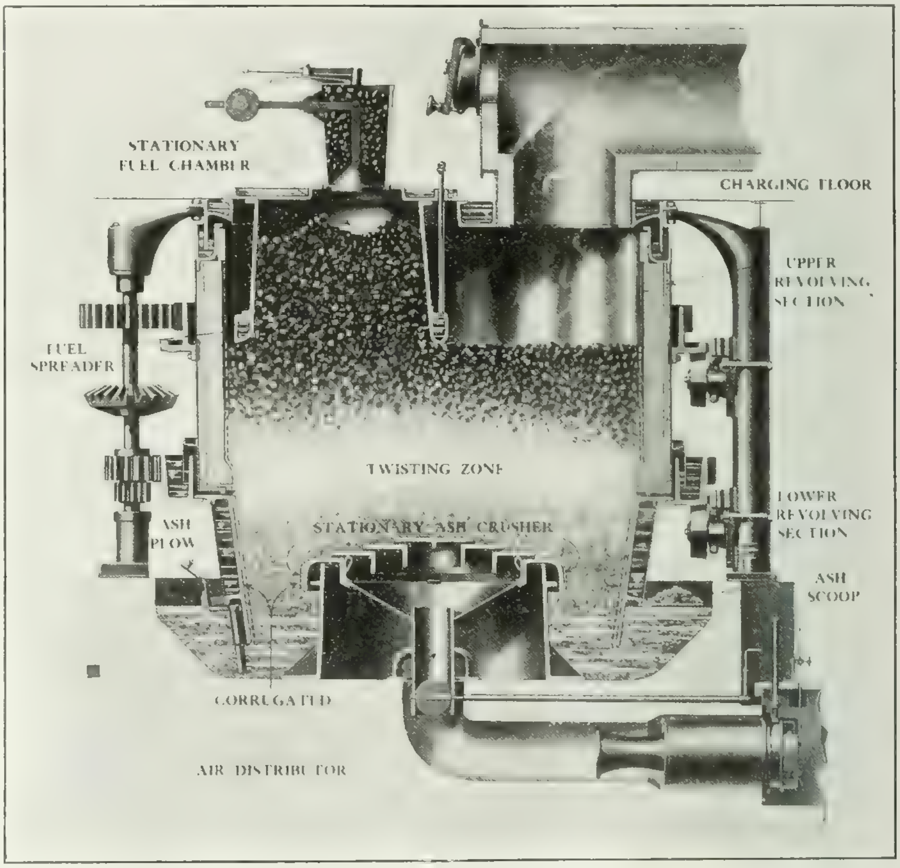
The company costs were increased about $120,000 during the year by the Crow's Nest Pass strike, and at the close of the strike the cost of electric power was increased to an extent which will probably increase the costs of the company by $40,000. However, many properties in the Slocan district have resumed work after years of idleness, and in general the prospects for the future are considered bright.

The company paid dividends last in 1907, and its surplus account stands at $1,183,635 on an outstanding capital of $5,805,200.

Chapman Rotary Gas Producer

The chief features of the Chapman rotary gas producer, shown in the accompanying illustration, are: (1) Mechanical feeding and spreading the fuel; (2) agitation of the entire fuel bed; (3) mechanical removal of the ash. The producer is made by the Chapman Engineering Co., of Mt. Vernon, Ohio.

The fuel chamber is water cooled at the lower edge, and holds about 1000 lb. of coal, enough to last half an hour. There is no separation of coarse and fine coal in this machine, and as can be seen, the most coal must be fed in at the low points and air holes in the charge, that is, just where it is most needed.



Chapman Rotary Gas Producer

Agitation of the fuel bed is obtained by dividing the rotating bed in two sections, which travel in the same way, but with different speeds, giving a shearing action in the fire bed, and effectually filling any holes. This gets away from the method of using rabble arms, which keep burning off, even if water-cooled.

This shearing action, and consequent prevention of blow-holes, has the secondary effect of preventing clinkers, which are ordinarily formed around any such air holes in the fuel bed.

Ashes are removed by grinding the ash between the sides of the stationary corrugated wall of the air box, and the revoving corrugated wall of the lower section. After the ashes have been crushed they are forced up to the top of the ash pan by three adjustable ash plows, which are kept in continuous operation. As fast as the ashes are lifted to the surface of the water in the ash pan, they are automatically scooped up and carried to the required point for automatic discharge. The fact that the ashes in being removed are taken upward makes a difference of several feet in the height required for the gas house and foundation.

Gypsum in Utah

The gypsum deposits along San Rafael Swell, which lie east of the Wasatch Plateau and west of Green River, in east central Utah, have been investigated by the U. S. Geological Survey (*Bull.* 530-N). The deposits require little or no prospecting on account of excellent natural exposures, but no great quantity can be mined until better transportation facilities are available. The beds of gypsum on the west flank of the San Rafael Swell are estimated to contain 2,425,400,000 tons in the upper, and 7,276,200,000 in the lower bed. The deposits carry about 32.48% of CaO; 45.75 of SO_3; 20.56 of H_2O volatile at 300° C.; 0.36% of Cl, and traces of Fe_2O_3.

The Midwest Oil Co., operating at Casper, Wyo., will pay a dividend of $60,000 this month.

The Scandal of the Comstock

The following paragraph is quoted from the San Francisco *Chronicle* of June 20, 1912:

> Twenty-seven thousand shares of stock in Alpha Consolidated, delinquent under the last assessment of 5c. a share, were offered for sale yesterday in the offices of the company and no voice was heard. Alpha is an undeveloped property that has been undergoing the regular assessments for office expenses and pumping fees. The market price of the stock reflects no physical value in the mine, but usually covers the amount of assessment money in the treasury. Yesterday's official quotation was 4c. bid—1c. less than the assesment, but 4c. more than the 27,000 shares brought at the delinquent sale. The offer of the stock in the offices of the company yesterday was followed by a sepulchral quiet.

There is nothing unusual about the above remarks. Substantially the same thing has been said year after year, not only in the case of one Comstock mining company but of many. The remarks that we have quoted, which we have selected quite at random, will serve as an introduction to a review of the management of the Comstock mines in general which may, we hope, throw some light on present scandals.

From beginning to end the history of the Comstock lode has been a chronicle of scandal. The chicanery of the earliest days was succeeded by the stock jobbery of the period of the Big Bonanza. Later came the operations of the mill ring, which conducted a system of simple and deliberate stealing until it was exposed and disrupted by the JOURNAL. Since then the production of the mines has waned and become relatively small; and the opportunities for Napoleonic plundering have ceased to exist, but the jackals find pickings after the tigers have gone and the spirit of graft still pervades the Comstock although the operations are but petty.

PRESENT PRODUCTION

According to Prof. George J. Young, who contributed to the JOURNAL of June 20, 1912, an excellent summary of the present situation of mining on the Comstock, the present output of the lode is about 15,000 tons of ore per month, yielding about $200,000, about 700 men being engaged in the mining and milling of this ore. About 5000 tons per month comes from underground stoping, chiefly in the Ophir, Mexican, Crown Point and Union Consolidated, about 5000 tons from the Chollar and Potosi croppings, and about 5000 tons from the Yellow Jacket dump. The cropping and dump ore is of low grade. The production of ore from underground is expected to increase as further progress is made on the plan of unwatering the mines, which is being prosecuted by the Comstock Pumping Association, a coöperative organization to which all the companies of the lode contribute, and the recent discovery of ore of good grade in what appears to be a body of some size in the Mexican mine has been an inspiration to such of the Comstock companies as really want to mine.

The major part of the Comstock mines are controlled by a group of San Francisco stock brokers and are operated for stock gambling purposes rather than for real mining. The Mexican mine is an exception and shows what can be done by intelligent, honest and modern methods.

DO THE COMPANIES WANT TO MINE?

Here we find ourselves at once confronted by the question which leads to the key of the Comstock situation, viz. Do the managements of these companies really want to mine? Professor Young says: "The stock exchanges list about 34 mines, the stocks of which are regularly bought and sold. Large as was the Comstock lode, it is difficult to conceive of such a number of companies flourishing at the present time. It is strange indeed that the Comstock should have survived so many years with the original organizations and the separate companies." It would be strange indeed if it were simply a case of mining. Considering, however, that the Comstock is still chiefly a basis of stock gambling it is not strange.

PSYCHOLOGIC PROBLEMS

Involved in this there are some psychologic problems. The Comstock shares have served as speculative chips ever since the beginning. As in playing roulette and faro, most persons lose their money, but now and then somebody makes a winning, which keeps the spirit alive. It is hardly conceivable that even the Comstock game could be kept going if everybody lost all the time. However, to the disinterested observer it does not appear that the Comstock shares offer such ordinary sporting chances as a reasonably square horse-racing meeting. Ask a Californian about it and he will tell you: "Our people have got to have something to gamble in. They can't play the Eastern markets—stocks, or grain, or cotton, etc.—because they are too far away, can't get the feel of them, and don't know the names of the chips, anyway. They know the Comstocks, have been born and brought up with them, like their fathers before them. They know that they are swindled, but after all it's just human nature."

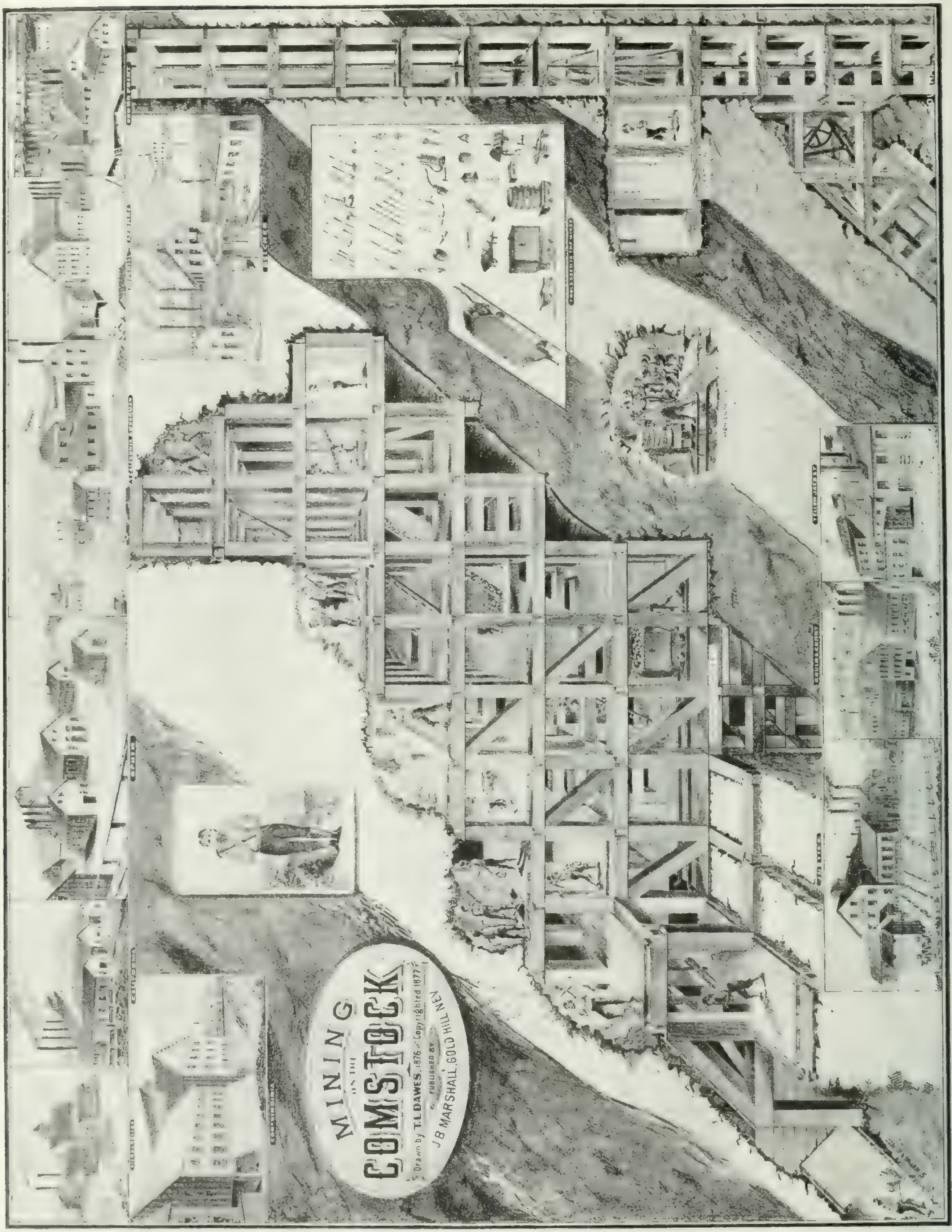
THE BROKERAGE RING

This is an argument that it is difficult to meet, there being no good in preaching morality to persons who don't want to be moral, or in giving warnings against a shell game to people who know all about it, but continue to play it nevertheless. Our interest lies in its bearing upon the mining industry. The prime consequence is that the capital stock of the Comstock mining companies is largely in the offices of, and in the names of, San Francisco brokers. The theoretical owners have no idea of being owners and don't want to be owners. Eastern brokerage houses carrying stock-exchange securities cause them to be transferred to their names but do not vote them, at least the most reputable houses do not, except under instructions from the legal owners. The San Francisco brokers carrying Comstock shares do not have the same regard for the ethics of the case, and vote the stock and control the companies. The evils that may develop under such a system may so easily be pictured by any intelligent imagination that no portrayal is necessary here. The dabbling in Comstock shares is, in fact, so disreputable that many persons who own them actually as an investment (such persons exist) are reluctant to let their ownership be known. In a few, very few cases, as in that of Mr. Slosson, the owners have come out in the open and declared their intention to operate their mines as mines, i.e., for the ore that may be obtained from them.

In the mines under the regime of the San Francisco brokers, besides the opportunities for rigging the stock market that they afford, a variety of small graft lies available. Salaries may be drawn for selves and henchmen installed in the official positions, of which there are plenty. The purchase of mining supplies gives opportunities for "rake-offs." When there is a mine product there may again be advantages that inure to private purses. In general the actual working of the mines, when such is done, is under the direction of "old timers," the relics of a previous generation, who are ignorant of modern methods and are wasteful. The managements don't care. Why should they? The public, which contributes the assessments that are levied, may be relied upon to supply heaps of money.

THE MEXICAN COMPANY

One of these Comstock cesspools has been cleaned out by H. L. Slosson, Jr., who in behalf of his own interests and those of Mr. De Sabla and others, as-


MINING
ON THE
COMSTOCK
Drawn by T.L. DAWES. 1876. Copyrighted 1877.
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J B MARSHALL, GOLD HILL NEV.

sumed possession of the Mexican Gold and Silver Mining Co., which they were entitled to by owning a majority of the stock. Mr. Slosson installed Mr. Whitman Symmes as general manager and Mr. Symmes organized a staff of young technical men, with whom the Comstock lode was previously unacquainted; and among them they have converted the Mexican into a mine that must be a revelation to the old fellows. By the introduction of a rational system of drainage and ventilation the dreadful heat of former times has been greatly ameliorated. The Mexican is still a hot mine but not much hotter than some mines at Butte, Mont., used to be. The air being good there is nothing excessively onerous in working in it. Pass from the Mexican mine into the Ophir and it is like going into an inferno. In the

Ophir the men work in "passes" in the old fashioned way, i.e., an hour at work and an hour to rest. In the Mexican they work a full eight-hour shift. As to the relative economy of the two systems no argument is necessary.

It is particularly gratifying that the management which has introduced modern methods in the Mexican mine has been successful in its prospecting and has opened a new orebody that is thought to justify all the ventures that have been made. Having obtained ore the company went ahead and put up a modern cyanide plant, dismissing from consideration the wasteful methods of milling practiced at some of the older mills of the district.

Why Not Consolidate?

The operations of the Mexican company constitute a good example of what may be done on the Comstock. The visitor to that famous old district is immediately impressed by the magnitude of the mineralization and the idea that possibilities of rejuvenation must remain. The old division of interest among many companies strikes him as absurd and uneconomic and he thinks of the advantages of consolidation. Such a scheme was in fact considered a few years ago by the General Development Co., but was not undertaken. Californians say that an actual consolidation would be inadvisable, because of the psychology of the stockholders on the Coast, who must still have chips of many colors to play with, but the elimination of the brokerage ring, the assumption of the respective managements by the real owners of the respective properties, and coöperation in the mining and milling of the ores are all things that are desirable and advisable. Among mining engineers there would be no two minds about those things.

An Old Comstock Print

In connection with this article it is interesting to present an old Comstock print, showing something of former methods of mining. Modern mining as conducted in the Mexican property exemplifies great changes. The dangerous, balloon-like shaft-houses have disappeared. Also the cooling rooms in which the miners sprawled on cakes of ice. The print is particularly interesting in its showing of the square-set system of timbering, which was introduced on the Comstock by Philip Deidesheimer in 1860. In that year a vast body of rich ore was cut on the third level of the Ophir mine. In width it was from 80 to 120 ft. and it was soft. The problem of extracting it baffled the local miners. Mr. Deidesheimer came from Georgetown, Colo., and solved it.

Philip Deidesheimer

Most of our readers will be surprised, we think, to learn that Mr. Deidesheimer is still living in San Francisco (2808 Clay St.). Unfortunately he is in destitute circumstances. He performed a great service to the mining industry, which ought to be recognized by the industry in some way that would make him comfortable in his declining years. The following is from a Reno, Nev., newspaper of not long ago:

> I see, said an Old Comstocker, "that Philip Deidesheimer passed through Reno a few days ago. 'Deides," as we used to call him on the Comstock was the greatest miner that camp ever knew. He was the man that made the mining of the Comstock possible by his invention of square-sets, a product of mining genius that has since been used in every part of the world where mining is carried on.
>
> "It is said that the artist does his work for art's sake. If so, Deidesheimer is an artist; for he never patented his great invention and so never derived any pecuniary benefit from it. That's one reason, perhaps, why he is going about the rough mining regions, still working at his profession at his present age. I don't know the exact tale of his years, but he came to California from Germany in 1851 so it is safe to say that he is hovering somewhere around the 80 mark.'

We believe that Mr. Deidesheimer is now upward of 80 years of age.

A Modern Charcoal Iron Plant

Not many years ago it was predicted that the advancing price of wood, and improvements in metallurgical practice at coke furnaces would put a definite end to the making of charcoal iron, says *Iron Trade Review*, Oct. 3, 1912. The charcoal-iron production was only 1.18% of the total 1911 production, but by adopting byproduct recovery plants for wood distillation, it is believed that the decline has been at least temporarily arrested by the charcoal-iron makers.

A modern charcoal plant is that of the Meshek Chemical & Iron Co., at Wells, Mich. Distillation is conducted in rectangular horizontal retorts, 46 ft. long, 6¼ ft. wide and 8⅓ ft. high. The retorts are made of ⅜-in. plates, set in brick walls like a boiler. The wood in 4-ft. lengths is piled on trucks and carbonized for 24 hours, 18 or 20 of which is at full heat. The charcoal is cooled for 48 hours in similar chambers except there is no outer brick setting, and the charcoal is not touched by hand until it enters the furnace bins. From one cord of wood are obtained 50 to 52 bu. of charcoal, eight to 12 gal. of wood alcohol, 150 to 200 lb. of calcium acetate, and five gallons of tar.

The blast furnace owned by the Stephenson Charcoal Iron Co., near-by, is 60 ft. high, 10 ft. in diameter at the bosh, designed for 80 tons per day and is arranged for hand filling. Two Otis elevators in balance are employed for feeding. The bosh is cooled by streams of water directed against a bosh jacket. There is a dust collector 13 ft. in diameter by 15 ft. high, and blast is heated by two Durham-type iron-pipe stoves, each provided with 65 pipes in three rows. Fuel consumption is said to be less than in a coke furnace of similar size.

The Policy of the Geological Survey

In a paper entitled "A National University," in *Science*, Aug. 16, 1912, President Van Hise, of the University of Wisconsin, alleged the neglect of science by the scientific bureaus. He states that the U. S. Geological Survey "is almost exclusively a department of practical geology," and "is not contributing in any large way to the advancement of science." To these statements George Otis Smith takes exception (*Science*, Sept. 27, 1912).

He premises that there is some difficulty in debating the question, as it is not easy to state what constitutes "advancement of science," and what constitutes "practical geology," but answers the generalized charges of Van Hise as follows:

Geological Survey Meant to Be Practical

"Geologic research as conducted under government auspices should, in my opinion, be largely practical. The purposes for which the U. S. Geological Survey was organized are practical, and the administrator who would venture to disregard the plain intent of the organizing legislation would not contribute to the ultimate advancement of science. The Survey began on practical lines, Director King arranging the initial work in districts offering 'examples of instructive geological structure and great bullion yield,' and even that classic work of science planned as the first monograph of the new survey, 'Lake Bonneville,' had its practical side, the hope having been expressed. by Mr. Gilbert himself in a report of progress 'that a critical investigation of the secular oscillations of climate in the past will help to solve the problem of secular change which is of such vital importance to the agriculture of an arid domain.'

"The most recent index of the trend of the Survey's work is afforded by the schedule of manuscripts being edited August 15, which affords some basis for judging of the character of the publications now in hand. The publications issued each year are known to the public, although I might mention as noteworthy in this connection two contributions that are just coming from the press: Monograph LI., 'Cambrian Brachiopoda,' by Walcott, and Professional Paper 71, 'Index to North American Stratigraphy,' by Willis. Of the 41 reports now being edited five are engineering bulletins, embodying data incidentally collected in the course of topographic surveys, and therefore not chargeable to scientific appropriations; eight relate to Alaska and represent work done under an appropriation made specifically 'for the investigation of mineral resources' and therefore not to any large extent available for theoretical investigations, though the results of the work in Alaska are a splended contribution to our knowledge of the geology of the globe; eight are water-supply papers contributed from the work under another specific appropriation; six relate to economic geology; and the remainder, 14, may fairly be described as outside the 'department of practical geology.' This group of 14 includes six paleontologic reports, three descriptions of areas having no special economic importance, and one report under each of the following subjects—glaciers, Pleistocene geology, petrography, stratigraphy and mineralogy.

"That the U. S. Geological Survey concerns itself with the practical side is true now as it has always been in the past; whether its work is more or less devoted to practical geology than formerly can be decided according to one's taste or prejudices; but that it is almost exclusively a department of practical geology must be denied.

Scientific Conclusions Often a By-product of Practice

"Besides making general investigations in geology and highly specialized researches in paleontology, petrography, mineralogy, geophysics and geochemistry, which it will be generally agreed contribute to the advancement of science, the Survey is making other investigations whose theoretic results are so closely combined with the results of practical geology that their scientific value may be overlooked by some readers. In some cases the purely scientific conclusions reached are incidental to the practical investigation, but in many instances are essential to it. Today, as in the past, the study of ore deposits by the Geological Survey continues to yield a large measure of scientific results of the highest grade, and the five manuscripts on economic geology mentioned above are no exception to this rule. Most of these are not detailed descriptions of mining camps, but deal to a great extent with the aërial geology and physiography of the hitherto blank spaces on the geologic map of the United States. The broader studies are not neglected—a fact illustrated by a manuscript just received from Prof. W. H. Emmons on 'Secondary Sulphide Enrichment,' which represents results gained in the course of economic work in several mining districts during the past twelve years. That the answers to the problems of chemistry and physics here discussed possess a practical present value to the mining engineer in nowise detracts from their permanent value to the broad science of geology.

"An example of work on a broad problem that concerns a number of states is afforded by the general and detailed study of the Atlantic and Gulf Coastal Plain, which for five years has been prosecuted under the direction of T. W. Vaughan, with the coöperation of several state and federal geologists. Similarly, the mapping of the San Juan region by Whitman Cross serves as a notable example of a general investigation of broad scientific interest, covering two decades. A third illustration is to be found in the geologic work of Messrs. Campbell and Alden in the new Glacier National Park. It is conceivable that the publications resulting from such geologic investigations will stand as large contributions to science, and when this literature has been illumined by the added glamor of the years, the Geological Survey of today may be cited as again 'the center of the world for the advancement of the science of geology.'

"More than this, the application of geology to economic problems has a reflex effect upon the science. The association of the scientist with the engineer is beneficial to both. The geology that is applied to big problems, whether of engineering or of governmental policy, must be not only qualitatively true, but also quantitatively exact. So the entrance of the Geological Survey into the administration of the public lands has modified field methods and established standards of accuracy not before demanded. The result is that the geologist who works in terms of 40-acre tracts observes details that were overlooked by his predecessor who looked the country over by the square mile.

Survey's Work Giving Geology a New Standing

"The recognition of the applicability of geologic data collected by government scientists to the administration of the public lands is in itself, I believe, a large contribution to the advancement of science. The field of science is broadened and the standing of science is dignified. The remark of the geologist whose experience had been gained largely in the East but who is now working in a Western mining camp illustrates this: 'It is a satisfaction to be looked upon as a worker and not have to make apologetic explanations as to what geology means.'

"Another illustration is afforded in the work of the Geological Survey in connection with the proposed forest reservations in the East. For years the geologists and hydrographers of the Survey had taken interest in the question of the relation of forest cover to stream flow and as opportunity afforded had made observations bearing on the question. The results, however, were at best only qualitative and to some extent confusing. The Weeks Act, however, specifically laid upon the Survey the burden of making an affirmative showing of the regulative effect of the forest upon stream flow, before land could be purchased, and then an investigation was planned with the purpose of obtaining conclusive results. That the Survey withstood popular clamor until its investigation was concluded and reported only on observed facts may of itself have been a possible aid in advancing science. As an intensive study, the hydrometric survey of selected areas in the White Mountains is believed to be without parallel in the world, and it has yielded quantitative results which, when thoroughly digested and compiled, will be published as an important contribution to science."

Concluding, Doctor Smith says: "This opportunity to apply science to an administrative problem came to the Geological Survey because its work was believed to be both practical and scientific; and I may add my opinion that whenever the Survey becomes exclusively 'practical' or exclusively 'scientific' it will cease to deserve either recognition or support. This idea has been best expressed by Brooks: 'Applied geology can maintain its present high position of usefulness only by continuing the researches which advance the knowledge of basic principles.'"

Influence of Titanium on Iron Castings

The influence of titanium on cast iron is one of the debated points of metallurgy. Rossi, Moldenke, West, and Goldschmidt have obtained favorable results, other investigators unfavorable. In a paper before the joint session of the American Institute of Mining Engineers, and the International Congress of Applied Chemistry, Bradley Stoughton reports that he believes it of benefit both in increasing the tensile and transverse strengths. But the technique must be carefully watched. The metal must not be cast too hot or too cold; the titanium must be got into the metal, not into the slag; and the melt must be given full time to absorb the titanium.

Under these conditions it appears to reduce the amount of entrained slag, and probably through this, it seems to reduce segregation. It is not an alloying element, but works through its affinity for nitrogen, in which it stands first of all the elements, and for oxygen, in which it appears to stand between Si and Al (Keyser gives the heat of formation of TiO_2 at 97,772 cal.). In steel, 0.9 lb. per ton of steel is effective. While Stoughton believes either ferrotitanium or titanium-thermit to be advantageous, he believes the latter to be the less effective.

The Ahmeek Mill, Hubbell, Mich.

By Walter R. Hodge*

The mill of the Ahmeek Mining Co. on Torch Lake, Michigan, is of steel-and-concrete construction. Ore is transported by railroad from the mine, 10 miles distant. Four heads are now in operation with two different flow sheets. It is expected that four more heads will be installed next year and the treatment made uniform throughout the plant. Tailings are discharged into Torch Lake.

The Ahmeek mill is situated on Torch Lake, about one-half mile south of the village of Hubbell, Mich., and about 10 miles by rail from the mine it serves. The mill went into commission with two heads in June, 1910; another head started in January, 1911, and the fourth head began dropping in March, 1911.

The mill building is 218x190 ft. and its highest point is 122 ft. above lake level. It is of steel-and-concrete construction throughout and departs from local practice in mill building insomuch as it is built with two floors. The boiler house is an integral part of the main mill building abutting on the foundations of the rock bins. Other buildings are a concrete pump house and a frame carpenter shop. The mill building houses a small forge shop and a small machine shop. The heavier repair work is done in the shops of the Tamarack mill, distant to the south about half a mile.

Rock is brought from the mine over the Mineral Range R.R. tracks and enters the mill on a long steel trestle at an elevation of 106 ft. above lake level. Here it is dumped into steel bins of 1000 tons capacity each. These are the largest steel mill bins in the copper country. They are four lobed in horizontal section and measure in their largest dimensions 42x30 ft. inside. These four bins rest on reinforced-concrete foundations. The open spaces in the foundations are used for storage and for machine and blacksmith shops and coal bunkers. Coal is delivered over the trestle and drops by gravity to the bunkers. There are two tracks on top of the bins.

From the bins the rock runs by gravity to the stamps. As it enters the feed chute it passes under a spray of water. As the rock slides through the chute to the stamp the larger pieces of copper are picked out by hand and thrown into a bin for shipment to the smeltery. Broken timber and other foreign matter is also removed by the head feeder.

THE AHMEEK MILL ON TORCH LAKE, MICHIGAN

CAPACITY OF EACH HEAD 600 TONS PER DAY

The stamps, four in number and set 44 ft. from center to center, are Nordberg compound steam stamps, dropping 106 times per minute. The high-pressure and low-pressure cylinders are respectively 16x24 in. and 32x24 in. Steam is used at 150 lb. and 36 lb. The valve gears of all four heads are actuated by one 75-hp. motor. The rock dumps directly on the dies, where it is crushed. The mortar discharge is two ways only, through screens punched with 5/8-in. round holes. Copper too large to pass the screens is removed by means of a hydraulic discharge, so periodical cleanups of the mortar are unnecessary. The capacity of each head is about 600 tons per 24 hours.

The mortar is seated on a concrete base or mortar block, at an elevation 50 ft. above lake level. The block is in the shape of a truncated pyramid 40 ft. square at the base and 38 ft. high. This block rests directly on a slab of concrete 4 ft. 6 in. thick, which in turn rests on hardpan. A mile of steel cable is imbedded in each mortar block and slab, uniting them thoroughly.

Under the present arrangement the products of the two west heads are treated in a different manner from the products of the two east heads. Descriptions and flow sheets of one head in each section are given herewith. When the new heads, now planned, are added to the mill, the method current in the west half of the present mill will, in all probability, be used for all the heads.

HODGE JIGS USED IN EAST SECTION

In the east half of the mill, after leaving the screens of the mortar, the 5/8-in. material passes over a hydraulic discharge, which removes the large pieces of clean copper and allows the remaining pulp to pass into a trommel, the screens of which are punched with 3/16-in. round holes. The oversize, discarded by the four trommels of each head, goes directly to an elevator and is returned to the mortar for further crushing. The pulp passing through the trommel screens goes over another hydraulic discharge, which removes the large pieces of clean copper, and drops into classifiers at the heads of sets of Hodge jigs. There are eight sets of these roughing jigs with four 2-compartment jigs to each set. Corresponding to each of the four jigs in the set is a spigot in the hydraulic classifier. The overflow of the classifier runs to one of eight settling tanks in the basement of the mill. The plungers of the jigs operate at a speed of 165 r.p.m., and have a stroke of from ¾ in. to 1 in. The screens used on No. 1 are 8-mesh and 10-mesh, on No. 2, 10-mesh and 12-mesh, on No. 3, both 12-mesh and on No. 4, 12-mesh and 14-mesh. The screens are skimmed by hand for copper. All skimmings, $\frac{3}{16}$-in. copper and ⅝-in. copper, are carried to a bin at the lower end of the mill by a shaking launder, and loaded into a gondola for shipment to the smeltery. The other products are collected from the various boxes by small tram cars, hoisted on an elevator and dumped into a hopper-bottomed mineral car for shipment.

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*Mining engineer, Houghton, Mich.

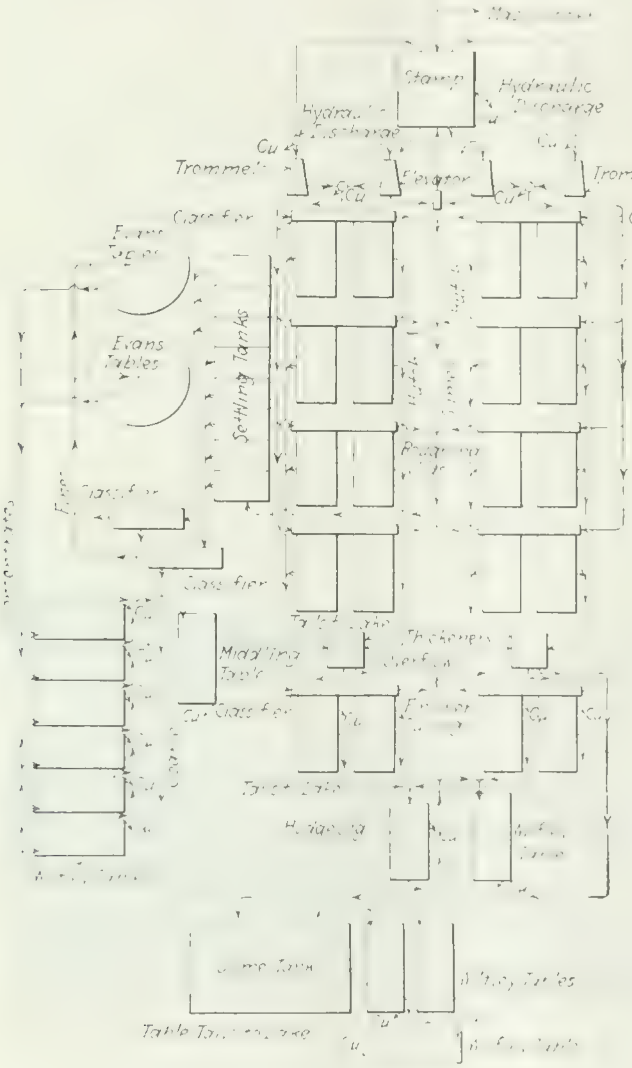


FIG. 1. FLOW SHEET, EAST HALF OF AHMEEK MILL

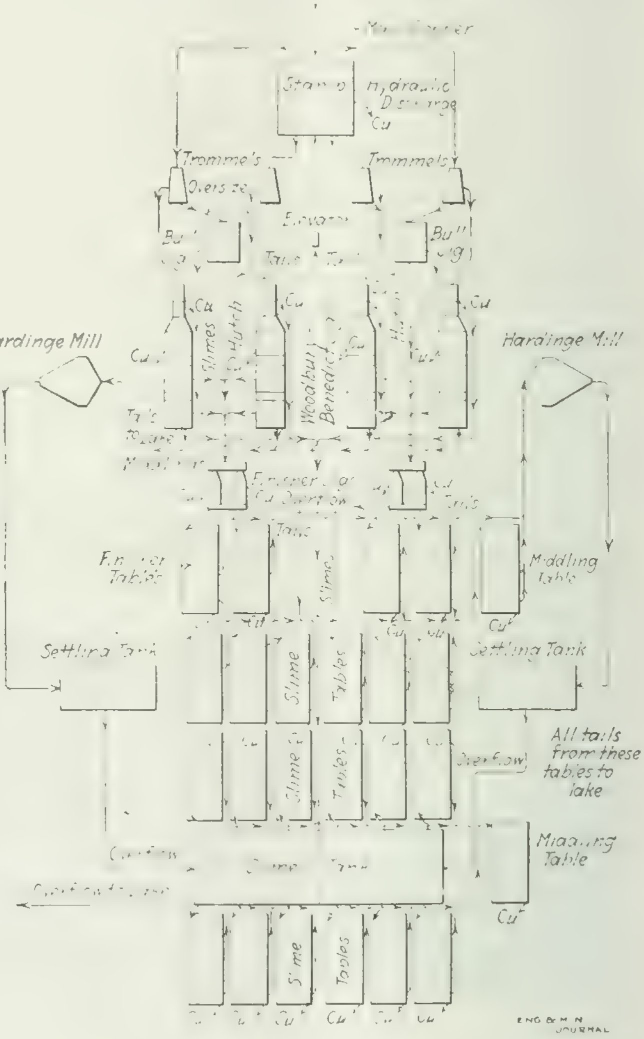


FIG. 2. FLOW SHEET, WEST HALF OF AHMEEK MILL

The tails of the roughing jigs are wasted to the lake, and the hutchwork is run to a thickening box. The overflow from the thickening box runs to a slime-settling tank and receives further treatment. The pulp from the thickener goes to a classifier at the head of a set of four Hodge finishing jigs. The overflow from this classifier joins the overflow from the thickeners in a settling tank. The plungers of the finisher jigs run at a speed of 175 to 180 r.p.m. with a stroke ranging from ¾ in. to ⅜ in. No. 1 jig of the finishers has 10- and 12-mesh screens; No. 2, 12-mesh and 12-mesh; No. 3 and No. 4 jigs are equipped the same as the corresponding roughing jigs as to screens. The tails of the finishing jigs are wasted to the lake. The hutchwork of the first compartment of all four jigs is "product" and is shoveled into a chute which delivers the copper to small tram cars on the ground or basement floor. The hutchwork of the second compartment of jigs 1 and 2 goes to a Hodge jig and that from the second compartment of jigs 3 and 4 to a Wilfley table. The hutchwork of the last Hodge jig is shipping grade, the tails go to the Wilfley with the hutchwork of finishing jigs 3 and 4. The tails of the Wilfley are wasted to the lake and the concentrates are shipped to the smeltery.

WILFLEY TABLES TREAT SLIMES

The thickened slime from the overflow of the thickeners and from the overflow of the finishing-jig classifiers runs to two Wilfley tables having a throw of ⅝ in. and a speed of 240 vibrations per min. The concentrates from these two Wilfleys are product and are shipped, the middlings go to a middling table and the tails to the lake. The concentrates of the middling table are shipped, and the balance wasted to the lake.

Going back now to the overflow from the roughing-jig classifiers, we find it run into eight settling tanks, one to each classifier. These tanks are divided, for convenience of handling the pulp, into two groups of three and five tanks, respectively.

The thickened pulp of each group of tanks runs into a classifier. From the classifiers two products are taken, coarse and fine. The fine pulp of each classifier runs to six Evans tables. These are round, wood-surfaced tables, 16 ft. in diameter, arranged in two groups of three decks each and revolving about once per minute. The concentrates from these six tables pass to two Wilfley tables, having ⅝-in. throw and running at a rate of 240 vibrations per min. They produce concentrates of copper, middlings which run to a middling table for further concentration and tails which are wasted. The coarse product from the classifiers is treated on four Wilfleys, which make products similar to those from the tables treating Evans table concentrates. All the middlings from these six tables come together on one middling table, which makes concentrates of copper and tails, which are wasted to the lake. The slime product is shoveled from the concentrate boxes into cars, weighed, elevated and dumped into shipping cars.

Woodbury-Benedict Jigs Used in West Section

At the west two heads of the mill the product of the stamps, after passing the ⅝-in. screens, goes directly to the trommels, with no hydraulic discharge intervening. These trommels are in all respects similar to those in the eastern section of the mill. The oversize, however, runs to two bull jigs having a 1¾-in. stroke. The screen of this bull jig is automatically skimmed by a cup, set into the mineral on the screen. The tails are returned by an elevator to the stamp for recrushing. The hutch runs directly to the classifier of the finishing jigs.

The 3/16-in. pulp from the trommels falls directly to a Woodbury-Benedict classifier, of which there are four to each head. This classifier makes three products, copper, sand and slimes. The copper is skimmed off automatically and continuously by a cup discharge set on the screen. The slime unable to penetrate the sand on the screen of the classifier is deflected by a shield and sent to slime-settling tanks at the bottom of the mill, and the sand is run over a series of three Woodbury-Benedict jigs, of which there are four sets to each head. The plungers of the classifiers and of the jigs following them make 195 strokes per minute and give a pulsation parallel to the flow of the feed. The classifier plunger has a stroke of ⅞ in., the first jig following ¾ in., second ⅝ in., and the last ½ in. The screens used are 10-mesh for the classifier and 12-mesh for the jigs. From the screen of the first jig is produced copper which is automatically skimmed and discharged into buckets. The hutchwork of all of the jigs is run to Hodge finisher jigs and the tails of the jigs wasted to the lake. Middlings are produced from the last two jigs in each series by means of a shield, the curved end of which dips into the bed of pulp on the screen and permits only the lower half of it to be discharged as middlings. These middlings from eight screens to each head, go to one Hardinge conical pebble mill, of which there are two to each head, for regrinding. Ordinarily the Hardinge mill is gear driven, but in the case of the mills in use here the gears have been replaced by pulley wheels surrounding the greatest diameter of the mill and permitting a belt drive. There is one 75-hp. motor to each two mills. The mills are 8 ft. in diameter, and make 26 r.p.m. They are lined with a silex brick laid in cement and the mills treating middlings from the Woodbury-Benedict jigs are fed with flint pebbles through the spiral pump at the head end of the mill at the rate of about 100 lb. per day. The product of these mills is pumped by a centrifugal pump to a settling tank.

Hardinge Mill Regrinds Tails from Tables

The hutchwork of all the Woodbury-Benedict jigs, together with the hutchwork of the bull jigs below the trommels is taken care of by two hydraulic classifiers and eight Hodge jigs. The overflow from the classifiers runs directly to a middling table, which also treats middlings from a part of the slime tables described below. The spigot pulp is run into the jigs. The screen and hutch give copper which is collected for shipping. The tails run to Wilfley finishing tables, of which there are four to each head. The middlings of these finishing tables go to one middling table, the concentrates are shipped as "mineral" and the tails are run to the second Hardinge mill of the head. Tails and middlings of the midling table are run to this same second Hardinge mill, which is similar in all respects to the first save that it takes about 180 lb. of pebbles per day. The product of this mill is also pumped to a settling tank.

The slime from the settling tanks of the two Hardinge mills is treated on six Wilfley tables. The overflow from the settling tanks goes to the same tank as the slimes from the Woodbury-Benedict classifier. The concentrates from the tables are "mineral," the tails are wasted and the middlings are treated on the middling table, which receives from the finishing tables and delivers middlings and tails to the second Hardinge mill.

The slimes from the Woodbury-Benedict classifier and from the overflow of the Hardinge mill settling tanks is treated on 12 Wilfley tables. The middlings of all 12 tables are treated on one middling table, the concentrates are all "mineral" and are shoveled into cars for weighing and the tails are wasted to the lake.

All the waste product of the mill except that of the tables on the lower floor of the mill run by gravity to the lake. The waste of the lower floor is pumped by centrifugal pumps to the discharge launder. The tails are sampled while passing through a small building *en route* to the lake shore. The Ahmeek mill has a frontage of about 2000 ft. on Torch Lake, where the maximum depth of water is 90 ft. This provides ample storage room for the sands of many years.

The boiler house is immediately behind and an integral part of the structure supporting the rock bins. It contains six locomotive boilers of 200 hp. each, and furnishes the power to run the stamps, generator and pump. The boilers are stoked by hand. The present boiler plant is but one of two equal units planned for the enlarged mill. Next year another four heads will be added to the mill and the second unit of boilers put in place. The stack now in use is a self-supporting steel structure 170 ft. high and 15 ft. inside diameter. It is brick lined.

The pump house is just south of the boiler house and contains a Nordberg pump of 40,000,000 gal. daily capacity. This is large enough to supply all the heads in use and proposed at present. The intake is 600 ft. to the east of the mill on Torch Lake. In the pump house is also a 300-kw. Northern Electric generator, which furnishes power to the six 75-hp. motors in the mill—one for driving stamp valve-gears, two for four Hardinge mills, two for tables and jigs on top floor of mill and one for driving basement equipment.

The Ahmeek mill has produced during the first half of this year, 7,779,023 lb. of copper at a concentrating cost of 0.73c. per lb. of refined copper. This was produced from 315,003 tons of rock stamped. The copper carries a little silver, but not enough to make hand picking worth while. During the six months ended July 1, 1912, the rock stamped ran 24.7 lb. to the ton.

West Australian State Batteries

Of the various state batteries erected by West Australia, 33 were in existence at the close of 1911. From the inception of the battery system to the close of 1911, there have been 843,780 tons of gold ore treated, producing £3,146,990 worth of gold by amalgamation, £429,274 worth by cyanidation, £88,974 from slime treatment. In addition 51,553 tons of tin ore have also been treated, producing tin worth £68,701.

The cost of running these batteries was £60,062 in 1911; the revenue, £53,322, from which £751 in additions were paid for, leaving a net loss for the year of £7491. The loss on operations since the start amounts to £28,870, and capital expenditure has been £290,733. The object of these batteries is, of course, to stimulate *bona fide* mining, but we note the Linden inspector makes particular mention that some properties which crushed rich grass-root ore in the government battery have done nothing further in the way of development, and are now under water at small depth.

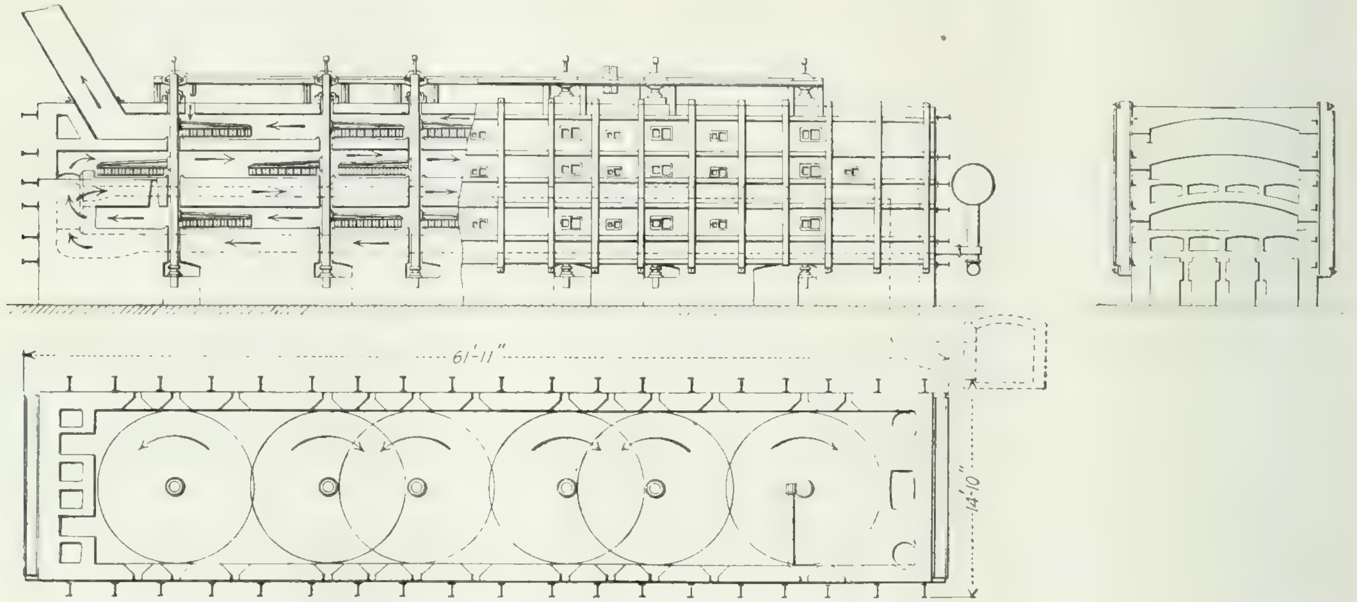
Over ten billion bricks were produced in the United States during 1911, according to Jefferson Middleton, of the U. S. Geological Survey. Of this number over eight billion were common brick valued at $49,885,262. New York led in the brick production. In the manufacture of clay products Ohio leads with a production valued at $32,663,895.

The Principles of Blende Roasting—II

W. Hommel discusses the agreement of the various forms of blende-roasting furnaces with theory, and makes a comparison between the various installations.

Note—Translated by O. H. Hahn, from an article by Dr W. Hommel, in "Metallurgie," May 8, 1912.

An examination of most of the hand furnaces in use at the present day, the larger part of which are constructed on the principles of the Hasenclever furnace, teaches us that they fulfill the requirements as laid down in the previous article, in a few points only. The old Liebig-Eichhorn furnace answers the purpose much better if its shape is altered somewhat. A position of the muffles at right angles to the course of the fire gases is advantageous, as it is conducive to a much more serviceable draft and allows an unhampered and almost unlimited working of the ore. Further, the labor in such muffles is much simpler than in the Hasenclever furnace, as it is performed in a longitudinal direction and consists entirely in moving the rabble forward and backward, or in a simple pulling down of the roast to the next floor, while in the Hasenclever the rowing motion (with paddles), which is indispensable for moving the ore onward, is trying to the workmen.



Merton Blende-roasting Furnace

Undue Agitation Leads to Flue Losses

In some quarters, as for instance in the case of the constructor of the Landsberg[1] furnace, the view still obtains that in the scraping manner of working the blende are hidden certain mysterious advantages. But this is not so. Some people think a good deal of it and imagine they are doing a great thing if they make the blende "fly." These are but useless jugglers' tricks and only conducive to heavy losses in flue dust. All that is wanted is constantly to bring new particles of the charge in contact with air by frequently turning it over, which is amply effected by the simple forward and backward motion of a rabble.

The experience I had with a hand furnace constructed by me on these principles confirmed what has been heretofore said, and the correctness of my statements is fully borne out by the Delplace furnace (a modified Maletra) coming more and more into use in Belgium. The position of the muffles in this furnace is analogous to that of the Liebig-Eichhorn furnace. The defective conduction of the fire gases in the latter is replaced by an ingenious mode of firing, in which the waste heat is utilized as much as possible for heating the air needed for combustion and for heating the last muffle.

In consequence of this arrangement these furnaces put through more than the old Hasenclever furnaces, in spite of their smaller hearth area, and with less consumption of coal. I consider the heating arrangement unnecessarily complicated, connection with a gas producer would be simpler and afford the same advantages. Firing with producer gas should be a *conditio sine qua non*, at least, in modern roasting furnaces, for only with that will all conditions for good and quick blende roasting be fulfilled.

Roasting in Mechanical Furnaces

A description with cuts of a number of such mechanical furnaces has been given by Schütz, in Engineering and Mining Journal, Mar. 16, 1912. I will, therefore, confine myself to a discussion of their principles and make some additions and corrections.

Mechanical furnaces may be divided into two main classes, according to whether the hearth or the stirring apparatus is moved. To the first class belong: (1) Revolving cylinders, truncated cones, etc., with horizontal shafts; (2) revolving-hearth furnaces with vertical shaft.

The second class includes: (1) Long-hearth furnaces with one or more floors in which the rabbles move in a longitudinal direction; (2) furnaces with revolving rabbles (scrapers or plows).

The Hommel furnace which was designed and patented by me may be considered a combination of these two main classes. In it the ore is roasted preliminarily on a revolving hearth and brought to a finish on an annular, immovable hearth by scrapers attached to the circumference of the revolving hearth, which moves the ore in the lengthwise direction of the annular one.

Revolving Cylinders

These furnaces present the most unfavorable conditions for blende roasting. The ore can only be present in a comparatively thin layer in order to get properly mixed, and on that account the proportion of gas space to ore volume will be more nearly as 20 : 1, than 1 : 1. The utilization of air will, therefore, be poor, and the SO_2 content of the roast gases low unless a long cylinder or a whole series of them is used, or, unless the air is set in a whirling motion. A rational heating in a single cylinder and a complete separation of the roast gases from the fire gases are highly improbable.

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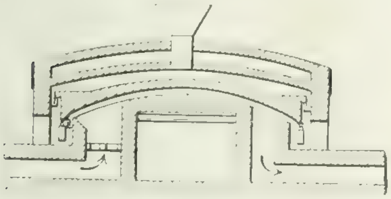
[1] The so-called Stolberg furnace in Schütz's article on "The Practice in Blende Roasting," cf. Eng. and Min. Journ., p. 559, Mar. 16, 1912.

Nevertheless, more than 10 years ago, a cylinder furnace was arranged as muffle furnace by Köhler and put into practical operation at a works in Lipine, Upper Silesia. Its capacity was small, but the constructor was sanguine of an ultimate commercial success.

REVOLVING-HEARTH FURNACES

In revolving-hearth furnaces the movement of the material takes place in a radial direction from the center. Hence the ore describes approximately a spiral in passing through the furnace. Arranged as a reverberatory this kind is eminently fitted for the preliminary roasting of lead ores in combination with the Huntington-Heberlein process. It surpasses any other system in regard to low first cost and repairs, small coal consumption and reliability. The consumption of power is also small, as it does not exceed one horsepower even with large sizes putting through 50 tons per day.



HOMMEL FURNACE

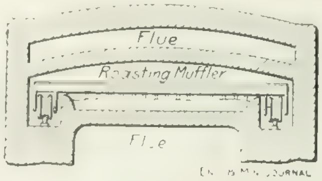
The construction of such a furnace as a muffle furnace is, however, connected with considerable difficulties. The indirect heating of the revolving hearth can be accomplished either through a stationary firebox or with one that revolves with the hearth. The air for oxidation is best admitted at the circumference of the hearth and allowed to leave in the center of the furnace. Only in this way will the air be fully utilized and gas rich in SO_2 obtained. And further, only in this way can the heat of the roast gases be made serviceable in heating the freshly arriving ore. From this it follows that furnaces in which the whole surface of their revolving hearths is made use of are to be preferred to such which have only a revolving annular hearth.

The arch question plays an important part in these furnaces. It is obvious that the hearth must have a fairly large diameter if the furnace is to put through a considerable tonnage. As the stability of the arch requires not less a rise than one tenth, it follows that, with diameters of eight to 10 m. the muffle will be disproportionately high in the center. A dead roast of blende in this furnace is, therefore, an impossibility; it can only serve as preliminary to a special finishing hearth, like the annular hearth furnace connected with it, as proposed by the author. The idea of a fire place revolving with the hearth has been proposed and carried out by Zelewski.

FURNACES FOR STRAIGHT-LINE RABBLING

In the furnaces of this class the ore is moved lengthwise of long rectangular hearths. The rabbles are fastened to a cross-bar which runs on rollers on both sides of the hearth. The dimensions of the hearths are limited inasmuch as a maximum width cannot be transgressed without making the muffle disproportionately high.

Further, on both sides of the hearth a free space for the rollers carrying the rabble guides is needed and, as the height of the rabble arm is equally high in the center and on the sides, the abutments of the arch must be correspondingly high, and the proportions, therefore, become still more unfavorable. They approach those of revolving cylinders and have the same disadvantages, to wit: Bad utilization of the muffle space, hence defective utilization of the air supplied and excessive consumption of coal.



SAEGER-BROWN FURNACE

In order to get the full benefit of the air the hearths must be very long. The one-story Saeger-Brown furnaces at the works of von Giesche's Erben in Upper Silesia have been built with hearths of over 100 m. in length, the rabbles are pulled through the furnace by means of chains and conveyed back over the arch. In spite of their great lengths the tonnage of these furnaces has been relatively small (rather less than 10 tons) and the consumption of coal high. The dotted line in the illustration shows where the top of the muffle would come if it were not for the space required by the rollers.

Rcently a Hegeler furnace has been erected at enormous expense. The total length of the seven hearths of this furnace amounts to 160 m. Hence the ore has a long way to travel. The muffles are comparatively low as the rabbles are drawn sled-fashion through the furnace and do not need extra space for wheel guides. The abutments on both sides of the muffles can, therefore, be lowered correspondingly. This advantage is, however, more than counterbalanced by the slow turning of the ore which takes place in intervals of 1½ hr. This furnace is also dependent in a great measure upon a constant manual attendance. The long guide bars run empty through the whole furnace to catch hold of the rabbles at the other end. A workman is stationed there to watch that the hook end of the bar locks into the rabble and then signals to the engineer to reverse the motion. Then the frame on which the rabbles rest must be turned round and pushed to the adjoining muffle when the rabble travels back. This arrangement is not only roundabout, but primitive. It reminds one of the time of Newcomen.

The whole furnace occupies an area of 90x6 m., that is 540 sq.m.; the height is 16 m. which implies that it requires a large shed, with platforms to reach the upper muffles. Hence the cost of installation and repairs must need be enormous. Compared with hand furnaces there is no advantage to be gained unless it be through independence from the good will of the workmen.

FURNACES WITH REVOLVING RABBLES

These furnaces consist, for the most part, of a number of muffles arranged one above the other in which the ore is moved alternately from inside to outside and *vice versa* by means of revolving scrapers fastened to a common vertical shaft. Externally more or less resembling their prototype, the McDougal furnace, these furnaces have, in the course of time been perfected in their details, and are now extensively in use under various names as Herreshoff, Kauffmann, Evans-Klepetko, Scherfenberg, Wedge and others. They have proved of excellent service in roasting pyrites, copper pyrites and other ores rich in sulphur, but are not adapted to blende roasting. As preliminary to dead roasting they are inferior to a well constructed revolving-hearth furnace on account of their higher first cost, their cost of repairs and their minor reliability. The excessive formation of flue dust which is due to the ascending gases meeting the ore in its downward course from muffle to muffle is another disadvantage.

The improved Merton furnace occupies an exceptional position in this class of furnaces. In it the ore is moved forward on long hearths by means of revolving rabbles. By this arrangement the ore is stirred during its onward course at a livelier rate than in any other furnace. A modern Merton furnace has three muffles, one above the other, the lowermost of which is heated from above and below by producer gas. There are six water-cooled vertical shafts present, with arms, to which the rabbles are fastened. The two outer stirring arms move the ore steadily forward, while the four inner ones are arranged in pairs and form two minor zones, in which the ore is stirred vigorously. By a special arrangement hot air enters the lowest muffle, thus insuring a perfect dead roasting of the blende. When in full operation the consumption of power is 6 hp. One man per shift can attend to four furnaces. One complete furnace costs 30,000 marks to build. A 12.5-ton furnace occupies about the same space as a Hasenclever block of four.

According to my views, this system fulfills the conditions of good blende roasting best of all. The height of the muffles is comparatively low because the guiding point of the rabbles, which in itself is the highest, coincides with the highest place of the muffle. The only thing that can be said against the furnace is that at various places not reached by the rabbles, dead corners will form in which the ore remains untouched. This is, however, a small disadvantage compared with the advantages the furnace offers. In order to remedy it, the idle ore accumulated may be pushed back into the circuit once a day by the attendant. This will, at the same time, serve as a check on the man and prove whether he is doing his duty by looking into the furnace from time to time. Recently several Upper Silesian works are said to have installed Merton furnace plants.

COMPARATIVE VALUE OF THE VARIOUS SYSTEMS

Herewith is presented a tabulated summary of the various furnace systems with their peculiarities. In the two last columns, the revolving hearth and the McDougal furnaces appear, although they cannot be used for a finishing roast. All items in this table refer to a two-shift, 24-hour working day.

MUFFLE FURNACE WORKING

	Hasenclever-Rhenania	Delplace	Hegeler	Merton	Revolving Hearth*	McDougal*
Furnace type	Single-hearth	Cross-muffle			four-hearth	six-hearth
Number of workmen	8	8	12	4	4	4
Put through per day, tons	7	10	40	50	60	30
Kg per workman	875	1250	3333	12,500	15,000	7500
Kg per sq m hearth area	54.7	100	65.8	80.5	300	200
Cost of plant, marks	20,000	20,000	250,000	4x30,000	4x30,000	2x70,000
Cost of plant per ton, marks	2857	2000	6250	2400	1666	4666
Consumption of coal, %	20	12	30	14	10	15
Consumption of power, hp	......		12	4x6	4x1	2x7
Hearth area, sq m	128	100	608	590	200	150
Desulphurization factor per sq.m. of hearth area	1	1.8	1.5	5.5	5.5	3.6
Operating expenses per ton						
Wages marks	5.71	4.00	1.50	0.40	0.33	0.66
Coal marks	2.20	1.20	3.00	1.40	1.00	1.50
Power marks	....		0.72	1.15	0.16	1.12
Repairs marks	0.30	0.30	1.00	0.70	0.50	0.80
Amortization marks	0.78	0.55	1.70	0.66	0.46	1.28
General expenses marks	1.00	1.00	1.00	1.00	1.00	1.00
Total cost per ton marks	9.99	7.05	8.92	5.31	3.45	6.36

*Cannot be used for finishing roast, but only for preliminary.

The number of workmen at the Hegeler furnace is especially high, as compared with the other mechanical systems. The reason of it is its mechanical imperfection, as pointed out above. At the Merton and the revolving-hearth furnaces, one man suffices for four furnaces, while one man can only attend two McDougals, on account of their great height, besides, each block of them requires a special fireman.

The explanation for the high output per square meter of hearth area of the preliminary roasting furnaces, is that the ore is not kept in the furnace for complete desulphurization, as it is in the other systems.

The costs of installation are highest for the Hegeler and the McDougal furnaces. They are most favorable in the case of the revolving-hearth furnace on account of their simple construction. The best comparison is shown by the cost of installation referred to the ton of raw ore put through. It will be seen from it that the revolving-hearth, as well as the Merton furnaces, are cheaper to build than the Hasenclever-Rhenania. The cost of the Hegeler is estimated rather low. The statements by Schütz made in regard to it do not agree with the facts.

Coal and power are lowest in the revolving-hearth furnaces. The consumption of power is comparatively higher by the Merton than by the Hegeler, on account of the greater intensity of the work performed.

The comparatively low desulphurization factor of the Hegeler and Merton furnaces is partially owing to the fact that the height of the muffle does not come up to the ideal one yet and partially to the necessity of leaving the ore longer than absolutely required in the furnace to afford a uniform desulphurization. The desulphurization factor of the Hasenclever has been put down as equal to 1, since it is the lowest. It represents in a sense an average figure, for, it differs in the three muffles, as has been shown, as 1 : 2 : 4.

OPERATING EXPENSES

For the calculation of the various items, the following figures, which vary naturally with the locality, were made the base: Wages, 5 marks per shift; coal, 10 marks per ton; power (electric), 0.10 marks per horsepower-hour.

The amortization was calculated for 10 years. The repairs at the Hegeler furnace have been assumed rather low. From the comparison of the total operating expenses, it follows that the Hegeler furnace does not afford any saving, while in the Merton it amounts to nearly 50%. The operating expenses of the revolving-hearth are so low that there is room left for combining with it one or two finishing hearths.

The Royal Japanese Steel Works, at Wakamatsu, have contracted for a 5-ton Roechling-Rodenhausen electric induction furnace to be operated by polyphase current. This furnace will be used for making alloy steel for castings and special ingots for forge work and tool steel.

Rock Grinding with Balls and Cylinders

In grinding mills in certain industries, R. O. E. Davis, of the Bureau of Soils, found cylindrical iron or steel pieces used instead of balls, their use being explained on the score of efficiency. In grinding phosphate rock, for instance, it was explained that balls became coated with ground rock and the mill had to be stopped to clean the balls, but that this did not happen with cylinders.

Laboratory experiments were reported to the International Congress of Applied Chemistry (*Proc.* Vol. XV, p. 73) in which equal grinding surfaces were used for feldspar grinding, the grinders consisting of 5/8x5/8-in. cylinders and 1-in. balls.

After five hours, the percentage passing 130 mesh was 45.5 for balls, 17.3 for steel cylinders, and 5.8 for wrought-iron cylinders. The amount adhering to the balls was 0.05%; steel cylinders, 0.30%; wrought-iron cylinders, 3.4%. The results, using equal weights of crushing media: Through 130 mesh, balls, 48%; steel cylinders, 35.2%; wrought-iron cylinders, 33.6%. Adhering to surface: Balls, 0.10%; steel cylinders, 0.26%; wrought cylinders, 33.6%. Equally decisive results were also obtained in grinding phosphate rock.

Tungsten Ore Production

In spite of its increasing electric use, there was a sharp decrease in 1911 in the production of tungsten ore, owing to the decrease in the demand for tool steels, in which the bulk of the tungsten produced is used, according to the U. S. Geological Survey. The production of domestic tungsten ore in 1911 amounted to 1139 short tons of concentrates, carrying 60% of tungsten trioxide; in 1910 the production amounted to 1821 short tons.

NEW PUBLICATIONS

ON THE ORIGIN OF THE HIMALAYA MOUNTAINS. By S. G Burrard. Pp 26, illus. Professional Paper No. 12. Survey of India, Calcutta.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, VOL. IV, 1911. 6¼x9¼, pp. 514, illus. D. Van Nostrand Co., New York.

A REPORT ON THE LIMESTONES AND CEMENT MATERIALS OF NORTH GEORGIA. By T. Poole Maynard. Pp. 285, illus. Bull. No. 27, Geological Survey of Georgia, Atlanta.

THE GEOLOGY AND ORE DEPOSITS OF PHOENIX BOUNDARY DISTRICT, BRITISH COLUMBIA. By O. E. LeRoy. Pp. 110, illus. Memoir No. 21, Canada Department of Mines, Ottawa.

EINFUEHRUNG IN DIE MARKSCHEIDEKUNDE MIT BESONDERER BERUECKSICHTIGUNG DES STEINKOHLENBERGBAUS. By L. Mintrop. 6¼x9½, pp. 224, illus.; 6 marks. Julius Springer, Berlin, Germany.

THE DESIGN OF WALLS, BINS AND GRAIN ELEVATORS. By M. S. Ketchum. Second Edition, Revised. 6½x9, pp. 556, illus.; $4. McGraw-Hill Book Co., New York.

In preparing the new edition of this book, the author has added 150 pages and many cuts, all in Part I, relating to the design of retaining walls; Part II, devoted to bins and elevators, remains as in the first edition. The added portions are Chap. IA, in which Rankine's formulas for computing pressure behind retaining walls are modified so as to become completely general for all angles of surcharge, and Chap. IVA, which applies similar reasoning to the problem of sheeting a deep trench. Chap. IV, on the design of reinforced-concrete walls, and Chap. VII, on the practical construction and cost of them, are rewritten.

Viewed from the standpoint of engineers engaged in metal mining, it is to be regretted that the chapters on bins do not offer much help in the designing of timber-ore bins of small or moderate size; while, of course, the stresses may be similarly computed, most of the examples of actual bins are selected from those built of steel or concrete for large-scale operations. For those interested in the design of such structures, however, the book is a most valuable source of help.

DIE BERGWERKSMASCHINEN Vol. II—GEWINNUNGSMASCHINEN. Edited by Hans Bansen. 6¼x9½, pp. 452, illus. Julius Springer, Berlin, 1912. 16 marks.

This book constitutes the second volume of a series of handbooks, of which Vol. I, on boring, was recently reviewed in this column. The editor was assisted in Vol. II, by the following engineers: Arthur Gerke, Leo Herwegen, Otto Pütz and Karl Teiwes, each of whom was the author of one or more entire chapters of the book.

Since coal forms the predominant mining industry of Germany, it is but natural that in this volume particular emphasis is given to those types of mining devices which are employed only in coal mining, such as auger drills, undercutters, etc.; the selection of types of machines, also, is made almost entirely from German and English sources. The scope of the volume is limited to the appliances used for blasting or otherwise breaking down material in mines and open workings; hoisting and pumping are omitted, and transportation receives only brief mention, though a long chapter is devoted to air compression.

The section on chain-bucket earth diggers contains probably the largest amount of information unfamiliar to American engineers; machines of this character seem to be much more generally employed in Europe than here, and have developed into a wide variety of types. A separate chapter is devoted to the special diggers designed for excavating lignite in open workings. European steam shovels appear to differ from American mainly in the construction of the dipper arm; American designs are well represented in the chapter on this subject. Itemized comparisons of cost form a valuable section of this chapter. Hydraulic mining is covered very incompletely.

The chapter on air compression is excellent, discussing briefly the theoretical aspects and then comparing many different types of machine; an interesting section describes electrically driven portable compressors, for transient service. Turbine compressors are also illustrated.

The chapter on coal undercutting and boring machines is extensive, and includes a number of designs unfamiliar in the United States. Among such are the types of machine used for boring a drift or small tunnel of circular section at one operation. As a means of detonating a charge of explosive, the electric method alone is described. The final chapter treats of the several mechanisms employed for breaking down coal without the use of explosive. The index is full and the entire volume is classified, subdivided and referenced in thorough German fashion. We are not acquainted with any single book in the English language which covers exactly the ground of this volume with any approach to its completeness of detail.

THE HYDROMETALLURGY OF COPPER. By William E. Greenawalt. 6x9, pp. 504, illus.; $5. McGraw-Hill Book Co., New York.

This new volume presents in a comprehensive form and covers very completely the field of hydrometallurgical treatment of copper ores; also incidentally, including the recovery of gold and silver hydrometallurgically. It is divided into two parts, viz. (1) Roasting; and (2) Hydrometallurgical Process, the second part occupying about two-thirds of the 500 pages of the book.

In Part I, are chapters upon preparation of the ore (crushing), fuels, pyrometry, etc., with a profusely illustrated chapter descriptive of the principal types of roasting furnaces, but the essential chapters in Part I, are the two, one upon oxidizing roasting, and the other upon chloridizing roasting, in which the author presents in a general manner the underlying reactions and principles of such roasting preparatory to hydrometallurgical treatment, and also gives typical examples; these, however, are almost entirely drawn from the practice of gold-silver ore lixiviation. While Part I may appear as preliminary, the proper preparatory roast, is, as the author states, an essential feature in hydrometallurgical extraction, and this part is well worth a careful perusal.

In Part II, after a chapter upon the properties and solubilities of copper, and the influences of the principal impurities, the author classifies hydrometallurgical copper processes under two broad heads, the purely chemical and the electrolytic, dividing the purely chemical into alkaline and acid processes, and the acid process again into sulphite, sulphate and chloride processes, under which different heads he describes, in more or less detail, the various processes that have been in actual use, or suggested or patented, taking the information mostly from articles which have appeared in the technical journals or patent-office reports. The author does not state in just what manner he made his selection, nor what standard for elimination he established for the processes that are not described, but one cannot but be impressed that the processes described have been well chosen, and are amply descriptive of what has been accomplished in the way of devising copper lixiviation processes, so that those who are interested have in this handy volume a very comprehensive view of the subject.

The presentation of the chemical and electrical data is also in convenient form, and the author's comments upon limiting conditions, as far as they go, are excellent. The author is an enthusiast with an abiding faith in the ultimate supremacy of the electrochemical treatment of all grades and classes of copper ore. While he utters no uncertain note as to the economical success of the process in which he is personally interested, he also presents with equal confidence the claims as to economic success of other processes. However, he refrains from such bursts of enthusiasm as he gave way to in his article in the JOURNAL, Nov. 12, 1910, and one may read, not altogether "between the lines," that he still sees obstacles to be overcome, but, as he truly says, the technical obstacles that appeared insurmountable in the days of the Hoepfner process, for example, have since been overcome in another branch of electrochemistry, and we cannot but hope for the overcoming of those still in the path of the electrometallurgy of copper.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

G. L. Sheldon has returned to Ely, Nev., after spending the summer in Alaska.

Charles P. Beresford is in charge of the Madura Syndicate, operating in Tepic, Mexico.

Ralph H. Moore has taken a position with Le Fe Mining Co., Zacatecas, Mexico.

H. W. Hardinge has gone to the Lake Superior copper region for a visit of about 10 days.

H. C. Hoover has returned from California to New York, where he expects to stay for two or three weeks.

Raymond Beignet is technical director for the Cia. Mexicana La Cera de Candelilla, at Galeana, Nuevo Leon, Mexico.

Oscar Lachmund has returned to New York after an examination of quartz properties in Yuba and Siskiyou counties, California.

Howland Bancroft will be engaged on examinations in the Magnolia mining district of Boulder County, Colo., for a short time.

Otto C. Morrill, of Norfolk, Va., has been appointed engineer for the Phosphate Mining Co., at Nichols, Fla., and has taken charge of the work.

David Taylor, of Salt Lake, Utah, has recently returned from an extended trip to New York on business connected with the sale of uranium and vanadium ores controlled by him in Colorado and Utah.

Rush T. Sill and Harvey A. Sill, formerly of Culiacan, Mexico, under the firm name of Sill & Sill, have opened offices in the Germain Building, Los Angeles, Calif., as mining and metallurgical engineers.

R. W. Brock, director of the Canadian Geological Survey, visited Rossland, B. C., on his way east from Victoria, where he had been attending the British Columbia meeting of the Canadian Mining Institute.

Frank Koester, consulting engineer, has removed his office from 115 Broadway to 50 Church Street, New York. Mr. Koester is principally engaged in steam and hydroelectric power plant work, electric transmission and traction.

L. D. Anderson, for six years past assistant chief engineer of the United States Smelting, Refining & Mining Co., has been appointed superintendent of the United States Smelting Co., with headquarters at Salt Lake City, Utah.

S. E. Bretherton has returned to San Francisco from a business trip to New York, stopping off on his return in Utah long enough to examine some copper properties in that State. For the present he expects to discontinue outside consulting work and devote his entire time to the interest of the Afterthought Copper Co., Shasta County, California.

Clarence P. Linville, after a service of nine years in charge of the Department of Metallurgical Engineering, and as professor of metallurgy, at the Pennsylvania State College, has resigned to accept the position of superintendent of blast furnaces with Joseph E. Thropp, and is now at Earlston (Everett P. O.), Bedford County, Pennsylvania.

OBITUARY

Joseph N. Pew died in Philadelphia, Oct. 10, aged 64 years. He was president of the Sun Oil Co. and the People's National Gas Co., and was a pioneer in the use of natural gas.

Societies and Technical Schools

American Iron & Steel Institute—At the latest monthly meeting of the directors 121 applications for membership were acted on, bringing up to 725 the total membership of the institute.

American Institute of Chemical Engineers—The fifth annual meeting of the Institute will be held at Detroit, Mich., Dec. 4-6, 1912. A number of the technical plants in and around Detroit will be visited and a program of papers and addresses presented. J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y., is secretary.

American Institute of Mining Engineers—The committee, in charge of the Iron & Steel Division, gives notice that, in addition to the papers promised for the Cleveland meeting, a list of which has already been published, the manuscript has been received of a paper on "The Most Recent Development in the Inspection of Steel Rails," by Captain Robert W. Hunt; and manuscript is promised at an early date on "The Heat Treatment of Steel," by Prof. Henry M. Howe, and on "Charcoal Iron," by J. E. Johnson, Jr.

National Council for Industrial Safety—At the recent meeting of the Association of Iron & Steel Electrical Engineers at Milwaukee, Wis., a special report was presented by a committee recommending the formation of a national organization to provide for future congresses and exhibits of industrial safety appliances. By unanimous vote the committee was at once made permanent as the National Council for Industrial Safety and will add to its number representatives of other bodies which concern themselves with safety problems. Officers were chosen as follows: Chairman, Fred C. Schwendtman, National Association of Manufacturers; vice-chairman, Lew R. Palmer, Association of Iron & Steel Electrical Engineers; secretary, Dr. Lucian W. Chaney, department of Commerce and Labor. For 1915 the National Council for Industrial Safety plans an international safety congress in conjunction with the Panama-Pacific exposition at San Francisco.

International Congress on Hygiene and Demography—In connection with the recent meeting at Washington an important exhibition of health and safety appliances was held, divided into several groups. In the group showing industrial and occupational hygiene, the most noteworthy exhibit was that of the American Iron & Steel Institute, one of whose purposes is "to promote health and safety in mine and mill." The exhibit was so large that supplementary space had to be secured. The Institute's principal exhibit was furnished by the United States Steel Corporation and its subsidiaries. On the walls were exhibited warning signals indicating danger and the need of caution. These were in many languages, to meet the needs of the men employed. Among the subsidiaries of the Corporation making exhibits of models and photographs covering all sorts of appliances for the prevention of accidents, the care of the injured, for providing water supply and toilet conveniences; pictures showing housing conditions and gardens, playgrounds for the children, and many other things calculated to promote health and happiness among the men and their families, were the Carnegie Steel Co., the National Tube Co., the H. C. Frick Coke Co., the American Bridge Co., the Oliver Mining Co. and the Tennessee Coal, Iron & Railway Co. The principal exhibitors among the independent companies were the Lackawanna Steel Co., photographs showing safety devices used in the mills and social service in the homes of the men; the Pennsylvania Steel Co., photographs showing provisions for safety in its mills; the Maryland Steel Co., photographs showing its herd of 100 Jersey cows used to standardize the quality and price of milk, and photographs showing its prize gardens; the Jones & Laughlin Steel Co., photographs showing the model housing conditions at its Aliquippa works; the Bethlehem Steel Co., photographs showing model yard conditions about its mills; the Cleveland-Cliffs Iron Co., photographs showing housing and social service at its mines; the American Blower Co., working model of its mine ventilator; Norton Co., models of its grinding wheels with their safety operating stands; the Thomas Iron Co., photographs showing its housing conditions; the Empire Steel Co., working model of its safety mine hoist and photographs of working conditions at its plants; the American Steel Foundries, safety appliances and photographs showing working conditions at its plants.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 9—Several hundred tons of waste was recently removed from the gloryhole of the Yellow Aster mine, in Kern County, to facilitate the caving of the upper ground and overburden, which was allowed to drop on Sept. 17. About 20,000 tons of ore and waste were caved and the breaking up of the ground, aided by the preparations in advance, has effected a large saving in the cost of boring and blasting. The ground was loose, and would have eventually caved, so the economic method of clearing the gloryhole was adopted. The ore will be separated from the waste and run through the stamp mills. The mills, one of 30 stamps, the other of 100 stamps, crush about 600 tons of ore in 24 hours. The 130 stamps have been dropping regularly for several years.

Denver

Oct. 12—The trouble between the union and non-union miners in the northern fields, mentioned in the last issue of the JOURNAL, still continues. The operators asked federal interference and an injunction to restrain the striking union miners from interfering with the operation of the coal mines. The operators claim that the governor of the state, the local authorities, and peace officers are in sympathy with the strikers, and that they cannot get protection from that source. Judge Robert E. Lewis denied the application for the restraining order and gave his reasons as follows: "This court has nothing to do with the quarrels between union and nonunion miners. Its only province is to protect the property of the plaintiff company. There is nothing in the evidence to show that there is any concerted effort on the part of the strikers, either to destroy the property or to prevent it being worked. All these quarrels and controversies between the strikers and the men who have been taken in to work in the mines, is incidental to the main issue. With them this court has nothing to do. I could no more enjoin the miners from quarreling with each other than I could enjoin *A* from murdering *B*, even if I had knowledge of the intention of the former."

The pyritic smeltery at Golden, formerly known as the Carpenter plant, owned by the North American Smelter & Mines Co., and which for many years has had an extremely checkered existence, recently passed into the hands of a receiver, G. L. Irvine, vice-president and general manager, being appointed by Judge McCall of the district court to fill that post. This was done on application of holders of the $500,000 outstanding bonds, interest on which had been defaulted. The smeltery has not been operated for one year. Ill-advised purchases of mining properties probably hastened the failure. Ten companies with a total capitalization of $16,500,000, most of which the receiver says are not involved in the failure, were promoted by the same men as the North American company. He also states that the action is of a friendly nature to protect the properties, that the company is solvent, and that it will be refinanced and operations resumed.

Butte

Oct. 9—The work preliminary to the building of a zinc concentrator by W. A. Clark is going along steadily. The mill is to be built on the North Side of Timber Butte, two miles south of the city, the steep slope making it an ideal site. The survey of the spur from the railroad to the mill has been completed and the grading is well advanced, a crew of 40 men being engaged in the work. Track laying will be commenced in a few days, and it is estimated that the road will be ready for traffic in about two months. The spur will connect with the Butte, Anaconda & Pacific R.R., about two miles north of the mill site, and as the mill will be at much higher elevation than where the spur joins the main line, it necessitates a grade of from 1% to slightly under 3%, and in places the curves are as sharp as 30°. The zinc ore from Mr. Clark's Elm Orlu mine will be transported by the Butte, Anaconda & Pacific R.R. to the point of connection with this branch line, and from there will be carried to the mill by electric motors. Water for milling purposes will be pumped from Silver Bow Creek to the mill, and a draw at the foot of the hill is to be used as a receptacle for the tailings. A concrete-lined dam containing a sluiceway is now being constructed across this draw to hold the waste products. The dam will also be used as a fill for the passage of the spur at this point.

By a referendum vote of the various coal-miners' unions of Carbon County, taken at Red Lodge, Oct. 5, upon the wage-scale agreement entered into in the convention of coal-mine operators and union representatives, held recently at Great Falls, the agreement was adopted by a majority of 63 votes.

During September, the Assay Office at Helena was in receipt of gold and silver to the value of $153,340, which was an increase of approximately $27,000 over the amount deposited during September, 1911. The amounts deposited by the various counties were as follows: Broadwater, $907; Chouteau, $17,769; Fergus, $24,749; Granite, $136; Jefferson, $189; Lewis & Clark, $29,206; Madison, $70,844; Missoula, $2459; Park, $330; Powell, $5551; Ravalli, $220; Silver Bow, $981.

J. J. McGreevy, vice-president of the Cooney brokerage company, accompanied by other Butte business men, left Oct. 7 for Billings, Mont., to make an inspection of oil properties adjacent to that city. A drill hole was put down about 60 ft. several years ago by ranchmen in that vicinity, who formed a stock company for the purpose. When the hole was drilled to this depth the project was given up, owing to the drill being rendered useless by an accident. Recently the Butte men decided to take up the enterprise and engaged an Oklahoma engineer to examine the field. He stated that conditions are ideal for discovering oil.

Salt Lake City

Oct. 10—Word has been received that the Department of the Interior has denied the application for a rehearing in the case of the East Tintic Consolidated Co., and has upheld the decision of September, 1911, requiring for patent the exposure of "a vein or lode of mineral-bearing rock in place possessing in and of itself a present and prospective value for mining purposes." This construction of the law governing patents is considered by Western mining men to be contrary to all precedent both in the courts and in the Department of the Interior, and is regarded as an instance of the extremes to which the advocates of national conservation of resources will go. It was hoped that the department would see fit to reverse the decision of 1911, and revert to its former interpretation of the law, under which the mining industry has developed and prospered. Under the present ruling, prospecting has been discouraged, and the chances of opening new camps and properties reduced to a minimum. It is probable that the Western mining interests will put their case before Congress, and ask for a new law, which will be practical in its application.

Several Tintic properties have granted an increase of 25c. per day in wages for underground work, making the present scale for mines operating six days per week: Muckers, $3; miners, $3.25; machine and timber men, $3.50.

The five-mile railroad from Helper through Spring Cañon to the coal properties in Carbon County, belonging to the Knights, is practically completed, and the work of erecting buildings at the camp, and installing machinery, is progressing satisfactorily.

The latest development in the strike situation at Bingham is the resumption of operations at the Utah Consolidated with a force of 50 men, Oct. 9, and at the Utah Copper Co., Oct. 10, with 150 men.

Negaunee, Mich.

Oct. 12—It is announced that the Bureau of Mines will station a mine-rescue car in the Lake Superior district, to serve the iron- and copper-mining regions. It is not known at what place the car will be kept as headquarters, but it will undoubtedly be in Michigan, as the Minnesota mines are largely open pits and not so dangerous as the old range properties. This granting of a rescue car is the result of petitions made to J. A. Holmes during his visit to the Lake Superior Mining Institute, at Houghton, last summer. The increased interest in mine-rescue work on the Michigan iron ranges is directly due to the disastrous fire in the Hartford mine, of the Republic Iron & Steel Co., at Negaunee, early in 1911, when seven men lost their lives. Since that time, several of the larger companies have purchased rescue apparatus and have trained rescue crews. The granting of a rescue car in charge of a Bureau of Mines official will give an added impetus to the policy of preparing for mine fires and cave-ins.

The adoption of the new workingman's-compensation law by the mining companies will make unnecessary the collection of 50c. per month from each man for "club fees." Such funds were used to help miners, when injured, and their families in case of death by accident in the mines. The collections were made through the payroll in the same manner as the doctor's fee of $1 is collected. In the case of the Cleveland-Cliffs Iron Co., when the change was made to come under the Compensation Act, the Club Fund had quite a surplus on hand. An election was then held to determine if this money should be paid out to families of employees dying from natural causes. The employees at all the mines voted upon the question, and the motion was lost. It was decided to pay out the money as in the past, namely, for accidental injuries or to families of employees accidentally killed, limited to employees who were in the employ of the company prior to Sept. 1, 1912, or who have contributed to the fund. Such payments will cease when the fund is exhausted, as no more collections will be made.

Deadwood, S. D.

Oct. 10—That the gold production of the Black Hills district is increasing, is evidenced by the receipts of bullion at the Assay Office, in Deadwood. For the last quarter, ended Sept. 30, 1912, Assayer L. P. Jenkins states that the purchases at this office were $1,988,724. This is larger than any previous quarter during the year, and has only been exceeded once before in the history of the office.

New work in the Black Hills is progressing at a good rate. The Victoria mill, which recently started, is operating steadily and with increased tonnages. The New Reliance plant has resumed, after a suspension during which a number of changes were made, which are expected to increase the facility of treatment. Construction work on the Bismarck mill, at Flatiron, is going forward rapidly, and should be completed this year. Work on the roaster at the Astoria mine of the Golden Reward company is being pushed with a good crew.

Property purchase and increased production are features of late operations at the Homestake. According to a local paper, August was a big month for the mine, as during that time 21 bars of bullion were produced, and all of them were large. That the lower levels of the mine contain deposits of rich ore has long been known, but never in the past has this ore been so extensively drawn upon as during August. This is given as the reason for the heavy production that month. During the last few months the Homestake has added nearly 1000 acres to its holdings along the "Belt" by the purchase of the Hidden Fortune and Columbus properties. The former was taken over a few months ago, and the latter is now being secured as fast as the necessary documents can be signed. The consideration being paid for the Columbus is the taxes and liens, amounting to about $40,000, and five cents on the dollar for the bonds. Outstanding bonds amount to $400,000, so that they will cost $20,000. Inasmuch as the taxes and liens are a prior lien to the bonds, the Homestake's purchase of the latter is more of a formality than a necessity.

A deal has been concluded between the Dakota Power Co. and the Consolidated Power & Light Co., whereby the latter buys all of the former company's surplus power, which at the present time amounts to about 1000 kw. The Consolidated Co. furnishes power and electricity to the mines and cities of the northern Black Hills district, and operates two plants, one water-power plant on the Redwater River, and a steam plant at Pluma. The Dakota Power Co. has recently completed and put in operation a hydro-electric plant, on Rapid Creek, near Pactola. To connect the distributing systems of the two companies will necessitate the construction of 29 miles of line, from Whitewood to Blackhawk. This work will be undertaken immediately.

Wallace, Ida.

Oct. 9—Two more litigations have been started in the Wardner field, making three lawsuits which are now pending. The first was begun when the Bunker Hill & Sullivan Mining & Concentrating Co., started suit against the Caledonia Mining Co., claiming that the apex of the Caledonia vein was on Bunker Hill ground. The Caledonia was forced to stop work. The second suit was started by the Stewart Mining Co., against the Ontario company. This action is also based on the apex rights, the Stewart company claiming the entire Ontario orebody. The action does not, however, affect the Stewart orebody. The work on the Ontario has been conducted through the 5000-ft. Silver King tunnel. The portal, the mill and the ore bins are in Government gulch. Work was begun about one year ago and since then 4000 ft. of development work has been done. A shaft has also been sunk 250 ft. A large amount of galena has been shipped direct besides the product from the 150-ton mill, which has been running at full capacity. Work has been entirely stopped at the property. The third suit to be started is by the Bunker Hill against the Stewart company. This suit is to prevent the latter company from extracting ore from the Saxon claim and to account for the ore already removed. The Saxon claim is owned by the plaintiff. It is claimed that in doing development work the Bunker Hill company broke into the workings of the Stewart on the Saxon ground, the ore from the Saxon being removed through the Stewart new Fir tunnel. The ore in the Saxon was reached through an extension from the Stewart 300-ft. level. The Saxon claim and the Senator Stewart claim, the latter owned by the Stewart, have a common end line. Following the serving of the restraining order, the Stewart removed its men from the disputed territory. This suit, like the one started by the Stewart, does not affect the principal orebody of the Stewart.

Toronto

Oct. 11—An interesting case was heard recently before Chief Justice Falconbridge. David Faskin, a lawyer in Toronto, sued John and Duncan McMartin, Noah Timmins, and David A. Dunlop to recover $600,000 commission which Mr. Faskin claimed was due him for making the sale of La Rose shares in New York, when the amalgamated properties, La Rose, La Rose Extension, Lawson, University, Princess, Fisher, and Epplet were purchased by W. B. Thompson and E. P. Earl, of New York, in 1908. It is said the action was settled out of court, Mr. Faskin receiving $125,000 for his services.

The Mining News

The Current History of Mining

Alaska

Alaska United—During August the Ready Bullion 120-stamp mill was in operation 31 days, crushing 18,648 tons of ore for a recovery of $56,438, which yielded $31,300 net. The yield per ton of ore milled was $3.06. The 700-Ft. Claim 120-stamp mill was in operation 31 days, crushing 20,706 tons of ore for a recovery of $54,030, which yielded $22,072 net; the yield per ton of ore milled being $2.64.

Houston Dredging Co.—This company has been incorporated with a capital stock of $1,000,000 to carry on a gold-dredging project on Kenai Peninsula. Joseph H. Houston, Seward, and Hiram C. Gill and J. R. Gondolfo, Seattle, are the incorporators. The head office will be in Seattle.

Skeen-Lechnor—A large block of stock from this company has been taken over by Otto R. Hanson, of Milwaukee. A test run has just been completed, and 200 tons of ore put through the mill returned $20 per ton as free gold.

Arizona

Gila County

Old Dominion—A crosscut from the drift on the 16th level has cut the east orebody and has passed through 8 ft. of ore. The crosscut is now in lean iron pyrite, but the hanging wall has not yet been reached and the prospects are considered favorable for finding more ore with this crosscut. Excavation for the new crushing plant is well under way.

Miami—The mine is maintaining an output of about 3000 tons per day, most of which comes from square-set mining next the capping, and from development work. Five shrinkage stopes are in operation. One is worked out and is full of broken ore, two are ready for actual stoping, and two more are being made ready. The capping is already beginning to settle, as is evidenced by large cracks at the surface. A two-compartment raise is being made in a "horse" from the 420-ft. to the 270-ft. level. A Nordberg, 120-hp. electric hoist will be installed on the 270-ft. level for hoisting men and timbers from the 420-ft., or first haulage level, to the levels above. This raise will take the place of No. 2 shaft, which is sunk in the orebody and is already beginning to squeeze from the settling of the capping, and will eventually be abandoned. The company is employing about 1000 men.

Inspiration Consolidated—Railroad construction is going rapidly forward, and it is expected that track will be laid to the mill-site and to the Live Oak tunnel by Jan. 1, 1913, and to the main shafts by Mar. 1. About 225 men are employed and it is stated that there is a scarcity of men and that 75 more could be used. Most of the laborers are Mexicans and Indians. Grading for the yards at Miami is finished; five miles of 75-lb. steel are on the ground, and as soon as the ties arrive, track laying will be started. Bids are being submitted for locomotives and other railroad equipment.

Iron Cap—The east drift on the 650-ft. level has been in ore for the last 80 ft. The average width of the vein is reported to be 5 ft., and the average width of the ore about 2 ft. A stope has been started and is now about 20 ft. long and two sets high. The east drift on the 800-ft. level is in 35 feet.

Arizona Commercial—Work in the shaft has been discontinued, pending the erection of the surface equipment. The steel headframe is up and the hoist and a boiler installed. The hoist will be operated with steam until the electrical equipment arrives.

Southwestern Miami—Churn-drill holes Nos. 4, 7 and 8 are 675, 1095 and 1267 ft. deep, respectively. Holes Nos. 7 and 8 are reported still to be in chalcocite. No progress is being made in them at present, as they are being reamed, after which drilling will be resumed. Final payments on the Roman Eagle Nos. 1 and 2, and on the Pinyon and Jack Pot claims, have now been made to all the owners. The total price was $57,000, but a discount was obtained on account of the final payments being made sooner than called for in the option.

South Live Oak—Churn-drill hole No. 4 is more than 125 ft. deep in schist, carrying small amounts of silicate and carbonate of copper.

Black Warrior—Fisk & Snell, lessees, have started to ship copper-silicate ore to the Old Dominion smeltery, and it is expected that regular shipments will be maintained. The ore is coming from the 100-, 200-, 250- and 300-ft. levels.

Irene—At this mine, two miles north of Globe, a station is being cut in the tunnel, 420 ft. from the portal and a gasoline hoist will be installed for sinking a winze. The two miles of road to the property is finished. J. A. Fleming is in charge.

New State Copper Mining & Smelting Co.—At the annual meeting of the stockholders, Oct. 7, J. N. McDonough was elected president, Harry Sultan, vice-president, Wade Sotel, secretary and treasurer, and Thomas P. Kelly, manager.

California

Nevada County

Oak Flat—Pay gravel has been encountered at a depth of 525 ft. in a raise from the tunnel. The channel measures from 8 to 10 ft. on the rim. Grizzly Ridge Mining Co., owner, also owns the Oustomah, which is improving with development, and the shaft is being unwatered. E. C. Klinker, of Grass Valley, is superintendent.

Bellefontaine—The installation of a five-stamp mill at this mine, near Willow Valley, is contemplated. It would be employed in development. P. C. Drescher, of Sacramento, is owner.

Montana—Electric power has been substituted for water power at this mine in the Nevada City district for hoisting, pumping and the machine drills. Drifts are being extended and the conditions are encouraging for the development of pay ore. Arthur Hodge, of Nevada City, is superintendent.

Deer Creek Placers—Herbert Kitts and others have taken a bond on this land with the idea of installing a dredge. An electric power line has been extended from Woods Ravine to the placers which are three miles west of Grass Valley.

Sierra County

Primrose—Machinery has been taken to this quartz mine, in Hog Cañon, ready for use in early spring; M. L. Morrison, Sierra City, in charge.

Eagle—This gravel property, near Port Wine, and the Arizona adjoining it, are under bond to Bert Davis, who has cleaned out and retimbered the 800-ft. tunnel that was run many years ago for the channel, but never driven far enough. Two shifts are employed and the work will be continued during the winter.

Bear Creek—At this American Hill quartz mine, a new electric hoist is to be installed, and the shaft now being sunk on the vein will be continued.

Kate Hardy—At this Forest mine, 100 ft. of tunnel has been completed on contract, undercutting the shoot from which a pocket was taken some time ago. The erection of a mill next spring is contemplated. W. M. Beggs, of San Jose, is operating the property.

Sierra Standard—The road has been completed to this mine and an auto truck is now in use between the mine and Downieville. Underground work is in progress and will be pursued all winter; J. S. Frye, superintendent.

Alhambra—A new shoot which pans gold freely, has been encountered in this mine, near Poker Flat. A series of quartz veins exists here, inclosed in a massive dike of maraposite, the formation being identical with that of the Red Ledge mine, at Washington, Nevada County.

Fruitvale—The tunnel has been driven on the vein for 700 ft., and at the face a crosscut shows the width of the vein to be nearly 40 ft. The dip gives over 1000 ft. of backs. Three shifts are employed with power drills.

North Fork—At this Forest mine the rebuilding of tunnel house, change-room, powder magazine, timber and machine sheds, storehouse and electric converter building is about complete, and a water system for added protection against future fires is being planned by Manager Stone. A drainage sump has also been completed, the water to be ejected by electrically driven pumps. The force of miners is being increased and extensive underground development is to be pushed.

Colorado

Lake County Leadville

It is stated that a zinc company recently let a contract to a lessee to ship 1000 tons of zinc ore at a flat rate of $5 per ton for 22% zinc, the highest price yet paid. It is also said that there are thousands of tons of 18% ore available in the district, if it could be shipped at a profit, and that zinc buyers are offering $4 per ton, f.o.b. cars at the mine, but limit the mine to 1000 tons.

Fanny Rawlins—This mine is being thoroughly prospected for zinc ore, a shoot of which was found a few months ago. E. A, Hawkins, lessee.

Eagle Mining & Milling Co.—This company, owning the Iron Mask, on Battle Mountain, Red Cliff, will enlarge the capacity of the mill to 120 tons per day, and new roasters, tables and magnetic separators for treating zinc-lead ore will be installed.

Highland Chief—It is reported that lessees on this Breece Hill property have opened a 3-ft. vein of zinc-carbonate ore in one of the upper levels, and that it is above average value.

Long & Derry—The present output of this property, in Iowa Gulch, is 200 tons of silver-lead ore per month; most of it comes from a level from the bottom of the shaft.

Sugar Loaf Consolidated Co.—The vein in the breast of the tunnel is widening and the output increasing. At present about 25 tons per day is being sent to the smeltery.

Yak Tunnel—This important work, which has practically reclaimed idle mines on Breece, Iron and Carbonate hills, and in Big Evans Gulch, is now in Resurrection ground, three miles from the tunnel portal, and 34 sets of lessees are at work in it, the average tonnage of ore shipped being 12,000 tons monthly. The elimination of the heavy expense of pumping and sinking has enabled many mines to be worked, which could not be operated from the surface when water had to be lifted.

San Juan District

Tomboy—During September, the mill was in operation 28 days, crushing 10,000 tons of ore, which yielded bullion worth $50,500, and concentrates worth $33,500. The expenses of operation were $44,000, and $11,300 was spent on permanent improvement.

Morning Star—A strike in this mine, in Bilk Creek basin, of Mt. Wilson, is reported by W. R. Vandeveer, the superintendent. The mine is at 11,000 ft. elevation, but will eventually be worked through the Sunshine tunnel, which is being driven 670 ft. lower.

Litchfield Mining & Milling Co.—This company has been organized by J. H. Litchfield, of Telluride, to develop the Great Eastern, Utopia, Colonna, and Great Western, in the Bilk Creek basin, above the Morning Star group, the stock being chiefly held in Elmira, N. Y. He will work six men on development all winter. The company owns 6000 ft. on the course of a vein 8 ft. in width, the principal valuable mineral being gold.

Teller County-Cripple Creek

Six Points—A washer is being operated on the dump by E. Moser. As is the case in many of the Cripple Creek mines the mineral is in the so called talc or more properly kaolin, which sticks to the surface of the rock. Chilson & Polly, lessees, ship seven carloads per month of high-grade ore and a 5-hp. electric hoist has been installed in order to sink a winze to prove the depth of the shoot from which the ore is being stoped.

Isabella—In September 83 carloads of ore were shipped from this mine, the royalties being estimated at about $4000 to the company.

Last Dollar—At this mine on Bull Hill, Lessee A. May has opened ore at the 1350-ft. level, reported to be 3½ ft. wide. F. T. Sanders is superintendent.

Idaho

Coeur d'Alene District

Tamarack & Custer Consolidated Mining Co.—The force of miners will be doubled at once, making 60 employed.

Copper King—This company, at Mullan, has started a raise to connect the upper and lower workings. When completed the raise will be 1400 ft. long. It is now up 50 ft. and shows a vein eight feet wide, all of which is good milling ore. The ore is a mixture of galena and copper glance, carrying silver and some gold. A winze has been sunk from the upper workings on an oreshoot which has not been found in the lower tunnel. It is planned to connect the raise and the winze and thus pick up the oreshoot.

Alice—A force of men has been set to work to get the mine in readiness for active operation again. The mine was shut down about three months ago, soon after it had been dewatered. The pumps have been kept in operation, however, since the shut-down. A lease has been obtained on the property. The mill will be in operation in a few days as there is plenty of ore available.

Bunker Hill & Sullivan—The fire which is believed to have claimed one victim, was brought under control, Oct. 8. Rescue crews began immediately a search for F. A. Bentz, a pumpman who remained at his post when the fire broke out, the miners on shift having made their way through the connecting workings to safety. Reports from the searching parties indicate that the gases have filled these workings, and it is extremely doubtful if Bentz will be found alive. The actual fire loss is small and it is expected that the mine will resume operations in a week or ten days.

Idaho County

Golden Scale Mining Co.—This company has completed a successful season's placer run and has suspended operations in order to make a few improvements before winter sets in. The ditch will be extended and other improvements will be made, involving a total expenditure of about $10,000 to facilitate working on a larger scale next season.

North Star—The mill is now running steadily on ores from the Black Diamond mine and Manager Hye has contracted to treat the ores from the Dillinger mine.

Hazlitt—This mill in Olive Gulch is rapidly nearing completion and will probably be in operation in a short time.

Frisco Mine—Work has been resumed on this property under the direction of E. J. Comly. The crosscut tunnel will be driven 250 ft. further to cut the vein at a depth of 500 ft. Drifting on the vein will then be started.

Michigan

Copper

Keweenaw—This company will start drilling along the trend of the Ash-bed lode as soon as General Manager Uren completes all the plans.

Houghton Copper—The winze started from the 620-ft. level is down about 200 ft., and will soon be bottomed, when it is planned to develop the lode tributary to this winze with lateral openings. Developments at the 620-ft. level continue satisfactory and a stockpile is being accumulated to carry a large quantity of commercial ore.

Hancock—This company's vertical shaft is nearing a depth of 4000 ft., at which depth sinking will be discontinued and attention be given to the development of the lodes. The property is in such shape that this work can go forward rapidly, and in a comparatively short time the property can be put on a permanently producing basis, the surface equipment being as complete as any in the district.

Isle Royale—Trenching has been started at another place to reveal the outcrop of the lode that was cut in drilling. The first trench revealed the lode in a favorable condition, and its further development will be watched with interest, as it is believed that the lode exposed is the southern extension of the Kearsarge.

Iron

Buffalo Iron Mining Co.—This company has been formed as a subsidiary of the Wickwire Mining Co. to operate the Donohue and McGovern properties, at Iron River, recently taken over from the Niagara Iron Mining Co.

McGreevy Steel Co.—This corporation has been formed to operate in the Iron River district. The holdings of the McGreevy Iron Co. have been taken over, including the LeRoy property, on Sec. 29, 43-34, and the Boyington property, on Sec. 13, 43-34. Also the Buckholtz mine, of the Iron River Ore Co. has been taken over, and the Purcell property, north of town, recently secured by Paul Chamberlain and associates. The old Sheridan mine has been secured by lease from Alexander MacKinnon. It is planned to unwater the Sheridan mine and sink the shaft several hundred feet deeper. This mine was shut down, 12 years ago, after producing 116,000 tons of ore from comparatively shallow levels. The mine was troubled at that time by burning of the sulphur in the ore upon exposure to the air. At the Purcell property, a shaft will be sunk, and the small orebody, known to exist, will be mined as quickly as possible. The Le Roy and Boyington properties are yet in the exploration stage. Diamond drilling has been carried on at the former during the last summer. The company is capitalized at $500,000, and is incorporated under the laws of the State of Utah.

Republic Iron & Steel Co.—This company has issued a call for 200 men for its Hartford, Cambria, and Lillie mines, at Negaunee. John Deacon is in charge.

Warner—A new headframe is being erected at this Pickands, Mather & Co. property, in the Amasa district.

Heidelbach—Diamond drilling on this Cascade Range exploration has been stopped. The results have not been made public.

Florence Iron Co.—Two electrical, belt-driven air compressors, each of a capacity of 1500 cu.ft. per min., have been purchased from the Ingersoll-Rand Co. One is for the Bates mine, at Iron River, the other for the Ernst mine, at Commonwealth, Wis. A drill sharpener has also been purchased from the same company.

American—The new iron-ore concentrator has been started in operation.

Saginaw County

Saginaw Valley Development Co.—Oil has been struck in Saginaw by this company at a point where testing has been recommended by the state geological survey for the last 11 years, at a depth of 2317 ft. It is said that the oil stands 1200 ft. deep in the well and will probably yield about 25 bbl. per day. It is a light-colored, high-grade oil.

Minnesota

Mesabi Range

Oliver Iron Mining Co.—The employees of this company's mines at Virginia have organized a first-aid team, one of the first on the range. The officers are: Claude Gill, president; Herman T. Reifel, vice-president; and J. E. Biron, secretary.

Missouri

Joplin District

About 3000 ft. of drilling has been contracted for on a 40-acre lease of the Cobble land south of the Sitting Bull mine at Thoms Station. The first hole has been sunk 200 ft. and good chippings obtained.

The zinc smeltery at Nevada, Mo., is to be closed down. Transportation difficulties and the high price of ore are assigned as reasons. The plant may resume operations in the spring.

A 500-ton mill is to be erected in the South Carthage field by the Ramage interests. The ground was thoroughly drilled and two runs of ore developed.

Gouverneur—This old mine on the Excelsior land at Four Corners is to be worked by Winsor & Co. The mill is in good condition and can be easily repaired. Because of the pockety character of the ore former operators have not been successful in this region; small operations paying better than those on a large scale.

Brown Mining Co.—A 12-ft. stope is being taken up by Ritter & Allen on a lease of this property. The ore occurs in seams in blue chert, soft ground, and is hoisted and milled on an adjoining lease.

Mineral King. No. 2—A derrick has been erected on a new shaft in the Riselling land west of Joplin. The mine is to be known as the Mineral King No. 2, and as soon as the shaft is completed and drifts opened up, a concentrating plant will be built.

Mohawk Mining Co.—Four drifts with high faces of ore have been opened in this Mohawk shaft. It is estimated that the ore will produce 20% concentrates.

Wilson Mining Co.—This company, operating on the Boston-Duenweg land at Duenweg, has built a sludge mill equipped with three tables, one of which is of new design. This table has a center discharge and valve draw-offs similar to a jig; the valve draw-offs being necessary because of the table carrying a one-inch bed. The sludge is delivered to the mill through a revolving dewatering screen.

Montana

Butte District

Butte & Superior—Work was started Oct. 5, on the concrete foundation for the new Nordberg hoisting engine, to be erected at the Black Rock mine. The old engine which, prior to its purchase by this company, was used at the Drum Lummon mine, at Marysville, has been found inadequate to handle the largely increased output of ore which development during the last year has produced. A new steel headframe is also under construction, and a skip-changing device similar to that in use at some of the Anaconda company mines, is being installed. The skip can be detached from the cable, and three- or four-deck cages be attached in its place in less than five minutes. The chippy, or auxiliary cage, is being operated while the main hoist is being changed, a small temporary headframe having been erected for the purpose. This cage is used for lowering the miners, timber and supplies, and in addition it hoists about 120 tons of ore per day. During the shutdown the stockpile is being utilized to furnish, with the ore hoisted, a total of 400 tons of ore per day, the amount which the mill is now handling. The work of making needed changes upon the other half of the mill is continuing steadily, and it is believed that by the first of the year it will be running smoothly at full capacity.

Fergus County

Gold Acres—This property, adjacent to the New Year mine, situated near Maiden, has been bonded to the Rheingold Mining Co., composed of Chicago men. N. J.

Littlejohn, of Lewiston, is in charge. Recently the Rheingold company completed a mill at the New Year property, and ore from the Gold Acres mine will be treated there.

Jefferson County

Mount Washington—John D. Pope and George W. Wilson, of Butte, who are operating this property, in the Wickes district, are making regular shipments of ore to the East Helena smeltery. During September they shipped 200 tons of silver-lead ore. A shaft is down 200 ft., and drifting has been done on the 100- and 200-ft. levels. The ore now being shipped is stoped above the 100-ft. level.

Calumet & Montana Mining Co.—A strike of good ore was recently made at the King Solomon property, near Clancy. During the last year new machinery has been installed, the shaft sunk deeper, and extensive development work done.

Lewis & Clark County

John Larson, who owns a property near the Bald Butte, has bonded it to Colorado men. They have pumped out the shaft, and are preparing to deepen it.

Four mines are being operated in the Marysville district, two of which, the Thomas Cruse properties and the Bald Butte company's mine, are paying. In addition the Barnes-King Development Co. is operating a property lately acquired, and the St. Louis Mining Co. is preparing to add a cyanide plant to its mill.

Bald Butte—The mill is running night and day upon ore being mined from a raise on the 600-ft. level. The ore is of excellent grade.

Nevada

Comstock Lode

Mexican—The new incline winze on the 2500-ft. level has been started and is 15 ft. deep. The winze is at the north end of the stope, in solid ground. It will follow the foot wall of the vein, which dips about 20° to the east. Cutting out for the sheaves for a hoist over the winze has been completed. At the mill, an additional tube mill has arrived and is being installed upon the foundations prepared when the plant was built. This will give the plant two tube mills for regular service and will increase the daily capacity about 25 tons per day to a total of 110 to 115 tons; 14 bars of bullion have been shipped to the smelter since the first of the month.

Sierra Nevada—A north drift has been started from the south boundary of the mine, and 25 ft. in encountered the east vein. It is a strong vein, but the assays in the quartz are low. This drift will penetrate virgin ground.

Consolidated Virginia—In the northeast drift on the 2300-ft. level, a west crosscut has been started driving for the foot wall of the main Comstock vein. The drift has encountered a fracture that contains a streak of promising quartz. The strike is toward the west, and is making into a big block of hitherto unopened ground. An effort was made to open this territory by Mackay and Fair, but was unsuccessful because a hot-water belt was struck. New pumps, recently installed in the shaft will easily handle this water now, and exploration in that direction will be pushed ahead.

Ophir—The new cyanide plant is now nearing completion, the pipe connections, etc., being made, and other finishing touches added. It is stated that the mill will be in operation by the last of October. Work has been resumed on the 2500-ft. level of the mine, driving east and south for the vein.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Oct. 5, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,550	133,969
Tonopah Belmont	3,431	94,931
Montana-Tonopah	1,069	41,369
Tonopah Extension	1,045	39,936
West End	975	30,122
Midway	50	570
MacNamara	469	14,619
North Star	....	170
Mizpah Extension	.....	40
Jim Butler	300	2,200
Totals	10,889	357,926
Estimated value	$272,225	

Tonopah-Belmont—A winze is being sunk on the oreshoot from the 13th level, it having now been drifted on for 300 ft. The vein is from 25 to 30 ft. wide on this level.

Tonopah-Merger—The west drift on the 980-ft. level has been extended 85 ft. into the oreshoot, the last 15 ft. showing six feet of ore. Shipments will be made to the old Belmont mill.

North Star—The new vein on the 1250-ft. level shows improvement in both drift and winze and good assays are again obtaining. On the 850-ft. level the ore has widened to four feet.

Tonopah Extension—The vein on the 660-ft. level in the extreme western workings is from 8 to 10 ft. wide of good milling grade.

MacNamara—The net profits for September amounted to $16,800.

Tonopah Empire Mining Co.—This company has been incorporated with a capital of 1,500,000 shares of $1 each to develop six patented claims adjoining the Merger mine. The directors are Seeley W. Mudd and Frank A. Keith, of Los Angeles, John G. Kirchen and Key Pittman, of Tonopah, and Max E. Bernheimer, president, Tonopah Extension Mining Co.

New Mexico

Soccoro County

Socorro Mines—All the development headings in the lower levels are in ore and the two lowest, the 700 and 800, show especially good ore. The mill is running steadily and crushed between 4000 and 5000 tons during September.

Mogollon Gold & Copper Co.—An electric hoist will be installed over the winze in the Little Charlie tunnel, which continues to yield a good tonnage of high-grade mill ore.

Ernestine Mining Co.—Production for September was 25,500 oz. of gold and silver bullion and 20,000 lb. of high-grade concentrate. The usual monthly dividend of 1% was declared Oct. 1.

Deadwood Mines—September production exceeded any month to date. Development in the 500, the lowest level, is exposing a good grade of ore four to seven feet wide.

Oaks Co.—During the month 420 tons of ore of an average value of $17 per ton was shipped from development work.

South Dakota

Lawrence County

New Reliance—The plant at this property has been started. During the time operations were suspended a Portland filter was installed. The mill contains 30 stamps; and the ore makes a large proportion of slime, and in the past the slime department has been a weak spot. F. C. Bowman, Trojan, is manager.

Deadwood-Homestake—This company has been reorganized and has taken over the Montezuma and Whizzers, and the Garfield properties. The property lies east and north of the Homestake, and a deep shaft will be sunk in an endeavor to find that orebody. Funds are being raised to sink 1000 ft. C. E. McHugh, Deadwood, is manager.

Black Hills Standard—Mill operations have been suspended for the winter, after a fairly satisfactory run on ore from the Deadwood Standard mine. Officials state that work will be resumed in the spring.

Wasp No. 2—Steam-shovel stripping will soon be suspended for the winter at this property. The shovel has been used on the north side of the open cut, and has 35,000 tons, or a four months' supply for that portion of the mine, now stripped.

Bismarck—The mill building has been completed and inclosed, the tanks erected, and as fast as the rest of the equipment arrives, it will be installed. This should require only a few weeks. F. B. Hitchings, Deadwood, is manager.

Kiemer—The long crosscut tunnel has intersected the vein and drifting easterly is now in progress. Less than 100 ft. will take the workings to a point immediately below important surface showings, and where it is expected that good ore will be found.

Heidelberg—Work at this property on Two Bit, is showing further oreshoots. Local men who recently made an examination, got excellent returns, and will probably become interested. The property is in an almost unknown part of the Black Hills. Treber & Bros. Deadwood, are owners.

Hailstorm—Louis Arpino and associates have leased this property, in Strawberry gulch, from the owners, Mrs. C. E. Zipp, Frank Viox and others. The property contains a small seam of high-grade smelting ore.

Monarch—Walter Nickoli, who is leasing on this property, is making regular shipments of ore to smelteries. The oreshoot is small, but good for leasing work.

Wells Fargo—Lessees on this property, belonging to the Golden Reward, and which had been idle for 15 years, are doing well, shipping milling ore to the Golden Reward plant at Deadwood, and higher-grade ore to the Denver smeltery.

Minnesota — Judgments and taxes, amounting to a little over $20,000 have been paid, and work is expected to be resumed at an early date. Former President, F. E. Little, is negotiating for an option, and states that he and associates are prepared to start work immediately if they can secure the ground under favorable terms.

Utah

Beaver County

Moscow—Shipments of silver-lead ores are being made at the rate of one car every two days. A new strike of good ore is reported on the lower levels.

Cedar Talisman—A contract for 200 ft. of work has been let to Tom Campbell, an old Beaver County mining man. This will consist of driving on the 500-ft. level for the Stalwart fissure and west contact.

Majestic—During September 45 cars of copper-iron ore were shipped from the Hickory, and two cars from the Harrington. This is one of the best months the property has had, and it is in good shape for the continued production.

Tot Eiler Gold—This property is in the Newton district, adjoining the Rob Roy on the southwest, and the claims cover placer ground. A tunnel has encountered loose gravel, most of which will pan, and some of which is reported to run $1.60 and upward in gold. This was cut at the 150-ft. point, and was followed 25 feet.

Juab County

Tintic shipments for the week ended Oct. 4 amounted to 208 cars, made by 22 different properties, including leases, which shows the large number of properties active in this camp.

Eagle & Blue Bell—During October production will be largely increased, and the management expects to average 100 tons of ore daily. At the annual meeting held Oct. 5, the following directors were elected: James P. Graves; H. N. Sweet, F. R. Sands, F. H. Williams, G. E. Davis, Imer Pett and Duncan MacVichie. Reports submitted regarding the work done and results obtained during the last year showed it to have been one of the most satisfactory in the history of the company. Winzes were driven below the 1000-ft. level, opening good quantities of shipping ore. In order to handle these to better advantage, the shaft was sunk from the 1000 to the 1350-ft. level, and a crosscut and raise driven on the 1350, to connect with the stopes above. New ore chutes and new ore bins have been installed, and the equipment generally put in good condition. Financial statements covering the last year's operations will shortly be sent to stockholders. The control is held by the Bingham Mines Co., owned by Boston men chiefly.

Swansea—The north face on the 940-ft. level is reported to be back in the vein again, and shipments from this place are expected.

Gold Chain—Operations are being carried on through the 1500-ft. level of the Lower Mammoth shaft, which corresponds to the 1700-ft. level of the Gold Chain. Work is being done on the vein, and ore has been opened.

Bullion Beck—Shipments are being made from some of the dumps at this property, and about 2000 tons have been marketed. The dump contains approximately 18,000 tons.

Iron Blossom—Eighty tons of high-grade silver ore was shipped recently from the No. 3 workings. The new machinery at the No. 1 workings is being put rapidly in shape, and is expected to be ready for operation early in November. This consists of a new hoist and other equipment. Steel has been ordered for a 60-ft. headframe.

Crown Point—After prospecting on the 500 level, work has been resumed in the shaft, which is 535 ft. deep. Crosscutting will probably be done on the 600-ft. level.

Yankee—Regular shipments of zinc ore are being made.

Dragon—Lessees made up a shipment for the week ended Oct. 4.

Grand Central—Driving and crosscutting is being done on the 2300-ft. level, which is one of the deepest in the district. The vein in some places is as much as 20 ft. between walls, and some ore has been found. It is planned to sink winzes on the vein.

Lower Mammoth—During September this company, for the first time in five years, made expenses. Shipments of lead, copper, and zinc ores are being made, and more ore is being opened. Some profit is expected for October.

Salt Lake County

Alta Consolidated—Funds for development work and payments due on the purchase price of the property have been provided by the sale of treasury stock. M. J. Dailey has been made general manager.

Cardiff—Five faces of ore are reported, and about 100 tons of ore of good grade are being shipped monthly.

Michigan-Utah — Leases have been granted on new ground, and lessees who have been operating on the City Rocks side are mining ore.

Summit County

Park City shipments for September amounted to 6412 tons, valued at about $260,000. The Silver King Coalition shipped 2389 tons, the Daly West, 1461 tons; Daly-Judge, 1781 tons. The remaining shippers were the Grasselli Co., E. J. Baggs, New York Bonanza, Silver King Consolidated, Frank Daley, Chas. Moore, Little Bell, Barry-Coxe, and Ontario lease.

Washington

Ferry County

McLaughlin—Rich ore has recently been encountered on this property near Orient.

Anaconda Gold Mining & Reduction Co.—This company has been formed by the consolidation of the Anaconda Gold Mining Co. and the Republic-Colfax Mining & Milling Co., and extensive operations will be carried on at the different claims in the Republic district. The new company is capitalized at $2,000,000.

Okanogan County

Gold Axe—John Berquist, Chesaw, owner of this property, announces that it is to be equipped with machinery in the near future.

Stevens County

Superior Copper—This mine has been leased for three years to J. B. Sullivan and associates of Chewelah. The new owners expect to begin shipments within two months.

Canada

Ontario

At Cordova, in eastern Ontario, the old Belmont gold mine is being opened by P. A. Kirkegaard. The property has been renamed the "Cordova," and it is expected that the 30-stamp mill will soon be running at a capacity of about 100 tons per day.

Dane Copper Mining Co.—A car of ore which this company recently shipped to the Copper Cliff smeltery, averaged 15½% copper. Diamond-drill explorations have been started.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Oct. 11, and for the year to date, were:

Bailey		21.57
Beaver	.....	299.38
Buffalo	32.82	959.20
Casey Cobalt	43.00	255.15
City of Cobalt	.....	887.99
Cobalt Lake	32.60	716.05
Cobalt Townsite	41.20	1,426.15
Chamb.-Ferland	.....	362.33
Conagas		1,673.95
Crown Reserve		368.66
Drummond	.....	383.05
Hudson Bay		538.47
Kerr Lake	30.55	590.77
La Rose	74.50	2,807.38
Lost and Found	.....	15.00
McKinley-Darragh	72.79	2,036.57
Nipissing	.....	1,704.50
O'Brien	.....	496.54
Penn.-Canadian	.....	29.70
Provincial		22.22
Right of Way	.....	242.82
Timiskaming	29.95	893.71
Trethewey	66.25	447.79
Wettlaufer	20.19	285.93
Colonial	.....	63.14
Dominion Reduction Co		56.64
Totals	443.85	17,584.66

Nipissing—Development on the Meyer vein has been satisfactory. The picking up of several branch veins has added to the known ore reserves. The fourth level is now being cut on this, the largest of the Nipissing veins, at the 300-ft. level. The low-grade mill is expected to be in operation about Nov. 1. All the machinery is in the mill, and the aërial tramways from the various shafts are being completed.

Timagami Reserves Mines, Ltd.—The assets of the Floyds Silver Mines company have been sold to this company.

ONTARIO-PORCUPINE

Porcupine Southern—Diamond drilling is expected to commence on this property this week.

Kenora—This property is to be reopened shortly.

Pearl Lake—The crosscut at the 400-ft. level shows 8 ft. of $10 ore.

McEnaney—This property, belonging to the Crown Reserve of Cobalt, is showing up well on development. On the 100-ft. level, the ore chute is 200 ft. long, on the 200-ft. level, 450 ft. long and on the 300-ft. level it has been developed for 250 ft. The shaft will soon reach the 400-ft. level. The orebody will average 42 in. in width with a gold content of $28 per ton.

Hollinger—This company has commenced the payment of dividends, the first to be made Nov. 2 to stockholders of record Oct. 25. The initial payments will be at the rate of 3% every four weeks or 39% per year.

Vipond—The oreshoots on the Davidson and Godfrey veins are being opened up on the 300-ft. level and show improvement in width and assay.

Plenaurum—There has been some talk of this company and the Jupiter amalgamating, but neither of these mines is sufficiently developed to warrant any deal of this kind.

Moneta—This property, upon which considerable exploration work has been done, is closed down.

Lucky Cross—Excavations for the foundations of a mill have been completed. Amalgamation and concentration is the practice to be followed at present, with the addition of a cyanide plant later.

Calvert — This company, composed chiefly of Buffalo men, will begin development on six claims which show several good veins on the surface carrying free gold. W. G. A. Woods is managing director.

Mexico

GUERRERO

Reforma Mining & Milling—Inability to get coke, due to repeated interruptions of traffic on the Cuernavaca line of the National Rys., and generally disturbed conditions in Guerrero, forced this company to shut down. Much work has been done on the railroad that will give the mines and smeltery connection with the shipping station on the Balsas River.

Suriana Mining & Smelting—This company has been idle since early in the year, when Manager Robinson killed a rebel leader, and all foreigners were forced to abandon the camp. The company was earning a good profit at the time of the shut-down.

JALISCO

Amparo—Production so far this year has averaged 140,000 pesos per month, and expenses 70,000 pesos. The company is paying 1% per month on a capital of $2,000,000. This year's showing will be much better than that of 1911, due to the fact that interruption in the power service of the Chapala Hydro-Electric Co. seriously interfered with operations last year. There have been few interruptions this year. In November, 1911, the Amparo began the shrinkage system of stoping, and by August, 1912, the reserve of broken ore in the stopes amounted to 54,000 tons. The system is being continued, and under it the reserve will be maintained. It is resulting in a material reduction in mining costs. A 200-hp. Ingersoll-Rand compressor has been put in at No. 2 shaft, which has three compartments and is the main shaft. It is down 1120 ft., and it will be extended to 1200 ft. soon.

Espada—This company is milling 100 tons daily at the Virginia & Mexico reduction plant, in the Hostotipaquillo district, which it took under lease at the beginning of the year. Concentrates and bullion are shipped regularly, and the value of the products sold so far has been 100,000 pesos. The company spent 30,000 pesos in putting the plant in shape for operation at present capacity.

PUEBLA

Puebla Smelting & Refining Co.—This company owns 1400 acres of mineral land near Magistral, 15 km. from Concepcion on the Teziutlan branch of the Inter-Oceanic Ry. According to a report by H. L. Swain, of Mexico City, there are 81,800 tons of dump ores, and 260,000 of partially developed ore in the mine, the average assay of which is gold, 1 gram; silver, 75 grams; and copper 2½%. A smeltery of 1000 tons daily capacity will be built. The first unit of the equipment, 500 tons, is now at the railroad station in Mexico, and the second unit will be shipped before the first is erected. Both reverberatory furnaces and blast furnaces will be used. Charles Q. Davis, president and general manager.

ZACATECAS

Mezquital Mining Co.—This company, capital $1,000,000, has been formed by the Philadelphia men who recently made a deal with the San Carlos Gold Mines, Ltd., of London, for the Mezquital del Oro mines and reduction plant. The 50-stamp mill and cyanide plant, built by the former English owners, are being overhauled, and it is expected that milling will be started late in November. There is much low-grade ore available, and 200 tons daily will be treated. Tests have shown a high extraction without fine grinding.

South America

COLOMBIA

El Recreo—This mine, situated in the Department of Tolima, in the central cordillera of Colombia, produced about 860 oz. of bullion from 1244 tons of ore, taken out in development from Sept. 1, 1911, to Aug. 31, 1912. The wooden stamp mill of nine stamps worked in all 354 days, and crushed therefore roughly four tons per day of 24 hr. All the gold was saved on the plates, no inside amalgamation being possible on account of the wooden mortars. The gold won is of very good quality, netting about $19.20 per oz. The tailings are carefully saved and stored for future treatment. J. F. Dierolf and associates, the owners, expect to have the mine sufficiently developed in another two years, to warrant the erection of a modern plant.

Africa

TRANSVAAL

Gold production in the Transvaal in September is reported at 747,893 oz. This is 16,844 oz. less than in August, the difference being due to the shorter month; the average daily production was 24,930 oz. in September and 24,669 oz. in August. For the nine months ended Sept. 30 the total was 6,099,442 oz. in 1911, and 6,824,875 oz.—or $141,070,166—in 1912; an increase of 725,433 oz., or 11.9%, this year.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Oct. 16—Coal trade in the West is in unchanged condition, with heavy demand, and with slow deliveries. The seaboard bituminous trade is also strong. Car shortage and labor troubles are limiting supplies for local and coastwise trade. Current prices are the highest known for several years.

In the anthracite trade the companies are gradually making up for the shortage of last spring; but the process is a slow one, and there is an urgent demand for supplies, which dealers find it hard to meet, so that deliveries to consumers are slow.

Coal passing through Sault Ste. Marie canals, season to Oct. 1. short tons:

	1911	1912	Changes
Anthracite..........	1,485,087	1,321,452	D. 163,635
Bituminous........	10,079,890	9,544,129	D. 535,761
Total...............	11,564,977	10,865,581	D. 699,396

There were decreases of 11% in anthracite, and of 6% in bituminous coal.

German Coal Production—Coal production of German Empire eight months ended Aug. 31, metric tons:

	1911	1912	Changes
Coal.............	106,176,645	116,395,324	I. 10,218,679
Brown coal.....	46,897,544	52,880,655	I. 5,983,111
Total coal.....	153,074,189	169,275,979	I. 16,201,790
Coke made.....	16,647,726	18,688,125	I. 2,040,399
Briquettes m'de	14,058,090	15,834,316	I. 1,776,226

Of the briquettes reported this year 12,363,471 tons were made of brown coal or lignite.

IRON TRADE REVIEW

New York, Oct. 16—The iron and steel market has grown more and more excited, and steel producers are giving serious attention to means for curbing the excitement, since it bodes ill for the stability of the trade in the long run. As the mills have fallen farther behind in deliveries, buyers have been piling orders and specifications upon them, until some of them find themselves sold up almost to the middle of next year, based on specifications already in hand and a conservative estimate of specifications to be received if buyers continue at their present rate. While the mills have been optimistic as to the country's probable requirements in steel they cannot in the present peculiar circumstances avoid the conclusion that some of the business is of a partly speculative character and would be canceled should the market take a downward turn. One at least of the largest steel producers has taken a definite stand against accepting any more business, unless in exceptional cases, and this is following a policy which the Steel Corporation has practiced for several weeks in some of its departments.

The most erratic market in the iron and steel group has been Connellsville coke. Prompt furnace coke has sold readily at $3.50 at ovens, which is just double the price some furnaces are paying for current supplies, upon contracts made last November for the year. It is openly charged that some of the operators are neglecting their contract obligations to sell prompt coke at fancy prices, and thus to an extent blast furnaces are buying their own coke at advances ranging up to 100%. Many of the furnaces have sent representatives to the Connellsville region to secure information as to where shipments are going.

The scarcity of unfinished steel has become more acute, and there is practically no steel being offered. While Eastern mills are selling in a limited way for first quarter, the Central Western mills are refusing to sell billets or sheet bars for first quarter, representing that with the tonnage of such steel they must carry over, and the requirements of their own finishing mills, they will have no steel to spare. One large seller of sheet bars which has a number of long-term contracts has notified the holders of those of the contracts which expire Jan. 1 that they cannot be renewed. There is a definite prospect that some finishing mills dependent upon outside sources for steel, and particularly sheet mills, will not be able to run at capacity during the first quarter. These mills are not selling sheets for the quarter, while some of the other mills have been free sellers.

Pig iron continues active, with large orders for both foundry and steel-making irons, especially for basic pig. Higher prices asked by furnaces do not seem to check the demand. Coke is an important factor in the pig-iron market just now, its rapid advance in price affecting the makers. The short supply is keeping some furnaces from going into blast.

Scarcity of labor is a source of complaint from several quarters. It is reported that the Gary works have suffered a considerable loss of labor, which is due to the war just breaking out in the Balkans. A number of Slavs, Rumanians and other men from Southern Europe have left to take part in the war.

Steel Corporation Orders—The United States Steel Corporation reports the total unfilled orders on its books Sept. 30 at 6,551,507 tons. This is an increase of 388,132 tons over Aug. 31, and is the largest quantity reported since June 30, 1907, when the total was 7,603,878 tons.

Baltimore

Oct. 14—Exports for the week included 253,277 lb. nails and wire and 2,165,255 lb. billets and sheet bars to Liverpool; 39,312 lb. nails and 104,000 lb. pipe to Belfast. Imports included 1312 tons manganese ore from Liverpool; 7500 tons manganese ore from Poti, Russia; 5800 tons manganese ore from Bombay, India; 4592 tons pyrites from Huelva, Spain; 17,000 tons iron ore from Cuba.

Birmingham

Oct. 14—While the sales of pig iron in Southern territory during the past week have not been as active as for several weeks previous, there is not the least doubt as to the strength of the market. Sales for immediate delivery as well as during the first quarter of the coming year are on a basis of $14 per ton, No. 2 foundry, with an inclination toward a higher basis. There is no anxiety to sell for delivery during the second quarter of the coming year, the manufacturers feeling confident there is plenty of time and that prices and other conditions will be more opportune. The make in the South is being held up as much as possible. The blowing in of two blast furnaces has been scheduled for this month. The accumulated stock of iron has dwindled down to about 25,000 tons and manufacturers will shortly be in a position of having to depend on the probable make. Deliveries are now steadier than they have been, the railroads handling iron and steel more promptly. The car shortage is felt mainly in the coal-mining section.

The home consumption of pig iron is good. Cast-iron pipe is being manufactured on a large scale. Good prices obtain for cast-iron pipe, $25 down being the quotation.

The steel market is strong with all shapes in demand. Charcoal iron sells right along with $22 per ton as the price. Foundries and machine shops report an improvement in conditions. Scrap iron is also in good demand.

Chicago

Oct. 15—The iron market continues to be one of great activity as regards finished products. For pig iron the de mand is steady but not large, sales being of small lots—up to 1500 tons—and there are indications that this condition will continue until after election. Melters are buying with something of their old-time caution, in small but frequent purchases, and the furnace agents profess satisfaction with this policy, in view of the continued favorable outlook for the consumption of iron and steel products and with advancing prices.

In general, prices are 50c. higher than last week, though there is a wide range in Southern pig iron, No. 2 foundry being sold at $13.50@14.50, Birmingham, which means $17.85@18.85, Chicago. Probably little is being sold or is obtainable at the lowest figure quoted, $14 or more being obtained on all but odd lots for last-quarter delivery. The furnaces are well sold up into the first quarter and are contracting for first-half needs generally, with an occasional inquiry about business extending beyond July 1, but no sales as yet. Northern iron is strong at $17.50 at furnace, which means about $18 delivered. In general no difference in price is being made between first-quarter and first-half deliveries. Lake Superior charcoal iron is firm and in good demand at $19@19.50 per ton.

Sales of railroad materials continue to be heavy and are being freely made for first-half delivery. Structural material has a large sale for local and Western uses and there continues to be difficulty in obtaining it for first-half needs. Bars are in heavy demand, soft steel selling at 1.58c. and iron bars at 1.50c., with local mills unable to produce enough to meet the demand. Sheets and plates likewise show a crowding of mills and minor lines are greatly in demand. There is no need of actively seeking business in these lines; it pours in from all sides.

Cleveland

Oct. 14—Iron-ore shipments continue heavy, and vessels are in good supply. Movement from the docks is slower, cars being a little scarce.

Pig Iron—Business is active and prices are going up again. Present quotations, Cleveland delivery, are $17.65@17.90 for bessemer, $16.25@16.75 for No. 2 foundry and $19.25@19.75 for Lake Superior charcoal. Basic iron is in demand.

Finished Material—Structural steel is in demand and some large contracts have been closed. Bars are very active and plates are still called for at advancing prices.

Philadelphia

Oct. 16—Several eastern Pennsylvania furnaces have advanced prices for pig iron during the rest of the year and for next year, the later delivery being at an advance of 50c. Contracts have been placed within a few days covering several thousands of tons low-phosphorus silicon, basic, forge and foundry. The foundry buyers are extremely cautious, while the basic buyers are crowding inquiries on an oversold market. Interest is now centering upon deliveries for the first half of next year. Increased output is interfered with by the cost of labor and coke. Numerous inquiries have been received within two days from New England, New York and New Jersey territory, notwithstanding quotations are at the outside limit. Offers of Southern iron are more frequent than two or three weeks ago. The mill demand for forge is still satisfactory. Consumers generally are more anxious than they ever have been to cover work that they feel is assured to them even as late as early summer. Best No. 2 X foundry is quoted at $17.75, basic $17, forge $16.75 per ton.

Steel Billets—Billets have advanced fully 50c. a ton, but this does not refer to premium prices that control nearly all recent transactions.

Bars—Bars have advanced in sympathy with Western advances and some heavy car-building orders have taken three or four mills out of the market for some time to come. Jobbing demand has become very brisk and the general retail demand has sharply improved.

Sheets—All kinds of sheets have been advanced from $1 to $2 a ton, but even with this advance premium prices are freely paid for special accommodations among the smaller consumers.

Plates—The condition of the Eastern plate market is best indicated by some urgent inquiries from Western sources seeking supplies for 30, 60 and 90 days delivery, owing to the oversold condition of Western mills. The latest inquiries from New York and farther Eastern sources show large and urgent requirements which the mills will hardly be able to handle on the terms that are specified as to delivery. The shipyard interests are taking time by the forelock and have placed a few large orders.

Structural Material—A large amount of business has been sent to the mills. Mill managements are straining every effort to accommodate incoming buyers but the volume of work is a little beyond mill capacity.

Scrap—The scrap market is bare of heavy melting steel; in fact, buyers are able to secure only a small portion of material needed.

Pittsburgh

Oct. 15—Effective Oct. 10 the Jones & Laughlin Steel Co. advanced its prices on wire products $1 a ton, to a basis of $1.75 for nails. The majority of the other producers now refuse to admit that they have correspondingly advanced their prices, yet it is learned from other sources that it is practically impossible to buy at less than the higher basis. There seems to be an effort to avoid the appearance of concerted action. Under date of Oct. 12 the American Steel & Wire Co. advanced its differential for galvanizing plain and barb wire, etc., from 30c. to 40c. per 100 lb. and this advance, which is due to the high price of spelter, is being generally quoted.

The local iron and steel market shows no material change from a week ago except for the advance in coke and the greater pressure upon the mills by way of buying and specifying. None of the mills seem to be receiving less tonnage than they are shipping, and as a rule they are getting more than they are shipping, so that they are falling farther behind. Barring accidents, the majority of the chief branches of the industry will be able to run full into the second quarter. Pipe and wire are not customarily sold so far ahead, but even in these lines there is a very heavy tonnage on books.

Prices of 1.35c. on bars and of 1.45c. on plates and shapes have disappeared. While the mills do not all admit that they have withdrawn the minimum quotations, it is known that they have, and that bars cannot be bought at less than 1.40c., or plates and shapes at less than 1.50c. Lately some of the mills have shown a disposition to name lower prices to trade publications than they quote to their customers, which is distinctly a new development, though whether this is due to business or political conditions it might be difficult to determine.

The Jones & Laughlin advance of $1 a ton in wire products placed nails at $1.75 per keg base, and plain wire at 1.55c., base. The advance of the American Steel & Wire Co. of Oct. 12 in galvanizing, from 30 to 40c. per 100 lb., makes galvanized wire 1.95c., while galvanized barb wire is 2.15c., painted being 1.75c. These prices, based on $1 a ton advance in the base rates, are quotable as the market although some of the mills have made no official announcement.

Pig Iron—Late last week a steel interest purchased 14,000 tons of basic iron, chiefly for the early months of next year, on the basis of $16, Valley, except that one of the three lots taken was at $16.10, Valley. This was in face of furnaces making open quotations of $16.25 and $16.50, Valley, on the basis of which we had quoted $16.25 a week ago. Bessemer iron has been quiet, but is firm. Foundry iron has shown an advancing tendency, some small lots for next year having been sold at $16.25. We quote: Bessemer, $17; basic, $16@16.10; No. 2 foundry, $16@16.25; malleable, $15.75@16; forge, $15.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Quotations of $59.50 on contract have been withdrawn, leaving the market on the basis quoted over a week ago by some sellers, $61, Baltimore. Prompt is quoted at about $65, Baltimore, freight to Pittsburgh being $1.95 per ton.

Steel—There are no regular offerings of steel by either mills or brokers. Occasional sales are put through, but are quite rare. The market is not quotable with any accuracy, for usually when steel is scarce there are quotations for farther forward delivery which furnish a quoting basis, but at this time the mills are not quoting for far forward delivery. We note a sale of small openhearth billets at $28, delivered Pittsburgh district, and a sale of standard bessemer billets at $27, delivered, and quote the general market approximately on the following basis, $1 above last week's figures: Bessemer billets, $26; bessemer sheet bars, $26.50; openhearth billets, $27; openhearth sheet bars, $27.50; rods, $29, f.o.b. maker's mill, Pittsburgh or Youngstown. The New York State Steel Co. is about to start its plant at Buffalo, N. Y., with a capacity of about 12,000 tons of billets a month, a portion of which will be sold in the market.

Sheets—As noted, about three weeks ago some of the sheet mills began advancing prices $2 a ton, to 2.25c. for black and 3.40c. for galvanized, and last week several more mills made advances. It is understood that the leading interest has advanced its prices, although no official information is available, and by the end of the week all sellers will probably be on the new basis. Meanwhile we quote: Black sheets, 28 gage, 2.15@2.25c.; galvanized, 28 gage, 3.30@3.50c.; blue annealed, 1.60@1.65c.; painted corrugated, 2.35@2.45c.; galvanized corrugated, 3.35@3.55c. per lb. Business for first quarter has been coming in very freely to the mills willing to sell, but some of them, particularly those uncertain as to whether they will be able to obtain steel, have refrained from selling for that delivery. Mills are running practically at capacity, though occasionally operations are curtailed by shortage of steel or of labor.

St. Louis

Oct. 14—Pig iron is in good demand, though buying is checked by the sharply advanced prices. For Southern No. 2 foundry $14, Birmingham, or $17.75, St. Louis, is the minimum figure. A number of agencies are out of the market for the present, and a few are asking a premium over this figure for first-half delivery, though as yet, it is thought there has been no business done at over $14. Northern iron is quoted at $18@18.25, St. Louis. Owing to the advance in Southern, there have been more inquiries for Northern than usual.

The coke market is also very stiff, foundry coke bringing $6@6.25, St. Louis.

Iron Ore Trade

Lake Superior iron-ore shipments by ports for the season to Oct. 1 are reported as follows, in long tons:

Port	1911	1912	Changes
Escanaba	3,086,847	4,010,985	I. 924,138
Marquette........	1,568,711	2,567,578	I. 998,867
Ashland	1,878,786	3,623,161	I. 1,744,375
Superior..... . ..	7,946,109	11,097,276	I. 3,151,167
Duluth.	5,501,364	7,729,187	I. 2,227,823
Two Harbors. ...	4,855,320	7,310,195	I. 2,454,875
Total	24,837,137	36,338,382	I. 11,501,245

Of the shipments in September, a total of 5,536,291 tons, or 76%. were delivered at Lake Erie ports.

Some more sales of El Cuero low-phosphorus ore to Eastern furnaces are reported at 9½c. per unit, f.o.b. cars Philadelphia.

German Foreign Trade—Imports and exports of ores in Germany, eight months ended Aug. 31, metric tons:

	Imports	Exports	Excess
Iron ore......	8,043,722	1,506,403	Imp. 6,537,319
Manganese ore	322,070	1,249	Imp 318,821

Imports of ores are chiefly from Spain, Sweden, France and Russia.

METAL MARKETS

New York, Oct. 16—The copper market has been disturbed by a heavy fall on the London market, due to the war rumors in Europe. Apart from this the metal markets have been generally strong.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Aug. 1912..	$ 2,498,472	$ 5,576,900	Imp. $3,078,428
" 1911..	480,799	4,105,331	Imp. 3,624,532
Year 1912..	43,159,972	34,589,111	Exp. 8,570,861
" 1911..	15,910,449	40,473,010	Imp. 24,562,561
Silver			
Aug. 1912..	5,574,644	3,952,279	Exp. 1,622,365
" 1911..	4,869,359	3,653,329	Exp. 1,216,030
Year 1912..	45,834,920	32,652,869	Exp. 13,182,051
" 1911..	44,587,570	29,534,724	Exp. 15,052,846

Exports from the port of New York, week ended Oct. 12: Gold, $40,100; silver, $1,121,989, principally to London. Imports: Gold, $4,148,753, from London and Mexico; silver, $68,709, from Central America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The demand for gold from Paris and Berlin is active, but most of the supplies were retained in London.

The revised statement of the United States Mint puts the gold production of the United States in 1911 at 4,687,053 oz., or $95,890,000. This is $379,100 less than in the preceding year.

Platinum—The market remains firm, both here and abroad. There is much speculation as to the time when the new law prohibiting the export of crude platinum from Russia will be put into effect. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Iridium—Prices are still high, $68@70 per oz. being asked for the metal.

Silver—The market had a reaction during the week owing to some speculative selling. Since then, however, it continues steady with no wide fluctuations in sight. Consequently for the present it seems as if the changes in price would be within narrow limits.

The production of silver in the United States in 1911, according to the revised statement of the director of the Mint, was 60,599,400 oz., an increase of 3,461,500 oz. over the preceding year.

SILVER AND STERLING EXCHANGE

Oct.	10	11	12	14	15	16
New York....	63⅜	62¾	...	63¼	63½	63⅜
London	29¼	29	29¼	29 7/16	29 5/16	29¼
Sterling Ex..	4 8555	4 8545	....	4 8595	4.8595	4.8585

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

NEW YORK

	Copper		Tin	Lead		Zinc	
Oct.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
10	17½ @17¾	17.30 @17.40	50	5.10	4.90 @4.92½	7.45 @7.50	7.30 @7.35
11	17½ @17¾	17.30 @17.40	49½	5.10	4.90 @4.92½	7.40 @7.50	7.25 @7.35
12	......	....	....	....	......	....	....
14	17½ @17¾	17.10 @17.30	49⅛	5.10	4.90 @4.92½	7.40 @7.45	7.25 @7.30
15	17½ @17¾	17.20 @17.30	49½	5.10	4.90 @4.92½	7.40 @7.45	7.25 @7.30
16	17½ @17¾	17.30 @17.40	49⅝	5.10	4.90 @4.92½	7.40 @7.45	7.25 @7.30

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market, which had remained quiet up to Oct. 12, received a jolt on Oct. 14 through the severe break in the London standard market, which fell to the parity of about 16½c., New York. While the largest of the American agencies professed utter disregard of this and maintained the pegged price of 17¾c., delivered, etc., as their price

LONDON

Oct.	Copper Spot	Copper 3 Mos	Copper Best Sel'td	Tin Spot	Tin 3 Mos	Lead, Spanish	Zinc, Ordinaries
10	77¼	78½	82¾	228¼	227¼	21⅜	27⅝
11	76⅞	77⅞	82½	226	225	21⅜	27⅝
12							
14	74¾	75	79	224	222½	21	27⅝
15	75⅝	76¾	81	225¼	224	21⅛	27⅝
16	76$\frac{11}{16}$	77$\frac{11}{16}$	82	226	225¼	21	27⅝

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

asked, others took advantage of the opportunity for profitable arbitrage transactions and sold freely for what they could get, a good deal being placed at 17¼@17⅜c., delivered, usual terms. In the aggregate transactions amounted to some millions of pounds, practically all with domestic consumers, sales to Europe being, of course, precluded under the conditions. The improvement in the London market gave a stimulus to the domestic, which closes a good deal steadier, but electrolytic is still offered at about 17½c., delivered. The business in Lake copper during the week has been relatively insignificant, and quotations are consequently more or less nominal. At the close Lake copper is quoted at 17½@17¾c., and electrolytic in cakes, ingots and wirebars at 17.30@17.40c. Casting copper is quoted nominally at 17.15@17.25c., as the average for the week.

The unsettlement on the large European exchanges, brought about by the Balkan disturbance, acted simultaneously on the London standard market, which was seriously affected and on Oct. 14 suffered a break, which at one time put the quotation down to £72 5s. for spot and £73 for three months. The recovery, however, was equally rapid, and the market closes firm at £76 13s. 9d. for spot and £77 13s. 9d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Tin—The Balkan scare, which created panicky conditions on the large European exchanges, was not without its effect on this metal, too. The unsettlement commenced on Oct. 11 of last week, when tin declined about £2 on comparatively small sales. A further sharp break occurred on Oct. 14, when spot tin touched £221 5s. and three months £220. However, a good deal of this decline was recovered, and though not at its high point, the market closes steady at £226 for spot and £225 5s. for three months.

Naturally, prices here followed the trend of the London market, but no extraordinary pressure to sell developed. The lower level was taken advantage of by consumers to cover a large part of their requirements. October tin is quoted at about 49⅝ cents.

Lead—St. Louis sellers have come out somewhat more freely and are booking business at slight concessions. Lead is quoted there 4.90@4.92½c. There is no change in this market, where lead is selling at 5.10, but lead for shipment to Eastern points is offered at less than the New York basis.

The London market is easier, Spanish lead being quoted at the close at £21 and English lead £21, 2s. 6d. per ton.

Our attention has been called to the quotation for Spanish lead at London on Jan 17, 1912, in the JOURNAL of Jan. 20, 1912, where it is given as £15$\frac{13}{16}$, which price was used in the computation of the monthly average. Upon investigation we find this to have been erroneous, the correct price on Jan. 17, 1912, being £15$\frac{7}{16}$. At this late date we are unable to explain the error, which may have been either clerical or typographical, but probably the former. The average price of Spanish lead at London for January, 1912, was £15.597, instead of £15.619 as heretofore reported.

Spelter—This market has been quiet. The demand from consumers seems to be well covered and there is no urgency on their part to purchase. Offers from sellers are coming forward somewhat more freely and at slightly lower prices. St. Louis is quoted 7.25@7.30c.; New York, 7.40@7.45 cents.

No change is reported from London, which is quoted £27, 12s. 6d. for good ordinaries and £27 17s. 6d. for specials.

Base price of zinc sheets is $9 per 100 lb., f.o.b., La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—Business remains good, both here and abroad, and prices are a little firmer. We quote 25½@26½c. per lb. for No. 1 ingots, in large lots, New York.

Antimony—Business has been fair but prices are a little easier. Cookson's is quoted at 10@10⅛c. per lb.; Hallett's at 9¼@9½c.; Chinese, Hungarian and other outside brands at 8¾@9c. Supplies are moderate only, and an advance is expected soon.

Quicksilver—The market has been rather more active, but prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb, for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Cadmium—Paul Speier reports from Breslau, Germany, that the current price of cadmium is 725@750 marks per 100 kg., f.o.b. works—equal to 78.27@80.97c. per lb. The production in Silesia for the half-year ended June 30, 1912, was 21,833 kg., an increase of 988 kg. over last year.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 12—The high price of zinc sulphide ore was $63, the base per ton of 60% zinc $55@60. Zinc silicate sold at $32@34 per ton of 40% zinc. The average price for all grades of zinc is $57.22 per ton. Lead sold as high as $68, the base being $63@65 per ton of 80% metal assay. The average price of all grades of lead is $63.54 per ton.

The weakening market for zinc ore is causing some producers to withhold their product from the market, and each week

SHIPMENTS WEEK ENDED OCT. 12

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,648,700		1,124,320	$170,790
Joplin........	3,184,560		264,360	103,997
Duenweg....	918,250		119,460	30,451
Galena....	711,330		78,000	23,124
Oronogo.....	485,720	......	235,300	19,784
Alba-Neck....	499,630		42,180	16,295
Cave Springs	481,770	...	11,130	15,290
Spurgeon	115,720	312,860	90,290	11,669
Carl Junction	195,600	..	10,150	6,486
Granby .	189,240	121,600	14,660	5,800
Springfield...	84,000	.....	60,000	4,750
Jackson	129,680	.	...	3,760
Carthage ..	138,000	.	...	3,726
Miami....	129,720	...	...	3,500
Sarcoxie.....	63,410	57,510	...	2,747
Wentworth...	64,320		.	1,736
Quapaw ...	62,190		..	1,680
Totals	12,101,840	491,970	2,049,850	$425,585
41 weeks...	438,663,140	27,754,490	73,726,280	$14,213,330

Blende val., the week, $351,840; 41 weeks, $11,689,277
Calamine, the week, 8,615; 41 weeks, 436,043
Lead value, the week, 65,130; 41 weeks, 2,088,010

MONTHLY AVERAGE PRICES

Month.	Zinc Ore Base Price 1911	1912	Zinc Ore All Ores 1911	1912	Lead Ore All Ores 1911	1912
January.	$41 85	$44 90	$40 55	$43 54	$55 68	$58.92
February....	40 21	45 75	39 16	43 31	54 46	52.39
March.......	39.85	51.56	38.45	49.25	54.57	54.64
April........	38 88	52 00	37 47	50.36	56 37	54 18
May	38.25	55.30	36 79	53.27	55 21	52.45
June	40.50	55 88	38 18	54 38	56 49	55.01
July....	40 75	58 85	38 36	56 59	58 81	58 83
August .	42 50	55 13	41 28	53 27	60 74	57 04
September ..	42 63	59 75	41 29	57 07	59 33	61 26
October .	42.38	..	40 89		54 72	..
November...	45.40		43 25		57 19	.
December...	44.13	..	40 76	..	62 03	.
Year....	$41.45		$39.90		$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold

there is an increasing tonnage of unsold ore in the bins. Six weeks ago all stock on hand was sold at each week-end; now the bulk of stock, very little larger than then, is being held for an upward turn of the market.

Platteville, Wis., Oct. 12—The base price paid this week for 60% zinc ore was $56@60. The base price paid for 80% lead ore was $64@65 per ton.

SHIPMENTS WEEK ENDED OCT 12

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	702,500	.....	..
Platteville	466,980	....	238,000
Hazel Green	420,000	....	...
Shullsburg	400,000	.....	.
Galena	391,400	......	
Benton	384,000	80,000	567,000
Cuba City	185,060	.....	313,840
Harker	129,970	.	.
Highland	126,600	109,500	.....
Montfort	84,000	...	....
Total	3,290,310	189,500	1,118,840
Year to date	158,527,860	6,541,160	28,329,490

Shipped during week to separating plants, 1,970,965 lb. zinc ore.

Chemicals

New York, Oct. 16—The general markets are active and business is in good condition.

Arsenic—Spot supplies are still scarce. Glassmakers are inquiring for considerable quantities, and makers of insecticides are beginning to prepare for the spring trade in Texas. Quotations are $4.87½@5.12½ per 100 lb. for spot and early deliveries; while futures have advanced, $4.75@5 per 100 lb. being firmly held.

Cobalt Oxide—There has been a sharp advance of 10c., and the quotation is now 90c. per lb., New York.

Copper Sulphate—Demand is good and the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is good, and prices for spot and November have advanced a shade, to 2.57½c. per lb. Later deliveries are unchanged, 2.57½c. per lb. being asked for them also.

Petroleum

Berlin dispatches state that a government bill, aimed at the Standard Oil Co., is announced Oct. 14 in the semi-official *Norddeutsche Allegemeine Zeitung*. The provisions of the bill are intended to bar that company from the wholesale business in illuminating oils in Germany, which is to be intrusted to a national stock company, operating under government supervision. The new company is to be empowered to acquire the existing wholesale oil plants and stocks by expropriation, if necessary. The capital of the new company is to be furnished partly by the German banks and partly by open subscription. The banks are to be given registered shares and an increased voting power, in order to prevent any attempt to obtain foreign control. The life of the corporation is fixed at 30 years. The company is to be strictly under government control as to prices and business connections.

The success of the measure, says the semi-official newspaper, is dependent on adequate supplies of independent oil. Negotiations with independent producers of America, Russia, Roumania and Galicia indicate that contracts for the greater part of the German supply can be arranged outside the Standard.

MINING STOCKS

New York, Oct. 16—On Oct. 10, the Exchange was moderately active, with few changes. Mining stocks on the Curb were active, but irregular. Coppers were off a fraction, but others stocks were inclined to be firm.

Oct. 11 the Exchange was uncertain, chiefly owing to depression abroad. On the Curb coppers were rather quiet and irregular. Other mining stocks were in fair demand and firm.

Oct. 12 was a holiday. Oct. 14 the markets were slow and hesitating. Sales of mining stocks on the Curb were not especially active and the tendency was to small declines in prices.

Oct. 15 and 16 the Exchange was more active, with a rather stronger tone, and some advances. The Curb was more active and quotations were firmer. Mining stocks were not in special demand, but were fairly firm, with the exception of the coppers, which were a little weak.

Boston, Oct. 15—The most prominent development and feature among the copper issues is the entrance of United States Smelting interests into the directorates of two of the former Dow properties—Indiana and Franklin. These issues responded to this favorable solution of difficulties by advancing for the week $2¼ and $1⅞, respectively, to $16¼ and $10⅜. The trend during the week, as a whole, has been upward, though the sharp break in London copper warrants caused some uneasiness which resulted in a mild set-back. On account of this, prices show little net change for the week.

Optimistic reports regarding underground developments at the North Butte property persist, but drifting on the new orebody has been discontinued. Earnings are reported large and copper costs declining.

The East Butte management has come to no decision with respect to new financing and it may be that no permanent securities will be issued. Foreign selling is held responsible for the continued weakness of Ray and Chino, as conditions at the mines are said to be never more promising.

Trading on the Curb has been rather brisk and broad. Old Dominion trust

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	July	August	Sept.
Alaska shipments	2,224,441	1,242,836	1,726,715
Anaconda	23,000,000	25,250,000	24,500,000
Arizona, Ltd.	3,200,000	3,260,000	3,340,000
Copper Queen	7,708,147	8,040,424	9,103,861
Calumet & Ariz	4,748,000	4,514,000	4,462,000
Chino	2,945,000	3,437,309	3,372,[illegible]
Detroit	2,194,090	1,882,289	1,881,668
East Butte	1,261,304	1,410,500	1,250,000
Mammoth	1,818,738	1,802,590	....
Mason Valley	1,500,000	....	....
Nevada Con.	6,084,274	....	....
Ohio	617,500	...	....
Old Dominion	2,543,763	2,597,896	2,204,000
Ray	2,985,965	2,888,095	...
Shannon	1,446,000	1,400,000	1,142,000
South Utah	142,555	224,855	225,568
United Verde*	2,500,000	2,500,000	2,750,000
Utah Copper Co	10,602,000	11,248,992	.....
Lake Superior*	19,500,000	21,000,000	......
Non-rep. mines*	8,970,000	8,970,000	....
Total production	105,991,687	...	....
Imports, bars, etc.	25,586,735	....	....
Total blister	131,578,422	....	....
Imp. in ore & matte	7,748,392	...	......
Total American	139,326,814	...	....
Miami†	3,027,710	3,048,750	2,949,150
Brit. Col. Cos.:			
British Col. Copper	1,026,000	941,364	....
Granby	1,802,753	1,970,388	.....
Mexican Cos.:			
Boleo†	2,386,480	...	....
Cananea	4,000,000	4,044,000	3,500,000
Moctezuma	3,094,016	3,229,839	771,844
Other Foreign:			
Cape Cop., S. Africa	...	....	....
Kyshtim, Russia	1,325,000	.....	....
Spassky, Russia	795,200	902,720	..
Famatina, Argen.	....	......	..
Tilt Cove, Newf'd	.....	..	..
Exports from:			
Chile	8,960,000	8,512,000	6,048,000
Australia	8,288,000	8,064,000	7,616,000
Arrivals in Europe‡	14,114,240	20,200,320	8,518,720

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,164,144	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,31[illegible],240	66,146,229	61,449,650
VII	137,161,129	71,[illegible],381	60,121,331
VIII	145,628,521	78,7[illegible]2,418	70,485,150
IX	140,089,819	63,460,810	60,264,796

VISIBLE STOCKS

	United States	Europe	Total
X, 1911	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	63,065,587	107,408,000	170,473,587

receipts were in the fore, selling down to $6½, off two points. Although Davis-Daly was reported to have encountered an orebody 12 ft. wide and improving, averaging over 3% copper, this stock did not respond to the news with anything more than a fractional gain.

Assessments

Company	Delinq.	Sale	Amt.
Best & Belcher	Nov. 6	Nov. 25	$0.05
Black Bear, Ida	Sept. 26	Oct. 26	0.01
Black Horse, Ida	Oct. 18	Nov. 8	0.01
Bullion, Nev	Oct. 16	Nov. 6	0.03
Columbus Extension, Utah	Sept. 30	Oct. 23	0.02½
Eagle Mt. Ida	Sept. 23	Oct. 23	0.00
Eastern Star, Ida	Oct. 12	Nov. 12	0.002
Empire, Ida	Sept. 23	Oct. 23	0.002
Exchequer, Nev	Oct. 30	Nov. 20	0.03
Franklin, Mich.	Oct. 18	....	2.00
Great Eastern, Ida	Sept. 28	Oct. 28	0.002½
Hale & Norcross, Nev	Oct. 3	Oct. 24	0.05
Holy Terror, Ida	Oct. 18	Nov. 18	0.00¾
Hypotheek, Ida	Oct. 14	Nov. 4	0.01
Indiana, Mich	Oct. 16	....	1.00
Michigan Cop. & Gold, Utah	Oct. 2	Oct. 22	0.00¼
Oneco, Mich	Oct. 10	....	1.00
Ophir, Nev	Nov. 11	Dec. 9	0.15
Rhoade Island, Ida	Oct. 31	Nov. 30	0.00½
Savage, Nev	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev	Oct. 4	Oct. 25	0.02
Snowshoe, Ida	Sept. 30	Oct. 30	0.005
Temple, Ida	Sept. 30	Oct. 30	0.002
Union Con., Nev	Oct. 15	Nov. 6	0.15
Utah Ideal, Utah	Oct. 9	Nov. 10	0.0⅛
Yellow Jacket, Nev	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	.....	25.596	24.594	.....
November	55.635	55.719		25.680	25.649	.....
December	54.428	54.905	...	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	.....	12.370	.	55.170	. .
November	12.616	...	12.769	. .	57.253	.
December	13.552		13.768		62.068	. .
Year	12.376		12.634	......	55.973	. .

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.[illegible]	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.18[illegible]	43.9[illegible]	October	41.185	..
May	43.115	46.053	November	43.125	....
June	44.0[illegible]	45.815	December	44.655	..
			Av. Year	42.281	.. .

Prices are in cents per pound.

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265	.	4.139	......	15.332	. . .
November	4.298	.....	4.181	......	15.821	. .
December	4.450	.....	4.332	......	15.648	. . .
Year	4.420	.....	4.286	......	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	......	5.951	......	27.256	.....
November	6.380	.....	6.223	....	26.795	....
December	6.301	......	6.151	....	26.849	......
Year	5.758	......	5.608	.....	25.281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No. 2 Foundry 1911	No. 2 Foundry 1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	......	13.44	.....	14.34	.....
November	14.92	..	13.30	....	14.25	.....
December	15.15	. .	13.10	....	13.90	......
Year	$15.72	......	$13.94	.....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Oct. 15

Name of Comp.	Bid.
Acacia	‡.04
Cripple Cr'k Con.	.01
C. K. & N.	.17½
Doctor Jack Pot	.05¼
Elkton Con	.64½
El Paso	5.49
Findlay	.04¼
Gold Dollar	.18¼
Gold Sovereign	.02½
Isabella	.18
Jack Pot	05
Jennie Sample	.07
Lexington	‡.007
Moon Anchor	‡.007
Old Gold	03½
Mary McKinney	72½
Pharmacist	01¼
Portland	99
Vindicator	.82
Work	.01

SALT LAKE Oct. 15

Name of Comp.	Bid.
Beck Tunnel	08
Black Jack	07½
Cedar Talisman	00¼
Colorado Mining	.15
Columbus Con.	11
Crown Point	01½
Daly-Judge	5.75
Grand Central	62
Iron Blossom	1.20
Little Bell	‡.20
Lower Mammoth	06
Mason Valley	12.00
May Day	16
Nevada Hills	1.67½
New York	01
Prince Con	1.75
Silver King Coal'n	2.90
Sioux Con.	‡.04½
Uncle Sam	.11
Yankee	.14½

TORONTO Oct. 15

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	‡7.45	Foley O'Brien	.16
Hudson Bay	‡63.00	Hollinger	14.15
Temiskaming	36	Imperial	02¼
Wettlaufer-Lor	35	Pearl Lake	.25½
Am. Goldfield	‡50	Porcu. Gold	.21½
Apex	02¼	Preston E. D.	03
Crown Chartered	04¾	Rea	25
Dobie	‡20	Standard	00¼
Dome	22.00	Swastika	09¼
Dome Exten	.12¼	West Dome	‡16

SAN FRANCISCO Oct. 15

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.04	Belmont	9.50
Belcher	.27	Jim Butler	.70
Best & Belcher	04	MacNamara	.23
Caledonia	1.45	Midway	.52
Challenge Con.	.05	Mont.-Tonopah	2.12½
Chollar	.07	North Star	.37
Confidence	.42	West End Con.	1.75
Con. Virginia	39	Atlanta	.17
Crown Point	.31	Booth	.05
Gould & Curry	01	C.O.D. Con	.09
Hale & Norcross	.12	Comb. Frac.	.10
Mexican	2.70	Jumbo Extension	.34
Occidental	.70	Pitts.-Silver Peak	.91
Ophir	.46	Silver Pick	.08
Overman	.70	St. Ives	‡.30
Potosi	.03	Tramp Con	.03
Savage	11	Argonaut	‡2.00
Sierra Nevada	.28	Bunker Hill	‡4.50
Union Con.	.56	Central Eureka	.28
Yellow Jacket	.26	So. Eureka	‡2.90

N. Y. EXCH. Oct. 15

Name of Comp.	Clg.
Amalgamated	89⅜
Am. Agri. Chem.	58¼
Am.Sm.&Ref.,com	85½
Am. Sm. & Ref., pf.	107½
Am. Sm. Sec., pf. B	86
Anaconda	44¼
Batopilas Min.	1¼
BethlehemSteelpf	77
Chino	42⅜
Federal M. & S., pf.	46⅛
Goldfield Con.	2½
GreatNor.,ore.,ctf.	48⅝
Guggen. Exp.	58¾
Homestake	99
Inspiration Con.	20½
Miami Copper	27½
Nat'nalLead,com.	65½
National Lead, pf.	108½
Nev. Consol.	22⅜
Phelps Dodge	215½
Pittsburg Coal, pf.	95½
Ray Con.	21⅛
RepublicI&S,com.	33½
Republic I & S, pf.	91
SlossSheffi'd,com.	55
Sloss Sheffield, pf.	95
Tennessee Copper	43⅝
Utah Copper	63¼
U. S. Steel, com	77½
U. S. Steel, pf.	114⅜
Va. Car. Chem.	48¼

N. Y. CURB Oct. 15

Name of Comp.	Clg.
Barnes King	‡78
Beaver Con.	.41
Braden Copper	6⅞
B. C. Copper	5
Buffalo Mines	1⅞
Caledonia	40
Con. Ariz. Sm.	⅝
Davis-Daly	2⅝
Diam'field-Daisy	7
Ely Con.	21
Florence	80
Giroux	4⅝
Gold Hill Con.	5/16
Greene Cananea	10¼
Greenwater	04
Internat. S. & R.	‡124
Kerr Lake	2 11/16
Keystone	1⅞
La Rose	2⅛
McKinley-Dar-Sa	1⅞
Min. Co. of A. new	3
Motherlode Gold	‡15/16
Nev. Utah M. & S.	‡01
Nipissing Mines	8¼
Ohio Copper	1 11/16
Pacific Sm. & M.	9/32
South Live Oak	2
South Utah M. & S.	⅝
Standard Oil (Old)	1110
Stand'd Oil of N.J.	399
Stewart	1 3/16
Tonopah	6¼
Tonopah Ex.	2⅝
Tonopah Merger	1 1/16
Tri-Bullion	11/16
Tularosa	⅞
Union Mines	10
United Cop., pfd.	10
Yukon Gold	3 7/16

LONDON Oct. 16

Name of Com.	Clg.
Camp Bird	£1 6s 6d
Dolores	1 10 0
El Oro	0 14 9
Esperanza	2 3 1½
Mexico Mines	6 17 6
Oroville	0 5 3
Stratton's Ind.	0 3 1½
Tomboy	1 7 0

BOSTON EXCH. Oct. 15

Name of Comp.	Clg.
Adventure	7
Ahmeek	340
Algomah	4¼
Allouez	45½
Am. Zinc	33½
Ariz. Com., ctfs.	4⅛
Bonanza	.35
Boston & Corbin	6¾
Butte & Balak	3⅝
Calumet & Ariz	81
Calumet & Hecla	588
Centennial	20
Cliff	‡4½
Copper Range	58
Daly West	3¾
East Butte	16¼
Franklin	10
Granby	63
Hancock	26¾
Hedley Gold	‡20
Helvetia	.85
Indiana	16¼
Island Cr'k, com.	‡56
Island Cr'k, pfd.	88½
Isle Royale	35½
Keweenaw	2
Lake	34⅞
La Salle	‡5⅝
Mass	‡7
Michigan	1½
Mohawk	66
New Arcadian	3
New Idria Quick.	5⅝
North Butte	38¾
North Lake	4¼
Ojibway	3¼
Old Dominion	61½
Osceola	113
Quincy	86½
Shannon	15⅜
Shattuck-Ariz.	28
Superior	44¼
Superior & Bost.	1 11/16
Tamarack	46
Trinity	5¼
Tuolumne	2⅞
U. S. Smelting	48¾
U. S. Smelt'g, pf.	51¾
Utah Apex	2
Utah Con	13
Victoria	3
Winona	5
Wolverine	77
Wyandot	1½

BOSTON CURB Oct. 15

Name of Comp.	Last
Alaska Gold M.	9¼
Bingham Mines	5½
Boston Ely	1
Boswyocolo	.01½
Butte Central	7
Cactus	.10
Calaveras	2¾
Chief Cons	1⅝
Corbin	¼
Cortez	81
Crown Reserve	3¼
First Nat. Cop.	1¾
Majestic	46
Mazatan	‡½
Moneta Porc.	‡03
Nevada-Douglas	3 11/16
New Baltic	2
Oneco	2½
Raven Copper	.30
Rhode Island Coal	‡10
San Antonio	‡3
Smokey Dev.	2 7/16
S. W. Miami	6¼
South Lake	7
Trethewey	.30
United Verde Ext.	.44

‡Last quotation.

The Engineering and Mining Journal

Vol. 94 OCTOBER 26, 1912 No. 17

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres Rob't McKean, Secy
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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Leaching versus Total-Sliming

After many years' labor and study in devising and developing the total-slime method of cyanidation of gold and silver ores, there are still metallurgists who maintain that it is not able to return the profit that may be obtained by a separate sand and slime treatment. That this difference of opinion exists is a fairly clear indication that neither method is all that its adherents claim for it.

There are several points which must be carefully considered when weighing the merits of either of these methods for comparison with the other, and each of these points must be given due weight in a comparison of the merits of the whole. To consider one of these points without viewing it in the light of its effect upon other essential items of the treatment is to fall into expensive error, an error into which many have been led by the specious claims for a new and apparently efficient, though untried, process.

The cost of reducing an ore to an entirely slimed product is an important item and varies with the character of the ore under consideration. A soft ore might easily be ground to a point where it could be handled as a total slime, while a tough rock might require an expenditure so great to accomplish the same end, that it would be commercially impossible. It is as well to bear in mind that extremely fine grinding does not necessarily result in total slime; in fact, it is practically impossible to produce a total slime, as a true slime would be colloidal; but it is possible to grind an ore so fine that the product may be handled as if it were slime, and with about as good results, as far as extraction is concerned.

The degree of subdivision necessary to allow an ore to give up the commercial maximum of its contained metal is another point which must be considered in connection with the cost of grinding. Often it may be found that a comparatively coarse product will give up so large a percentage of its metal content by simple leaching that further subdivision would be a useless expense. Even if the ore has to be ground extremely fine, it does not necessarily follow that agitation of the product must follow. It is to be remembered that a clean sand is leachable even when it is so fine as to pass a 200-mesh screen. The leaching process has the advantages of cheapness of operation and the possibility of using stronger solutions than are permissible in agitation. The expensive part of leaching is in the handling of the sand, and this one item may, in some arid regions, make the process commercially impracticable.

It is not unlikely that improved mechanical methods and chemical processes may put one or the other of these systems in the lead definitely, but the question is not yet settled. It is a rather general opinion that the question has been settled in favor of the total-sliming method, but within the profession this is known to be not correct.

Iron and Coke

The remarkable expansion of the demand for iron and steel which has taken place during the present year has, apparently, not yet reached its limit; but it bids fair to be halted and circumscribed for the time being by an unexpected cause. The demand for pig iron, the basis of the industry, has come to a point where it seems difficult to satisfy it. It is not that blast-furnace capacity has been exceeded, for there are idle furnaces whose owners are willing to put them in blast under present conditions of active business, advancing prices and the general exhaustion of reserve stocks. Iron ore can be had, and there is no fear that sufficient supplies are not attainable. The trouble just at present is the scarcity of coke, which is the fuel with which nine-tenths of our iron is made. The proportions of iron made with anthracite, charcoal and raw bituminous coal are too small to be seriously regarded when we consider the total.

The main sources of supply for those furnaces which sell their iron—and for many which convert it into steel in their own mills—are in western Pennsylvania and in West Virginia. Considerable quantities are made in Alabama and Colorado, but they are made for the use of local furnaces and there is no surplus for sale. The same may be said of the various byproduct plants in various parts of the country, nearly all of which furnish coke for special groups of furnaces, and are controlled by the owners of those groups. Last year Pennsylvania made over 60% of the total coke output of the country, most of it in the Connellsville and adjoining regions. West Virginia made much less, about 7% of the total, so that Connellsville is the main reliance of the furnaces which have to buy their coke. The consequence of these conditions is a scarcity of the iron-making fuel and an extraordinary rise in its price.

These advances have come about rather suddenly. Three months ago the production in the Connellsville region had increased more than 50% over what it was at the opening of the year, but prices had advanced only to a moderate degree. At that time there was a sort of agreement among producers to ask $2.50 per ton for furnace coke at the ovens, but the buyers resisted it with so much success that many contracts were made at $2.25. Since then, however, so many furnaces have gone or are going into blast that much higher prices have been paid, though the production in the region has gone up to 400,000 tons weekly, the highest point ever reached. It cannot go much higher for a time; there are only a few idle coke ovens, and they cannot be started, since it is impossible to get the necessary labor. Coke for prompt delivery has been sold at $3.50 and even $3.75, while $3 and over is named for contracts. West Virginia cannot increase its production largely without building more ovens, and that will take time.

The fuel problem is rather a serious one for the blast furnaces and it cannot be worked out in a hurry, even though the advance in iron prices enables them to pay the greater cost of coke. Apparently the increased production of iron will be limited for a time, not because of diminished demand but by insufficient fuel supply. One ultimate result will probably be an increase in the number of byproduct-coke plants under the control of the ironmakers; and this will a desirable outcome.

Money Incomes and Cost of Living

Col. Robert W. Thompson, president of the Orford Copper Co., in a recent communication to the editor of the *Evening Post,* asked him, or some of his readers, to tell what would happen if the "bookkeeping wage" of every workman in the United States were doubled and the "bookkeeping income" of all who have incomes and salaries were also doubled. Colonel Thompson, unlike Judge Gary and Daniel Guggenheim, is an economist of no mean attainment. He goes on as follows:

> By "bookkeeping wage" or "bookkeeping income" I mean the credit given each month or each year to the individual, which is measured in dollars; whereas by the "economic wage"; or "economic income" I mean the real things, such as food, clothes, shelter, transportation, etc. Each year we have a fund of these things and each year they are all consumed. It seems to me that doubling the bookkeeping figure could have no effect upon the "economic wage"; in other words, if you double the nominal income of every individual in the country you would also double the price of everything. In the same way, I take it, that if you cut the "bookkeeping income" of everyone in country to one-half, you would not reduce the "economic income" a particle, for, after all, the "bookkeeping wage" or "bookkeeping income" is only the machinery to aid in the distribution of real things. I take it as nearly as I can make out that 85% of all the real things are consumed each year by people whose income is less than one thousand dollars a year. Can you increase the quantity of real things for everybody unless you increase the supply of real things?
>
> Each year we bring into this country a million foreigners, who must be fed, clothed, housed, and transported. This puts an abnormal demand upon our power of production. If all of these immigrants went to the land they would support themselves, but when they gather in the cities or along the lines of new railways someone else has to support them. The labor employed on the land has not been particularly efficient. In transportation and manufacturing we have been fairly efficient, and this is true of the wholesale distribution of the products; but the retail distribution is very inefficient. The much-abused Meat Trust for instance, makes about 2½% on its turn-over, whereas the local butchers and meat markets need from 40 to 60% on their turn-over to keep them out of bankruptcy.
>
> We hear a great deal about the high cost of living. Is not the real trouble in part due to the cost of high living and in part due to this abnormal increase in population, which puts an ever-increasing demand upon our supplies without providing an equivalent increase in the production. When this begins to pinch the workmen the trade unions step in and demand an increase in wages. They get an increase in the "bookkeeping wage," but it is impossible to give them an increase in the "economic wage" because the things that they desire do not exist.

The above views are, of course, the expression of good common sense. Everybody knows that when wages are raised the cost of supplies is raised, or *vice versa*, and things go round in a vicious circle. A cheap coat may make a cheap man, in the words of a martyred president, but if we could all buy our coats cheaper, we fancy that we should all be better off nevertheless. The conditions at Butte, Mont., are illustrative. The miners there receive high wages, but they have to pay 25c. to be shaved, 15c. to have their boots blacked, with other things more or less in proportion, wherefore they do not prosper greatly. A lot of Lake Superior miners went to Butte five or six years ago, but after an experience there were glad to return to Michigan to work for lower wages in dollars but higher wages in net results, as they learned. Those miners, we venture to say, possess now a better idea of economics than most. At the time of the recent increase in the wages at Butte, the shopkeepers received the tip that they must not increase their prices, the advance being intended for the benefit of the men.

Cyanogen Radical Determination

In giving an abstract of Anton Vorisek's paper on cadmium nitrate in acid-radical determinations, we believe we are presenting what will be of interest to the ordinary chemist, as it covers the separation of the AgNO group of Acid radicals, but of especial value to the cyanide chemist who may wish a quick method of determining CN, SCN, $Fe''(CN)_6$, and $Fe'''(CN)_6$ qualitatively.

The reports that efforts are being made to persuade miners in the Joplin zinc-lead district to go to Utah to take the places of striking miners there have doubtless some foundation in fact. It is not known yet whether they have had any success. Joplin is at present active, ore prices are high and the unemployed few in number.

By the Way

Daniel Guggenheim, upon his return from Europe last week, expressed himself as being still fearful of a runaway copper market. However, he is going to try to prevent it (along with other producers).

A letter from Ely, Nev., Oct. 17, gives the following concise account of the labor trouble there: "The strike is on yet here. Two Greeks killed this morning at the smeltery; they tried to enter the gates against orders, would not stop and were shot. Governor Oddie is here; the sheriff is running for reëlection; too much politics. Outlook bad."

The first steel produced in this country was probably made in Connecticut in 1728 by Samuel Higley and Joseph Dewey, according to the U. S. Geological Survey. Crucible steel was first successfully produced in the United States in 1832 at the works of William and John H. Garrard, at Cincinnati, Ohio. Bessemer steel was first made in this country in September, 1864, by William F. Durfee, at an experimental plant at Wyandotte, Mich., and openhearth steel in 1864 by the New Jersey Steel & Iron Co., at Trenton.

The varied character of the labor employed in the steel mills is shown by the complaints that many men are leaving the Pittsburgh district and Gary just when their services are urgently needed. The men who are quitting are Greeks, Bulgarians, Rumanians and others, who are moved by a desire to take part in the war in the Balkans. These men have found work readily in the steel mills, largely as helpers and laborers, and their number is considerable. The emigrants from Southeastern Europe, however, do not as a rule become assimilated or take root in this country; they retain a strong interest in their native lands—to which most of them expect to return some day—and they are easily moved to hasten that return, as in the present case, where the war feeling is strong.

To be president of several going promotions seems more lucrative than most occupations. According to the bill of complaint filed by Courtenay Crocker, counsel for complaining stockholders, Stephen R. Dow has received for at least three years as president of the Franklin Mining Co., a salary of $5000 per year, and at the same rate from four other companies, Indiana, North Lake, Algomah and the Corbin Copper Co. Other officers have received salaries in proportion from all five companies and, according to the complaint, conspired not only to pay these salaries to themselves but also violated the corporate rights in permitting a loan to one of its directors. In the suit, the restitution is sought of $76,400 loaned to Stephen R. Dow & Co., by the Franklin Mining Co. The lumping of cash and accounts receivable in the annual report made it impossible to tell how much cash the company actually had.

Winfield Scott Stratton, prospector, miner and carpenter of Colorado Springs, discovered the Independence mine at Victor in the Cripple Creek district, and took about $10,000,000 worth of gold out of it. He left a will providing a large sum for building the Myron Stratton home for the poor. For eight or nine years the executors have done nothing, but now by popular clamor they have been compelled to start building, and it is announced from Colorado Springs that the first 13 buildings, including the superintendent's home, two dormitories and ten cottages, will be completed by midsummer of next year at a cost of between $100,000 and $110,000.

According to press dispatches, rioting attended the attempt of the management of Nevada Consolidated to resume operations on Oct. 15. Strikers gathered around the entrances to the company's property and maltreated the men going to work. Only strenuous exertions by officers prevented riot and bloodshed. Anticipating trouble, the company had early rushed 350 men inside the stockade around the works, which is now operating under guard of 60 deputy sheriffs. A crowd of striking Greeks and Austrians armed with revolvers and clubs met 200 laborers going on shift Oct. 15, and drove them back to their cabins after a short fight in which clubs and stones were freely used. Several other encounters occurred between the strikers and company employees during the day. American mechanics are taking little part in the fight, and many of them are leaving the district. Industry is theoretically a peaceful and beneficent thing, but the practice at McGill is strenuous and savors too much of reports of fighting in the Balkans.

Several years ago the Illinois Geological Survey was complimented upon its accurate and practical work in pointing out the promising oil formations which were later developed into the Carlyle oil field. However, the medal for geological sharpshooting must be passed to the Michigan Geological Survey for the discovery of oil at Saginaw, Mich. Several years ago, former State Geologist Alfred C. Lane discovered the anticline under the city of Saginaw and repeatedly called attention to it in the publications of the survey. Doctor Lane reported that oil might be expected near the old Wiley mill, at a depth of 2325 ft. The Saginaw Valley Development Co., drilling as near as it could to the Wiley mill, struck oil at a depth of 2317 ft. According to State Geologist R. C. Allen, the oil stands in the casing at a height of 1200 ft. above the source, indicating a pressure of about 120 lb. per sq.in. after shooting; the initial yield will probably be from 25 to 50 bbl. per day. The oil was encountered in a sandy layer about 15 ft. thick in the Antrim shales. Beneath this horizon about 500 ft. lies the Dundee limestone, which is productive in the Petrolia and Port Huron fields. It is planned to sink into this formation.

So long as the copper-metal market holds strong, there will be no fear regarding Amalgamated's dividends, says the *Evening Post*. The recent quarterly increase of 0.25% calls for distribution to shareholders of $384,000 more than in the last quarter, when 1¼% was paid; but, as the increase in the Anaconda dividend last month turned into the Amalgamated's treasury an aditional $768,000, the advance in the Amalgamated rate seemed well warranted. Maintenance of a 6% rate will mean more than ever now the supporting of the copper-metal market against a break. Statistics on output and stocks must constantly be favorable; reports of "hidden stocks" must regularly be denied; optimistic interviews must appear at short intervals. A 6% dividend will require the payment of $9,240,000 a year to Amalgamated shareholders, instead of the $3,077,000 which has been paid since 1908. So long as copper is maintained above 17c., and Anaconda preserves its 12% dividend rate on the $76,875,000 stock which is in the Amalgamated treasury, the enlarged payments will be made. But all depends on maintenance of copper's price.

Germany has been growing restive under Standard Oil domination in its oil trade, and the government is devising measures to put an end to it. A bill has been prepared for this purpose and its provisions have been freely discussed, though it has not yet been introduced in the Reichstag. In effect this bill provides for a monopoly of the petroleum trade administered not by the government, but by a company which will be closely controlled by the government. The early publication of the bill was brought about by negotiations with the banks, which are expected to furnish the necessary capital. Some of its provisions are not yet fully settled, but the general scope and purpose are plain. The new company is expected to draw its oil supplies from Galicia, Rumania, Russia and independent producers in America. Its manager, it is said, will be Bernhard Durnberg, who was for some time minister of colonies, and who was previously known as a successful business man whose competitive methods were almost as aggressive and ruthless as those of the Standard itself. There is some talk at Washington of diplomatic intervention in favor of American oil producers, but it does not seem likely that such action would be any more successful than in the potash cases, the matter being one of internal regulation, in which Germany would not submit to any intervention.

Largest Direct Current Generators

Seven vertical waterwheel-type electric generators, which represent units of the largest capacity ever built for generating direct current, will be installed in the new plant of the Southern Aluminium Co. at Whitney, N. C. Each machine will have a rating of 5000 kw., delivering 20,000 amp. at 250 volts and operating at a speed of 170 r.p.m. Two smaller direct-current generators of the same type, rated 2500 kw. at 300 r.p.m.; two 1250 kva. alternators, having a speed of 514 r.p.m., with two 16-kw. exciters, and all necessary switchboards and controlling devices are also included in the installation.

The contract for all the electrical apparatus has been placed with the General Electric Co. and the installation will be one of the largest and most modern of its kind in the world. It is the intention of the Southern Aluminium Co. to push to completion the project now under way and to have in operation in the course of the next eight months a manufacturing plant that will turn out about 25,000 tons of aluminum annually.

The work at Whitney is in charge of **Dr. Paul Heroult**, an eminent French engineer, who is recognized as one of the most expert authorities in the world on the manufacture of aluminum, and who will operate the plant after completion. Although Doctor Heroult has been directing construction operations there but a few weeks, remarkable progress has been made, and it is confidently expected that the entire plant will be in readiness for turning out the product of the company by the middle of 1914. For partial description of the plant see the JOURNAL of Sept. 28, 1912, p. 585.

The immense machines, which will supply the electric current for the several operations of this vast industry, will be installed immediately over wheel pits and direct connected to vertical shafts of S. Morgan Smith turbines by forged-steel flanged couplings. Each 5000-kw. generator will weigh in the neighborhood of 150 tons, measure 22 ft. in diameter and extend 13 ft. above the floor level. The entire rotating element of the generators will be supported from an overhead thrust bearing. While the normal speed will be 170 r.p.m., they will be designed with provision for a safety runaway speed of 75% above normal. The wheel governors will be provided with remote electric control for both hand and automatic operation.

The establishment of the Southern Aluminium Company's plant at Whitney is transforming the site into a bustling city. While the construction of the plant is under way, it is anticipated that 2000 people will reside there, and 500 new concrete houses are being erected to accommodate the influx of population.

Glaciers as Prospectors

By H. W. Hardinge*

In a recent issue of a technical mining journal reference is made to geographical situation of minerals as being a basis for the valuation of such minerals. The article states as an illustration, "that ice at the North Pole has no value while it would be of immense value at the Tropics." Paradoxical as it may seem, especially in regard to its mineralogical reference, we admit the metaphorical truth yet practical falsity of the illustration cited. For the third time in one year I have been called upon to make investigations which would not have been necessary but for "the ice at the North Pole."

A recent trip to the iron mines of Lapland, 150 miles or more north of the Arctic Circle was a forcible reminder that the greatest of all prospectors is the glacier, carrying upon its back geological tools for its work in the form of immense boulders and fields of debris which finally work down, through, and under the ice to do its erosive prospecting. The modern prospector also carries his tools upon his back imitating his glacial predecessor.

It is true the glacier as a practical worker is not an economist, for it scatters outcrops and metal contents of veins and deposits far and wide, at the same time its work is no surface scratching, for it digs deep, carrying away mountains as easily as the modern prospector shoots away his outcrops, exposing ore and coal deposits which even the most advanced geological miner of today would hardly anticipate existing below primal "indications." The glacier has cut deep into the rocky storehouses of Alaska, scattering the country rock and gangue broadcast, detaching bunches of gold from the original matrix of rock, rolling them into nuggets which have been later covered by the tundra.

Tht miner of today is profiting by the work of the glacier, virtually "jumping its claim" as is evidenced in the silver and gold mines of Cobalt and Porcupine of Canada, where the "development" has exposed veins of native silver and gold, which still show the "first prospector's" tool marks, made years ago. Here again this first prospector and miner has scattered his winnings with the groundup rock formations, making the farm lands hundreds of miles to the south. This ancient prospector has exposed the remains of the tropical Carboniferous age of Spitzbergen in coal veins which preceded his own advent into the region of this present land of ice. Further to the south in the islands of the North Atlantic, where the raised plateaus attest to the effect of the glacial forces which cut great fjords through the superincumbent strata of igneous formations, veins of coal are found throughout these islands as vast conformable strata, showing but slight displacement. It provides evidence of an age in which carbonic acid practically formed the atmosphere, giving existence to the heat-forming elements locked beneath the "ice measures" of the present time.

It is more easy to understand the original occurrence of coal than it is to comprehend the vast quantities of iron ore which are today exposed in Lapland. In one deposit or vein alone, I computed as "in sight" over five hundred millions of tons, while double this amount is probably theoretically "in sight"; iron of a grade which no modern concentrating device can duplicate. This ore forms an immense hogback rising from the surrounding country to an elevation of nearly 500 ft. for over a mile in length before it disappears beneath the surface. The width varies approximately from 500 to 1000 ft. Surface developments and results of prospecting by diamond drills indicate a depth and quantity which will give the total mass a life of over 200 years, when mining daily shipments of 10,000 to 15,000 tons. The iron is of a purity and grade almost as incomprehensible as the quantity, for the average analysis of a one-year sample comprised of 3,800,000 tons, shows an actual average of a little over 68%, of a possible theoretical content of 72% of iron.

We Americans are apt to consider that we are materially ahead of the world in mining, at least in advanced ideas, but our Swedish friends are certainly capable of giving us "pointers" of which I hope to speak a few words in their praise in another short article bearing on this subject.

---

*Mining engineer and president, Hardinge Conical Mill Co., 50 Church St., New York.

The natural gas produced in the United States in 1911, according to figures compiled by the U. S. Geological Survey, was 508,353,241,000 cu.ft., valued at $74,000,000, as compared with 509,155,309,000 cu.ft. in 1910. Pennsylvania was the greatest consumer of natural gas in 1911, being followed by Ohio, West Virginia and Kansas in the order named. On Dec. 31, 1911, the number of productive wells in the United States was 28,428, of which 10,809 were in Pennsylvania, 4755 in West Virginia, 4717 in Ohio, 2633 in Indiana and 2004 in Kansas.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Illuminating the Cross Hairs in Mine Surveying

In the JOURNAL'S discussion column I notice space given to the question of illuminating cross-hair in underground surveying. The practice at the Copper Queen Consolidated Mining Co., Bisbee, may be of interest.

In transit work all angles are doubled; and as survey parties consist of but two men a small pent-house shaped lantern is used for illuminating one plumb-bob string, which saves extra trips. The lantern has slots for inserting a piece of frosted glass, candles are used for light. The lantern is made at the mine of heavy sheet tin and is approximately 8x6 in. The other plumb-bob string is illuminated by an acetylene lamp held behind tracing cloth.

MAXWELL C. MILTON.

Tucson, Ariz., Oct. 17, 1912.

The Bingham Strike

The editorial in the JOURNAL of Oct. 12, 1912, is not quite fair to the Bingham operators. I am sure that the JOURNAL did not intend or would not wish to do any injustice to them.

The following scale of wages went into effect at Utah Copper and other Bingham mines on Sept. 1, 1912, 17 days before the strike was called. Machine miners, $3.25 per shift of eight hours; machine helpers, $3; hand-steel miners, $2.75 and $3 (maximum to apply only to skilled hand-steel miners); muckers, $2.75; timbermen and timbermen's helpers increased 25c. per shift with maximum for timbermen of $3.25; hand trammers, $2.75; horse and mule trammers, $3; horse and mule helpers, $2.75; nippers, $2.75. All of these are for shifts of eight hours.

The Utah Copper Co. put the above scale into effect on Sept. 1, the same day as the other Bingham operators. Common surface labor at the Utah Copper Co.'s mine is paid $2. The Utah railroads are paying for similar kind of common labor to section men on desert divisions, $1.50; section men on mountain divisions, $1.60; special gangs laying rails, $1.75. The railroad men pay their own board in railroad construction camps in this region. I am informed that the ruling wages are $2.25 per day out of which men pay $5.25 per week for board; and in some cases $2.50 with 75c. per day deducted for board.

OPERATOR.

Salt Lake City, Oct. 17, 1912.

[We certainly did not intend to do any injustice to the Bingham operators or cast any reflections upon them, but simply to discuss certain economic conditions. The facts are that the Lake Superior mines raised wages last April, the Butte mines on June 1 and the Arizona mines a little later. The Bingham operators advanced wages by 25c. per day on Sept. 1, and the men struck on Sept. 18, because they wanted 50c., which the companies refused.—EDITOR.]

Caving System in Chisholm District

There has recently been completed in the JOURNAL[1] a series of articles on the development and method of working of the Nels mine, an imaginary but typical property on the Mesabi range in Minnesota. There are a few points not made clear and others which possibly might bear discussion.

The surface plant is situated over ore on an adjoining "forty." A case of this sort where the surface rights could be leased for the period of time necessary to mine out a property the size of the Nels is hardly typical. However, granting that it could be done, it would seem probable that the fee owners of this adjoining forty would permit the sinking of the shaft on their ground far enough from the line so that no ore would have to be left on the Nels to support the shaft. There are several mines on the range where this has been done, a requirement being that the shaft, station and head-frame be left in good repair for the company owning the ground occupied. The first article states that the shaft is placed as it is so that it "can be used for hoisting until the mine is completely worked out" but it does not explain how to mine the shaft pillar.

Another situation for the plant and shaft worthy of consideration is the northwest corner of the Nels. If the shaft were placed here it would be permanent with plenty of stockpile and timber-yard space requiring but little grading, and would be available for the whole of both properties. The owners of the forty on the west apparently do not intend starting operations until the Nels is finished and the Nels company probably could sell them the shaft and surface equipment when it is done operations. The disadvantage would be the extra extra expense of rock sinking and drifting.

Slicing is started at the west property line. Now at one mine on the eastern end of the Mesabi, having an overburden of glacial drift material of the same character as that of the Nels, the surface caved back 35 ft. in 140 ft. vertical when two subs were mined out. At another mine a shaft 70 ft. horizontally from the outer line of workings on the 130-ft. level was seriously injured by the pulling of the ground after this "sub" was caved. The shaft track and the timber spur at the Nels do not seem to be in a safe place as shown.

A pillar of ore wide enough to support a strip of ground for a timber yard probably 90 ft. across extends from the main shaft east across the forty. This pillar should be at least 160 ft. wide at the top of the ore, 150 ft. from surface, and is a large body of ore to be tied up until the rest of the mine is finished and to be mined out after the timber shafts are caved. Besides, leaving a block of ore standing in this way is not good mining unless absolutely necessary, for a considerable amount of ore is bound to be worn away by the surface material as it settles into the mined-out space alongside the pillar. Assuming it slopes one-fourth as much as the surface overburden in an equal vertical distance, or about 4½ ft. in 66 ft., there would be a loss of 10 tons of ore per linear foot of pillar exposed, or a total of over 26,000 tons. This could all be avoided if the timber yard were to be located near the main shaft. An extra compartment in the main shaft or a timber shaft close by would lower the timber for the whole mine. A 4½x5-ft. counter-balanced timber cage will handle the daily timber necessary for 50 gangs, working at the depth of 200 ft., in eight hours. A disadvantage of this plan would be the long tram necessary to get the timber to the working places, but a solution for this is mentioned later. There would be little circulation of air by this arrangement, but the three timber shafts as shown are not well located for ventilation anyway. One or perhaps two small air shafts, 4½x5 ft. inside, provided with ladders so that they could be used for emergency exits, should be sunk along the south line where they would last the longest, and one in the northeast corner.

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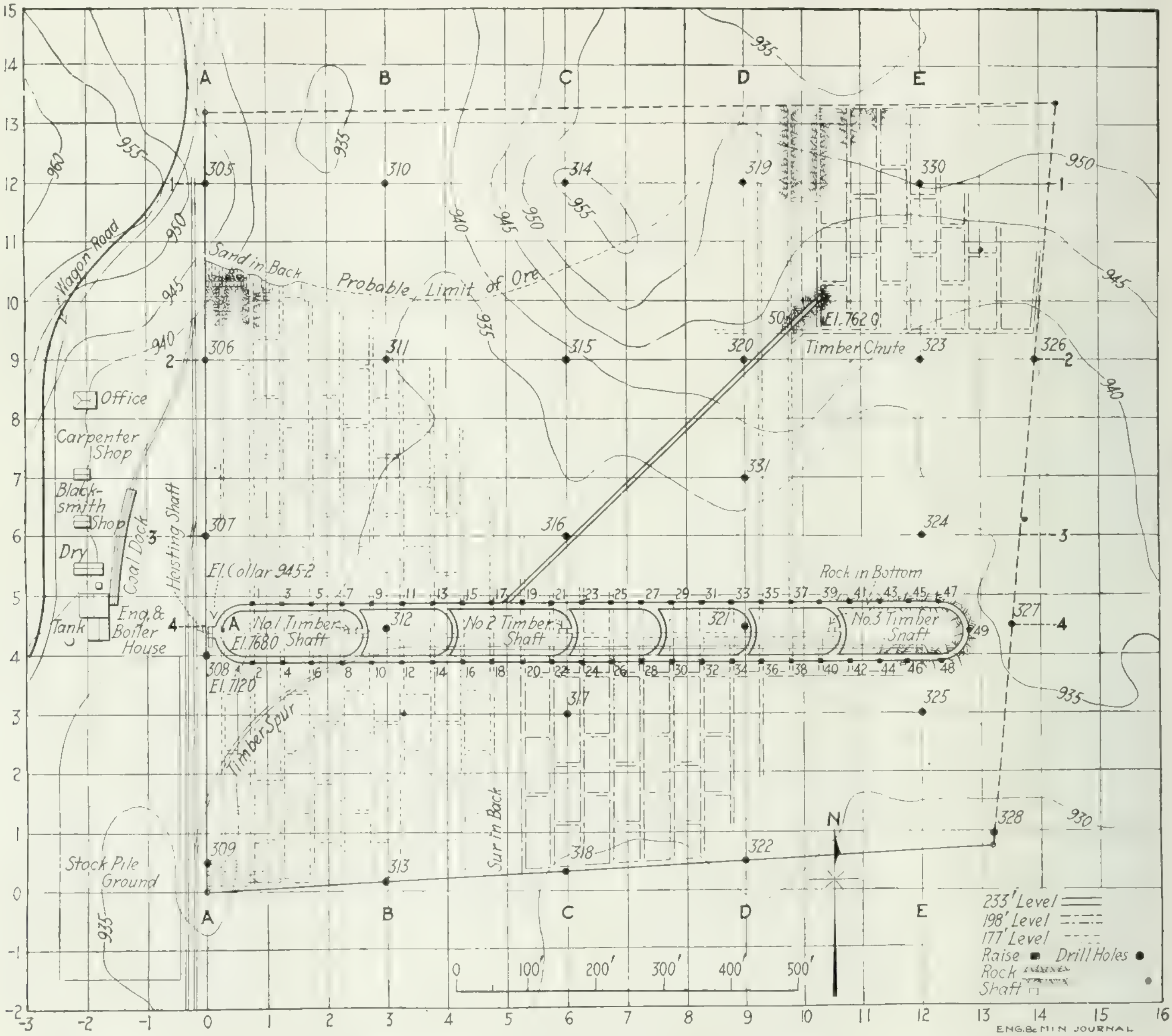
[1] Sept. 7, 1912, p. 437; Sept. 14, 1912, p. 511. Sept. 21, 1912, p. 559.

Going on to the layout of the main level, the article does not state the power to be used for haulage. It is probably electric as motors are usually used in mines of this size in this district and as the curved crosscuts would be unnecessary for mule or hand tramming. The main drifts on the bottom level are driven at 0.5% grade and at 1050 ft. in, strike rock in the bottom. At the east end the bottom level has 3 ft. of rock in the bottom. If the grade of the drifts had been changed on striking this rock so that they would clear it as shown by the drill holes then considerable dead work would have been saved and the last crosscut could have been at the east line instead of 75 ft. from it, making a material saving in the hand tramming necessary on the subs above. A 2½% grade would be necessary, but a motor can climb this for a short distance with a considerable train.



Map of Nels Mine, an Ideal Iron-ore Property

Slicing is started on the south side of the mine with a hand tram of 400 ft. and on the north side with a tram of 500 ft., while the motor haul is less than 100 ft. This could be avoided on the south side by driving lateral drifts 100 ft. apart off the main entry to the south line and putting up raises 50 ft. apart along them. Then the hand tram would never be much more than 100 ft. Besides the labor saved, the air would be much better, due to the circulation through the raises, and they would afford a convenient means for opening a new sub in several places at once. On the north side, however, the laterals would strike rock before they would be far enough in to be of any use. On this side the third sub above the main level could be made a motor sub and, according to the sections, would have 20 or 30 ft. of ore in the back. This sub should open to the timber shaft, so it can be used for distributing timber, and to raise *A* so the ore can be dumped directly from the motor cars into the pocket. Two 5-ton motors would probably be necessary because of the low chutes.

Trucks of timber for the south side could be spotted at the most convenient crosscut or some of these crosscuts could be laid out so that the motors could push the timber nearer the working places. But little extra work would be needed to install motor haulage on the subs for, I believe, tracks of 2-ft. gage are used on the subs in the Chisholm district. The longest hand tram on the north side would then be about 250 ft., while before there was a 550-ft. tram, as shown on Section *C*, and one of 800 ft. on Section *D*. When the ore above this sub motor level is mined out a second sub motor level two subs down and one sub above the main level would underlie much more of the remaining ore than the main level 12 ft. lower, which would not need to be opened up until ready for mining.

Todd Kennedy.

Gilbert, Minn., Oct. 19, 1912.

The Antimony Industry of China

By C. Y. Wang*

Antimony is found in nearly all of the southern provinces of China. The antimony industry of recent times was first developed under grants of monopoly, but these have now been canceled in most of the provinces.

Undoubtedly the natural sulphide of antimony has long been known to the Chinese porcelain manufacturers as a coloring material, under different local names. Antimony ore has been found in almost all of the southern provinces, namely, Hunan, Kwangsi, Kwangtung, Yunan, Kweichow, Szechuen, Fukien and Kiangsi; the last four provinces, however, are unimportant commercially. It has been reported that antimony has also been found in Anhwei and Chekiang provinces.

Mining Centers in the Southern Provinces

The mining centers of these provinces are:

For Hunan: Yiyang, Anhwa, Sinhwa, Supu, Chenki, Pasa.

For Kwangsi: Fengyi, Lungan, Pin, Hochi, Tienho, Ining.

For Kwangtung: Kok-kong, Yingtak, Tsingyun, Fongshing, Tingan, Yuyuen, Yanfa.

For Yunnan: Paoning, Kaihwa.

For Kweichow: Siushan.

The ore found is generally stibnite; this holds good in almost all of the districts, except at Fengyi, where the ore is composed mainly of senarmontite, Sb_2O_3. Alteration products—valentinite, senarmontite, kermesite and cervantite—are sometimes found in comparatively small quantities associated with the original sulphide. At the Kok-kong mines, situated from 20 to 30 *lis* directly west of the city of Shiuchow, the formation consists mainly of limestone, which is underlain by shale and sandstone. The whole region has been greatly disturbed. The general strike is east-west, and the general dip is to the south. The ore, in the form of pockets, occurs disseminated in the limestone. This deposit belongs to the type of epigenetic stocks[1] and undoubtedly originated from metasomatic replacement. It is similar to a few of the Wheaton River antimony deposits, Yukon Territory, as described by Cairness[2], and also perhaps to the antimony deposit at Ardèche, France.[3] One peculiarity of this deposit is that at the Tsar Lou Ting mine, the mining was at first confined to the clearing off of the surface soil, thus exposing here and there round balls of ore, ranging from a few inches to three or four feet in diameter, covered superficially with a thin layer of decomposed stibnite. These are known locally as Ma-tsai. Undoubtedly these round balls are remnants of former pockets in the limestone which has been eroded or dissolved away.

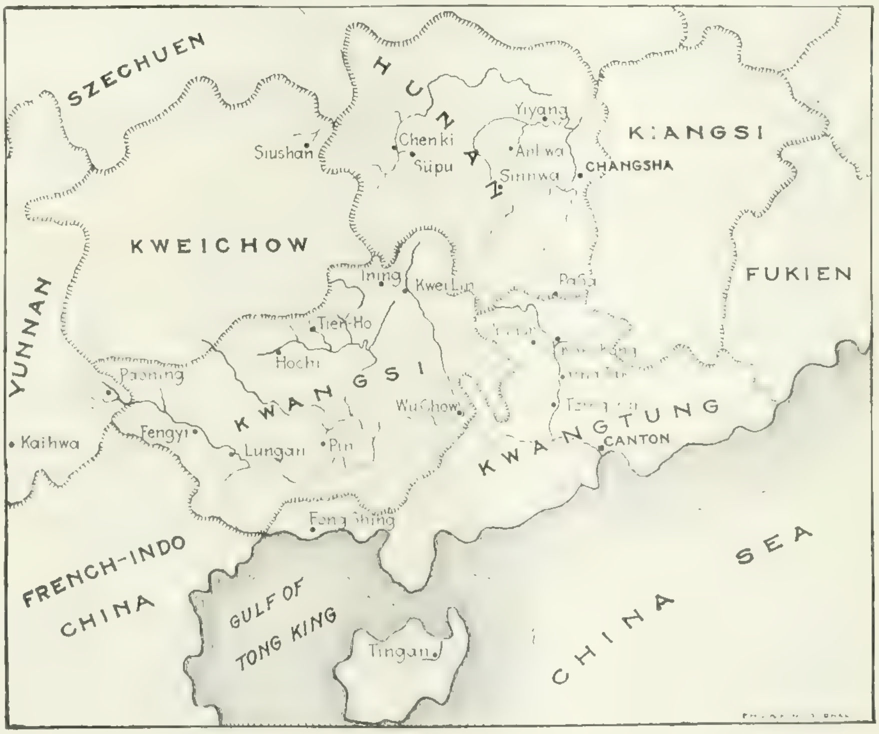
Ore Ranges from 20 to 60% Sb

I have seen specimens of ores from almost all the antimony-producing provinces. The ore in Hunan occurs mainly in quartz veins. The tenor ranges from 20% up to 50 or 60%. The low-grade ore is sometimes argentiferous, as well as auriferous. An analysis of this gives the following: Sb, 31.2%; As, trace (less than 0.1%); Cu, nil; Pb, trace; Fe, 0.7%; insoluble, 49.5%; Au, 15 dwt. 5 grains per ton; Ag, 11 dwt. per ton.

The ore from Kwangsi and Yunnan Provinces is found associated with quartz, slate or limestone. Probably the slate type is of sedimentary origin, similar to that found at Su Suergin, Sardinia, as described by Traverso.[4] The ore from Hoichi is sometimes argentiferous as well as auriferous, as shown from the following analysis: Sb, 45.88%; insoluble, 54.12%; Ag, 7.5 oz.; Au, 0.02 oz. per ton.

The Hunan Bureau of Mines Monopoly

Some years previous to 1896, the Hunan Bureau of Mines enjoyed the monopoly of exporting antimony ore, through foreign agents, to foreign countries. It was in 1896 that they entertained the idea of smelting the ore. In 1897, the Tai Shing Co. was formed, under contract with the Bureau of Mines, with a 10-year monopoly, to smelt the ore to crude antimony. The life of the monopoly was a short one. For the people soon got to know that the smelting business was a profitable one and, by mere force exercised by the local gentries, another smelting works was started in 1901 under the control of the Shan Yu company.



Southern Provinces of China, Showing Principal Antimony Centers

Thereafter company after company sprang into existence until there are at present more than a hundred companies were formed for mining the ore, and about eight smelting works, seven for crude and one for regulus. The smelting for regulus was started by me in 1908, when the Wah Chang Mining & Smelting Co. was formed with a capital of 300,000 taels, under grant of a 10-year monopoly, including a government subsidy; in the next year Chinese regulus was for the first time quoted in the London market.

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*Care of Board of Industries and Commerce, Canton, Kwangtung, China.

[1] "Antimony," by C. Y. Wang; Charles Griffin & Co., London, 1909, p. 47.

[2] "The Wheaton River Antimony Deposits, Yukon Territory, Canada," by D. D. Cairness; Canadian Min. Inst., 1910, Quart. Bull. No. 10, pp. 177-188.

[3] Vide "Antimony," by C. Y. Wang, p. 152.

[4] Ibid. p. 53.

The concentration plant for lead and zinc ore, owned at present by Carlowitz & Co., in Hankow, belonged once to a Mr. Laidrich who tried to concentrate antimony ore. The crude smelting works, belonging to a joint company of Chinese and Japanese, stopped operation about 1908. It was in the same year that a german firm, Gomes & Co., started a crude- and regulus-smelting plant. The undertaking has apparently proved a failure.

Antimony ore was discovered in Kwangtung Province about the year 1896; but it was not until the next year that operation began. The mining continued until 1899, when a lawsuit drew the attention of the Canton government, which under the notion that the ore was used for manufacturing explosives, at once prohibited its mining. However, in the next year, mining was resumed in the form of a monopoly under government control. This continued until 1910 when I obtained permission to form a limited company, the Pao Chang Mining & Smelting Co., with a capital of $200,000 (silver currency) half of which belonging to the government, for the purpose of mining and of smelting the ore to regulus. Owing to mismanagement, I severed my connection with the company at the end of the year, the smelting works were never erected and the company went into bankruptcy. At the beginning of 1912, the antimony monopoly was discontinued by order of the Bureau of Industries and Commerce.

Kwangsi and Yunnan Province Monopolies

The Kwangsi governor, wishing to make the antimony industry a provincial monopoly, sanctioned, in 1906, the erection of a government smelting works at Wuchow with a fund of 200,000 taels. It commenced operation in the next year and continued until the early part of 1909 when it had to stop working; owing partly to technical difficulties and partly to the declining market. I was then asked to assume charge as managing director, the Pao Tai Mining & Smelting Co. was formed and is still in operation.

In 1910 the Pao Wah Mining & Smelting Co. was formed with a capital of 200,000 taels, and under grant of a monopoly in the Yunan Province. Several years previous to this date, small quantities of ore found their way out through Wuchow. The Pao Wah smelting works has never been started and the company, owing to the present unsettled condition, has been temporarily dissolved.

The antimony production is shown in the accompanying table. These figures[5] are taken from the annual reports of the Chinese Maritime Customs.

CHINESE ANTIMONY PRODUCTION

(Long Tons)

	Canton	Wuchow		Yochow		Changsha		
	Ore	Ore	Regulus	Ore	Crude	Ore	Crude	Regulus
1900	.	237				. .		.
1901		71	.			. .		.
1902	.	. .	. .	200	1795	.	.	. . .
1903		. .	. .	2438	4554	.		. .
1904	473	. .	. .	1370	3265	224	851	. . .
1905	261	. . .	. .	340	1487	1774	1679	. . .
1906	292	. .	.	1199	733	2271	2375	. .
1907	504	. .	.	2758	666	3092	1751	.
1908	142	.	3	1128	1903	853	5956	. . .
1909	51	41		1964	974	1101	5542	240
1910	5	115	19½					.

Cadmium Nitrate in Acid Radical Determination

The use of cadmium nitrate as a reagent to separate the anions of the second ($AgNO_3$) group of acid radicals was discussed by Anton Vorisek, of New York, at the International Congress of Applied Chemistry. These anions are Cl, Br, I, CN, SCN, $Fe''(CN)_6$, $Fe'''(CN)_6$, and S. The attempt was made to remove the last three as these interfere with the ordinary methods of determination, but most reagents also completely remove CN with them. Cadmium does not do this quantitatively, but under conditions as described below leaves four-fifths of the CN ions in solution where they may be determined later.

Procedure

For the preliminary tests, take three small portions, 0.5 to 1 c. c. To one add KOH to alkalinity, dilute with water, and add a dilute solution of $Na_3(NO)Fe(CN)_5$ [sodium nitroprussiate]. The other two are acidified with HCl, and one tested for $Fe''(CN)_6$ with $FeCl_3$ (which will also test for SCN at the same time, as its presence is shown by a deep-red color), the other for $Fe'''(CN)_6$ by $FeSO_4$ solution. If any or all are present proceed as follows:

Neutralize about 10 c. c., of the solution, with KOH or HNO_3 as necessary. Add an excess of 10% $Cd(NO_3)_2$ solution and add KOH solution to faint alkalinity. Neutralize the excess KOH with a few drops of $Cd(NO_3)_2$ solution, or of dilute acetic acid, dilute, and heat on steam bath for five or 10 min. Filter hot and reject precipitate. With $Fe'''(CN)_6$ present, the filtrate may contain traces. To remove them, add a few drops H_2SO_3, heat to boiling, and filter.

Tests on the Filtrate

Test one-fourth the filtrate for CN by adding $FeSO_4$ and KOH, heat, add a drop of $FeCl_3$; and acidify with HCl. SCN may interfere, but can be eliminated by $HgCl_2$ solution. Acidify the remainder of the filtrate with dilute HNO_3, and treat for the detection of Cl, Br, and I as usual.

The author also points out that citric and tartaric ions, when the customary calcium-salt precipitations are interfered with by ammonium acetate or thiocyanate, may also be precipitated by cadmium nitrate.

Miners' Wages

The Bureau of the Census has recently published some advance sheets covering mining in the United States, from which we abstract a table showing the number of mines, the wage earners employed therein, the total wages paid during the year, and the average yearly wage. As in all statistical work, the average is a figure requiring some explanation. The amount of wages paid is the gross expenditure, as shown by the records of the operators, and should be correct.

MINERS' WAGES

Industry	Mines	Wage Earners	Wages	Av-An-nual Wage
Anthracite	423	173,504	$92,317,659	$532+
Bituminous.	6013	569,789	294,196,488	516+
Copper..........	368	53,143	49,382,979	929—
Iron	483	52,230	29,731,456	570+
Prec. Met. Lode..	2845	33,316	30,868,371	918—
Prec. Met. Placer	880	4,199	2,669,574	636—
Lead and Zinc	1142	21,603	10,477,657	485+
Phosphate.	153	8,186	3,215,661	393
Gypsum	222	3,778	1,820,877	482
Sulphur	4	408	324,538	795

The number of miners is, however, not the average number of men employed during the year, but is the number employed on Dec. 15, 1909, or the nearest representative day. In the copper and precious-metal mines this number coincides with the minimum employment of the year, while in bituminous-coal mining and lead and zinc mining it corresponds to the maximum. Consequently any average wage computed on the basis of employment as of Dec. 15, 1909, would, in the bituminous-coal and lead and zinc industries, be too low, while in copper and precious-metal mining it would be too high.

To the average wage we have therefore suffixed the signs + and —, indicating that the wage is probably higher or lower respectively than the amount shown. The saving between maximum and minimum employment is greatest in the lead and zinc mines, the minimum being 83.4% of the maximum; next comes bituminous-coal mining, 85.2%; while the swing is least in anthracite mining, where minimum is 95.8% of maximum.

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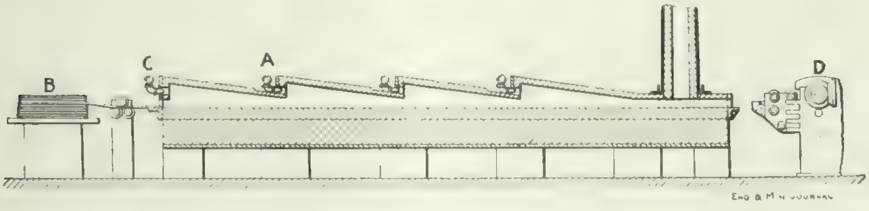
[5] It should be noted that these statistics do not agree with those published in "The Mineral Industry," possibly due to difficulties in translation or in construing the report of production in which Mr. Wang should have all the advantage.—Ed.

The salaried employees are excluded from the list, both in numbers and amounts paid, but even then the figures are averages of the wages of the engineers and mechanics employed around the mines, the common laborers, and the boys employed, although less than 1.7% of all the labor in American mines is under 16 years of age. Of these boys, about 40% are in the coal-mining industry, and over five-eighths of them are employed above ground. The figures given refer only to producing mines of the United States, no account is taken of the non-producers.

Multiple Fired Continuous Furnace

An oil-fired furnace of novel construction is being used at the Republic Iron & Steel Co's. plant at Youngstown, Ohio, for heating rods for making railroad spikes, although the idea is capable of extension to sintering furnaces, for continuous furnaces for general rolling-mill use, glass furnaces, etc. There were three furnaces of this type in use in April, 1912.



Multiple Fired Continuous Furnace

The construction consists virtually in having a number of reverberatory hearths in tandem, as shown in the illustration. Gaseous or liquid fuel may be used. The furnace at the Republic's plant is 9½ in. wide, 12 in. high at the burners, and 5 in. high at the "verbs," so that its appearance when fired is that of an incandescent tube. The furnace is the invention of Peter J. Gordon and Ralph T. Prall, of the Republic company, and is covered by U. S. pat. 1,021,144.

Deep Drainage Plan for Cripple Creek

Denver Correspondence

As stated in a previous issue of the Journal, a deeper drainage tunnel for Cripple Creek has already been considered. Now a new idea has been promulgated which is certainly well worth looking into, and that is, the sinking of a deep shaft from the level of the present tunnel and driving laterals from it to tap the known watercourses, the water to be raised by electric pumps. It is believed by some engineers that the cost per annum would not be greater than the amount of interest and depreciation as figured on the cost of driving another tunnel which would be approximately $500,000 as against the comparatively small cost of sinking a shaft and driving laterals.

Effect of Standard Oil Dissolution

Washington Correspondence

Attorney-General Wickersham has been making inquiries into the present condition of the business of the country in the production and selling of crude oil and the sale and distribution of refined oil and its products, as affected by the decrees of dissolution in the Standard Oil case. He has already asserted on several occasions the fact that the decree in that case gave precisely the relief which Mr. Roosevelt's attorney-general and his able assistant, Frank B. Kellogg, sought in the bill filed at St. Louis. Mr. Kellogg himself, on more than one occasion, has declared that Colonel Roosevelt's statement that nothing had been accomplished by the decree was wide of the truth, and in Mr. Kellogg's annual address before the American Bar Association, at Milwaukee, in August, 1912, he said:

> I believe absolutely in the justice, in the soundness and in the economic necessity of the decisions in the Standard Oil and Tobacco cases. . . . The judgment . . . put an end to all the long list of unfair methods of competition used for the purpose of crushing out and destroying competitiors; it severed the holding company, separated the subsidiary corporations and prohibited them from being thereafter managed as one harmonious whole, and thereby deprived them of the power to control the commerce of the country. To the smaller corporations and individuals engaged in the business, it brought protection from the control and domination of the great combination and today the independent manufacturer in the oil industry is enjoying the right to engage in business with a fair opportunity to compete.

For the purpose of ascertaining the views of representatives of the independent dealers on this latter point, the attorney-general some days ago wrote to C. D. Chamberlain, who is secretary and general counsel of the National Petroleum Association, an association of a large number of independent refining companies, embracing practically all the companies not connected with the Standard Oil Co. and its subsidiaries, asking that he furnish as accurate information as he could concerning the present condition of the oil business as contrasted with its condition prior to the decree against the Standard Oil combination in May, 1911. Mr. Chamberlain has replied to that inquiry in the following letter:

October 10, 1912.

Hon. George W. Wickersham,
Attorney General,
Washington, D. C.

My dear Sir:

I am in receipt of your letter of Oct. 9, in reply to which I would state that it is not easy to draw a sharp line for the purposes of comparison between the conditions of the oil business at the date to which you refer, when the Supreme Court decided the Standard Oil case in May, 1911, and the present time, because the effect of the Government's prosecution of the Standard Oil combination began practically with the filing of that suit in November, 1906; and from that date the practices of the Standard Oil combination in large measure ceased to be predatory, and the independent dealers began to have a chance to live.

This condition continuously improved during the pendency of the Government's suit, and that improvement has continued since the decree of dissolution, so that it may be safely stated that the giving of rebates upon which the Standard Oil monopoly was built up has ceased, preferential rates are few and far between, disclosure of information by carriers of competitive shipments is no longer practiced, price-cutting below cost to kill competition is rare, and many other unethical commercial practices have become so infrequent as hardly to cause complaint. Now, however, the independent manufacturer and refiner of oil is able to conduct his business with a fair share of profit reasonably due him, and without the fearful handicap under which he labored before the Government's suit was brought.

In 1906 returns from the oil industry show that the Standard Oil combination controlled about 84% of the entire oil business of the United States, and the remaining 16% was distributed among the independent companies. The most accurate data which I have been able to secure show that at the present time the independent companies control 34%, exclusive of California, where, I am informed, the independents control nearly 60 per cent.

One other practical result of the Government's prosecution and decree is shown in the increased prices secured by producers of crude petroleum. The total production for the last five years (stated in millions) was: for the year 1907, 166,000,000 bbl.; 1908, 178,000,000 bbl.; 1909, 183,000,000 bbl.; 1910, 209,000,000 bbl.; and 1911, 220,000,000 barrels.

You will, of course, recall that it was never the policy of the Standard Oil combination to own the oil wells, and their actual ownership was but a trifling percentage of the whole, being not more than 12% in 1909—the latest data that I have. Their policy was to control transportation, and by controlling transportation and the enormous volume of business in the refined product, they fixed the price of crude at figures which they chose to give. Since the date of the degree of dissolution (May, 1911) the price of crude oil has advanced from

44c. to 70c. a barrel in the Mid-Continent field, from 55 to 87c. in the Illinois field, and from $1.30 to $1.60 in the Pennsylvania field—those being practically the large fields of production of refinable oil. Of course, these increases in the price of crude, which benefit the producer of the crude, and not either the Standard Oil companies or the independent refining and marketing companies, have resulted in a somewhat increased price of the refined products, added to which the enormous increase in the demand for gasoline in the United States materially contributed.

Of course, too short a period has elapsed since the disintegration of the Standard Oil combination to estimate accurately the full effect of that decree, but it is very apparent to everyone engaged in the oil business that the independent companies have today an unrestricted and uncontrolled opportunity to carry on their business without unfair, secret and oppressive competition on the part of one great rival, than they have enjoyed for years past. This of itself is a tremendous and significant result which has been brought about, and could only have been brought about by the Government's prosecution. With this opportunity and insurance of its permanence growing competition will benefit the public in natural course and as a necessary result, and a monopoly of the business be impossible.

Yours very respectfully,
(Signed) C. D. Chamberlain.

Broken Hill South Silver Mining Co.

The Broken Hill South Silver Mining Co. reports that for the half year ended June 30, 1912, dividends amounting to 60% have been paid, an allowance made for depreciation, and a balance carried forward to surplus. The concentration process has given better recoveries than ever, the results being as shown in the table:

CONCENTRATION AT BROKEN FILL SOUTH SILVER MINING CO.

Product	Net Weight	Proportion	Assay value			Metal contents			Proportion of Metal contents		
	Tons	%	% Pb	Oz Ag	% Zn	TonsPb	Oz Ag	TonsZn	% Pb	% Ag	% Zn
Concentrates....	26,630	16.1	70.0	23.2	5.9	18,652	617,178	1,572	78.8	57.5	7.0
Tailings Zinc .	125,294	75.6	2.9	3.0	15.4	3,674	378,921	19,322	15.5	35.3	85.5
Tailings Quartz	160	0.1	1.9	1.5	7.1	3	240	11			
Slimes .	13,448	8.2	10.1	5.7	12.7	1,350	77,104	1,703	5.7	7.2	7.5
Totals	165,532	100.0	14.3	6.5	13.6	23,679	1,073,443	22,608	100.0	100.0	100.0

Working costs per ton of ore have been: Mining, $3.13; filling depleted stopes, $0.35; development, $0.39; concentrating, $0.91; total, $4.78. Concentration was 6.2: 1, making the costs per ton of concentrates, $30.352.

Mineral Production of Tasmania

The report of the minister of mines of Tasmania states that the gold production for the half-year ended June 30 was 21,300 oz. Silver-lead ore mined was 43,889 tons, the metal contents of this ore not being given. Copper included 2830 tons blister copper and 592 tons classed as copper ore and copper. Tin ore produced was 1610 tons. The minor metals included 27.29 tons tungsten ore from five mines; 4.29 tons bismuth, all from the Shepherd & Murphy mine; 550 oz, osmiridium from the Savage River district. The coal mined was 26,112 tons. The total value of the mineral product was £723,147 for the half-year.

The average number of men employed during the quarter ended June 30 was 5538, of whom 5448 were white men and 90 Chinese. Dividends paid by mining companies for the second quarter were £94,561, of which £906 was paid by one coal company; £7996 by two silver mining companies; £40,593 by three tin mining companies, and £45,066 by one copper company, the Mount Lyell.

Utilizing Natural Gas

With the idea of establishing the facts as to meter operation and efficiency of combustion of gas under varying conditions of pressure, experiments were carried on at the University of Kansas, the results of which are repoted by P. F. Walker in the Bulletin of the University of Kansas, July 1, 1912.

Pressure, temperature and volume are the three characteristic properties of gases. Since all measurement of gas is by volume, the chief concern is with the effect of pressure and temperature change on volume. After a consideration of all influences, the conclusion is reached that varying pressure within the limit possible in gas-distributing systems is a negligible factor in its effects upon the theoretical heat value of the gas. In using gas, however, the theoretical heat value is but one of several factors influencing its value as a heat producer.

Two other important factors are: (1) the supply and mixing with the gas of the proper amount of air to furnish the requisite oxygen for complete combustion without which the full heat value will not be generated; (2) the handling of the heated gaseous products of combustion so that the generated heat may be effectively utilized. The latter point is one mainly of the consideration of designers and builders of furnaces and stoves. All users of gas have the manipulation of the air-opening into mixers in their power, however, so that a consideration of the requirements at that point is of great importance. Air should be thoroughly mixed with the gas before the point where ignition occurs is reached. One cubic foot of gas requires about 9.5 cu.ft. of air for complete combustion Furthermore, the velocity imparted to the air is but 1/50 to 1/30 that of the gas itself. It follows, therefore, that the air opening should be from 300 to 500 times as great as the gas orifice.

When the gas pressure diminishes conditions are changed. The best rule of action in adjusting the mixer is to make the air opening as large as possible when adjusting for high pressures, and as small as possible when adjusting for low pressures, being guided by the color of the flame in all cases.

The two steps in which efficiency may be affected are: (1) the generation of the heat and (2) the imparting of this heat to the substance which it is desired to have heated. Three elements have determining influences upon this passage of heat, namely: the area of surface exposed, the time the gases are in contact with the surface and the difference between the temperature of the gases and the substance being heated. When running a fire low in mild weather, a single burner with comparatively long flame gives better efficiency than two or more burners with shorter flame in cases when this shorter flame fails to reach the heating surface by any appreciable amount.

The only feasible method of measuring the amount of gas used by consumers is by meters through which the gas passes, registering the volume. As a result of tests, it is shown that two variables enter into the problem, namely, pressure and rate of flow. The rate of flow affects accuracy for the probable reason of the greater drop in pressure produced while the gas is passing the meter. The pressure difference tends to produce leakage past the valves and would serve to make the meter register low. Another effect of high velocity is that rapid motion of meter parts and especially the rapid filling of the flexible pockets might serve to give the recording mechanism the necessary impulse before the pocket could be entirely filled. This tends to make the meter register high. The rate of flow was found to be by far the more active agent in influencing accuracy.

Of the four types of meters tested, three showed increasing errors as the rate of flow increased. Therefore when the rate of flow is increased the consumer pays too much or too little, according to the type of meter, if the meter is adjusted to accuracy at the lower rate. The more just method would be to adjust the meters for accuracy at an average rate of flow. Meters have individual idiosyncrasies and need with consideration of the average rate of flow.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Some Details of [*]Mesabi Range Mining

By E. W. R. Butcher

The orebodies on the Mesabi Range are generally outlined according to the results of drill holes, and the probable positions of sublevels determined upon; each sublevel represents about 12 ft. of ore. The first main level is usually driven from the shaft about 60 ft. below the top of the orebody, thus allowing five sublevels between the main level and the roof. Other main levels are driven from the shaft at intervals of 60 ft. Two main drifts are driven 100 ft. apart, about parallel to the major axis, and in the center of the orebody. These are connected every 200 or 300 ft. by means of crosscuts. Other crosscuts are driven to the limits of the orebody from the outer side of the main drifts, 100 ft. apart. As these crosscuts advance raises are put up to the top of the ore at intervals of about 100 ft. A sample of the ore in the raise is taken every five feet before cribbing-up and a careful record kept of these analyses for future estimates. When the probable extent of the sublevel is determined from the drill holes and raises, a layout is made and the ore mined accordingly. Tramming drifts are driven along the raises and from these drifts crosscuts are driven at intervals of from 30 to 50 ft. in the block of ore to be mined. These extend to the limits of the orebody. The pillars are now taken out by slicing either in a straight line or in step fashion.

When a room shows weight, as indicated by timbers breaking and cracking, the slice being worked is finished and the side of the pillar along the slice is boarded up. A bulkhead is built in the crosscut where the last slice was taken and the room, which may be from one to five slices wide, is blasted by shooting out all posts, except those to which the boards have been nailed. The room then fills and the slicing is continued, the boards and the bulkhead keeping the caved material separate from the ore. Boards lapped end to end are placed in the bottom of the slices and drifts, at every set, as the working place advances; this keeps the caved material separate from the ore below.

It is essential not to do any work on a sublevel until the ore above has been removed, as any drifts that are driven will be badly crushed when the sublevel above is worked and a large amount of extra timber will be necessary for its support. In developing a sublevel it is important to drive the main drifts and crosscuts so that the grade will favor the loaded car.

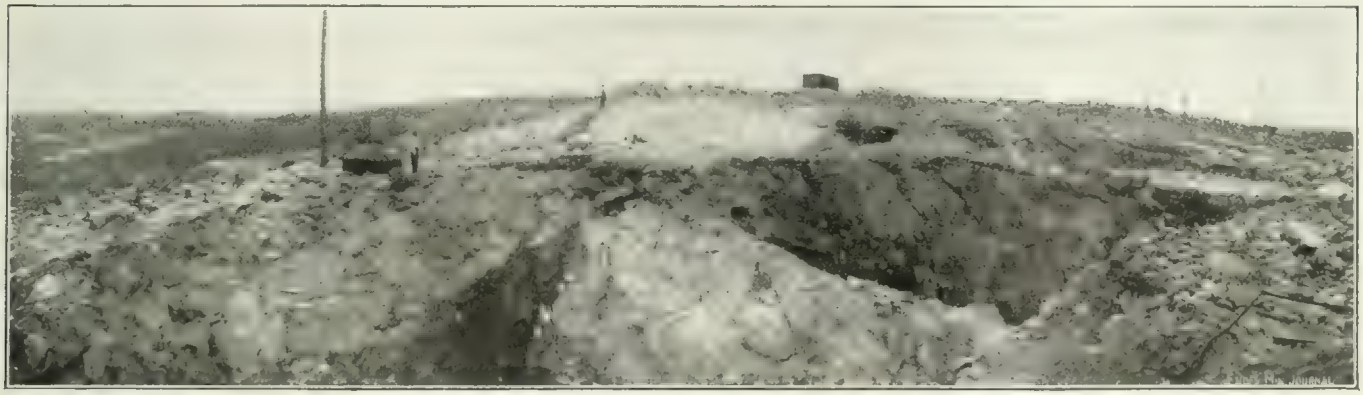
Slices and drifts are as a rule cut about nine feet wide, except on main levels where they are 10 ft. or more in width. The timbering reduces this width about two feet in each case. Sets are placed five feet centers except in special cases. In some cases a drift will weaken and crush and it is necessary to put in extra sets (lining sets) and props. No timber is recovered.

The structure of the ore varies in the same mine and in different mines. Most of it is soft enough to allow easy drilling with a hand auger, while some is hard and requires machine drilling. Dynamite of 30% and 40% strength is used in blasting. Miners work by contract and are paid by the car of ore mined or by the number of feet of drifting done.

Open Cut Work at the Dome Mine, Porcupine

The Dome Mines Co., Ltd., of Porcupine, is doing some open-cut mining that is worthy of attention. There is an elaborate system of cross veins of quartz running in all directions through a country rock of schist, and within a certain zone of mineralization the rock is all rich enough to be milled. In order to recover this ore at a minimum cost it is being mined by the "glory hole" system.

There is a drift at a depth of 100 ft. under this orebody and crosscuts radiating from the main drift. At intervals of 50 ft. chutes are put in from the surface to the drift and to the crosscuts. The chutes are large enough to take care of ordinary boulders resulting from blasting away the rock at the surface. The rock is blasted from the surface into these chutes, beginning wide at the surface and working on such an incline that the broken rock will fall down without much assistance. The openings of the surface will run together and eventually all the pay ore will be mined in this way to a depth of 100 feet.



Glory Hole System of Mining, Dome Mine, Porcupine, Ont.

Air pipes are distributed over the surface at convenient intervals and air drills are connected with them. The drills in use are one-man machines of the Butterfly type. They are satisfactory, the only difficulty being in getting steel that will stand the work. The cars are run underground in such a way that there is no interference with the regular work. Empties are run in on one track, stored in dead ends of the crosscuts until desired, and then run out into the drift. The empties are drawn in by a mule and the full cars are also drawn out by the mule and delivered at the incline station, where they are taken in tow by the hoist which draws the cars up a slight incline to the surface and into the crusher house. The whole system is simple, the rock breaks easily, and the operation is inexpensive. Large boulders which cannot be broken by one man with a hammer, are blockholed and broken with a small powder charge. The photograph shows three of the glory holes.

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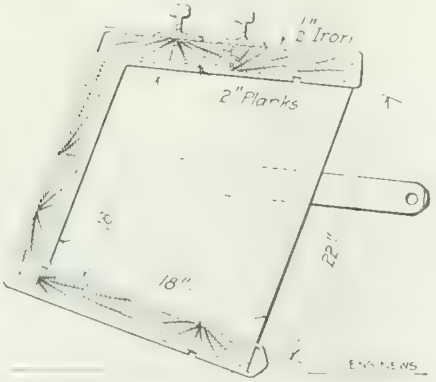
[*] Mining engineer, Gilbert, Minn.

Leveling Dredged Ground at Oroville

The gold-dredging industry of California has given rise to a method of leveling ground that offers possibility of a considerably more general application than has been developed to date. The method, by the electric drag scraper, was originated in the Oroville field, where one of the dredging companies was required by the municipality to restore to an approximately level surface the ground that it had dredged within the city limits. Although some such leveling had been done by means of horses and scrapers, prior to the development of the electric drag scraper, it had been on small tracts only, and the cost had been almost prohibitive when the acreage involved amounted to more than one or two, or possibly three acres.



SECTION THROUGH BUCKET USED ON ELECTRIC DRAG SCRAPER

The equipment for the electric drag scraper, described by James C. Bennet (*Engineering News*, Oct. 17, 1912), consisted of a winch, motor, transformers, drag scraper, hauling and back lines, and snatch blocks. The winch was of the type commonly used on gold dredges, having been taken from a dismantled dredge. It was driven by a 50-hp. motor, through one belt and two gear reductions, giving a rope speed—both lines—of about 130 ft. per min. There was but one drum on the winch, having a central flange to separate the ropes. The hauling speed proved a satisfactory one, but the return rope should have been speeded up to at least 150 ft., and possibly would have worked satisfactorily at 175 ft. per min. In fitting up the winch for the scraping work, the original cast-iron frame was discarded in favor of a much lighter timber frame, in which skids were made a part of the machine. For transmitting power from the transformers to the motor, an armored three-conductor cable was used. This permitted the winch to be moved about the field with its own power, and made unnecessary any moving of transformers. During the execution of the work, the winch was moved twice, that is, had three positions, including the original.

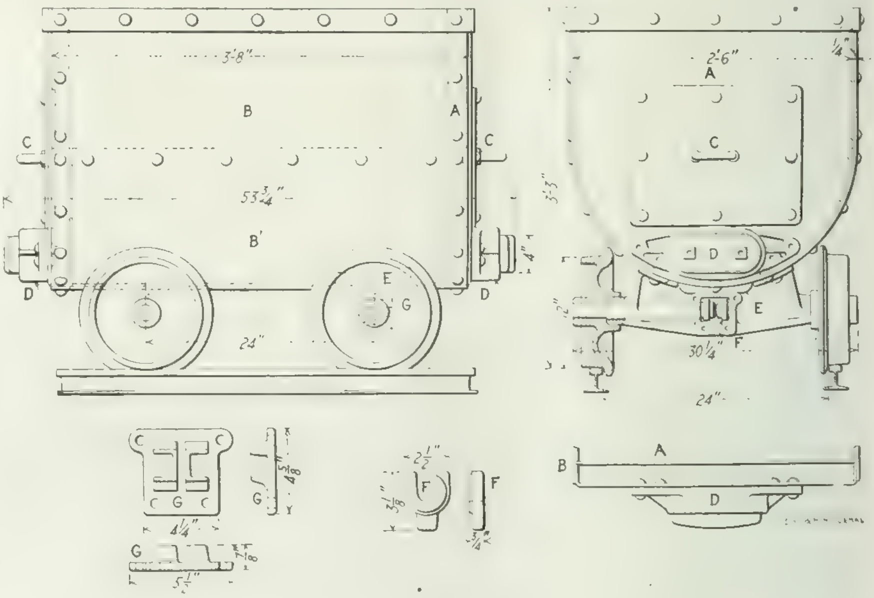
The transformers were not disturbed after being originally connected, as the nature of the ground permitted the selection of a site within reach of the several positions of the winch.

The scraper was made of 2-in. planks, the cross-section being of the shape shown by the accompanying sketch. The inside measurements were 18x18 in. and it was 12 ft. wide. A little experimenting was necessary at the beginning of the work to determine the correct angle at which the bail irons should be set. It was found necessary to make one or two changes of this angle during the progress of the work, owing to different conditions of ground and material. The planks were well strapped together with bar steel, and the ends were of steel plate. One, and some of the time two, pieces of rail were fastened to the top of the scraper for added weight. Both hauling and back lines were second-hand mine-hoist ropes, in good condition, but discarded for mine use in compliance with state mining laws. With the exception of one or two small portions of the work, the hauling line ran over only one snatch block, while the back line ran over three blocks a large portion of the time. A fairly liberal use was made of deadmen, it being more economical to employ them than to move the winch.

Mine Car with Round Bottom

In the accompanying drawings are shown the details of the mine cars used by the St. Louis Smelting & Refining Co. in its mines in the southeastern Missouri lead district. The car is made to dump by a tipple arrangement, as there is little necessity of dumping a car underground, except where on account of tramming arrangements it is better to dump down to a chute leading to a lower level than to tram directly to the shaft. In these cases the chute is surmounted by a tipple arrangement.

The car is made with a semi-cylindrical bottom, to which the cast-iron bearings are bolted so no truck is necessary. The body is made by riveting together plates ¼ in. thick. There are five of these plates; the bottom plate *B'*, the two side plates *B*, and the two end plates *A*. The side plates and the semi-cylindrical bottom plates are riveted, so as to form a lap joint, while the end plates are riveted with the flanges of the end plates inside the side and bottom plates. These end plates are flanged at the boiler works where they are cut, but the rest of the building of the body is done at the company's shops. If desired, the plates could be joined together by angle irons, which would stiffen the car somewhat more than the manner shown of fastening the body. Around the top of the car there is a stiffening band of ¼x2½-in. iron.



ROUND-BOTTOM MINE CAR USED IN FLAT RIVER DISTRICT

These cars have a capacity of approximately 20 cu.ft. and hold about one ton of lead ore, the gangue of which is a magnesian limestone. They are made to be trammed by hand or pulled in trains either by mule or by electric motor. On that account hooking rings are provided at each end. These are U-bolts of ⅞-in. iron, put through the body with stiffening plates of ¼-in. iron 18 in. square put on the latest cars to spread the strain of the pull over a larger portion of the front. These U-bolts, or hooking rings, *C*, are made with collars welded to them, so that they can be riveted tightly to the body of the car.

Owing to the fact that the cars are hauled in trains by electric motor, cast-iron bumpers *E* are riveted to the body of the car at its bottom, where the strain of the bump will be distributed directly to the reinforcement afforded to the ends by the riveting flanges. The details of the bumpers are shown in the accompanying illustration.

The bearings *E* for the wheels are riveted directly to the body of the car by brackets that extend up to reach the cylindrical bottom plate. These bearings are made of cast iron, the rough castings which weigh about 100 lb., being bored at the company's shops. These bearings are cut away on the outer side, so as to allow the clips or forks to be slipped over the axles in the bearings, as the wheels are mounted tightly on the axles and the axles are cut in two at the middle, so as to allow the cars to go more easily around curves.

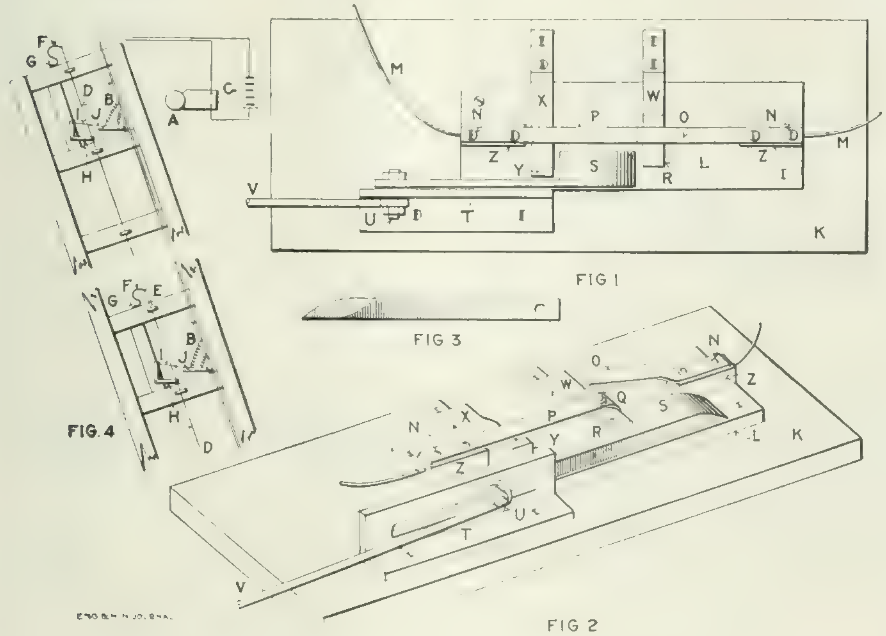
While this type of axle is fairly common in the West where the drifts are crooked, in Eastern metal mines such refinements in car bearings seem seldom to be resorted to, possibly because of the straighter tracks that are generally used. This opening in the journal is closed by a plate *F* that is fastened to the body by four cap screws. A hole is cut in it for shooting in the oil used for lubrication by a squirt gun, such as is used in watering holes in stopes, but the oil works through the bearing rather rapidly, so that it is the intention to use grease in the bearings in the future, instead of oil.

Electric Signal System, Argonaut Mine

By R. S. Rainsford*

The electric signal described below was devised to meet the following requirements: (1) To be available from a moving skip or cage, as well as from a station platform; (2) to be easily rung, as by a light pull on the bell signal cord; (3) to be absolutely reliable, even if portions of the signal cord in the shaft were broken; (4) to register one stroke of the electric bell for each tug on the cord. For reasons to be explained this last requirement is the crux of the whole problem.

The great depth of the Argonaut shaft, and the fact that it is an incline (60°) made the ringing of signals by the ordinary bell cord a difficult task. For despite the addition of long hand levers for ringing and the supporting of the signal cord at intervals by sensitive S-shaped springs, together with the greasing of all cleats guiding the cord and constant supervision of the line, the system was anything but satisfactory. Consequently when telephones were introduced in the mine about three years ago a four-wire cable was laid in the shaft, two of the wires being used for the telephone circuit and two for a system of electric push buttons situated at all stations and loading chutes in the shaft. These push buttons, greatly modifed in design, are still in use, but have the great disadvantage that they are not available from a moving skip.



Electric Shaft Signal at Argonaut Mine, Jackson, Calif.

The most common method of meeting the fourth requirement above mentioned, namely two naked wires strung in each hoisting compartment about four inches apart, and charged with current of exceedingly low potential, is usually unsatisfactory and dangerous. To ring a bell one has only to short circuit the two wires with any convenient piece of metal, as a candlestick. But two objections present themselves. One is the rapid eating away of any uninsulated wires, whether galvanized iron or copper, when subjected to the mine waters and atmosphere of certain mines. The other is the danger of a signal given by mistake through contact with the wires by any tool in the hands of a miner repairing the shaft, particularly a bar when the skip tender is barring a loading chute in the shaft.

Another system was tried which included bonding the shaft rail for one leg of the current, insulating the skip and using the hoisting cable for the other leg or conductor, together with a signaling device on the skip to make or break the circuit. This system proved exceedingly troublesome, either on closed or open circuit, and was finally abandoned. The only solution remaining therefore was some yet undetermined method of a more sensitive signal cord in connection with the electric gong of the push-button system and its cable.

To make the signal cord sensitive was an easy matter. It was cut in 500-ft. sections, the bottom of each section fastened to a divider of the shaft sets, the top of each section supported by an S-spring, as shown at *F* in Fig. 4, and the signal cord guided by cleats in the usual way. Then a bell crank, with 8-in. arms, was connected to the signal cord below the S spring and its free upper arm used through an appropriate device to register every pull on the signal cord.

A signal cord has one peculiarity—all pulls on it are not of equal strength. One may easily arrange an electric contact which will be made or broken, depending on whether open or closed circuit is used, by a light tug on the cord. The problem is to prevent a double signal if this sensitive cord is pulled so hard that the contact is passed and the mechanism must retrace its steps and again pass the ringing contact as the signal cord is released. If a long sliding contact is used to meet this difficulty the electro-mechanical gong at the surface may have time to ring twice before the contact is broken. The solution in the case of the signal device to be described is to jump the contact on the return stroke, or release of the signal cord.

Thus a light pull on the signal cord drives the lifting member *S* under the lifter pin *R* and so closes the contacts *Q* and *O* by raising *R* and the spring *P*. On the release of the signal cord, *S* drops back to its normal position in front of the stop or guide *Y*. A heavier pull, however, drives *S* under *R* and out beyond, thus both making and breaking the contact at *Q* and *O*, but on the release of the signal cord *S*, which has a laterally projecting portion beveled on the under side as well as on the top, as shown in Fig. 3, slides over instead of under *R* and so makes no contact on the return stroke.

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*General manager Argonaut Mining Co., Jackson, Calif.

The rest of the apparatus is easily understood from the figures, in which *K* is a wooden base, *L* a slate slab, *Z* brass connectors with binding posts *N* for the wire terminals *M* of the electric circuit. On the two brass connectors are mounted the springs *O* and *P*, the latter supporting also the contact point *Q* and the lifter pin *R*. A bracket *W* supports the pin *R* at the proper elevation, while another bracket *X* serves as a guide and backstop *Y* for the lifting member *S*. The latter is fitted with the stud *U* running in the guide *T*. To the stud is fastened the link or rod *V* leading to the upper arm of the bell crank *I* through the insulating block *J*.

The device is applicable to any shaft whether vertical or inclined, and if any section of the signal cord should break, or any individual circuit closer be damaged, signals in other sections of the shaft are not interfered with. In practice, moreover, we find that a signal can easily be rung from a fast moving skip by giving the signal cord a jerk with only one or two fingers. The operation of the system, which we have now been using for a year, has proved most satisfactory, and a patent upon it (No. 1,023,040) has recently been issued to the inventor John Rule, an employee of the Argonaut Mining Company.

Factor of Safety for Hoisting Ropes

The present safety regulations of the Transvaal government require a factor of safety of six, which R. B. Greer says means a margin of safety of seven when the rope is new, so as to show the above government requirements after a little wear (*Journ. South African Inst. Eng.*, April, 1912).

The factor of six was decided upon in 1877, when the depths of mines were by no means so great as now, and was the result of experiments hoisting with a 9-in. slack chain, when it was found that the strain at starting was about 2½ times the weight to be hoisted. Mr. Greer contends now that with depths of 3000 ft., a slackness in the chain at the top of the cage would not, if tested with a dynamometer, give anything like these alarming results, because the elasticity of the rope would take up the effect of any sudden strain, therefore a 4½ margin at 4500 ft. would give more real safety than a six margin, 20 ft. from the top. It would, therefore, be wise to put the factor of safety on a sliding scale after a depth of 2500 to 3000 feet.

In a number of Transvaal mines, the weight of the ropes in the shaft is equal to the weight of skip and rock together. As a result the mine engineers are constantly requiring higher tensile strengths in order to haul heavier loads without increasing the weight of the ropes. There is danger in going to too high tensile strengths, for the rope requires too much carbon in it, and is so drawn that it is likely to become brittle in a few months, and break without notice.

Mr. Greer believes it would be much safer to lower the margin of safety for great depths, rather than to get high-breaking-strain steel to overcome the dead weight of rope carried. In general support of his contentions, he says it will be found ropes do not break when there is a great length of rope out and the margin of safety at its lowest, but when the cage is nearing the top of the shaft and the margin of safety is at its highest.

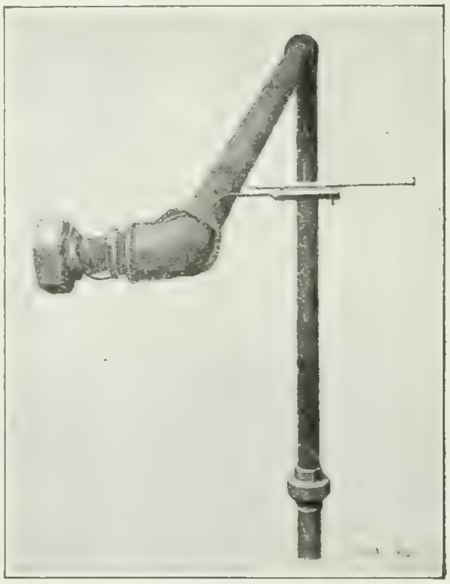
New Steel Dredge for Yuba Consolidated Goldfields

A new dredge will be built by the Yuba Construction Co. for the Yuba Consolidated Goldfields to be operated on the Yuba River, at Hammonton. It will be a duplicate of Yuba No. 13 in dimensions and will have 15-cu.ft. buckets; but will be provided with steel instead of wooden hull. The operating machinery will be of improved design. This will be the third steel-hull boat built by this company for the Hammon interests. The design includes a steel deck, the first to be provided for a gold dredge in California. As a type of large steel dredge it is designed to hold the highest position, as the Natoma No. 9 does in the wooden-hull field of construction.

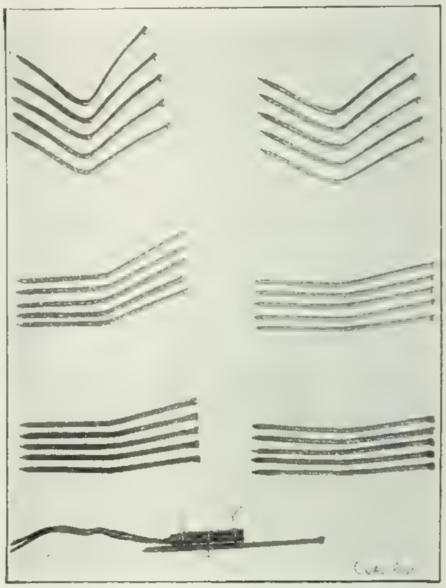
Practical Test of Strength of Detonators

Sometimes a miner will find that he does not get a satisfactory result with his shots and he is in doubt whether the trouble is due to the deterioration of the explosive or to a loss of strength in the detonator, says *Coal Age*, Oct. 12, 1912. The illustrations accompanying this article show how the uncertainty can be removed.

A small finishing nail is attached by wire to a detonator and the electric leads are connected. These leads are stiff enough to hold the explosive cap and the nail in a level position. The stand on which the detonator is mounted will, of course, vary with convenience, but the one shown will serve the purpose well.



MANNER OF TESTING THE STRENGTH OF DETONATORS



EACH GROUP OF NAILS WAS BENT BY DETONATORS OF EQUAL STRENGTH

It has been found that detonators of equal strength, when fired as shown, produce equal deformation of nails of like character. The groups of nails shown were bent by the action of detonators, the members of each group being bent by exploding caps of equal strength. The miner has but to observe the bending produced by a detonator, of which the strength is sufficient and condition suited for perfect detonation of undeteriorated powder. He can then gage the condition of any other detonator.

This scheme has been developed by Clarence Hall, of the Bureau of Mines. In proving detonators, to obtain the best possible results, they should be tested with explosives artificially aged by the addition of water and their effectual action judged by the energy developed by the explosive in a Trauzl block or on a ballistic pendulum. But this method of testing would not be available for a miner, whereas the new test may be used readily by the man in the field.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Refining Zinc-box Precipitate

By Wilton E. Darrow*

I have read your editorial in the Engineering and Mining Journal of Sept. 7, regarding a field for improvement in the melting and refining of zinc-box precipitate. I have tried a number of suggested methods and devised several schemes of my own that have been fairly satisfactory.

For a number of years I used to smelt the acid-treated precipitate in the ordinary way and blow the impure bullion up with an air jet. Air under about 10 to 15 lb. pressure was introduced into the furnace by means of a section of ½-in. hose terminating in a piece of ¼-in. pipe about four feet in length. The air line from the compressor comes in along the ceiling of the melting room, and the hose and ¼-in. pipe nozzle were adjusted to enter the melting pot through a notch cut in one side of the crucible cover.

By this means the air jet impinged on the surface of the molten metal at an angle of about 45°. The point of the pipe was kept about four inches from the surface of the metal, so as to diffuse over about one-half of the surface. In this way I could turn up about 15 lb. of speiss and lead in the bullion in an hour. The fumes, however, were extremely unpleasant. The slag produced was also exceedingly corrosive and destroyed the plumbago crucibles rapidly. The greatest objection, however, was that the slag was rich, containing on an average about 4% of the gold and about 10% of the silver.

About six months ago, after making a few laboratory tests, I installed a small chlorination plant for refining the precipitate. In my laboratory tests I found that I could extract about 999½ parts in a thousand of the gold from the acid-treated precipitate by treating it with a strong chlorine solution, and that after the chlorine treatment nearly all of the remaining gold and the silver chloride was soluble in cyanide solution. The small chlorine plant generates the gas in a small tub by means of sulphuric acid, salt and potassium permanganate.

The acid-treated precipitate is placed in the tub and allowed to remain in the chlorine solution over night. The solution is then decanted off and the residue given several washes with clear water to remove the dissolved gold. The decanted solution and wash water are flowed to a larger tub set on a lower level in the refinery. When the gold solution has been transferred to the second tub, it is precipitated with iron sulphate solution and allowed to settle for 48 hours before the waste solution is siphoned off.

As soon as the gold has been washed out from the original residue, the acidity is neutralized with caustic soda and cyanide solution added for the recovery of the remaining gold and the silver. The solution is agitated with an air blast through a pipe and hose for several hours and then siphoned off slowly to a couple of small iron zinc boxes and the treatment repeated several times during the two days before the final cleanup of gold precipitate. The silver precipitate from the zinc boxes and the gold precipitate from the precipitation tub are then cleaned up and melted together, bullion about 960 fine resulting. The recovery from the original precipitate averages about 99½% of the gold and silver value.

By the former method it took about 16 hours, with two furnaces using No. 25 plumbago crucibles, to melt and refine the gold-silver bar. Now I do it in about four hours, with one melting pot. I think that the process is good, but the installation of a small lead-lined chlorinating barrel for dissolving the gold would be an improvement. Perhaps some metallurgists would go a step farther and recover the gold by electrolysis, thus dispensing altogether with the disagreeable melting process.

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*Amador City, Calif.

Prevention of Plumbism

Lead works in Germany produce 44,500,000 marks worth of lead, of which one-third goes to the making of lead colors, chiefly white lead. The earliest attempts at the control of plumbism date from 1876, but the problem has not yet been solved (*Journ.* Soc. Chem. Ind., Aug. 31, 1912, abstr. from *Chem. Zeit.*, 1912, p. 882). Substitutes for white lead are not successful and the present position is that lead may be used in color-making under certain precautions, some technical and some personal, regulated by the German Act of 1903. The chief technical precaution is the avoidance of dust. Personal precautions include medical examination and the supply of prescribed food and medicines. Alcohol is prohibited in the works. Respirators and special wearing apparel are furnished. As a result of the new act, plumbism has been reduced by 25% in the Cologne district. The author considers that the most essential problem is the education of the worker to a higher standard of cleanliness.

Trap Spout for Copper Blast Furnace

By Arturo Poupin*

Since the late Mr. Shelby gave us the details of the Cananea furnace, the want of more such work has been felt by those that have followed closely the design of furnaces and converters. I had, three years ago, the opportunity to take advantage of the complete drawings and description of the copper spout designed for the Cananea smeltery; and made a spout that was a success and did away with the other types that were troublesome. Trap spouts are not new, but there are some points that I want to make clear, that may be helpful to some of the Journal readers.

Blast Furnace Trap Spout

The sketch shows our old design that must have met with difficulties wherever used, and probably never worked satisfactorily, and the reason can be explained by the impossibility of keeping a stream of hot liquid in contact with the cooled surface of the spout, causing the formation of a crust that would stop up the tap hole of the breast jacket. After that, not having an outlet, slag and matte would soon fill up to the level of the tuyeres and stop the working of the furnace.

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*Cia. Minera de Gatico, Gatico, Chile.

To obviate this fault the later design provides space below the taphole that can be kept filled with brasque, preventing the formation of a crust. Another point also worth remembering is that the opening in the furnace wall is made ample in the last design, so that any iron sow can be taken out easily.

The halftone engraving shows another spout made of ⅜-in. steel plate, with the addition of a copper nose at the end. The spout is made of two ⅜-in. plates bent to shape and riveted outside all round the sides, has an inlet of 1½ in. at the bottom and two outlets for the water at the top; on the lower part there is a cover bolted to the shell which serves for cleaning the salts and sediment that is carried by the sea water. The copper nose is composed of a 1-in. water pipe imbedded in copper; water enters one side and leaves on the other. In the line engraving, Fig. 1 shows spout built in 1903, Fig. 2 in 1906, Fig. 3 about 1910, an illustration of evolution.

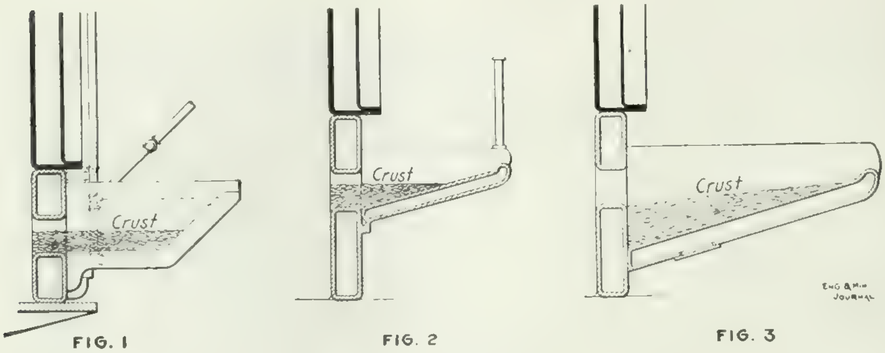


FIG. 1 FIG. 2 FIG. 3

Evolution of the Trap Spout

The following grading analysis of the product of a Lane slow-speed chilean mill, made at the Lane Mill Works, Cue, Western Australia, on ore from the Chunderloo Gold mine, Yaloginda, Western Australia, is reported by John McDermott, the results being expressed cumulatively: Through 40 mesh, 99%; through 60 mesh, 97%; through 80 mesh, 94%; through 100 mesh, 90%; through 150 mesh, 81%; through 200 mesh, 67%. The mine ore was crushed to about 1¼ in. in preliminary breakers and then fed to the Lane mill, the height of overflow in the latter being seven inches above the mill track. The above results were obtained at the rate of 36 tons per 24 hr., which is slightly less than the rated capacity of 40 tons.

Standard Hardinge Mill Sizes

The increasing use of the Hardinge conical pebble mill makes interesting the accompanying table compiled by the Hardinge company. The short cylinder mills are recommended for fine grinding with a minimum of slimes while the longer cylinders are better adapted for grinding with a maximum of slimes.

STANDARD SIZES OF HARDINGE CONICAL PEBBLE MILL

Size	Floor Space	Weight Pounds				Horsepower	Nonimal Capacity per hour
		Mill	Silex Lining	Pebbles Mill Charge	Pebbles Supplied		
Ft. In.	Ft.						
4½x13	6x 8	4,000	2,000	1,500	2,000	6—8	1 —1½ tons
*4½x72	8x15	8,000	5,000	5,000	6,000	15—18	1½ 2½ tons
6 x16	8x10	7,500	4,000	3,500	4,500	12—15	1½—2½ tons
6 x22	8x11	8,000	4,500	4,000	5,000	15—18	1½—3 tons
6 x48	11x12	8,750	6,000	6,000	7,000	20—25	1½ 2½ tons
*6 x72	11x16	10,000	7,500	8,000	10,000	25—30	2 3 tons
8 x22	11x12	11,000	7,000	8,000	10,000	30—35	2 —3½ tons
8 x30	11x13	11,500	7,500	10,000	12,000	35 45	2 —4 tons

*For very fine or slime grinding only.

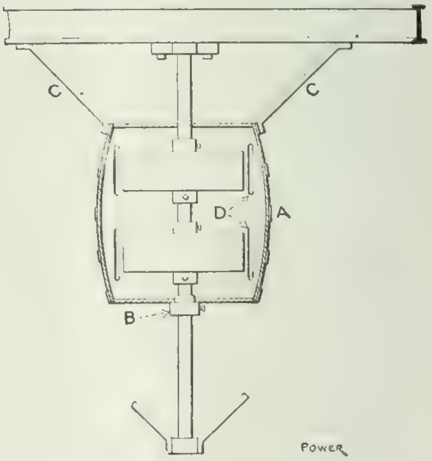
Size of mills is given in diameter of drum in feet and length of cylindrical portion in inches. Capacity and power depend upon weight of pebble charge and will vary according to hardness of material to be ground as well as size of material fed and product required. The lining is made up of silex (flint) blocks, or a combination of ribbed iron or steel plates with Hardinge lifting bars and silex.

Dangers from Heavy Chemicals

Some of the dangers of frequently used heavy chemicals were discussed by Dr. Julius Aeby before the International Congress of Applied Chemistry: Bleaching powder will occasionaly decompose under elevation of temperature, although the manufacturers say only when it is new; potassium permanganate accidentally mixed with sawdust or fine sweepings will ignite by friction; arsenic acid may retain enough nitric acid to burst its drums under influence of summer heat, and a man was killed in New York by being sprinkled with powder thrown out in this way; metallic sodium must be kept from air and water; and cyanamide should be kept from water and naked lights, because of occasional calcium carbide in it. A Norwegian vessel and its crew of eight men were lost for lack of these precautions. To this he might have added that at least one building containing potassium chlorate has gone up in the air, apparently through detonation of its contents.

Protecting Pulleys from Dust

In some processes, it is highly desirable to avoid drops of oil from pulleys or shafting. A simple way of protecting pulleys from dust or to prevent oil from being thrown about the room, is to cover the pulleys with a barrel as shown in the accompanying illustration. As described in *Power*, in a certain mill a flour barrel *A*, was placed around the pulleys as shown in the illustration. The barrel was thoroughly reinforced throughout, and a hole bored in the bottom of the size of the shaft. The braces were removed from the bottom of the shaft and the barrel slipped over the pulley into position. The collar *B* was fastened on the shaft to support the barrel, and braces *C* to the top of the barrel and I-beam for the same purpose. Slits *D* were cut in the barrel for the belt. This device was used in this way on pulleys revolving on a vertical shaft



Barrel Oil Baffler

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Buffalo Mines

The annual report of the Buffalo Mines Ltd., Cobalt, Canada, for the year ended Apr. 30, 1912, states that 50,167 tons of mill ore were broken during the year, of which 44,510 tons were hoisted, 5118 tons discarded as waste and 6689 tons of ore added from the surface dumps, making a total of 46,081 tons of ore to the mill. This ore averaged 32.35 oz. of silver per ton of which 83.88% was recovered.

Based upon the tons milled the cost of operating was approximately as follows: Mining, $2.82; milling, $1.66; cyaniding, 50c.; installation and repairs, 20c.; depreciation, 52c.; boarding house, 11c.; shops, stable, assaying, surveying and drafting, 19c.; total, $6 per ton milled. In addition to these costs the Cobalt office cost 37.8c., New York and Buffalo offices 23c., insurance 16.2c., and taxes 30.8c., making the total cost of production $7.07 per ton of ore milled.

The development work consisted of 37 ft. of sinking, 85 ft. of raising, 20 ft. of station cutting and 1157 ft. of drifting, a total of 1299 ft. of development or about one foot of development for every 35 tons of ore milled. It is stated that the conversion of the cyanide plant to a continuous process proved unsuitable to the treatment of the ore and the original system of individual tank charges had been resorted to. In order to catch up with the underground work machine drills were increased from nine to twelve.

Motor Truck Haulage in Arizona

The Inspiration Consolidated Copper Co. has three Velie motor trucks in continuous service, hauling supplies from the town of Miami to the Inspiration and Live Oak mines, distances of from one to three miles. One is of 1500 lb. capacity, another 1½ ton, and the largest 3 tons.

A record was kept for one month of the performance of the 3-ton truck in hauling fuel oil from the railroad station at Miami to Live Oak No. 2 shaft, a distance of 3.1 miles. The load consisted of 870 gal. of oil weighing 6740 lb. The road was in fair condition, with less than 3% grade for most of the distance, the last 300 or 400 yd. having a grade of from 3 to 8%. About 45 min. was required for a trip loaded and 20 min. for the return trip, empty. The maximum number of loaded trips per day was six. The cost per ton-mile was 48c., of which 24c was for labor and depreciation, 13c. for repairs, and 11c. for fuel and oil. This was 9c. per ton-mile less than the cost of hauling by teams, a saving of 16 per cent. The two lighter trucks haul other supplies, from Miami to the mines and between various points on the property.

Cananea Consolidated Unit Costs

The following costs of the Cananea Consolidated Copper Co., Cananea, Mexico, were compiled from data furnished by John V. Montague, treasurer. The company owns and operates the following mines: The Cananea-Duluth, Cobre Grande, Kirk No. 9, Kirk No. 15, Veta Grande, Oversight, Capote, Eureka, Elisa, Henrietta and Puertecitos. During the month of July 131,175 tons of ore and waste were produced from these mines; 39,173 tons or 29.8% of which were hoisted from an average depth of 400 ft., the remainder being brought to the surface through tunnels. Of the tonnage mined 91,127 tons were ore and 40,048 tons waste. Stopes produced a total of 87,025 tons consisting of 77,362 tons of ore and 9663 tons of waste. Development work produced 13,765 tons of ore and 30,385 tons of waste. The accompanying table gives the character of the formation and ore mined.

CHARACTER OF ORE DEPOSITS OF CANANEA CONSOLIDATED

Mine	Predominant Formations	Ore
Cananea-Duluth	Siliceous brecciated diorite	Chalcopyrite and tetrahedrite
Cobre Grande	Decomposed diorite & veins in siliceous diorite	Malachite, chalcocite and chalcopyrite.
Kirk No. 9	Soft decomposed limestone	Chalcopyrite and bornite
Kirk No. 15	Diorite	Chalcocite and cupriferous pyrite.
Veta Grande	Diorite	Chalcocite and cupriferous pyrite
Oversight	Soft decomposed diorite.	Chalcocite and cupriferous pyrite.
Capote	Brecciated quartzite and diorite	Chalcopyrite and bornite.
Eureka	Limestone	Chalcopyrite and cupriferous pyrite
Elisa	Metamorphosed limestone garnet rock	Chalcopyrite
Henrietta	Siliceous diorite and quartz porphry	Chalcopyrite and bornite
Puertecitos	Metamorphosed limestone and granodiorite	Malachite, bornite and chalcopyrite

Of the ore mined an average of 5% is extracted by the square-set system, 19% by stulling, 60% by top slicing, 8% by shrinking and 8% by the caving system. Two 9-hr. day shifts, and an 8-hr. night shift are worked. The labor consists of approximately 93.1% Mexicans and the remaining 6.9% is composed mostly of Americans. The total average number of underground employees is 1480 men of which 533 are engaged in stoping and 947 in development work. The labor in the stopes is divided as follows: Breaking ore, 320 men; shoveling ore to chutes and mucking, 153; and timbering 60 men. In development work 395 are engaged in advancing, 400 in mucking and tramming, and 152 in timbering. The development work during this period amounted to 8135 linear ft. of which shaft and stations consisted of 182 ft., drifts and crosscuts 5327 ft., raises 1590 ft., winzes 15 ft., and tunnels 1021 feet.

According to these figures, of the total tonnage mined 69.4% was ore and 30.6% waste or about one ton of waste was mined for every 2.28 tons of ore produced. In stoping about 11.1% of the tonnage mined was waste or one ton of waste for every eight tons of ore. In development 68% of the tonnage produced was waste or about 2.2 tons for every ton of ore produced by development work. Of the total tonnage stoping produced 66.4% against 33.6% from development, or 84.4% of the ore and 22.5% of the waste against 15.6% of the ore and 77.5% of the waste for development work. Based upon the total men engaged underground the average output is about 88.5 tons of ore and waste or 61.5 tons of ore per man per month including development. In stoping the average output per man per month is equal to about 163 tons of ore and waste or 145 tons of ore produced from stopes. Based upon the men engaged in breaking ore in stopes the average is 272 tons of ore and waste or 242 tons of ore from stopes per man per month; on men shoveling ore to chutes and mucking it is about 569 tons of ore and waste or 506 tons of ore; and upon the men engaged in timbering stopes, there is one man for every 1450 tons of ore and waste or 1289 tons of ore mined from the stopes per month. The development work is equal to about one foot for every 11.2 tons of ore produced from development and stoping or 9.5 tons of ore from stopes. The ore produced from development was equivalent to one ton for every 0.59 ft. of advance. Based upon the men engaged in development the advance was equal to 8.6 ft. per man per month; on men engaged in advancing 20.6 ft. per month; on men mucking and tramming 20.4 ft. and men timbering 53.5 ft. advance per man per month.

The timber consumption is equal to about 13.6 b.ft., per ton of ore produced, or in stoping 9.5 b.ft. per ton of ore from stopes. In development the timber consumption averages approximately 53.7 b.ft. per ft. of advance. The timber used in general repairs during July was equivalent to 0.55 b.ft. per ton of ore produced. The dynamite consumption in stoping was equivalent to 0.814 lb. per ton of rock broken and in development 8.7 lb. per ft. of advance. The main drifts and stations of the mines are lighted by electricity and in nearly all the mines carbide lamps are used by the men instead of candles, the average number of candles consumed, where used, is about three per nine-hour shift. In development during July, 9385 machine-drill shifts were worked and 8504 in stoping, this is at the rate of about 0.865 ft. of advance in development and 10.2 tons of rock in stoping per machine shift worked, but includes all advance or tonnage from hand-drill work. Drill-steel consumption averages about 8610 lb. of machine-drill steel and 2690 lb. of hand-drill steel per month, or a total consumption of one pound for every 8.6 tons of ore produced. On an average of 128 piston and 87 hammer drills are used per day and 2650 pieces of machine-drill steel are sharpened by eight men and eight helpers in nine hours using a drill sharpener. The air blast is furnished to the forges by Connersville positive blowers. One set-up of machine drill is made in drifts per shift and requires on an average of 40 min.; the drilling rate is approximately 40 ft. per shift in drifts. In stopes using Ingersoll BC 21 stoper drills the drilling rate is about 90 ft. per shift. Lubricating oil for piston drills is consumed at the rate of one-half pint per machine per shift.

In driving a 4.5x6.5-ft. drift through a hard quartz two men working on shifts of nine hours advance on an average of three feet per shift, drilling about six hours of the time; the dynamite consumption was 6.6 lb. per linear ft. or 0.21 lb. per cu.ft. of drift; the advance was equal to one linear foot or 29.25 cu.ft. of drift per six man-hours. In running a 6x11-ft. raise two men working on a shift of nine hours, six hours of which were spent in drilling, advanced at the rate of three feet per shift. This is at the rate of one linear foot or 66 cu.ft. of raise per six man-hours; the dynamite consumption was approximately 8.3 lb. per linear ft. or 0.126 lb. per cu.ft. of raise In sinking a 7x15.5-ft. shaft through hard limestone, six men working on a shift advanced 15 ft. in 20 shifts, 10 of eight hours and 10 of nine hours each, drilling one 5-ft. round per day. This is at the rate of 0.75 linear ft. or 81.37 cu.ft. of shaft per shift; or the equivalent of 0.0129 linear ft. or 1.399 cu.ft. of shaft per man-hour. The consumption of dynamite as reported was equal to about 0.1 lb. per cu.ft. of rock.

A man shoveling into a 2.5x2.25x3-ft. car and tramming 300 ft. to shaft averages 17 cars in eight hours which is equal to about 119 cu.ft. per man-hour. A trammer shoveling from a plat and loading into the same size car and tramming the same distance as mentioned will average 20 cars in eight hours or 140.6 cu.ft. per man-hour. A man tramming from a chute for the same distance and with the same size car will average 40 cars per eight-hour shift or 281.2 cu.ft. of material per man-hour, which according to these figures is just double the efficiency of a man loading from a plat and tramming. The usual life of a mine car at these mines is about four years by replacing worn-out wheels. Manganese-steel wheels have been in use for two years on a nine-mile tram per day and are still in good condition. The average length of tram is 600 ft. in the mines and about 0.6 gal. of lubricating oil is used per car per month.

Wolverine Costs

According to the annual report of the Wolverine Copper Co., Lake Superior copper district, Michigan, for the year ended June 30, 1912, it produced 9,408,960 lb. of refined copper from 401,308 tons of ore stamped, at a total cost of 7.586c. per lb., of which 6.75c. was for mining, transportation and milling, and 0.836c. for smelting, freight and marketing, including New York office expense. The average yield of the rock treated was 23.45 lb. of refined copper per ton, or 1.172%. Tons hoisted amounted to 414,544, of which 13,236 tons, or 3.2%, were discarded as waste. The cost per ton for mining, transportation and milling was $1.53 per ton hoisted, or $1.58 per ton stamped.

During the year, 541 ft. of shaft sinking averaged $15.34 per ft.; 4293.3 ft. of drifting, $6.12 per ft., and 25,844 fathoms of stoping, $8.15 per fathom. It is stated in the report that 795 ft. of diamond drilling was performed underground on the Osceola lode, and in the statement of expenditures this account is charged with $4039 for drilling, which would indicate that the average cost was about $5.07 per foot.

A general summary of the costs is as follows, the underground expenses being based upon the tons hoisted: Sinking, drifting and stoping, 59.4c.; timbering, 1.2c.; tramming, 17.4c.; mining captains and labor, 10.6c.; mechanics, 2.8c.; hoisting and pumping, 4.7c.; compressor, 8.8c.; teaming, etc., 0.5c.; supplies and fuel, 5c.; electric lights, 0.5c. per ton hoisted. From these costs a credit of about 18c. per ton was deducted for profit on supplies furnished contractors. Rock-house expense amounted to 4.8c. per ton hoisted and general surface expenses, including superintendence, taxes, insurance and freight on mineral from mill to smeltery, 17.9c. per ton of ore treated. From these costs a credit of 1.85c. was deducted for rents received from houses. The stamp-mill expense was 40.4c., including transportation charges on rock from the mines to the mill, which amounted to 14.41c. per ton. Other items of stamp-mill expense were: Supplies and electric lights, 5.06c. per ton; machinists, 2.47c.; fuel and teaming, 6.96c.; labor, 8.34c., and pumping, 3.16c. per ton treated. The average yield of mineral at the mill was about 30.2 lb. per ton of ore and averaged 77.346% refined copper.

Power Cost in a 6500-kw. Station

Figures for the Fall River (Mass.) Electric Light Co.'s generating plant for the year ended June 30, 1912, are given in *Electrical World,* Sept. 28, 1912. The station is a tidewater plant of 6500-kw. rating, containing six 350-hp. water-tube boilers, one 4000-kw., one 500-kw. and two 2000-kw. turbines. The 4000-kw. unit was new in 1911. In 1911 the plant produced 5,764,466 kilowatt-hours at a manufacturing cost of $51,840, or 0.9c. per kilowatt-hour, coal costing $3.67 per ton. The fuel consumption averaged 3 lb. per kilowatt-hour. This year the plant generated 7,293,783 kilowatt-hours at a station cost of $55,359, or 0.76c. per kilowatt-hour, coal costing the company $3.53 per ton. The payroll of the generating department listed 16 men in 1911 and 18 in 1912. The costs given include no fixed charges or administrative expenses, but show the results of station operation in 1912. The station load-factor for the year was 32.5 per cent.

FALL RIVER STATION OPERATING COSTS, 1912

Fuel (0.47c. per kw-hr.)	$34,164
Oil and waste	900
Water	1,206
Wages at station (0.19c. per kw-hr.)	13,687
Repairs of building	1,688
Repairs of steam equipment	1,538
Repairs of electrical equipment	686
Miscellaneous	1,490
Total, excluding fixed costs (0.76c. per kw-hr.)	$55,359

According to the United States Geological Survey, the number of miners engaged in bituminous and lignite mining in 1911 was 549,750, and those in anthracite mining, 172,585, a total of 722,335. The average production per man was 738 tons for the year in the bituminous and lignite mines and 524 tons in the anthracite mines. In 1910 the corresponding averages were 751 and 498 tons.

How the Metals Are Sold—Spelter

By W. R. Ingalls

An account of the customs and practices obtained in the marketing of an important metal and the conditions that determine them.

The American zinc industry has escaped any general consolidation and there has not developed in it any single concern of sufficient power even to attempt to regulate the price. This may be ascribed primarily to the nature of the occurrence of the ore deposits which are worked in a multitude of mines whereof a general control would be a hopeless undertaking. Given therefore an open supply of ore and a metallurgical process for its reduction that does not so strenuously demand mixtures as does the process of lead smelting, the metallurgical side of the industry is also bound to remain open. There are other conditions favoring the maintenance of that condition, but what I have stated will suffice as a broad generalization. There have, indeed, been numerous consolidations of groups of works during the last 20 years, but these have been simply promotive of efficiency, not restrictive of competition. In many cases the vendors of works have promptly built new works with the money received for their old ones, and have successfully continued in the smelting business. With such an ability, what would be the use of any trust organizer in buying up all the works of the country? However, there has been during the last 15 years a natural segregation of interest, which has been merely a manifestation of the modern tendency to substitute strong industrial units for small and weak ones, and this of course has had an effect upon market conditions, especially in the conversion of the brokerage houses into producers.

ELIMINATION OF THE MIDDLEMEN

Twenty years ago the production of spelter was largely made by small concerns, mostly of small capital and frequently on the ragged edge of insolvency. Their policy was commonly to combine smelting and speculation and their purchases of ore and sales of spelter were largely governed by their forecasts of the market. When pinched by some unforeseen turn and caught with a stock of spelter on hand their lack of resources compelled them to unload at a sacrifice upon some one of the metal houses able to carry the stock and distribute it to consumers later on. These metal houses often were called upon to make advances to smelters and through the combination of their banking and merchandizing facilities became great factors in the business.

As the smelting industry became concentrated in fewer and stronger hands the necessity for such middlemen disappeared, and the latter being desirous of maintaining their well organized system of merchandising their only recourse was to go into the smelting business themselves, whereby their purview was extended beyond the production of zinc as spelter and to the zinc-ore market, but none has actually entered upon the production of ore.

THE SMELTING INTERESTS

A list of the American zinc smelters has been published repeatedly, wherefore it is unnecessary to repeat it here, but it will be of interest to present a list of the controlling factors of the industry, which is given herewith:

Name	Retorts
American Zinc, Lead & Smg. Co., 3 wks	11,488
American Metal Co., 3 wks	11,840
Chanute Zinc Co., 1 wks	1,280
Beer, Sondheimer & Co., 1 wks	4,256
G. E. Nicholson, 2 wks	5,696
Collinsville Zinc Co., 1 wks	1,536
Edgar Zinc Co., 2 wks	6,800
Granby Mg. & Smg. Co., 1 wks	3,840
Grasselli Chemical Co., 1 wks	9,216
Hegeler Bros., 1 wks	1,800
Illinois Zinc Co., 1 wks	1,460
Matthiessen & Hegeler, 1 wks	4,380
Nevada Zinc Co., 1 wks	648
New Jersey Zinc Co., 4 wks	16,116
Pittsburgh Zinc Co., 1 wks	448
Sandoval Zinc Co., 1 wks	896
U. S. Zinc Co., 1 wks	1,680
United Zinc & Chem. Co., 1 wks	3,680

It will be observed from this list that there are five concerns each possessing upward of 6000 retorts. Of these the Edgar Zinc Co. is controlled by the United States Steel Corporation and supplies it with spelter to a large extent. There are seven concerns with less than 2000 retorts each. There are six concerns with from 2000 to 6000 retorts. Of these, the Matthiessen & Hegeler Zinc Co. and the Illinois Zinc Co. consume the major part of their product in the manufacture of sheet zinc. The New Jersey Zinc Co., the American Zinc Lead & Smg. Co. and the Granby Mining & Smelting Co. are the only ones of these smelters who have any mining interests worth mentioning.

KINDS OF SPELTER

At the annual meeting of the American Society for Testing Materials in June, 1911, Prof. William Campbell, of Columbia University, chairman of the committee on "Non-Ferrous Metals and Alloys" reported a classification of the kinds of spelter, the figures representing the maximum percentages of impurities allowable. This classification is rational and corresponds substantially to the understanding among American zinc smelters.

The trade recognizes different grades of some of these kinds of spelter. Thus, "Horsehead" and "Bertha" spelters are considered to be superior to any other brands of high grade spelter and realize the highest premiums. "Glendale Refined" is, so far as I am aware, the only kind of intermediate spelter. This is made out of especially selected ore. Prime Western spelter corresponds to the "Good Ordinary Brands" of the European market. The bulk of the American spelter product is of this class. There is considerable variation in the quality of the several brands. Most of the Prime Western spelter is now made out of ore from the far West. There are some smelters who continue to use mainly a good grade of Joplin ore and produce a spelter standing between Prime Western and Brass Special and realizing therefor a small premium.

KINDS OF SPELTER

Kind	Pb.	Fe.	Cd.	Total not over
A. High grade*	0.07	0.03	0.05	0.10
B. Intermediate*	0.20	0.03	0.05	0.50
C. Brass special*	0.75	0.04	0.75	1.20
D. Prime Western	1.50	0.08		

*to be free from aluminum.

The price commanded by the high grade spelter is so much above that realized for Prime Western that to all intents and purposes it is a different metal. The premium runs anywhere from 2 to 4c. per lb.[1] The premium for intermediate spelter is usually from 1 to 2c. per pound. Brass Special fetches a premium of from 5 to 25c. per 100 lb. The high grade and intermediate spelters are made by few concerns, which are able to command their own terms. Brass Special is made by many concerns and the supply of it is relatively abundant. In speaking commonly of the price of spelter, the price for Prime Western is meant.

MARKETING

In the main the producers of spelter market their own spelter, i.e., they sell it directly to consumers. So far as I am aware there is none sold regularly through the metal selling agencies on commission[2], but these agencies not infrequently buy outright from some of the weaker smelters still remaining, who find among them an ever present market at a price. It goes almost without saying that with so many producers of spelter the competition among them to dispose of their product is keen. In this market in fact the common condition is reversed, the concentration being on the consuming side, not on the producing. The United States Steel Corporation alone takes upward of 30% of the entire make of prime western spelter, and the activity in the spelter market is likely to depend upon whether that company is buying or not buying.

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[1] The supply of high-grade spelter could no doubt be greatly increased if there were need for it and prospective competitors in this market would find it hazardous to reckon upon the full premium now realized.

[2] I exclude from this statement the sales by L. Vogelstein & Co., for the American Zinc, Lead & Smelting Co., and of Beer, Sondheimer & Co., for the National Zinc Co., where the agents are interested in the respective producing companies.

General Conditions

The conditions governing the marketing of spelter are in the main the same as in the marketing of copper which I have described in a previous article. The so-called "spot" business is essentially of a retail character, the main business in the metal being in contracts, which are made for a longer or shorter period ahead according to notions of what the future is going to develop. The stock of spelter in the hands of the smelters is always relatively small. Anything like 25,000 tons is considered large, but in fact that is only about the production of one month and includes all kinds of the metal. At some times there may be a practically complete disappearance of stocks, as for example, during the last year, and buyers who must have some metal for immediate delivery are likely to be required to pay stiff premiums, but such are in no way representative of the broad commodity market because but relatively little business is done under those conditions, the bulk being in contracts anticipating requirements.

When contracts are made for a long time ahead there may be a differential in the price, plus or minus, according to the preponderance of views respecting the future. Most of the smelters are governed by their position as to ore supply. Those who take in ore under contract, on a sliding scale, desire normally immediately to sell spelter against it. The trend toward a rising market must be very well defined and certain to cause them to adopt a policy of reserve in their selling. The smelter who buys his ore as needed or as offered will always be governed in his attitude toward the spelter market by the quantity and cost of his stock.

St. Louis the Basing Point

It has become the custom in the American spelter market to adopt the price at St. Louis as the basis for contracts and business generally. The spelter may not actually be sold there and it may not even pass through there on its way to the buyers. Some spelter is actually sold in St. Louis, but a very large quantity is sold in New York on St. Louis basis. The price at New York, if ever it be necessary to refer to it, is simply the St. Louis price plus 15c. per 100 lb., which is the freight rate from St. Louis to New York.

St. Louis is a natural basing point, because the major part of the consumption of spelter in the United States occurs at places between it and New York. Upon the rare occasions when European spelter is imported through New York, as in September, 1912, New York may become an independent basis point and there may be a variation from the normal freight differential, but this is only temporary. Importations of foreign spelter will begine, of course, when consumers in the immediate vicinity of New York, or in Connecticut, can be supplied more cheaply than from the western smelting points, while the latter may still retain the interior market.

Speculation in Spelter

There is more speculation in spelter than there is in copper. The fluctuations in the price are rapid and often violent, the sellers of spelter for distribution are numerous, no single interest is predominant, all of which conditions contribute to the absence of aversion to speculative participation in this market such as exists in the copper market. There are many smelters who will sell spelter to anybody who wants to buy it, hold the spelter and issue certificates representing it. These certificates may pass from hand to hand and be redeemed after five or six endorsements have been made on them. They correspond, of course, to any warehouse receipt. It is, however, only at times that there are general transactions of this kind.

Similarly as to transactions on the New York Metal Exchange. They are never of any great volume or significance. Long periods may elapse without there being any at all. Then several hundred tons may be sold in a day. These reflect speculative business. Consumers do not buy through the Metal Exchange. Most of the smelters do not try to sell through it or indeed pay any attention to it. Some smelters are represented upon it and may buy up what is offered there, especially if it be desired to clean up the market of speculative spelter. In the same way there are transactions from hand to hand in St. Louis, although there is no organized exchange there, the business being of the nature of that of a curb market. The entire volume of the business of this kind, both in New York and St. Louis is only a few hundred tons per month and is insignificant in comparison with the marketing of the bulk of the spelter product, which is done directly between producers and consumers. Almost without exception the smelters give preference to orders from consumers over orders from dealers, and frequently give the former as much as 5c. per 100 lb. advantage in price, and even more.

The real spelter market being established by private transactions between producers and consumers the information reflecting the market can come only from them. Among such transactions there are often considerable differences, the means of exchanging information in the spelter market being distinctly inferior to those of the copper market. Some consumers do considerable "shopping," Others do not. Some who do so ordinarily may upon certain occasions make a negotiation with some one smelter without letting anybody else know that he is in the market. The direct market, if I may use that term, is often quite different from the speculative, or semi-speculative, street market. The quotations made on the New York Metal Exchange do not ordinarily command any serious attention anywhere. Before accepting any quotations made there it is necessary to know whether anybody trading in spelter was present at the call and whether the price was the result of a genuine transaction. If nobody who wants to buy or sell spelter be present at the call it is easy of course to bid up, or offer down, the price ⅛ to ¼c. above or below the real market.

The conditions above recited explain the contradictory reports about the spelter market that frequently are in circulation. In cases of discrepancy the high figures are generally to be rejected on the probability that they represent merely prices that are squeezed on a small order required under special conditions or in speculative business that is small in volume anyway.

Foreign Relations

The tariff on spelter causes the American market to be independent of the European market during most of the time. Formerly, American smelters used to dump a good deal of spelter upon the European market at certain times, but during recent years no such opportunity has arisen. On the other hand, we have lately witnessed circumstances in which we were upon the verge of importing European spelter, duty paid, and have actually made such importations.[3] At these times the European market was a restraining influence to a further rise in our own. Similarly, upon other occasions, the possibility of exporting spelter has checked a decline in our market. Except for these conditions the European market and American market may display wide disparity and doubtless will continue to do so so long as our producers are protected by the tariff on zinc ore and spelter.

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[3] We are, of course, importing foreign zinc ore all the time and smelting it in bond, the product being exported or entered for consumption according to the market conditions of the moment. The duty on imported spelter is 1⅜c. per lb.; on zinc in ore, 1c. per lb.

Standard Curtails California Oil Purchases

The Standard Oil Co. is persistent in refusing to renew contracts for crude oil under 18 gravity. The reason seems to be sufficient as the Standard has a steadily accumulating reserve of residuum from its refineries, which with the crude in storage makes a total of about 27,000,000 bbl. in the Standard storage tanks and reservoirs. The company claims that its stocks are sufficient for the requirements of its fuel market. It is evident that it is the intention of the Standard Oil Co., to confine its supply for the fuel-oil marke which it controls, as nearly as possible to the residuum product of its refineries, and give other producers the right-of-way to the crude fuel. There will no doubt be some demand for 18 gravity oil for fuel purposes, but the demand for this grade of oil for fuel is small compared with the requirements for refining or topping. The congestion of storage that must follow the refusal of 18-gravity oil by the Standard while embarrassing to the Agency producers, will be somewhat relieved by the General Pipeline which will turn over its tanks so far completed to the relief of producers affected by the Standard. The General Pipeline will not be completed until March, 1913, but the present capacity is sufficient to be of material aid. It is difficult to see how the Standard could act otherwise in the present situation, since the increased demand upon its refined products requires the production of increased stocks of fuel residuum. Whatever its attitude toward independent producers, there appears to be no good cause for the criticisms that have been offered regarding its determination to protect its own interests in the matter of purchasing no crude oil below 18 gravity.

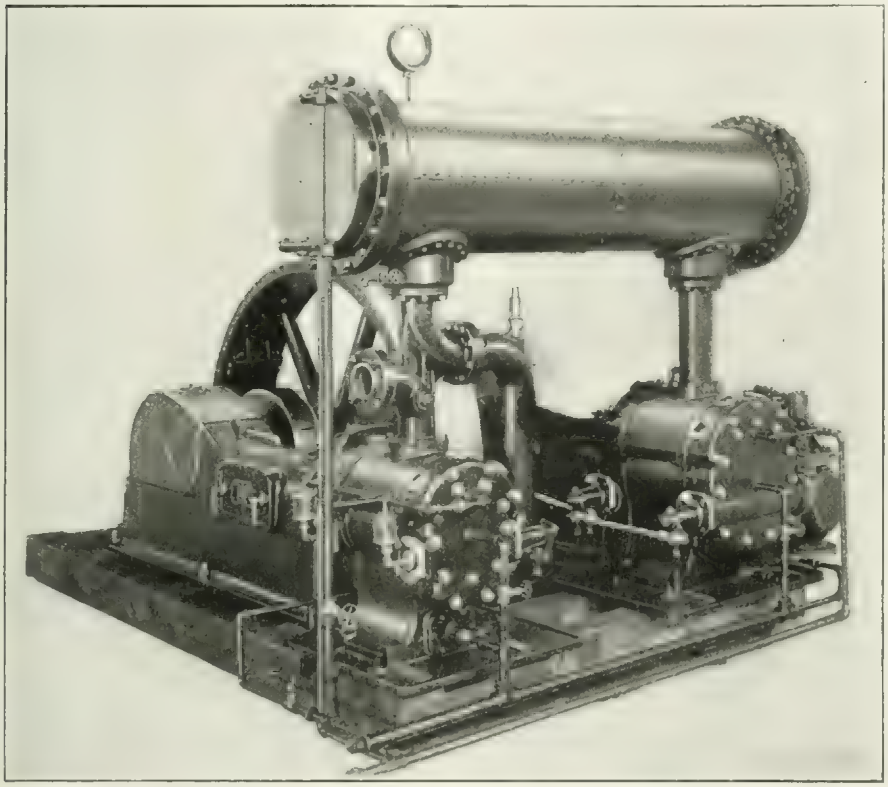
Chicago Pneumatic Air Compressor

The Chicago Pneumatic Air Compressor shown in the accompanying illustration embodies some of the most recent developments in compressor design of the Chicago Pneumatic Tool Co., Fisher Building, Chicago.

The machine, which is of the belt-driven type, is completely inclosed and is self-oiling, the oil being fed from the reservoir only while the compressor is in motion. The complete inclosure of the machine makes flood lubrication of the main bearings and crosshead possible and at the same time economical. The crossheads are provided with both top and bottom guides, as it has been found that this provides smoother and more perfect action than the single guide.

The inlet valves are of the semi-rotary Corliss type and are placed high in the head, thus giving them larger area than usual, at the same time reducing the clearance and raising the volumetric efficiency. The discharge valves are placed radially in the cylinder heads and are fastened by one bolt, making easy their removal and repair. None of the valves has parts projecting into the cylinder. The air cylinders are bolted to the frames, thus making it possbile to remove the cylinders for repair without disturbing the bedplate of the machine.

An automatic regulator, controlled by receiver pressure, throttles the intake air so that when no air is being used the machine runs light with a partial vacuum on both sides of the piston. Heads and cylinders are arranged with independent water supply, permitting the use of solid gaskets between the heads and cylinders. The intercooler is somewhat larger than is common with this type of machine. This compressor is built in capacities up to 4000 cu.ft. per minute.



THE CHICAGO PNEUMATIC AIR COMPRESSOR

Canadian Mining Institute

The semi-annual or Western meeting of the institute was a successful one, a large number of the Western members being present at the sessions held at Victoria, B. C., Sept. 18 and 19, and at Frank, Alberta, Sept. 30. Dr. A. E. Barlow, president of the institute, presided. At Victoria, the institute was welcomed by the premier and minister of mines, Sir Richard McBride, who delivered an interesting and instructive address on the recent developments of the mining industry of the province and also referred appreciatively to the work of the Institute. The mayor of Victoria and the president of the Victoria Board of Trade also addressed the members. During the morning session of the first day, the proposed amendments to the by-laws were discussed, and a resolution was adopted urging the appointment of a Minister of Mines for the Dominion. At the adjourned meeting at Frank, this resolution was endorsed.

Among the papers read and discussed were, at Victoria: "The Relation of Earthquakes to Colliery Explosions," by Frank Napier Denison; "Fuel Problems of the Pacific," by H. Foster Bain (read by D. B. Dowling); "The Geology and Mineral Resources of Northern Quebec and Ontario," by Dr. A. E. Barlow; "Notes on Copper Mining in British Columbia," by E. Jacobs. At Frank: "Engineers' Reports on Property," by W. D. L. Hardie; "Provincial Mining Legislation," by W. F. McNeill; "Jasper Park Collieries," by R. H. Morris; and "Notes on the Work and Scope of the Canadian Mining Institute," by H. Mortimer-Lamb.

During the meeting at Frank, the members present decided to organize what will be known as the Rocky Mountain Branch of the Institute, to which will be attached all members resident between Fernie and Medicine Hat. The following were elected to serve as an executive committee of the new branch: W. R. Wilson, general manager of the Crow's Nest Pass Coal Company, Fernie, B. C., chairman; J. T. Stirling, Provincial Inspector of Mines, Edmonton, secretary; W. F. McNeil, Lewis Stockett and O. E. S. Whiteside.

Development Methods at Mineville

By Guy C. Stoltz*

The Harmony mines at Mineville, N. Y., are opened by turn-vertical shafts which follow the irregular foot wall of the orebody. Horizontal and vertical curves make slow hoisting necessary. Sinking methods at the Harmony and Joker shafts were similar. Other development methods on the Witherbee-Sherman properties are described.

Development work, such as sinking skipways to lower levels, opening and equipping stations, driving drifts, crosscuts and raises and exploration by magnetometric surveys and diamond drilling, receives constant attention at the magnetite mines owned by Witherbee, Sherman & Co., Inc., at Mineville, N. Y. In fact, development by sinking is favored over operating when there is a shortage of labor. A certain amount per ton, on all ore mined, is set aside to cover such development work. The company is at present operating the Harmony, Joker-Bonanza, Barton Hill and Cook mines.

In the Harmony Mines 20% of Ore Left as Pillars

The Harmony mines A and B were opened by vertical shafts sunk through 250 ft. of glacial drift and perhaps 50 ft. of gneissoid hanging wall. The ore was cut at this point, and the double-track skipways were continued along the foot wall, levels being turned off at about 100-ft. intervals, measured along the foot wall. The level interval, of course, depends upon the dip, when the dip is flat sublevels are driven. Both shafts are sunk with the dip, which will average 30°. About 80% of the ore is mined, 20% being left in pillars and braces. Pillars will average 25 ft. high, 30 ft. in diameter and are spaced about 80-ft. centers; this depends upon the lay and condition of the hanging wall.

The Harmony mines have been worked along the incline for about 1200 ft., the elevation at the shaft collars being about 1150 ft. above Lake Champlain and the lowest levels about 400 ft. above the lake. Vertical curves, made necessary by sinking along the variable dip of the foot wall, several horizontal curves (not severe because of long radii) and the knuckles at the foot of the vertical shafts are not conducive to rapid hoisting. Still this permitted all development sinking to be done in ore, and the ore broken has covered the sinking expense.

One Ton of Concentrates from 1.3 Tons of Crude Ore

Skips of 3½-ton capacity, as shown in Fig. 7 of the accompanying drawings, are used for regular hoisting. A fair rope speed is possible if good back rails are provided and there are plenty of rollers to guide the hoisting rope around both vertical and horizontal curves. The two shafts produce 1000 tons in 24 hours. If the orebody had been sufficiently explored by drilling to permit of a more intelligent choice as to an angle for sinking, that would do away with the horizontal and vertical curves, a much greater capacity could be maintained. Still the value of magnetite ore will not allow much dead work; this is especially true with the Harmony ore, which requires 1.3 tons of crude ore to make a ton of concentrates.

In the old method of sinking, in the Harmony mines, the main skip was used to hoist from the sink; or when the dip permitted, a tram car, operated by an auxiliary hoist, took the ore from the sink up to the lowest operating station, where it was transferred and dumped into the main skip. There was no storage at the levels other than several extra tram cars.

Auxiliary Skips Used in Sinking

The present method of sinking in the Harmony mines was introduced by H. Comstock, assistant general manager. The method adopted at the Joker mine is shown in detail in the accompanying drawing, Fig. 3, as is also the track system and equipment of pockets. The auxiliary skip used in sinking has a capacity of one ton of broken ore. It is carried on 6x6-in. stringers, the wheels have a 30-in. tread and ride on ½x3-in. flat iron. The 3x6-in. back rails are set 15 in. above the flat iron and are held in place by ¾x6-in. spacers, introduced every 10 feet.

Girts, 3x6 in., act as spacers for the track stringers, and these are held in place by ¾-in. tie rods. The skip wheels are 14 in. in diameter, those forward having a 3-in. tread and the rear 6 in. This allows the forward wheels to ride out on horizontal sticks at the dump, while the rear wheels run on the main stringers until the car is at an angle of 45°. The skips discharge their contents into a small storage bin of from 50 to 100 tons capacity. The ore is drawn from the bin by an air-operated gate, which allows the ore to run down a swinging chute, discharging into the main skip. The swinging chute can ordinarily be kept in a horizontal position, where it permits hand tramming on the bin level.

The auxiliary skip is kept on the bottom of the sink by means of a pair of 6x6-in. lap slides, girted and fitted with flat-iron shoes, which rest on the permanent stringers. The 18-ft. slides are hooked to the skip and hoisted when firing. A chain ladder reaches from the last timber ladder to the bottom.

Miners Do Their Own Mucking

A 6- to 8-ft. pentice is left the full width of the two skipways to protect the men in the sink. In the Harmony mines the skipways are sunk 8 ft. high and 23 ft. wide, and, in general, follow the dip of the foot wall. New levels are being opened at vertical intervals varying from 50 to 75 feet.

Considerable ore is tied up in roof pillars over the hoistways and also in the 15-ft. shaft rib pillars. Still it would be difficult to open new levels, when needed, if the sinks were carried the full height from foot wall to hanging. This distance in some cases would be 40 ft., at right angles to the dip. Two machine crews work in each sink and usually do their own mucking, except when cutting out for a station; then considerable muck can be in the sink and still afford drilling faces.

The main skips ride on 8x8- or 10x10-in. stringers, shod with 45-lb. steel rails. These are bolted to the stringers, as spikes constantly work loose. The back or guard rails which are not put on over the whole length of track, are made up of two 3x6-in. stringers bolted together, shod with ½x3x4-in. angle iron and held 15 in. above the rail by ¾x6-in. iron braces. The stringers are girted with 3x6-in. sticks, held by 1-in. tie rods. Foot-wall plates of 10x10-in. timber are introduced under the stringers at 15-ft. intervals. These are blocked up to proper elevation and held by 1¼-in. L-shaped plugs of bent round iron. These are, of course, split at the end, fitted with wedges and driven to hold.

Skip Holes Cut at Pocket Levels

Rollers are spaced at about 50-ft. intervals along the skipways, these are 2 to 3 ft. long, and are either basswood, in which case the shaft turns in the boxes, or they may be made of wrought iron with ends made of worn-out skip wheels; this roller turns on the shaft. The objection to the iron roller is that the rope scours before the roller starts rotating, this occurs particularly when lowering an empty skip with the rope bobbing. At the severe knuckles along the hoistways, manganese-steel sheaves with a 3-in. axle are used.

The skips on the Harmony hoistways which are inclined at about 30°, cannot

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*Superintendent of mines, Witherbee, Sherman & Co., Inc., Mineville, N. Y.

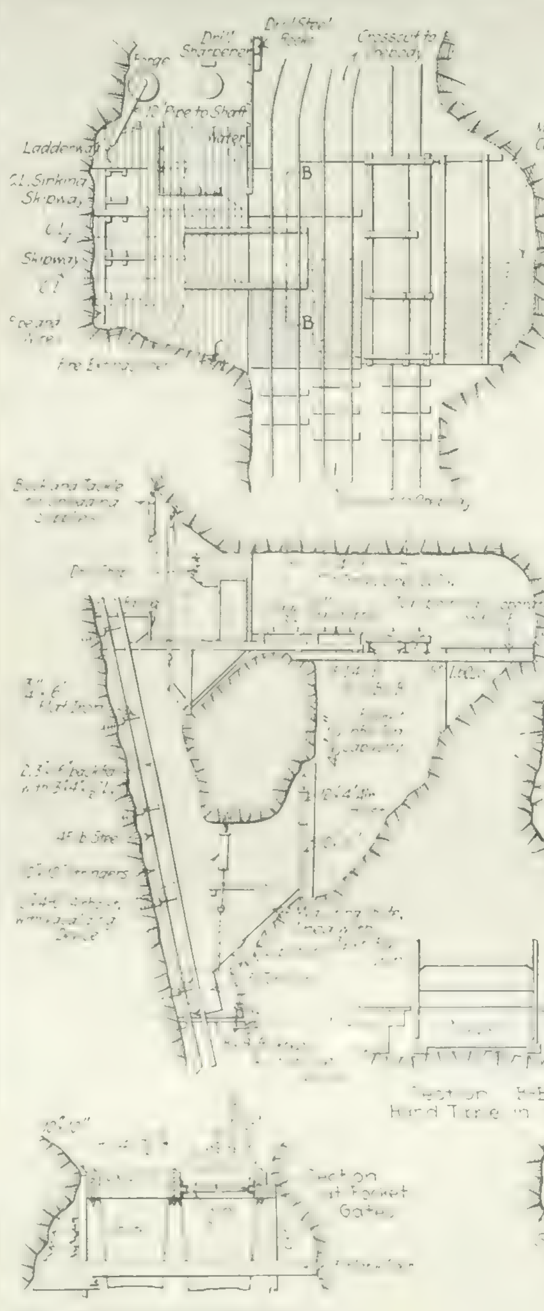

FIG. 1, PLAN AND SECTION AT 340 FT. LEVEL OF JOKER MINE

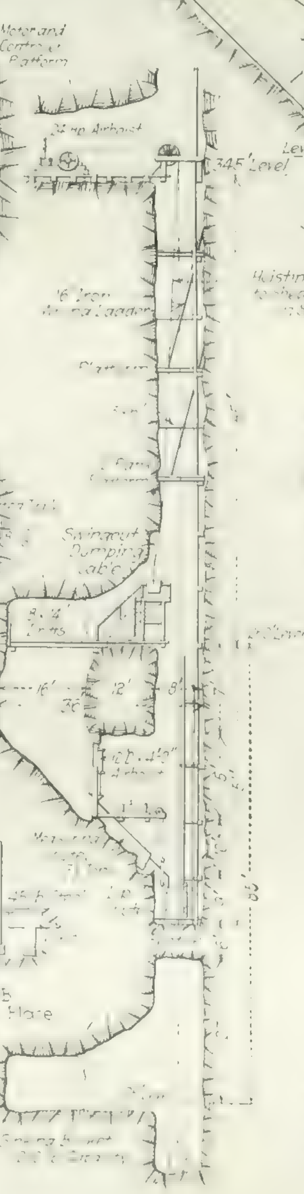

FIG. 2
SECTION THROUGH BONANZA SHAFT

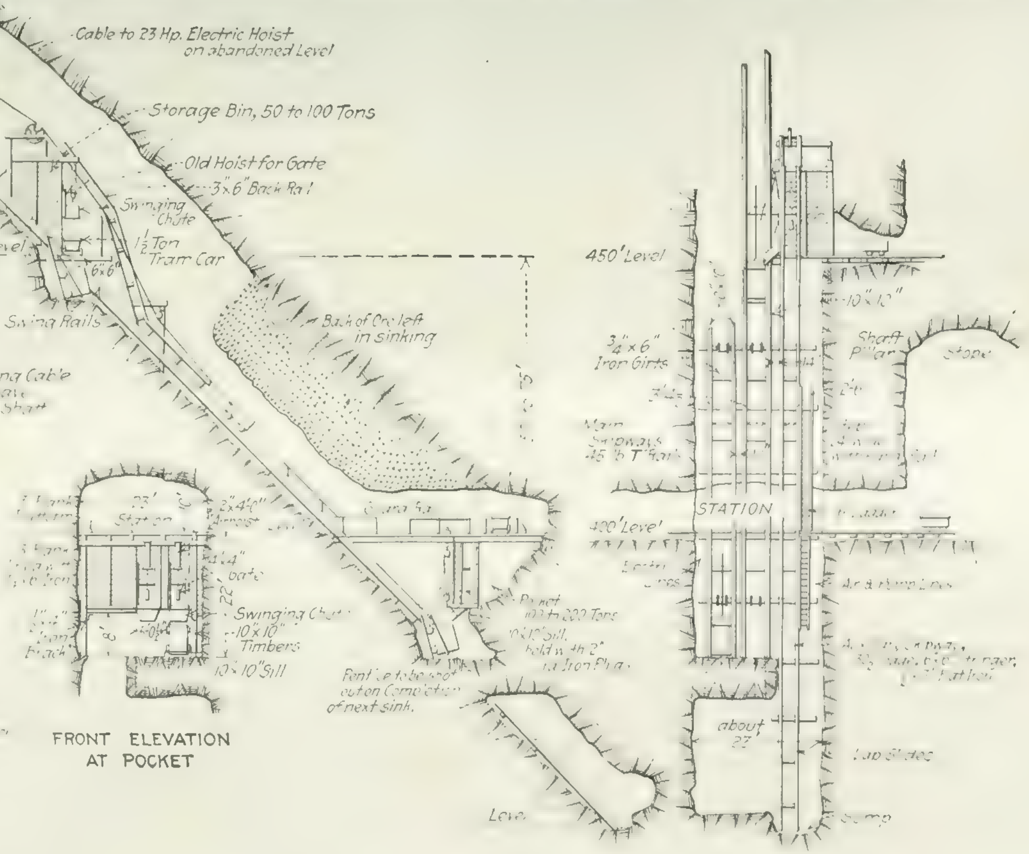

FIG. 3, SECTION AND ELEVATION OF SKIPWAY AT HARMONY MINE

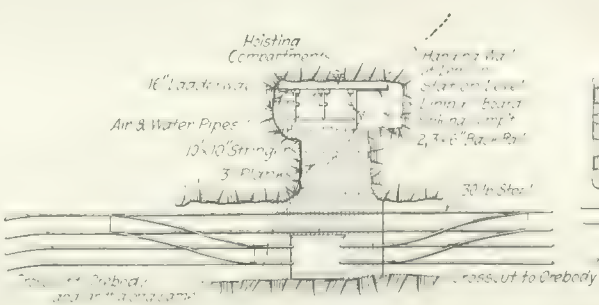

FIG. 2 A, PLAN, 260 FT. STATION, BONANZA SHAFT

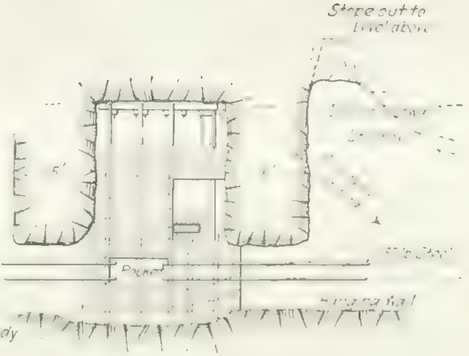

FIG. 3 A, PLAN, 400 FT. STATION, HARMONY MINE

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METHODS OF SHAFT SINKING, AND STATION AND LEVEL EQUIPMENT IN WITHERBEE-SHERMAN IRON MINES

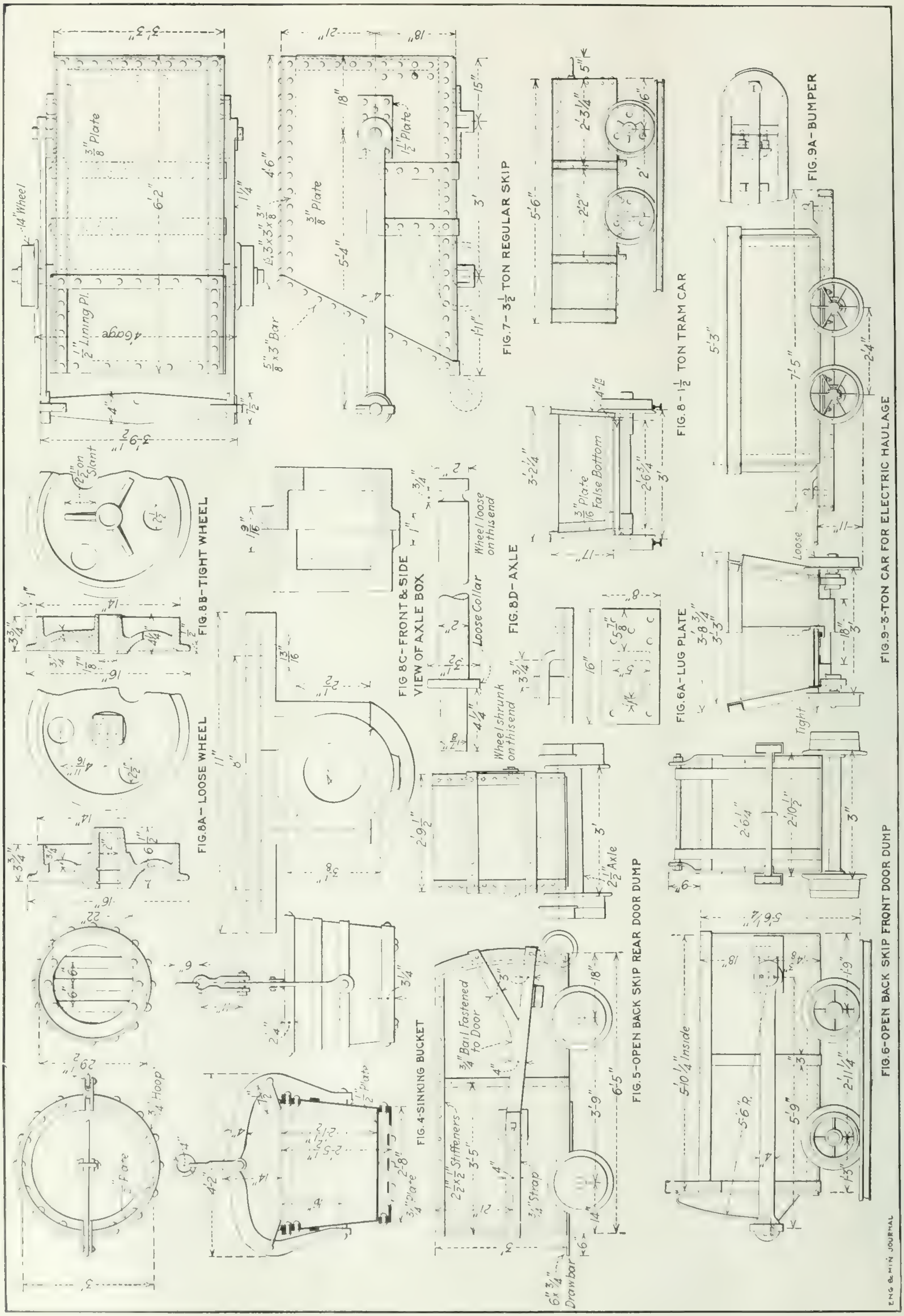


FIG. 7-3½ TON REGULAR SKIP

FIG. 8-1½ TON TRAM CAR

FIG. 9A-BUMPER

FIG. 8B-TIGHT WHEEL

FIG 8C-FRONT & SIDE VIEW OF AXLE BOX

FIG. 8D-AXLE

FIG. 6A-LUG PLATE

FIG. 9-3-TON CAR FOR ELECTRIC HAULAGE

FIG. 8A-LOOSE WHEEL

FIG. 4-SINKING BUCKET

FIG. 5-OPEN BACK SKIP REAR DOOR DUMP

FIG. 6-OPEN BACK SKIP FRONT DOOR DUMP

TYPES OF APPARATUS USED FOR ORE TRANSPORTATION IN THE IRON MINES AT MINEVILLE, N. Y.

be filled by the pocket chutes unless the axis of the skip is brought to an angle of almost 80° from the horizontal. To accomplish this a skip hole is shot out in the foot wall; at each pocket level a knuckle is made in the stringers and rails to allow the car to rest nearly vertical. This necessitates a break in the stringers and rails at each skip hole. The break is bridged by throw rails about 10 ft. long. These are hinged to the 45-lb. rails just below the skip hole. When the skip is signalled for a certain level, the throw rails are swung to the right and left and the skip lands in a loading position. When a lower pocket is to be emptied the throw rails are closed at the pocket just emptied and the skip rides on over the skip hole to the pocket below.

Measuring chutes are not used at the pockets in the Harmony mines, as they would take up room which could be used to advantage in allowing more pocket storage. The capacity of the pockets varies from 100 to 200 tons.

STAIRS INSTEAD OF LADDERS IN INCLINED SHAFTS

Koppel, roller-bearing end-open tram cars of 1½-ton capacity, Fig. 8, are used on the levels and are tended by two men on a long tram and three men on a shorter tram. Stint work is applied, 12 cars per trammer being required. The tram cars are flared, the top being wider than the bottom of the car. To dump the cars, the 30-lb. tram rails are broken near the center of the pocket, the wheels are stopped by coming against 1x3-in. inverted U-shape iron straps bolted to the ends of the rails. Center-throw switches are used on all tram roads. Some of the switch points are made from 2½x2½-in. iron, while usually points are made on a planer from a 3-ft. length of 30-lb. steel. The points, throw mechanism and frogs with a variable spread, are made in the company's shops. The angle of the foot wall permits of stair steps with hand rails, the stairs following along the side of the skipways as far as the knuckle at the foot of the shaft. Through the vertical portion of the shaft 16-in. iron-rung ladders are used; these are arranged parallel with platforms at 20-ft. intervals.

The A and B shafts of the Harmony mines are served by a four-drum Wellman-Seaver-Morgan hoist, driven by a 300-hp., 440-volt, 250-r.p.m. General Electric motor. Each drum is 10 ft. in diameter and carries 3500 ft. of 1⅛-in. steel cable. This length of rope permits of four 250-ft. cut-offs and a change of ends before it is discarded. The skip end of the cable wears because of scouring in starting the rollers.

The Joker shaft, on the Joker-Bonanza orebody, has been sunk about 1000 ft. on an angle of 78°. The method of sinking is similar to that adopted at the Harmony mines. The shaft has been carried in the country rock of late, the stations with 700-ton pockets are cut out in the country rock and crosscuts are driven to the orebodies. Koppel cars of 3-ton capacity, Fig. 9, and fitted with roller-bearing wheels, are trammed to the pocket by a five-ton direct-current General Electric locomotive, and the cars are dumped three at a time by a revolving cylindrical tipple operated by a 12-hp. motor. A one-car hand tipple is also installed in case the larger tipple should require repair. Details of the station on the 340-ft. level, the pocket and loading system, introduced by S. Le Fevre, general manager, are shown in Fig. 1. Skips of 3½-ton capacity are loaded at the pocket and these are hoisted in balance by a Wellman-Seaver-Morgan hoist, operated by a 500-hp., 440-volt, 250-r.p.m. General Electric motor. The hoist has 10-ft. drums each with 2500 ft. of 1⅛-in. steel cable, and the normal hoisting speed is 900 ft. per minute. The locomotive gathering tracks are all of 45-lb. steel and laid to grade while the spurs to the different workings are 30-lb. steel and laid to a 1¼% grade favoring the loads.

The old method of sinking for new levels in the Joker mine was to use a bucket of 1-ton capacity. The bucket rode to the dumping level on the 78° angle by sliding on a pair of 8x8-in. stringers set 30 in. apart. At the dumping level the bucket was hooked to a "swing out" rope, swung off to one side of the shaft and dumped into a chute discharging into a tram car.

To use the auxiliary skip in sinking the shaft, by the newer method, the main difficulty is to keep the rear wheels on the lap slides near the bottom of the sink. The back rails cannot be kept close to the bottom of the sink, for they would be blasted off, and in hoisting on stringers so nearly vertical, the tendency is for the rear wheels of the skip to raise off the track. To obviate this a hole is drilled in the bottom of the nose of the skip and the bail is tied to the nose by a chain and toggle. The hoistman on the dumping level stops the skip before it reaches the dump and disengages the toggle, after dumping, he again engages the toggle and lowers the skip.

BONANZA SHAFT SUNK BY BUCKET

The Bonanza vertical shaft is sunk by means of a 1-ton bucket, Fig. 4, this is hoisted through a separate compartment. Boards are nailed vertically, several inches apart, against the wall plates and dividers, so that when riding one can prevent the bucket from swinging by keeping the fingers in the gap between boards. The boards, of course, keep material from falling into the other compartments.

The temporary 16-in. ladderway is maintained in the sinking compartment. On the completion of a sink, and after equipping the station and pocket, the ladderway is moved to the other side of the shaft. Platforms are placed at 20-ft. intervals, the ladders standing at about 65° and are arranged parallel with one another. The pocket arrangement, track system and level equipment is similar to that in the Harmony mines and is shown in an accompanying drawing, Fig. 2.

Drawings are also shown of the several types of skip cars. The regular 3½-ton skip (Fig. 7) is now hung by having the bail arms reach to the bottom of the skip and cotterpinned after fitting on the turned ends of 3x3-in. iron, which is held by ¾x4-in. straps to the skip bottom.

The 1½-ton hand-tram car (Fig. 8) and the locomotive-haulage car (Fig. 9), are standard equipment in all the mines. The rear-door-dump open-back skip (Fig. 5) of three-ton capacity, is used in the Barton Hill mines, for that portion of the ore above the main-tunnel level, which must be lowered to storage bins in the tunnel level. The front-door-dump open-back skip (Fig. 6) of three-ton capacity is used in the above mines to hoist the ore below the tunnel level.

Iron Blast Furnace Temperatures

Some blast-furnace reaction temperatures are given in the following list, taken from a paper by S. H. Stupakoff before the Engineer's Society of Western Pennsylvania.

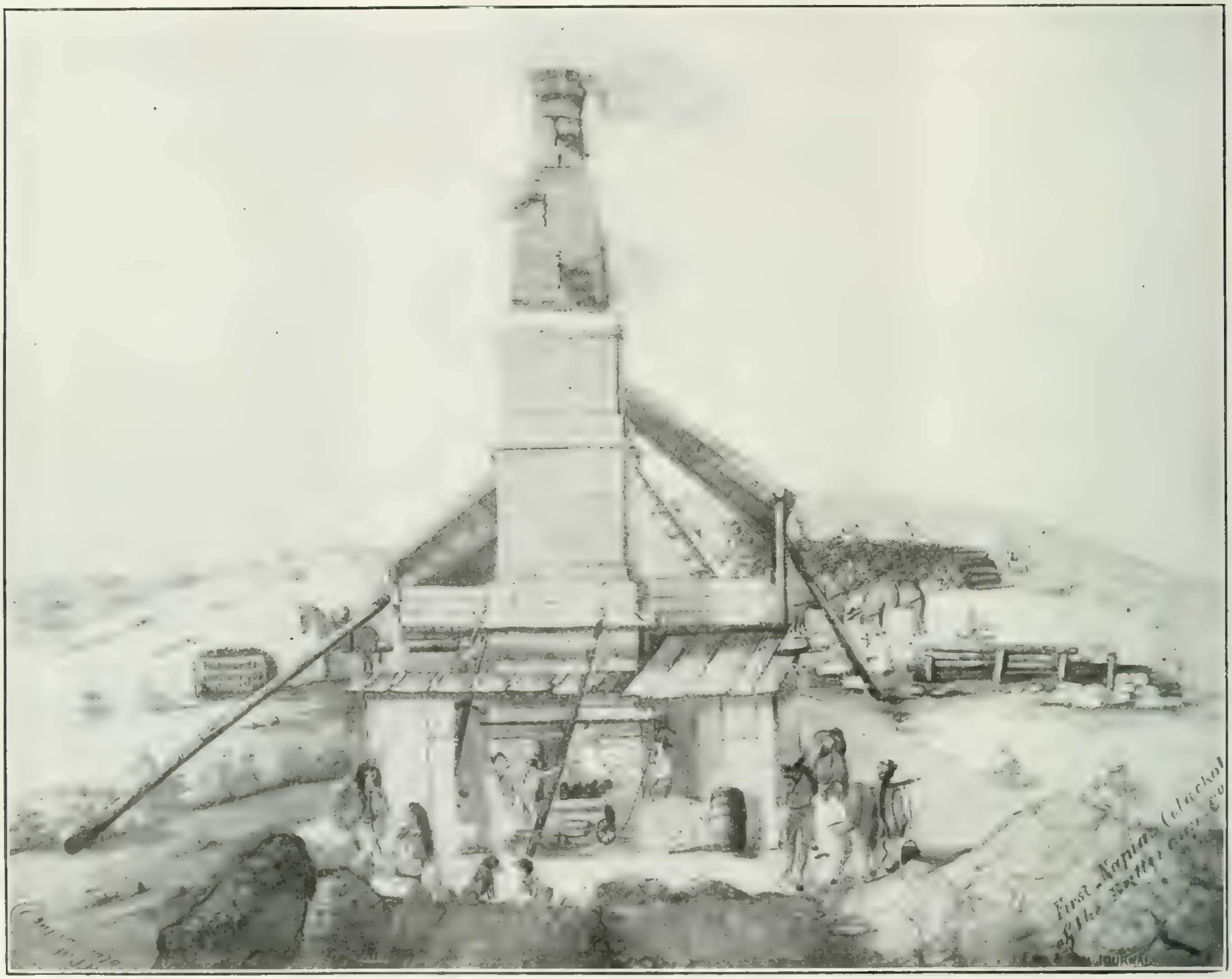
Carbon monoxide begins to reduce precipitated iron oxide at 285° F.; roasted carbonate at 390° F.; and is active for all ores at 750° F. The reverse reaction, CO_2 reduced by iron to CO begins from 800° F. to 1110° F., depending on mass-action, etc., and is active at 1475° F. Solid carbon begins to reduce iron oxide at 800° F. The reduction by CO is most active at 1000° F., and begins to lessen above that temperature. A mixture of $3CO_2$ and 2CO is oxidizing at 1000° F., and a mixture of $1CO_2$ and 2CO is oxidizing anywhere over 1500° F. Limestone decomposes at 1600° Fahrenheit.

Nickel Extraction from Garnierite

The extraction of nickel from garnierite ($H_2(Ni, Mg)\,SiO_4 + aq.$) is taken up in French patent No. 441,074, by P. A. M. de Mehereng. The finely crushed ore is roasted in a reverberatory, and then boiled for two hours with a 1 to 5% solution of sulphuric acid. The solution is then treated with powdered chalk, precipitating all metals but nickel and magnesia. The nickel is then precipitated by sodium carbonate, and the carbonate reduced to metal in an electric furnace, or else the nickel solution is electrolyzed, using nickel cathodes and carbon electrodes, keeping the solution neutral with the powdered chalk. The patentee also suggests recovery of the sulphuric acid by diaphragm cells, including making a larger quantity of sulphuric acid by use of sulphurous acid in the diaphragm cell.

Early Western Lead Smelting

In 1869, a smelting furnace was erected in the Eureka district, Nev., by C. A. Stetefeldt, which appears to have smelted ores from several of the mines, but a large proportion of gangue in th ores rendered the flux required too great, and pecuniary difficulties prevented the completion of the plant.



The First Successful Lead Smelting Furnace in Nevada, Erected at Eureka in 1869

The first successful commercial plant appears to have been erected by Col. G. C. Robbins at Eureka, in 1869, which plant was described by R. C. Canby before the International Congress of Applied Chemistry, the data being furnished Frank Robbins, son of Colonel Robbins. The stack, shown in the accompanying illustration taken from an old drawing, was a draft furnace, through which the mixture of oxide and carbonate ores is said to have "run like butter."

Originally slag was run off into ordinary iron wheelbarrows, and bullion molds were made of sheet iron, folded and reinforced by a heavy wire rim. In 1870, the original draft stack had already given way to two small blast furnaces, and within the next four or five years there were 12 or more plants erected. However, it did not take the mine owners long to learn that the smelting toll charged by a large plant was less than the operating costs of an individual one, so that eventually two only, the Eureka Consolidated, and Richmond Consolidated, survived. These eventually combined to fix a smelting charge which was all the miner could stand and just low enough to prevent the ore going to Salt Lake City.

In 1870, with the exception of Stetefeldt, there were no skilled metallurgists, there were two or three itinerant assayers whose knowledge did not extend beyond the use of crucible and cupel, but careful hourly analyses of slags were made on the point of a long-handled shovel.

The Pritchard, whose name appears on the box eyed by a meditative mule, was the smeltery foreman, a son of a Welshman and a Mexican woman, described as racially a metallurgical marvel. The crew was Mexican and Indian and celebrated feast days with great vigor. During one of these shut downs Pritchard whitewashed the furnace interior with bone ash, having gotten the idea from the resisting properties of the cupel.

Three young German metallurgists, Karl von Leibinau, Albert Arents and Otto H. Hahn came to the camp about this time. Hahn, probably with Leibenau as his assistant, planned and constructed the smelting plant of the Richmond company in 1871. Arents remodelled that of the Eureka. These men probably brought with them the plans of the Raschette furnaces from Germany. They were the first to introduce dust chambers into the camp and Arents invented and patented his siphon tap. For many years metallurgical pilgrims came to steal ideas from these works.

The Ore Deposits of Goldfield—I

By Augustus Locke*

Goldfield developed as a boom camp where promoters, speculators and lessees delimited the ore-bearing ground and then gave way to the consolidations which followed. Ore never occurs in unaltered rock but usually in rock which is well silicified. The productive area may be considered part of an irregular lode, the walls of which are better defined in dacite than in latite.

The Goldfield discoveries were antedated several years by those of the Yukon and the Seward peninsula. Their lateness has caused much wonder; it has seemed to be something of an anomaly that Nevada should hide its wealth longer than Alaska. The conditions which surrounded the Goldfield discoveries, however, rendered them more difficult than the discoveries in any notable North American gold district.

In the first place, the Goldfield district, though not so remote as Nome or the Yukon, was, in reality, further from the beaten trail. The forbidding Nevada desert offered no motive for exploration except that of prospecting. Even now, when the state contains several centers of successful mining enterprise, it possesses interior expanses of which little is known.

Ore Difficult to Recognize

The ore deposits themseves were intrinsically hard to recognize. The region was by no means entirely unknown, from the sixties onward, the excitements at Montezuma, Lida and Silver Peak had brought prospectors to the vicinity, and in 1902, some months before the initial discoveries, a genuine invading horde had come in, applied their energies for a time to prospects near the sites of the present mines, and then gone away. But, in spite of these explorations, the existence of the Goldfield ore deposits was still unsuspected. There was nothing to hold the gold-seeker's eye; rusty, siliceous ledges existed in vast quantity, and good ore reached the surface in several places, but the croppings which carried gold were effectively hidden in the multitude of their similar brethren which carried no gold whatever. The country had that "burnt up" aspect which the miner associated with the idea of barrenness. Moreover, the sign of the placer was lacking. In other localities, placers have served as infallible trails, easily recognized and yielding such rich rewards that, once found, they were inevitably and instantly followed. The remarkable fact is, not that the Goldfield deposits were so long undiscovered, but that they were discovered at all.

It was in 1901 that Tonopah became a noteworthy producer. Like California in the fifties and Virginia City in the sixties and seventies, it constituted, during its early days of prosperity, a source of prospecting impulses, and overflowed with men, eager to follow whatever gleams of hope the desert afforded. One such gleam of hope was the discovery, in the latter part of 1902, of float gold on Columbia Mountain, about 30 miles south of Tonopah, and a mile or so north of Goldfield. The resulting stampede, and the quick discouragement and departure of the stampeders have been noted already.

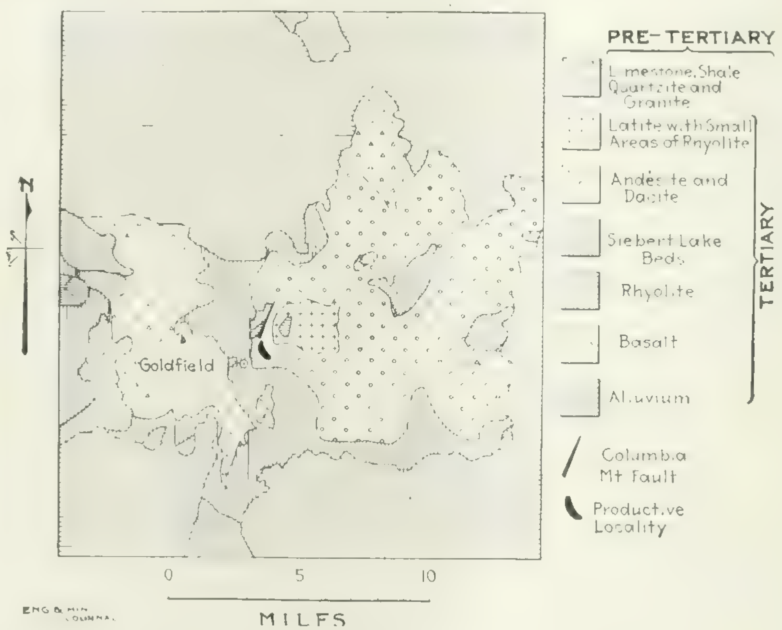
A few prospectors, however, remained, and in the spring of 1903, a location was made on the Combination. Shallow holes revealed ore which was later to be mined in open cuts. Almost from the start, the orebodies developed automatically, paying for their own exploration. The first shipments were made in November. By the end of 1904, the production amounted to half a million; by the end of 1905, it amounted to a million. The Combination had immediately become a great mine.

The discovery of the Combination was quickly followed by the discoveries of most of the other orebodies which apexed at or near the surface. The Jumbo, January and Florence were actively and successfully worked by lessees during 1904 and, during the year, the high-grade portion of the Jumbo and the greater part of the January were worked out. Up to the end of 1904 the total production was as follows: January, $500,000; Jumbo, $1,100,000; Florence, $650,000; Combination, $500,000; total, $2,750,000.

The important discoveries in the Red Top were deferred until the beginning of 1905. The long delay would seem surprising; for in one place ore has since been stoped to the surface. A consideration of the facts affords an explanation; the finds in the Jumbo, Florence, Combination and January were so scattered as to give little suggestion of the trend of the ore, and the relations of the individual ore occurrences to each other were exceedingly puzzling.

At the beginning of 1906, the parts of the district known to be ore bearing are to be regarded as the outliers of the far richer central portion, that of the Mohawk, which was still unrevealed. The Jumbo, the Red Top, the January, and even the Florence and Combination, are according to present indications, shallow mines; they have yielded little below depths of 300 and 400 ft. But the Mohawk (or, rather the Clermont, for the Mohawk in its lower levels goes under that name) has rich ore in considerable quantity down to the depth of 1000 ft., and there is a chance that further development will find deeper ore.

The discovery of the Mohawk was delayed by the barrenness of its croppings. For over two years, while its neighbors



Geological Map of Goldfield and Vicinity
(Adapted from Ball)

Note.—The work on which this article is founded was done under the direction of Henry Lloyd Smith, professor of mining and metallurgy, Harvard University, and while Mr. Locke was a holder of a Sheldon fellowship from Harvard University.

*Mining geologist, Apartado 34, El Oro, Mexico.

were enjoying the full measure of prosperity, the Mohawk was generally scorned. Not until the mining excitement prompted the sinking of numerous shafts (chiefly by lessees) was its worth learned. One of these shafts, quite by accident it seems, found the Mohawk ore in the spring of 1906, at a depth of 250 ft. The very core of the district was now reached, and in 1906 Goldfield yielded over seven millions.

Goldfield Boom Followed the Mohawk Discoveries

Goldfield was in a state of boom the greater part of the time from the early discoveries until 1908. As early as the beginning of 1905, it had a population of about 8000, a number exceeding the industrial need several times over.

It is not, however, to the conditions of the earlier years that the term, Goldfield boom, is ordinarily referred, but to the period succeeding the Mohawk discoveries. By the end of 1906 Goldfield had developed into a speculative bedlam with a population of at least 15,000.

Of themselves, the discoveries had those sensational qualities which create excitement, but it was to certain accompanying conditions that the full flow of this excitement was due. The first and most important of these conditions was the coincidence of a nation-wide industrial optimism. Promoters made clever use of the prevailing speculative tendency. Two hundred shafts were in simultaneous operation and, according to some estimates, the public paid $30,000,000 for shares in Goldfield mining companies. The facts that only a dozen or so shafts are now active, that dividends have been considerably less than $30,000,000, and that the bulk of this amount has been gained by a restricted group of stockholders, show impressively the magnitude of the inflation.

A second important accompanying condition was the prevalence of ore stealing. I like to regard that part of the boom which concerned the inhabitants of Goldfield as a sort of maelstrom, in which money, easy to get and easy to spend, circulated at an enormously rapid rate, giving the illusion of abundance by the frequency of its appearance. Ore stealing added an impulse, indirect but effective, to the maelstrom. The highgrader who got $20 during the day made haste to get rid of it at night. Goldfield was a community containing some thousands of gamblers.

The result of all the conditions together was a mining excitement as intense, though not as prolonged, as that of the Comstock. And it is interesting that the delimitation of the ore-bearing ground was accomplished entirely during the period of the boom, and largely at the expense of speculators. When it had been finished, a few cool-headed organizers stepped in and took possession.

Lessees enjoyed much prosperity in Goldfield between 1903 and 1908. The first important discoveries in all the mines, except the Combination, were made by the lessees. Goldfield had no such inherent characteristics as those of Cripple Creek which made leasing a logical and permanent necessity, it got a hold largely because of the vagueness with which the ore occurrence was at first understood. Its application was an expedient used only during the stage of preliminary development. Once the limits of the ore locality became known, leasing on a large scale ceased.

Curiously enough, leasing and ore stealing coincided closely in duration, and if leasing had not existed, I doubt if ore stealing would have attained its enormous development. It must be understood that the owner of a productive lease was invariably in a hurry; good miners were hard to get, and the lessee who deprived his men of their "right" to steal ore was likely to have no men at all. In short the consenting silence of the lessees made of Goldfield a place in which ore stealing, approved by the bulk of the population, could scarcely be regarded as immoral.

Goldfield Consolidated Mining & Milling Co. Formed

As already suggested, leasing constituted a sort of intermediate stage between the prospector and the large company. Eventually the time came for big-scale operations. Such operations, however, could have been carried on without consolidation; for the unit mines would individually have constituted enterprises of great magnitude. I believe that the scheme of consolidation was first suggested because the Sheets-Ish lease workings in the property of the Combination Mines Co. followed ore from the surface downward into the Mohawk No. 2 claim, threatening the right of the Mohawk company to important orebodies. The possibilities of apex troubles as here suggested were large, and they looked the more ominous because the relations of one orebody to another were regarded as hopelessly complicated. The fear of destructive litigation caused the possible enemies to enter into an alliance which converted them into permanent friends. Just how much trouble was avoided by this alliance is impossible to say, but Goldfield has been conspicuously free from apex litigation.

The motive afforded by the fear of litigation was, of course, only one of several conditions which promoted consolidation. The orebodies were so arranged that they logically constituted a single unit for exploitation. The ore-bearing area was compact and small, and was controlled by a small number of interests. I know of no great gold district where consolidation has been so easy a matter.

Miners Object to Change Houses

For several years after the early discoveries, Goldfield existed in a state of abnormal excitement. Certain conditions which existed during these years, notably ore stealing and high wages, became fixed habits. The breaking of the habits involved serious labor troubles.

The first of these troubles came in 1906. In that year and in 1907 occurred numerous brief strikes, largely inspired by attempts to reduce wages or to introduce change rooms. The miners were in a most sensitive frame of mind, especially those who had been blacklisted in the Cripple Creek labor troubles.

Meanwhile, important changes had taken place in the character of the Goldfield community. The wages of the early days had been rightly high. But now the excitement was over. Railroads communicated with both the north and the south. The population was three or four times larger than the industrial need. The continuance of high wages was an economic anomaly. At the same time, leasing, except in the Florence, had ceased. The large number of small operators in the mines of the Goldfield Consolidated were replaced by a single deliberate management. The odds were turning rapidly against the strikers.

The decisive struggle started in November, 1907. About 2000 men then quit work, their immediate grievance being the desire of the mining companies to make part payment of wages in clearing-house certificates. Any repetition of the Cripple Creek disorders was rendered impossible by the prompt arrival of Federal troops, and under their protection the mining companies within a short time announced a reduction of wages amounting to something over a dollar per shift. In April, 1908, the miners' union admitted defeat, declaring the strike to be at an end.

The defeat was a complete one. Wages have continued at the figure set during the strike by the mine owners. Ore stealing, through the institution of change rooms, has been mostly done away with. Since 1908, no effective miners' organization has existed in Goldfield.

First Mill Built in 1905

The early production was shipped out of the district in the form of ore. At first, there was a wagon haul of 60 miles. Soon this was shortened to 30, a railroad then reaching Tonopah. In 1905, the railroad reached Goldfield. A 10-stamp cyanide mill was built in 1905 for the Combination mine. Later, its size was doubled. Three custom mills with a total maximum capacity of 70 tons per day, were, according to Ransome[1] running in 1905. The Florence mill was put into operation as a 20-stamp cyanide mill;

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[1] U. S. Geological Survey, Professional Paper No. 66, "Geology of Ore Deposits."

this was later enlarged to 40 stamps. Close to the beginning of 1909, the Goldfield Consolidated company put into operation a 100-stamp mill and later in that year, the 20-stamp Combination mill was dismantled.

It was only while leases were in operation, that there was room for custom mills; at present the custom mills are doing little or nothing. Formerly, the Consolidated shipped to smelters the concentrates from its mill and a considerable amount of high-grade ore. In 1911, the shipments of high-grade ore were mostly discontinued and lately a local concentrate treatment plant has been put into operation. The greatest part of the bullion production is now accomplished within the district.

A large part of Goldfield's prosperity is due to the successful application of cyaniding to the treatment of its ores. Goldfield did not have to experiment and wait for the application of this process. Mexican silver deposits, notably those of Pachuca, furnished the motive for the development of the patio process; the quartz veins of California, for the development of stamp milling and amalgamation; the Comstock, for the development of pan-amalgamation; and the Rand, for the development of cyaniding. But when Goldfield got ready, there was a process suitable for the treatment of its ores already in a high state of perfection. No other locality of refractory gold ores was ever discovered under such propitious metallurgical circumstances.

TERTIARY ROCKS OF THE GOLDFIELD DISTRICT—RANSOME

Formation or map name	Petrographic name	Occurrence
Malpais basalt	Dolerite	Flow or flows with a few small intrusions
Rabbit Spring formation	Breccia, conglomerate and sandstone.	A variable and for the most part thin deposit; probably fluviatile.
Spearhead rhyolite	Rhyolite	Flow or flows
Pozo formation	Conglomerate	Fluviatile deposit. Conformably underlies Spearhead rhyolite and unconformably overlies the Siebert formation.
Siebert formation	Conglomerate, sandstone, tuffs and diatomaceous earth.	Lake beds
Mira basalt	Quartz bearing doleritic basalt	Flow intercalated in Siebert formation.
Siebert formation	Conglomerate, sandstone, tuffs, etc.	Lake beds
Espina breccia	Dacitic breccia	Roughly bedded deposit.
Andesite breccia	Andesite breccia	Roughly bedded pyroclastic deposit.
Meda rhyolite	Rhyolite	Flow.
Dacite vitrophyre	Dacite vitrophyre	Flow.
Chispa andesite	Andesite	One or more flows in dacite vitrophyre.
Dacite vitrophyre	Dacite vitrophyre	Flows
Dacite	Dacite	Sheet-like and irregular intrusive masses passing into flows and breccias east of the area mapped
Milltown andesite	Andesite	Mainly flows, but some dikes and intrusive masses and with some tuff and breccia. Locally includes some effusive basaltic rocks which are not exposed at the surface.
Morena rhyolite	Rhyolite	Intrusive masses.
Sandstorm rhyolite	Rhyolite	Flows.
Kendall tuff	Rhyolitic and andesitic tuff	Obscurely bedded and in part lenticular deposits closely associated with the sandstorm rhyolite.
Latite	Latite	Flow
Vindicator rhyolite	Rhyolite	Flow

ORE-BEARING AREA LIMITED

It is not safe to count on the Goldfield ore area being enlarged. That any important orebodies apexing at the surface remain undiscovered, is entirely unlikely. And as for important orebodies which do not apex at the surface, there is no reasonable warrant for suspecting their existence outside the area which is now productive. A conservative estimate of future production then, must be limited to the locality known to be ore bearing.

The last annual report of the Goldfield Consolidated company states that in the latter part of 1911, its mines had in reserve 600,000 tons of ore, a two years' supply, of a value per ton probably considerably lower than that mined in the past. The Florence mine keeps little ore developed. It is safe to say that in general, above the depth of 300 ft., the ore-bearing quartz bodies have been well prospected, and that the bulk of the ore has been extracted; yet some ore is still being found there. Below 300 ft., ore in important quantities is being mined in the Red Top, Mohawk, and Clermont, and below 400 ft., in the Mohawk and Clermont. On the 1000-ft. level, the Clermont has important orebodies about 400 ft. long. On the bottom level, the 1200, which is the level immediately below the 1000, little prospecting has been done, and the results have so far been negative.

Goldfield has certainly reached, and perhaps passed, the crest of its production. In the last two years, about 20 miles of development work have been accomplished; yet none of the orebodies discovered has a value equal to that of the orebodies of the earlier years. It must, of course, be remembered that the work done on the lower levels is relatively meager in amount. Nevertheless, at present the presumption is that, should the deep ground so far unexplored prove productive, it will be far less productive than the upper levels have been. Even in the last year, the important new discoveries have taken place above the depth of 450 ft. Altogether, the deep exploration strongly indicates that the ore dwindles with depth.

But if it is certain that the life of the district is limited, it is equally certain that it will be much longer than that of the present ore reserves. The deposits so far found have been the more obvious ones. I believe that the discovery of additional orebodies will be gradual and that the great quartz masses will long continue to yield them up. Without any enlargement of the productive area, and without the discovery of important ore below the depth of 1000 ft., Goldfield ought to keep up a production, important though diminishing, for a considerable number of years.

SKETCH OF ROCK OCCURRENCE

The following is from Ransome: "The district is essentially a low, conical uplift of Tertiary lavas and lake sediments, resting upon a foundation of ancient granite and metamorphic rocks."

The Tertiary rocks, as Ransome lists them, are given in the accompanying table, the youngest at the top.

The pre-Tertiary rocks are: Alaskite and granite (occurring as large irregular intrusions in shale); shale and quartzite.

All but 2 or 3% of the production has been derived from latite or dacite. The rocks encountered in mining operations are chiefly:

Shale: Thin-bedded, contorted, exceedingly metamorphosed, consisting of fine-grained quartz with pyrite and abundant microscopic black specks, probably carbon.

Alaskite.

Latite: Never fresh. Has marked flow structure. Biotite occasionally fresh. Hornblende never fresh.

Andesite: Distinguished from the latite by absence of flow structure and by frequent freshness of dark phenocrysts.

Dacite: Closely resembles the andesite; distinguished by possession of quartz phenocrysts. The most common rock distinction required in mining is that between dacite and latite: this is often rendered difficult where the rocks are much altered by the presence in latite of blebs of secondary quartz resembling quartz phenocrysts.

FOUNDATION ROCKS PRE-TERTIARY

The foundation rocks of Goldfield belong to that body of material which constitutes the pre-Tertiary floor over many thousand square miles in this part of North America. Broadly, their age relations to the overlying Tertiary rocks are analogous to those between the "bedrock complex" and the "superjacent series" of the Sierras, and also, I believe, to those between the foot wall and hanging wall of the Comstock.

No fossils have been found in the Goldfield metamorphics; yet fossils of

Cambrian age are known in foundation rocks a few miles distant, and the presumption is that the corresponding rocks of Goldfield are also Cambrian. And because, in California and in some parts of Nevada, the late Jurassic or early Cretaceous time was a period of enormous granitic intrusion, the granitic intrusions of Goldfield are reasonably regarded as belonging to this class.

Concerning the shape of the pre-Tertiary floor, little is known. In Columbia Mountain, which has a relief of 400 ft., and in several places further east, the old rocks emerge as islands. But these are the only islands in an area of some scores of square miles. Immediately south of Columbia Mountain, in the vicinity of the productive mines, the slate and granite are occasionally encountered in the mine workings.

Underground exposures are so fragmentary as to define the floor only imperfectly. Perhaps the old surface is roughened by pre-Tertiary eminences, like Columbia Mountain. Or, it may be smooth on account of pre-Tertiary erosion, or, locally, on account of faulting. About all that we can be sure of concerning the shape and position of the pre-Tertiary floor in the productive locality is this: Its depth below the surface increases directly with the distance southeast from Columbia Mountain. Close to Columbia Mountain it lies at 300 ft. below the surface; one-half mile further southeast, at 1000 ft.; and a little further southeast, in the Clermont, at 1200 feet.

If several layers of rocks, each having a uniform thickness, had been laid down on a floor of basement rocks; and if, subsequently, the basement rocks had been at some point forced upward, so that the surface sloped in all directions away from the top of a dome; then, after sufficient truncation of the dome by erosion, the layered rocks would appear at the surface in rings with a core of older rocks at the center. The Black Hills uplift of South Dakota constitutes an almost ideal example of this condition.

In Goldfield, as Ransome believes, this condition is exemplified, but incompletely. Broadly, if the effects of faulting be taken into account, the grouping of the volcanic rocks is such that the older are nearer to the exposures of slate and granite and the younger are farther from them. Ransome's map shows a roughly circular area of rhyolite and latite, two miles in diameter, containing all of the islands of granite and shale (excepting Columbia Mountain, which owes its position to faulting) and surrounded by dacite and andesite.

DACITE WHOLLY EXTRUSIVE

The matter of the structural relations of dacite and andesite is of little economic importance. Yet it has considerable geological bearing; for the acceptance of Ransome's conclusion that the dacite is partly intrusive and partly extrusive would necessitate the belief that the intrusive phase of the rock passed before our eyes into the extrusive phase, making what would be surely a most interesting situation.

The more important arguments favoring Ransome's conclusions are as follows: (1) There is a steep dacite-andesite contact in the Florence mine. (2) The dacite transgresses the rule of ring distribution. The first of these arguments is weakened by the fact that the contact referred to is so obscured by the extreme alteration of the rock that it seems fully as likely that the contact is one of faulting as that it is one of intrusion.

The second is weakened by the absence of dacite dikes, by the fact that the andesite, as mapped, includes a number of irregularly distributed varieties, and the possibility that the dacite may be merely an additional variety. Indeed, the chief mineralogical difference between the dacite and the andesite is the possession by the dacite of the scattered quartz phenocrysts. Ransome's rock analyses show that the dacite is more acid than the most basic of the andesites and more basic than the most acid of them. Altogether it is noteworthy that the structural relations of the dacite and of the andesite to the other rocks are in the main identical. For example, both rest on latite. And when the two are mapped together as andesite, the andesite ring becomes at once complete. The evidence now available favors the view that the dacite in the vicinity of the mines was wholly extrusive.

Certain hills in the district which are known to have been produced by erosion, possess a relief as great as 500 ft., and this figure may be taken as a minimum for the total erosion.

Post-ore erosion is difficult of determination. There are several conditions which suggest that it was small: (1) The relative youth of the ore; (2) the extreme slowness of present erosion; (3) a marked increase in the complexity of ore and lode from a depth of 600 ft. upward, suggesting an originally shallow deposition; (4) the entire absence of placers.

SILICEOUS OUTCROPS INVARIABLE CONDITION OF ORE OCCURRENCE

The Goldfield district is clearly distinguished from the surrounding monotonous expanses by the occurrence within it of siliceous croppings. These lie scattered over an area of several square miles, as Ransome says, they "stud the hills." Not 1% has been proved to cover ore. Yet little ore occurs without them. They, and the buried quartz of which they are the superficial manifestation, are to be regarded as the largest invariable condition of ore occurrence.

The siliceous croppings belong to an area of intense solfataric rock alteration. Within this area, the rock minerals are seldom sufficiently fresh to show good cleavages; the rock itself is either softened, with the production of much kaolin and alunite, or hardened by silicification. A great body of softened rock, it may be said, carries an incomplete siliceous skeleton. The differences in hardness between the softer and harder parts have produced a topography of rough details, but generally subdued elevations, the soft parts being designated by the depressions, and the hard parts by the siliceous croppings.

SURFACE INDICATIONS MISLEADING

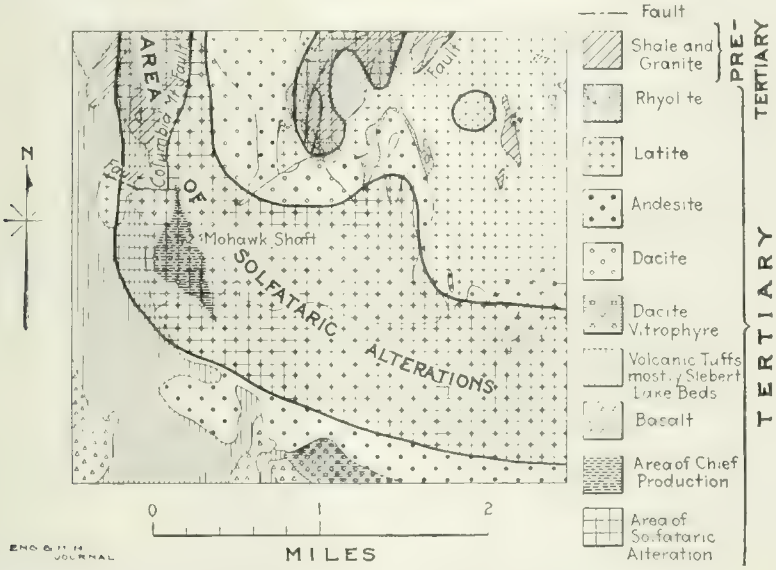
From the time of the first discoveries, the puzzling characteristics of the area of alteration have bewildered the prospector and miner. The distribution of the quartz bodies suggests, not a mineralization which followed dominant fissures, but one which progressed along complex and tortuous channels. How one quartz body is related to another; how silicification is related to softening alteration; and how alteration in general and silicification in particular are related to ore mineralization, are problems of great difficulty. When the fact became known that some of the croppings covered ore, it became at once a question why all or many of them did not do so, and the question has not yet been definitely answered. The surface material is frequently a barren cover which hides ore; one cropping looks as inviting as another. Until the ore-bearing ground had been delimited, the prospector was in a state of frenzied expectancy and indecision, attracted equally by the "surface indications" of some thousands of acres. Moreover, when he made a choice of locality, taking usually a strong outcrop, he often found that his outcrop was a boulder, that his shafts soon passed out of quartz, or that his tunnels even failed to enter quartz. Or, if the outcrop was more than a boulder, he often found that its limits were crooked, he could scarcely call it a vein, for it had no definiteness of trend either on strike or dip.

In reality, the only established rule of association between rock alteration and ore is this: Ore never occurs in unaltered rock, never in rock not to some degree silicified, and usually in rock which is well silicified. The fact that the orebodies lie within the region of general solfatarism establishes a connection, however vaguely it may be understood, between solfatarism and ore deposition. It would seem, at least, that both were results of volcanism. There is no better indication, however, of our ignorance of the fundamental facts of ore genesis, than our failure here to produce useful working theories, and there is no better proof of the present unsuitability of the so called "genetic" classifications to the purposes of the miner.

ORE AND DACITE NOT COEXTENSIVE

The map shows the ore area, with the exception of its southern end, to lie wholly within an area of dacite. For a long time, dacite was regarded as the only favorable rock. The statement, "We are in the dacite," was frequently and profitably used by promoters. The situation prompts an inquiry into the causes of the almost exclusive limitation of the ore area to dacite.

In the first place, it is evident that ore and dacite are in no way coextensive. There is no such large coincidence between the ore and the dacite as there is in Tonopah, for example, between the ore and the trachyte, or in Cripple Creek between the ore and the body of volcanic rocks. Large areas of dacite are barren. Even of that particular area which comprehends the ore locality, it is only a limited portion (near the western edge) which is ore bearing. But if ore and dacite are in no sense coextensive, then does the presence of dacite constitute an invariable condition of ore occurrence? Later explorations, and especially those of the last three years, prove conclusively that it does not.



GEOLOGICAL MAP OF THE GOLDFIELD DISTRICT

(Compiled from Ransome's maps)

Ore occurs in andesite. As has been already suggested, the ore area runs across the andesite-dacite contact of the Florence mine into andesite, and persists there for several hundred feet. True, the andesite orebodies have been so small as to look insignificant beside those of the Mohawk, but they are sufficient to spoil the rule.

Again, ore occurs in latite. The great orebody of the Clermont 750-ft. level, to which a considerable part of the extraordinary production of the Consolidated during the years 1910 and 1911 was due, lies in latite on the downward prolongation of the ore-bearing quartz of the Mohawk. The ore on the 900- and 1000-ft. levels also lies in latite. The limitation of the chief ore field to the area of dacite, looks, then, far less significant than it did before the mine workings reached below the bottom of the dacite.

Following are five hypotheses concerning the relations of ore and dacite: (1) The source of the ore minerals was the dacite itself, or the magma from which the dacite was derived. For example, the ore may have come from solutions or gases belonging to a period of expiring vulcanism which closely followed the dacite eruption.

(2) Dacite was intrinsically more favorable than other rocks to the circulation of the transporters of gold.

(3) Dacite was more favorable than other rocks to the precipitation of gold.

(4) The dacite was localized by faulting. The ore was localized by renewals of this faulting.

(5) The inclusion of the bulk of the productive ground in the area of dacite was accidental.

Concerning the applicability of the first, second, and third of these hypotheses, I have no conclusive evidence. The utter barrenness of large stretches of dacite (the ore belt occupies only one-sixteenth of the dacite area which immediately contains it) creates a strong presumption against them, however.

The fourth hypothesis has plausible arguments in its favor. The ore-mineralizers followed, as seems most likely, fissures belonging to the Columbia Mountain fault movement. Ransome believes the dacite body which contains the ore to have been intrusive and to some extent to have been directed by this same movement. I believe the dacite to have been effusive. But, though effusive, it may possess intrusive roots, similarly directed. Or it may be wholly effusive and occupy a pre-dacite basin whose position was similarly directed. As is stated later, there is no convincing proof that any part of the Columbia Mountain fault movement preceded the solidification of the dacite.

Altogether, the occurrence of ore is a matter of locality rather than of petrography. There is no indication that, had the present dacite area been occupied by andesite, rhyolite, latite, or even shale or alaskite, it would not still have comprehended the ore area.

THE GOLDFIELD LODE

The Goldfield ore is chiefly silicified rock-bearing ore minerals; the ore containers are larger masses of silicified rock lacking ore minerals. Ransome believes that the ore containers have not sufficient continuity and definiteness of shape to deserve the term, lode. I have found, however, that they possess greater continuity and definiteness of shape than Ransome's report led me to expect, especially in the levels which have been opened since Ransome's time, those below the 600. Indeed, they are now clearly proved to be parts of a great and complicated lode, having many spurs, curves and interruptions, but showing characteristics which demonstrate its essential unity. It is the presence of this lode which constitutes the second invariable condition of ore occurrence.

The known extent of the lode along the strike is one mile, and along the dip is 2500 ft. These measurements are from the south end of the Florence to the north end of the Red Top, and from the outcrops of the Mohawk to the 1200-ft. level of the Clermont. The siliceous croppings of the lode lie close to the western edge of the area of solfataric alteration, and are weaker than those of many other parts of this area. The sole lode-like suggestion yielded by them comes from the possession of a fairly well marked fracturing striking northerly and dipping easterly, and of a vague north-south orientation.

On the 600-ft. level of the Mohawk, the lode is continuous for a distance of 2000 ft. or more. It has a width, measured at right angles to the walls, of 75 to 100 ft.; it dips 30° easterly.

It is possible to follow this lode upward on its 30° dip and keeping always in quartz, to come out in the Mohawk croppings, or by rising on a steep-dipping, hanging-wall spur, to come to the surface further east. Or it is possible to work northward on the 600-ft. level and, again keeping always in quartz, to come out in the Red Top, or to work southward on the 350-ft. level and come out in the Combination.

The Mohawk, Red Top, and Combination quartz masses, then, have a common root. That the Jumbo and Florence connect with this root has not been proved. The lode crops, as we have seen, near the western edge of the area of solfataric decomposition, and dips under this area. The bulk of the solfatarically altered rock is in its hanging wall, and, in a general way, it constitutes the western and approximate lower limit of such rock. Altogether, there is a strong suggestion that the lode channel was an important route for the travel of the solfataric mineralizers, and that from it they departed upward by devious and manifold paths, into the hanging wall. Following this hypothesis, the barren quartz bodies lying to the east may have somewhat the same structural relation to the lode as the nearer upspringing spurs. The limitation of the productive locality to the foot-wall region of the solfatarically altered rock appears even more strikingly at the Comstock, and is a matter well worth the attention of prospectors.

Lode Better Defined in Dacite Than in Latite

King's famous cross-sections of the Comstock lode, showing a simplification and contraction of the lode from the surface downward, in a large way, represent the conditions as they exist in Goldfield. Not that there is in Goldfield any such well defined foot wall, or that all the superficial quartz masses so definitely connect at depth with a common channel, but that while, in the upper 600 ft., Goldfield has several ore-bearing quartz bodies, in the lower levels; so far as is known, it has but one; and that, again, this one, the persistent quartz body, has an easterly dip on which it extends from the surface to at least the 1200-ft. level, while the other ore-bearing quartz bodies are usually steeper hanging-wall branches.

The most definite lode boundaries exist on the easterly sides of the Combination and of the Jumbo. In these places, the wall is usually marked by a selvage or gouge, and the change from quartz to soft rock is instantaneous. The westerly sides are vaguely bounded. In a direction at right angles to the strike, the silicification diminishes gradually, and there is difficulty in determining where lode material ceases.

Generally speaking, the lode walls are definite when they have gouges and indefinite when they lack gouges. The conclusion is suggested that any sharpness of definition which they may possess is the result of post-lode movement. Ransome expresses his belief in post-lode movement when he states that the gouges have been caused by the squeezing and consequent movement of soft rock around hard kernels (the quartz bodies) which it contains. Altogether, the walls are better defined when the lode is in dacite than when it is in latite, probably because dacite lode material is harder than latite lode material.

Quartz Bodies Weaken with Depth

Ransome's generalization that the quartz bodies weaken with depth survives the developments of later years. The clearest example of such weakening is in the Jumbo. The Jumbo stands vertical or nearly so. At the surface, the quartz is (for Goldfield) excellently defined. At the depth of 300 ft., it is narrower and its outlines are vague. At 600 ft., crosscuts exploring the locality through which its downward continuation ought to pass, have so far intercepted no trace of it. The Jumbo appears to have the non-persistence of a gash vein.

The January acts much as the Jumbo does, a crosscut to it at the depth of 380 ft. reveals only a feeble and barren silicification.

The Combination, apparently, acts somewhat similarly. Since the opening of the lowest, 380 ft., level, questions as to where the lode and where the ore have gone have been asked repeatedly. So far, the most plausible answer is that they quit as they come down to an east-dipping quartz body, and that this quartz body, pitching to the north, forms the connection with the Mohawk.

The Red Top is still strong at the 600-ft. level, some lease workings in a crosscut somewhat over 1000 ft. deep and on the dip of the lode show excellent quartz actually below the porphyries and in the underlying shale.

The Mohawk has great strength on the 600-ft. level. Here it is continuous with the Red Top and the two together are traced for over 2000 ft. On the 750-ft. level, the area explored is smaller, but the lode shows no signs of giving out. On the 900-ft. level, the area explored is still smaller; yet within it, one limit to the well defined portion of the lode has apparently been reached; for to the north the lode merges into a locality of extremely feeble and irregular silicification. It is likely that the quartz comes in strong again further to the north, but at present good quartz is visible for a distance of only 400 ft. along the strike.

On the 1000-ft. level conditions resemble those on the 900. On the 1200, the small amount of exploration work accomplished proves that the quartz is persisting along the dip, but it gives no basis for a generalization as to its persistence along the strike.

Now the three quartz bodies noted as giving out at shallow depths, the Jumbo, the Combination, and the January, are steep or vertical, while the two which have more extensiveness along the dip, possess dips of about 30°. I am unable to avoid the conclusion that steepness of dip is fundamentally connected with persistence in depth.

The Combination quartz weakens when it reaches the dacite-latite contact; the Jumbo and the January quit far above it and the Mohawk and Red Top go down through it. Of what is going to happen when the Mohawk and the Red Top go down into the shale, present developments give us only a hint, that rendered by the single crosscut before referred to, which shows good quartz existing in shale at a point on the downward projection of the Red Top. The 1200-ft. level of the Clermont appears to be immediately above the latite-shale contact.

Three Grades of Quartz

But if the vertical persistence of the lode has no clearly proved general relation to the rock contacts, there is nevertheless a marked connection between them just above the latite-shale contact.

An inspection of Ransome's surface geological maps shows that silicified croppings are abundant in dacite and andesite, but conspicuously scarce in latite. For some reason or other, hard quartz failed to attain any such development in latite as it attained in the other rocks. In my work underground, I gathered much evidence of the general truth of this rule. I found it convenient to distinguish three grades of quartz, the first being flinty, the third soft with much included unsilicified rock, and the second, intermediate. Quartz in dacite, that is, quartz resulting from the alteration of dacite, is chiefly of the first and second grades, while that in latite is chiefly of the third. When the lode passes from one rock to the other, the rule is strikingly exemplified.

For example, the Mohawk comes down to the bottom of the dacite at close to 600 ft. Above 600 ft. there exist huge bodies of hard quartz; below 600 ft. almost the only hard quartz is the ore itself, sometimes 20 ft. wide, and sometimes only half a foot, and the bulk of the lode which attains widths as great as those on the higher levels, is composed of material so soft that the pick in striking it often fails to ring. For the softness of the lode in latite, no satisfactory explanation has been offered.

(*To be concluded*)

Recovery of Metallic Iridium

Metallic iridium, used for the points of gold pens, is made from the iridium powder left in the wet processes of platinum refining. This powder cannot be smelted alone, says the *Brass World*, Sept. 1912, but is strongly heated in a sand crucible and stick phosphorus added, the mass melting down as iridium phosphide. This is then heated with lime, removing the phosphorus, leaving a brittle white mass of iridium, which cannot be filed or cut, but is broken into the small pieces necessary for pen points, which are ground by carborundum into shape. These pieces of iridium are said to be about the hardness of a ruby.

Mining and Metallurgical Patents

A Classified List of New Inventions

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by "The Engineering and Mining Journal" upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COPPER

ALLOY OF COPPER AND ZINC. Alfred Schmid, Zurich, Switzerland. (U. S. No. 1,040,027; Oct. 1, 1912.)

ELECTROLYSIS—Improvements Relating to the Production of Copper by Electrolysis. Raymond Dovvreleur, Veauche, Loire, France. (Brit. No. 21,593 of 1911.)

EXTRACTION—Improved Process for the Extraction of Copper and Nickel Particularly from Low-Grade Ores and Products. W. Borchers, Aachen, Germany, and H. Pedersen of Trondhjem, Norway. (Brit. No. 227 of 1912.)

LEACHING—Improvements in the Oxidation of Ferrous to Ferric Solutions Applicable to the Extraction of Salts of copper and Other Non-ferrous Metals from Ores, Mattes, Residues and the Like. A. McKechnie and F. G. Beasley, Birmingham, Ala. (Brit. No. 15,489 of 1911.)

ROASTING—Ore Burner for Sulphuric Acid Manufacture. Curtis C. Meigs, Woodbury, N. J. (U. S. No. 1,038,408; Sept. 10, 1912.)

GOLD AND SILVER

CRUSHING—Gold-Ore Grinding Mill. John H. Buston, Baltimore, Md. (U. S. No. 1,040,876; Oct. 8, 1912.)

CYANIDE CYLINDER. Henry B. Meade, Los Angeles, Calif., assignor of one-half to William F. Shedd, Los Angeles, Calif. (U. S. No. 1,038,173; Sept. 10, 1912.

CYANIDE PLANT. Albert F. Tanner, Greenfield, Wis. (U. S. No. 1,034,532; Aug. 6, 1912.)

CYANIDING—Filter. Bruce W. Traylor, New York, N. Y. (U. S. No. 1,037,561; Sept. 3, 1912.)

HYDRAULIC CLASSIFIER—Apparatus for Classifying or Grading Crushed Ore and the Like. George Hardy Stanley, Johannesburg, Transvaal, assignor to Sands Limited, Johannesburg, Transvaal. (U. S. No. 1,040,804; Oct. 8, 1912.)

STAMP MILLING—Pneumatic Ore Stamp. Hans Charles Behr, Johannesburg, Transvaal. (U. S. No. 1,038,521; Sept. 17, 1912.)

STAMP MILLS—Supporting and Lifting and Adjusting Device for Stamp Mill. Edward H. Moyle, Los Angeles, Cal., assignor to Edward Moyle, Grass Valley, Cal. (U. S. No. 1,040,235; Oct. 1, 1912.)

IRON AND STEEL

AIR-BLAST HEATER. Edmund Hohmann, Stettin, Germany, assignor to Stettiner Chamotte-Fabrik Actien-Gesellschaft vorm. Didier, Stettin, Germany. (U. S. No. 1,038,887; Sept. 17, 1912.)

FERROMANGANESE—Improved Process and Furnace for Melting Ferromanganese and other Ferro-alloys. J. I. Bronn, Rombach i/Lothringen, Germany. (Brit. No. 20,121 of 1911.)

HARDENING—Compound for Hardening Steel and Other Metals. Patrick W. Brennan, Philadelphia, and Michael Meehan, Williamstown, Penn. (U. S. No. 1,036,434; Aug. 20, 1912.)

INGOTS—Solidifying Ingots. James E. York, New York, N. Y. (U. S. No. 1,035,933, Aug. 20, 1912.)

MIXERS—Safety Device for Metal Mixers. William P. Gleason, Gary, Ind. (U. S. No. 1,038,872; Sept. 17, 1912.)

REGENERATIVE FURNACE. Peter Patterson, Pittsburgh, Penn. (U. S. No. 1,038,640; Sept. 17, 1912.)

TITANIUM ALLOY—Compound or Composition of Matter and Method of Producing Same. Auguste J. Rossi and William F. Meredith, Niagara Falls, N. Y., assignors to Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,039,672; Sept. 24, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINUM—Channel Furnace. Alfred H. Cowles, Sewaren, N. J., assignor to Electric Smelting & Aluminum Co., Sewaren, N. J. (U. S. No. 1,040,895; Oct. 8, 1912.)

ALUMINUM—Charge Mixture for Forming Alkali-Silico-Aluminate and Hydrochloric Acid. Alfred H. Cowles, Sewaren, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,893; Oct. 8, 1912.)

ALUMINUM—Method of Protecting Tunnel Furnaces from Injurious Gases. Alfred H. Cowles, Sewaren, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,892; Oct. 8, 1912.)

ALUMINUM—Process for Producing Hydrochloric Acid and Alkali-Silico-Aluminates. Alfred H. Cowles, Sewaren, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,977; Oct. 8, 1912.)

ALUMINUM—Process for the Manufacture of Ammonia by Means of Aluminum Nitride. Ottokar Serpek, Paris, France, assignor to Societe Generale des Nitrures, Paris, France. (U. S. No. 1,040,439; Oct. 8, 1912.)

ALUMINUM—Process for Welding Aluminum. Franz Jordan, Reinickendorf, Germany. (U. S. No. 1,033,412; July 23, 1912.)

ALUMINUM—Process of Forming a Charge Mixture for Producing Hydrochloric Acid and Alkali-Silico-Aluminate. Alfred H. Cowles, Sewaren, N. J., assignor to Electric Smelting & Aluminum Co. (U. S. No. 1,040,894; Oct. 8, 1912.)

ALUMINUM—Process of Making Aluminum Sulphate. Percy Hutchins Carter, Harry Horace Shackleton, and Thomas Edward Grafton, Rome, Ga. (U. S. No. 1,037,591; Sept. 3, 1912.)

TIN—Recovery of Tin from Tin-Bearing Ores and the Like by Conversion into Volatile Tin Compounds. A. Richards, London, Eng. (Brit. No. 56 of 1912.)

VANADIUM—Improvements in Processes for Extracting Vanadium from Ores. B. D. Saklatwalla, Pittsburgh, Penn. (Brit. No. 6119 of 1912.)

ZINC—Improvements in Condensers for Zinc Vapors. A. L. J. Queneau, Philadelphia, Penn. (Brit. No. 2669 of 1912.)

ZINC—Improvements in or Relating to the Separation of Metals from Zinc-Bearing Ores or Compounds and Apparatus Therefor. E. A. Ashcroft, London, Eng., and Sande Gaard, Balestrand, Norway. (Brit. No. 19,257 of 1911.)

ZINC—Improvements in the Extraction of Zinc from Zinc Ore. A. Rotzheim, Duren, Prussia. (Brit. No. 19,587 of 1912.)

NONMETALLIC MINERALS

CLAY—Process of Purifying Clay, etc. Hermann Gruber, Leipzig-Plagwitz, Germany, assignor of one-half to Fritz Schulz jun. Aktiengesellschaft, Leipzig, Germany. (U. S. No. 1,036,831; Aug. 27, 1912.)

CLAY-SIEVING MACHINE. Alfred H. Cowles, Sewaren, N. J. (U. S. No. 1,040,639; Oct. 8, 1912.)

FELDSPAR—Process for Extracting Alumina from Feldspar. Samuel Peacock, Chicago, Ill. (U. S. No. 1,036,897; Aug. 27, 1912.)

MINING GENERAL

BLASTING—Miner's Combination Tamping-Tool, etc. Lewis Shaffer and Alfred W. Shaffer, Duryea, Penn. (U. S. No. 1,040,037; Oct. 1, 1912.)

CAR-DUMPING MECHANISM. K. N. H. Hansen, Pittsburgh, Penn., assignor to Orenstein-Arthur Koppel Co. (U. S. No. 1,040,670; Oct. 8, 1912.)

DRILL. William E. Thrasher, Bisbee, Ariz. (U. S. No. 1,037,082; Aug. 27, 1912.)

DRILL—Hand-Held Handle-Supported Rock Drill. John George Leyner, Denver, Colo., assignor to J. Geo. Leyner Engineering Works Co., Littleton, Colo. (U. S. No. 1,039,971; Oct. 1, 1912.)

DRILL-BIT SHARPENING—Fluid-Operated Drill-Steel-Gripping Vise for Drill-Bit-Sharpening Machines. John George Leyner, Denver, Colo. (U. S. No. 1,040,221; Oct. 1, 1912.)

DRILL RODS—Safety-Clamp for Drill Rods and the Like. Charles Wommer, Mammoth, Calif. (U. S. No. 1,036,400; Aug. 20, 1912.)

DRILLING—Dust Receptacle. Thomas E. Mitchell, Meaderville, Mont. (U. S. No. 1,038,413; Sept. 10, 1912.)

DRILLING—Jack for Removing Pipes or Casings from Earth Borings. Albert C. Ludlum, New York, N. Y., assignor to New York Engineering Co. (U. S. No. 1,037,179; Aug. 27, 1912.)

EXCAVATING AND LOADING MECHANISM. Job Sheridan Tindall, Pueblo, Colo. (U. S. No. 1,038,684; Sept. 17, 1912.)

HOISTING—Self-Dumping Mining-Tub. Oscar Belford, Golconda, Ill. (U. S. No. 1,039,688; Oct. 1, 1912.)

LAMP. Alva E. Thompson and James Cameron, Hastings, Colo., assignors, by direct and mesne assignments, to Miners Electric Safety Lamp Mfg. Co., Trinidad, Colo. (U. S. No. 1,040,056; Oct. 1, 1912.)

ORE POCKETS—Door Mechanism for Ore Pockets or Similar Receptacles. Robert B. Pearson, Duluth, Minn. (U. S. No. 1,040,237; Oct. 1, 1912.)

VENTILATION—Improvements in or Connected with Means for Use in Promoting Ventilation in Subterranean Mines. Mavor & Coulson, Ltd. and S. M. Mavor, Glasgow, Scotland. (Brit. No. 20,188 of 1911.)

ORE DRESSING—GENERAL

CLASSIFICATION—Improvements in Apparatus for Classifying Ores. Comp. d'Enterprises de Lavage de Minerais, Paris, France. (Brit. No. 5235 of 1912.)

CONCENTRATING TABLE. Emil Deister and William F. Deister, Fort Wayne, Ind. (U. S. Nos. 1,040,164 and 1,040,165; Oct. 1, 1912.)

CONCENTRATOR—Ore Concentrator. Thomas W. A. West, Ocotlan, Oaxaca, Mexico. (U. S. No. 1,038,046; Sept. 10, 1912.)

CONCENTRATORS—Head Motion for Ore Concentrators. Henry Eggers, Denver, Colo., assignor to the Mine & Smelter Supply Co., Denver, Colo. (U. S. No. 1,038,322; Sept. 10, 1912.)

CRUSHING—Adjusting Mechanism for Crushers or Pulverizers. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher & Pulverizer Co. (U. S. No. 1,039,623, Sept. 24, 1912.)

CRUSHING — Gyratory Ore Mill. George H. Bradford, Berkeley, Cal. (U. S. No. 1,036,433; Aug. 20, 1912.)

MAGNETIC SEPARATION—Improvements in and Relating to the Magnetic Separation of Ores. I. S. Dalgleish, London, Eng. (Brit. No. 19,678 of 1911.)

MAGNETIC SEPARATION—Improvements in or Relating to the Separation of Ores or the Like. Murex Magnetic Co., Ltd. and A. A. Lockwood, London, Eng. (Brit. No. 18,189 of 1911.)

SLIME CONCENTRATOR. William F. Deister, Fort Wayne, Ind. (U. S. No. 1,037,212; Sept. 3, 1912.)

METALLURGY—GENERAL

AGGLOMERATING—Method of and Apparatus for Agglomerating Fine Ores, Metalliferous Residues, etc. Carl Dellwik, London, England. (U. S. No. 1,039-70[illegible]; Oct. 1, 1912.)

ELECTRIC FURNACE. [illegible] Assar Alexis Gronwall, Axel Rudolf Lindblad, and Otto Stalhane Ludvika, Sweden. (U. S. No. 1,039,732; Oct. 1, 1912.)

MELTING FURNACES—Attachment. for Melting Furnaces. Robert T. Johnston, Scotch Plains, N. J., assignor, by mesne assignments, to Automatic Furnace Co., New York, N. Y. (U. S. No. 1,036,[illegible]; Aug. 27, 1912.)

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Percy E. Barbour has returned to the Uwarra mine, Candor, N. C., after a week passed in New York.

W. F. Ferrier has returned to Toronto, Ontario, after having spent the summer in Alberta and British Columbia.

Benjamin Talbot, manager of the Cargo Fleet Iron Co. Ltd., Middlesbrough, England, will visit the United States soon.

E. C. Musgrave, after having spent several weeks in British Columbia, recently left Victoria on his return to Mexico.

H. Oeking, founder and managing director of the Oeking Steelworks, Düsseldorf, Germany, is in this country on business.

N. C. Vigeon, assistant general manager of the Spassky Copper mines in Russia, left London Oct. 4, on his way to Russia.

W. Hoesch, of the Hoesch Eisen & Stahlwerk, Dortmund, Westphalia, is visiting the important steel-manufacturing centers of the United States.

R. B. Lamb, of Toronto is making a professional trip to the Gowganda silver district in Ontario. He will extend his trip to the goldfields of Northern Ontario.

Otto Frick, inventor of the Frick induction furnace for the electric production of steel, is in the United States in connection with the introduction of his furnace.

W. J. Elmendorf, of Victoria, B. C., formerly general manager of the Portland Canal Mining Co. is now manager of the Portland Canal Tunnels, Ltd., in the same district.

R. G. McConnell, of the Geological Survey of Canada, has returned to Ottawa, after having spent the field-work season in the coast district of British Columbia.

Joseph Banks, formerly of Auckland, New Zealand, is now manager of the gold-quartz mine and stamp mill of the Jewel Syndicate, at Long Lake, Boundary district of British Columbia.

William Fleet Robertson, provincial mineralogist for British Columbia, has returned to Victoria from a trip to Groundhog basin, a new coalfield in the Upper Skeena district of that province.

R. H. Stewart, of Trail, B. C., general manager of the Consolidated Mining and Smelting Company of Canada, Ltd., has been in Toronto, Ontario, to attend the annual meeting of shareholders in that company.

H. M. Wolflin, for several years engineer in charge of the United States Bureau of Mines mine-rescue station at Seattle, Wash., is in New York taking some post-graduate work at Columbia University.

Harry Howard Johnson, of Johnson & Hoffmann, London, has been some weeks on Vancouver Island, B. C., in connection with the intended development of a large deposit of low-grade copper ore on that island.

H. B. Kaeding has gone to the copper-mining region of Lake Superior for an extended trip. His address for mail, in the meanwhile, will be in care of the American Institute of Mining Engineers, New York.

W. W. Leach, of the Geological Survey of Canada, having concluded his season's field work in the Blairmore-Frank district, southwestern Alberta, paid a visit to Vancouver and Victoria, B. C., before returning to Ottawa.

E. T. McCleary, formerly assistant superintendent of the blast furnaces and steel department of the Youngstown Sheet & Tube Co., Youngstown, Ohio, has been appointed general superintendent, succeeding Henry A. Butler.

Joseph G. S. Hudson, of the Mines Branch, Canada Department of Mines, has been in Alberta and British Columbia, obtaining information for a new edition of the "Report on the Mining and Metallurgical Industries of Canada."

Robert M. Black, a graduate of the Michigan College of Mines, and subsequently engineer with coal mining companies in West Virginia and Illinois, is now assistant professor in the School of Mines of the University of Pittsburgh.

Herbert Carmichael, assistant provincial mineralogist in British Columbia, about the middle of September left Victoria for Tete Jaune Cache, in the Upper Fraser River district, to investigate the mineral resources of that part of the province.

D. D. Cairnes, of the Canadian Geological Survey, has returned to Ottawa, after completing the Canadian part of the international geological work along the Alaska-Yukon boundary line from the Yukon River to the Arctic Ocean, about 350 miles.

Milnor Roberts, dean of the College of Mines, University of Washington, Seattle, Wash., has returned to the university work after having spent the summer examining placer ground suitable for dredging, on Kenai River, Kenai peninsula, Alaska, for German capitalists.

Dr. M. E. Wadsworth of the University of Pittsburgh has been unanimously elected the first honorary member of the Alumni Association of the Michigan College of Mines. Dr. Wadsworth had charge of the Michigan College of Mines for 12 years and was its first president.

Among passengers sailing from New Orleans last week for Nicaragua were: Barry Searle, who will spend a month or so at the Lone Star mine; H. B. Sherrick, manager of the Mars mine, who returns from a vacation; Dr. Theo. Bouchelle, metallurgist, who is now connected with the Snyder Brothers interests; Richard B. Stanford, who will spend a few weeks at the Topaz mine; M. Macdonald and W. Feilds.

OBITUARY

Frederic Austin Warren, for 11 years chief electrician of the Colorado Fuel & Iron Co., died at Cañon City, Colo., Sept. 18. Prior to his connection with this company, he was employed by the General Electric Co., and later served as electrician at the Fremont and Coal Creek mines.

Charles R. H. Blyth, chief surveyor for the Mazapil Copper Co., Ltd., operating in Zacatecas, Mexico, died at the company's hospital on Sept. 19, aged 28 years. The cause of Mr. Blyth's death was typhoid fever coupled with complications of the lungs. Mr. Blyth was educated at Freiburg, Germany.

Societies and Technical Schools

Queens University—The Nicol Mining and Metallurgy Building, which has just been completed and equipped at Kingston, Ont., was formally opened by Hon. W. H. Hearst, Ontario Minister of Lands, Forests and Mines on Oct. 16. He was introduced by D. M. McIntyre, chairman of the Board of Governors of the Mining School, and in his address congratulated the University upon having such a benefactor as Prof. Nicol upon its staff. Addresses were also given by Dr. James Douglas, New York; D. H. Brown, Copper Cliff, Ont.; and Dr. Willet G. Miller, provincial geologist.

Michigan College of Mines—Four new courses under the head of technical writing are offered this year. Two of these will be required for graduation, the others will be optional. Up to last year no courses in English or report writing were given by the college. Last year the work was tried out experimentally and it was then decided to outline a set of courses under the general heading of technical writing. They are as follows: Elements of technical writing, forms of technical discourse, technical journalism and business correspondence. John D. Black, a graduate of the University of Wisconsin, has charge of the new department. The courses in the new department are founded upon the principle of collaboration. Portions of the subject matter of the other courses in the college are reëmployed in the new work. The written work in many of the regular courses, usually in the form of reports on laboratory work, on mines, smelters and power plants will now be given a direct connection with the department of technical writing.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 16—An important item of new dredge construction, is the contract made for the building of another all-steel dredge to be operated in the Yuba River field. It is the purpose of both the Yuba Construction Co. and the Yuba Consolidated Goldfields to make this dredge, which will be known as Yuba No. 14, the acme of steel dredges of the 15-cu.ft. type, as Natoma No. 9 in the Natoma field is considered the greatest of the wooden-hull dredges of the 15-cu.ft. type now in operation in California.

Without any doubt the most interesting operation in the reopening of old quartz mines is in the active preparations at Forbestown in Butte County. These mines, which produced about $10,000,000, including the adjoining placers, in the early days, have recently attracted the attention of men of large capital who have sent engineers into the camp to make careful examinations as to the possibilities of further development and operation on a large scale. The most prominent of these quartz mines, based on past production, are the properties of the Forbestown Consolidated Gold Mines, which are being reopened. The Burlington mines, though not so active in past production, are showing positive improvement under the new prospecting recently undertaken. There had been for several years an impression obtaining that the Forbestown mines had been worked out, until recent publicity of the history of the camp and the present conditions indicated the contrary. Not only have the old mines been attracting attention, but some of the smaller ones in the same district have within the last few months been put in working order for new development and renewed operation.

Denver

Oct. 18—One of the largest public-land suits ever brought by government officials in this state, and in which they sought to recover 9500 acres of coal land in Routt County, has just been settled by a compromise, in which the Union Land Co. gives back to the government 7000 acres, retaining 2500. According to the suits the company paid agents to file on the coal lands for the purpose of turning them over to the company. The value of the land is now from $100 to $200 per acre. Judge Lewis allowed the stipulation agreed upon by attorneys on both sides to be filed, and entered an order dismissing the actions against the company and its officials.

A big movement of labor is taking place through Colorado of men being imported by the Utah Copper Co. to take the place of the striking miners of Bingham, Utah, and as they pass through Denver the Western Federation of Miners endeavors to prevent them from continuing their journey, by telling the strike breakers that railroad work in this state is hampered for lack of labor, and that if they stop here they are sure to receive good wages. This has been successful in some instances. A special train of seven coaches with 300 men on board left Omaha over the Union Pacific, Oct. 15, for Salt Lake City.

The case of the Consumers League against the Colorado & Southern Ry., and the Burlington and Union Pacific as interveners, is being continued. This is being brought to reduce the tonnage rate to Denver on coal from the northern field. The Burlington has adduced testimony in facts and figures to show that the reduction in rates ordered by the railway commission would be confiscatory and under it impossible to operate their Lyons branch on which are the coal camps. The Colorado & Southern testimony was to the effect that if the coal schedules ordered by the commission were put into effect the road would lose money. The high rates of haulage were blamed on the delay of cars between the mines and Denver and also on the high cost of railroad labor. It was shown that an average of 15 days was required to load one car of coal at the mines, transport it, say 20 miles to Denver, unload it and redeliver the car to the mine. All this made operative expenses extremely heavy.

Butte

Oct. 16—E. O. Meinzer, of the government underground water-supply research work, who recently arrived at Butte, has made a preliminary examination of the flat south of Butte City. At a meeting of the members of the Butte chamber of commerce, at the solicitation of which Mr. Meinzer came here, he stated that in his opinion a sufficient flow of water for reclaiming a large acreage on the flat may be obtained by pumping from bored wells. He thought there was little probability of discovering artesian water, owing to the absence of sedimentary deposits, Butte and the adjoining territory for several miles in all directions being underlain entirely by volcanic rocks. The flat which is in the form of a basin several miles in diameter is, however, covered with wash from the erosion of the surrounding mountains to the depth of several hundred feet, some of the material being water bearing. Experimenting has been going on with shallow bores to ascertain the possibility of obtaining water for Sen. W. A. Clark's zinc concentrator, shortly to be built near-by. A small pumping plant has been erected and from the eight holes that have been sunk about 800 gal. of water per min. is being pumped, which is said to be about 1% of the rainfall in the basin. Mr. Meinzer stated that the supply from these wells would undoubtedly be permanent, as he noted that after the pumps were shut off for a period of half an hour, the water in the wells rose rapidly nearly to the surface. From figures compiled by H. H. Cochrane, an engineer of the Butte Electric & Power Co., it is shown that water could be pumped from a depth of 50 ft. and supplied for irrigating at a maximum cost of $6 per acre.

Salt Lake City

Oct. 17—The backbone of the strike at Bingham appears to be about broken. At the mines of the Utah Copper Co. an increasing number of steam shovels are being worked, and about 5000 tons of ore is being mined daily. D. C. Jackling has expressed the opinion that it will be possible to mine between 10,000 and 11,000 tons of ore before the close of another week. Many of the men now at work are unskilled and therefore the production is not up to what would be expected from the number of men employed. Work has been started at the Utah Consolidated, the New England, and the Ohio Copper mine. At Butte, Mont., the miners union decided to submit to a referendum vote, an assessment of one day's pay from each member for the benefit of the striking miners at Bingham. This assessment would amount to about $24,800.

A dividend of 15c. per share, or $27,000, has been declared by the Daly West payable Oct. 25. The total distribution to date, including this dividend, will be $6,511,000. The output at present is 350 to 400 tons of ore weekly. During September, 1461 tons was shipped. The company is working on the lower levels, having turned the levels above over to a leasing company.

Negaunee, Mich.

Oct. 18—Fifteen fatal accidents occurred in the mines of Marquette County during the year ended Sept. 30, 1912, according to the annual report of the mine inspector. . This is a ratio of 2.83 per thousand men employed, the lowest proportion on record in the county. The proper safeguarding of machinery and underground workings by the mining companies, and their policy of teaching the men to observe habits of caution, are the main reasons for this low fatality record. It is to be noted also that during the last 18 months the Cleveland-Cliffs Iron Co. has maintained a safety department. This company is the largest employer of labor in the county. Of the 15 men killed, five were employees of the Cleveland-Cliffs Iron Co.; one was an employee of the Oliver Iron Mining Co., which has also devoted considerable time and expense to safeguarding machinery and stopes; four were employees of the Breitung-Kaufman mines which have recently decided to create a safety department; one was an employee of the Jones & Laughlin company; one of the Republic Iron Co.; and the American-Boston mine of the M. A. Hanna Co., was responsible for three deaths. The causes of 13 of the fatalities were as follows. Falling down shaft 1, falls of ground 4, gas and smoke 2, falling in open pit 1, caught between cage and shaft-house 1, caught between tram car and chute 1, falling from shaft-house 1, falling down raise 1, being thrown from trestle, caught between motor and timbers 1. Study of the reasons for accidents is being made by the mining companies' safety departments in order to guard against recurrences.

Birmingham, Ala.

Oct. 21—Development in ore fields around Birmingham is taking on considerable life and three or four companies have recently been organized to operate mines on red- and brown-ore tracts. J. J. Shannon and associates have taken steps looking to the operation of mines on a tract of 2500 acres of ore land in Shades Valley, across Red Mountain from Birmingham, the ore running 35 to 37% iron. The McDonough Ore & Mining Co. has been incorporated, for the purpose of developing an ore tract. The capitalization of this company has been placed at $5000, with the right to increase. J. N. McDonough is president of the company. Several prominent men of Birmingham are interested in a company being organized to develop a tract of ore lands on Red Mountain, a friendly suit having recently been instituted to quiet title to the property. Full announcements will be made shortly of this company. The brown-ore beds in Alabama, especially those near Russellville, are being developed.

Spokane, Wash.

Oct. 16—The Imperator-Quilp company of Spokane, a mining corporation which until recently has been operating the Quilp mine in the Republic district under option to purchase, instituted suit in superior court against the Quilp Gold Mining Co. and E. L. Tate, secretary, for $410,000 damages. The action is based on the allegation that the Quilp company supplied J. L. Harper, by whom the mine was taken under option in October, 1910, with fraudulent maps of the property in order to consummate the deal. The Quilp was taken over by Harper on an option of $250,000, of which $15,000 was to be paid on or before Sept. 24, 1910, and $5000 every 90 days thereafter until the purchase price was paid, provided the obligation was liquidated by Mar. 9, 1913. The complaint alleges that at the time the contract was made there was said to be developed and exposed in the Quilp workings ore estimated to be worth $200,000, and that it was upon the maps and charts provided by the Quilp company, in which this ore was shown to be within the Quilp lines, that the contract to purchase was entered into.

Cordova, Alaska

Oct. 16—Mining men here are interested in seeing that men thoroughly familiar with conditions become candidates for the territorial election in November. At that time 16 representatives and eight senators will be elected for the first territorial assembly to convene in Juneau next spring.

Recent heavy floods have caused damage to mining property in Copper River valley. For the month ended Oct. 10, 1912, the rainfall was 40 in. at Cordova, on the coast, which is unusual. To a lesser degree, the rainfall extended over the whole of the Copper River valley. This also is unusual, as the heavy rainfall ordinarily is confined to the narrow coastal belt. Beside direct losses of machinery and buildings, the mines had been suffering from lack of supplies, owing to the interruption of traffic by numerous washouts and slides along the Copper River & Northwestern Ry. George M. Esterly, operating a group of placer claims on Chittitu Creek, saved his buildings and machinery from the flood with the aid of loyal employees. Last year the cleanup amounted to $80,000. Operation has been on a larger scale this season. The most damage was caused by the filling of a recent cut. Workmen are now trying to find the sluice boxes in this cut, which contain some of the cleanup, and it will be a race between them and the frost. The Bonanza mine, at Kennicott, suffered minor losses through the flood. No copper-ore shipments have been made to the smelteries in Tacoma for more than a month, owing to the washout on the Copper River & Northwestern Ry. The mine has been worked short hours, owing to lack of supplies. The mining industry in the Chitina district is paralyzed.

Toronto

Oct. 18—An important decision affecting the rights of prospectors has been made by Judge Kehoe, of Sudbury, to the effect that unpatented claims are still Crown lands and consequently not subject to assessment for local taxation when situated in organized municipalities. Both Whitney and Tisdale townships, in the Porcupine area, are affected by this decision, which will enable many men to retain claims which they might otherwise lose.

It is announced that the provincial government of British Columbia will investigate the commercial value of the mica deposits on Mica Mountain, at Mile 53, B. C., on the line of the Grand Trunk Pacific Ry. This deposit is at an altitude of 5000 ft., and was practically inaccessible before the advent of the railroad. The beds are said to yield unusually large sheets of mica. The work will be undertaken next summer by Herbert Carmichael, assistant provincial mineralogist.

Chihuahua

Oct. 15—The active mines in the western part of the state are the Dolores, Concheño, Yoquiva, Batopilas, Tres Hermanos, Barranca del Cobre and Cienega, together with those in Cusihuiriachic. In the last camp there are no less than six shippers, the most important being the Promontorio, Princess and Cusi-Mexicana, and at least as many more properties are under active development. The reworking of several formerly productive mines, together with new discoveries in both old and virgin ground, has given an impetus to activities and withal has occasioned many new denouncements.

The taking over of the mineral railroad, in service between Chihuahua and Santa Eulalia, by the Mexico Northwestern Ry. Co. and completion of laying standard-gage track on the line will facilitate shipments from that camp. All the mines there have considerably increased production of late, and it is announced that the Chihuahua-Potosi mines will shortly be producing at the rate of more than 700 tons daily.

The Chihuahua smeltery of the American Smelting & Refining Co. is operating furnaces regularly, an abundance of ores being furnished by the mines of Santa Eulalia and neighboring districts. The Rio Tinto Copper Co. is working at normal capacity and is shipping its product via the Mexico-Northwestern to El Paso. By Dec. 1, 1912, the National Rys. line between here and El Paso should be in shape to permit regular traffic.

The Mining News

The Current History of Mining

Alaska

A rich strike has been made on the upper Fairbanks Creek, by Cook brothers, $85 in gold having been taken from 10 lb. of ore.

Riley & Marston, of Fairbanks, have purchased some claims on Otter Creek, and intend to install machinery next season.

George Nightingale and Roy E. Maddox, of Fairbanks, have purchased an interest in the Rainbow quartz claim, and preparations are being made for the erection of a mill.

Alaska Syndicate—This company has purchased the Midas Copper Co. property near Valdez. The syndicate will expend $300,000 in development work, machinery and improvements before shipping ore. A diamond drill, compressors and other machinery will be installed at once.

Dan Creek Mining Co.—Floods destroyed all the buildings, pipe line, machinery and improvements of this hydraulic property, and swept away the summer's cleanup in the sluice boxes. Last spring the company shipped in 200 tons of supplies and machinery, and began operations last summer on a large scale. The company expected to clean up at least $150,000. It is supposed that there was at least that much gold in the sluice boxes. In addition to the loss, the damage will approximate $50,000. Howard Birch is manager.

Arizona

GILA COUNTY

Southwestern Miami—Churn-drill holes Nos. 4, 7 and 8 are 716, 1267 and 1140 ft. deep, respectively. Holes 7 and 8 are still in chalcocite-bearing schist and in No. 8 the grade is increasing with depth. This hole has now passed through 430 ft. of schist carrying chalcocite. No depth is being gained in No. 7 hole, as it is still being reamed.

Prospectors' Group—Frederick W. Hoar, manager for the Southwestern Miami, has taken an option on this group of 13 claims, which is bounded on the east by Southwestern Miami, on the south by South Live Oak, on the west by the Needles group and on the north by the Barney group. The prevailing formation is Pinal schist, much of which is mineralized, and it will be explored by churn drilling, as there are indications of the existence of a deposit of low-grade copper ore. The total purchase price is $125,000. The option includes a clause requiring that the assessment work be started at once and this is now being done, in the form of roads to churn-drill hole sites. The claims are owned by William Phillips, Theodore Phillips, Isaac Martindale, William Hobbs, L. H. Trim and George Ward.

South Live Oak—Churn-drill hole No. 4 is more than 200 ft. deep in silicified schist, carrying silicate and carbonate of copper, the samples assaying about 0.3% copper. Drilling is proceeding slowly and with difficulty on account of trouble with the machinery, but it is expected that this will soon be remedied.

Arizona Commercial—The erection of surface equipment at the Copper Hill shaft is finished and the hoist is being operated with steam, pending the arrival of the electrical equipment. The retimbering and enlarging of the shaft to three compartments has been resumed and this work has been finished to a point 80 ft. below the fourth level.

Old Dominion—The first crosscut from the east drift on the 16th level has reached the hanging wall after passing through 8 ft. of chalcopyrite and bornite ore. The ore is of better grade and width than was found at the corresponding point on the 14th level. The next crosscut is 100 ft. farther east. This development is important as it proves the continuation of the east orebody 200 ft. below any point at which it has before been worked. Excavation for the new crushing plant continues and engineers under C. B. Cline, assistant to H. Kenyon Burch, are working on the plans for doubling the capacity of the 500-ton concentrator.

Superior & Boston—The east drift on the eighth level on the Great Eastern vein is reported to have been, for the last 60 ft., in ore from two to five feet wide. The north crosscut on the 12th level has cut a vein 14 ft. wide, showing mineralization, but carrying no ore. Exploration has been started on it east and west. Shipments to the Old Dominion smeltery continue. President W. G. Rice is now at the property.

GRAHAM COUNTY

Detroit Copper Co—This company is making extensive changes in its reduction works and power plants. The slag dumps built up while the company was producing "black copper" will be resmelted. As soon as the new smeltery office, which is about completed, is ready for occupancy, the present office, which is situated on the slag dump, will be abandoned. The smeltery comprises one 500-ton blast furnace, which will be supplemented by a larger furnace as soon as the company decides what size of furnace they will need. The pumping plant on Frisco River has been torn out and brought to Morenci and the two boilers are being installed at the power plant, to work in conjunction with the two units now in place. The two new steam turbines have arrived and will be installed as soon as the boilers are in place. It is the intention to furnish steam power for all the engines, excepting those which operate the blowers; these will continue to be operated by gas.

PINAL COUNTY

Lake Superior & Arizona—After unwatering and making an examination, the American Smelting & Refining Co. relinquished its option on this property at Superior.

YAVAPAI COUNTY

General Development Co.—This company has taken a two years' option on the property of the Bagdad Copper Co., aggregating 3000 acres. It is reported that there is a reserve of 4,000,000 tons of 2%-copper ore. Unless this tonnage can be materially increased the option will probably not be exercised.

California

PLACER COUNTY

Despite the scarcity of water on the Forrest Hill, Iowa Hill and Ralston divides in the last season there has been a large amount of development and extraction. The Sierra Nevada Development Co. is continuing the development of the Pat Goggins mine on Ralston divide. This mine is reported to have produced $17,000 last year and is still producing. The Red Star mine on Duncan ridge is being developed by Savage and Ray. A 150-ft. tunnel and crosscuts have been driven, developing high-grade gravel between andesite and granite. A new tunnel has been started at the Buckeye on the Iowa Hill divide by I. H. and W. W. Rodehaver, of Auburn. It is estimated that the tunnel will be driven 350 ft. and tap the gravel at 15 ft. below the channel. Rich gravel is reported by Moss and Young at a depth of 80 ft. in the channel between Succor Flat and Indian Cañon.

Plumas County

Gold Mountain Hydraulic & Dredging Co.—The reservoir and pipe line are practically completed. Buildings and machinery are in course of construction. It is expected to begin hydraulic operations in the spring. The property is in the vicinity of Willow Creek.

Gold Leaf—Development will be carried on during the winter. A 900-ft. tunnel is contemplated to tap the vein at a depth of about 200 ft. The property has been bonded by Sacramento men. It is situated in the Squirrel Creek region, east of Quincy. W. D. Stone, Charles Penman and J. P. Dutre, of Quincy, are owners.

Heath—This old mine, adjoining the Gold Leaf in the Squirrel Creek region, near Quincy, is being re-opened by Byron Turner, of Quincy. The old tunnel, 300 ft. long, is in as good condition as when abandoned several years ago, with the exception of a cave-in at the portal.

Sunnyside—Rich gravel carrying heavy gold has been tapped in the 800-ft. tunnel in this mine in the Seneca district. Harry Merrill and others, of Greenville, are lessees.

Riverside County

Hemet Belle—Development of this mine in the San Jacinto mountains, about 35 miles southeasterly from Hemet, has been in progress for about a year. The shaft is about 200 ft. deep. A drift from the 100-ft. level for a length of 300 ft. is in high-grade ore. A 2000-ft. aërial tramway carries the ore to a five-stamp mill. Water is furnished from a reservoir holding 50,000 gal., supplied by a spring and carried to the mill through a pipe line one mile long. Irvin Carl and C. W. Hernandez, of Los Angeles, are the principal owners. The mine is operated under the name of the Golden Beauty Mining & Milling Co.

San Bernardino County

G. B.—This mine in the Stringer district has recently been leased to C. G. Illingworth, R. Roschl and J. P. Burns. Pay ore has been disclosed in a 30-ft. drift from the 165-ft. level. A gasoline hoist has been installed. The mine produced medium-grade ore in the earlier working. D. J. McCormick, of Randsburg, is owner.

Merced—A 12-in. vein of good ore on the 235-ft. level is being followed; 25 tons of ore is on the dump, which is being hauled to the Sunshine mill. The mine is in the Stringer district. Thomas Atkinson, of Randsburg, is owner.

Siskiyou County

Final proof of title to the townsite of Sawyers Bar, one of the oldest mining towns in California, was made on Sept. 23 by Judge James F. Lodge before the county clerk at Yreka. There was too much mining in the early days of Sawyers Bar to allow interest to develop in the making of proof of title to the townsite. About three years ago the town was included in the U. S. forest reserve, and proceedings were begun by asking that 110 acres, including the townsite be exempted.

Homestake—This mine is near Snowden. The vein is about four feet wide and has been developed for a length of 200 ft. in the 500-ft. adit. The five-stamp mill to be installed will be operated by a water-power plant with a capacity of 100 hp. to be developed from a ½-mile ditch. It is an old mine that was a producer in early days. R. S. Taylor, of Etna, is owner. J. F. Boyle, of Etna, is superintendent.

Big Cliff—Two good pay shoots have been disclosed in a large vein. The successful development of the last season has induced the owners, H. B. Wintering and Mr. Osgood, to prepare for the installation of a small stamp mill in the spring.

Ventura County

Russell Borate Co.—The demand for borax is reported to be the inducement for the company to endeavor to secure eight or ten 10- to 14-animal teams for hauling the product from the mines on the line of Ventura and Kern Counties near Stauffer to Bakersfield, a distance of 59 miles. The round trip will require seven days, including one day lay-over at Bakersfield. Recently the product has been hauled to Lancaster in Antelope Valley, a distance of 61 miles, but the roads have not been kept in condition. W. S. Russell, of Stauffer, is superintendent.

Colorado

Lake County—Leadville

Garbutt—From this mine on Breece Hill 60 tons daily is being shipped which comes from the lower level at a depth of 1000 ft. It is proposed to sink the shaft to the Cambrian quartzite.

Yak Tunnel—Four miles in from the portal, a winze is being sunk, from which, when it has been sunk 160 ft. drifts will be run to a known orebody found by prospecting in Resurrection ground. This work will be done at a depth of 1100 ft. below the surface toward the head of Big Evans Gulch.

Silent Friend—From the 600 level lessees on this mine in South Evans gulch are shipping 60 tons per month of gold-bearing sulphide ore.

Columbia Shaft—Lessees on this property, in California Gulch, have opened 30 to 35% zinc ore, and will begin shipping shortly. A new hoisting plant has just been installed.

Jolly—The lessees are shipping 20 tons of iron ore daily. They are also driving for a known shoot of zinc ore.

La Plata—A good grade of zinc-carbonate ore is being shipped steadily by lessees on this mine, on Rock Hill, who are also doing considerable prospecting.

Baby Shaft—Regular shipments of good-grade zinc-carbonate ore are being made by lessees on this mine, in California Gulch, and from the Pagent mine, just south of it, a good grade of iron ore is going out.

Ella Beeler—Shipments of high-grade silver-lead ore will be resumed by lessees of the Ella Beeler tunnel, Iowa Gulch, as the orebody which had pinched has come in again as big as ever.

Stone Shaft—The old stopes from the Stone shaft in California Gulch have now been worked for more than a year by lessees and much ore has been taken out. In addition much dead work is being done for development. At the St. Louis tunnel, Breece Hill, a shaft is being sunk from the tunnel level, when drifting north and south will be started. The new Golden Gate shaft, East Tennessee Gulch, is being sunk by H. Hanson. The Winthrop Mining Co., Birdseye Gulch, will drive the Crescent tunnel, now in 1300 ft., during the winter. The Great Western shaft, Tennessee Pass, will be sunk to 100 ft. by Maupin brothers, who will then start drifting. The Nevada shaft, East Breece Hill, has been unwatered below the 100 level and the drifts at this level are being carried forward. Lessees on the Rockefeller group, at the head of Big Evans Gulch, have driven a tunnel 150 ft., and will continue driving through the winter.

Teller County—Cripple Creek

Cresson Consolidated—Oreshoots at the 1200 level are proving up to all expectations and the production for September was about 1500 tons. As soon as it is known that the water has receded 100 ft. below the 1200, another lift will be sunk.

Mary McKinney—Frank Costello, president of the company, says the water in the main shaft has receded 260 ft. since the completion of the deep-drainage tunnel. The output of the mine for September was 33 carloads. The ninth level will be reached about Nov. 1. The water recession is now four to six inches per day.

Portland—An oreshoot is reported as having been opened on the 1600-ft. level of No. 2 shaft, which is stated to be 14 ft. wide, and worth over $100 per ton.

El Paso—The September production was 109 carloads, of which lessees shipped 39 cars.

Gold King—Lessees Boarig & Marson have opened ore on the 500 level. Several carloads have been shipped.

Free Coinage—The Pinto or main shaft was shut down last month to permit the installation of a new hoist. This is now completed and shipments will be resumed shortly as the stopes are filled with broken ore. There are five machine drills working on ore.

Vindicator Estate—A big strike by John Sharpe, lessee, is reported in the Hull City shaft, and the output for September will approximate 30 carloads.

Henry Adney Estate—This estate owns 46 acres on Beacon Hill and the output from two shafts, the Adney and Maid of Orleans, is about eight carloads per month.

San Juan Region

The shipments of ore from Ouray, both crude and concentrates, since Jan. 1, amount to 13,500 tons. This is exclusive of the gold bullion from the Camp Bird, and the ores of Red Mountain district, which go to Silverton.

A strike of importance is reported in the Terra del Fuego group, on the northwest slope of Mt. Sneffles, where only one mine of note, the Blaine, has yet been found. For many years rich float has been found on the Dallas, and it is believed by M. Regan, the owner of this new discovery, that he has the extension of the Smuggler vein, which is the longest and most continuous in the San Juan region. He reports 7 ft. of ore, of an average assay value of $23.

Cliff Group—This group comprises three claims in the Hydraulic district, of Paradox Valley, and A. M. Wilson, of Telluride, has so far this year shipped 305 tons of high-grade carnotite. This ore is bought by New York men.

Primos Chemical Co. — Ninety-one sacks of vanadium ore were shipped recently from Telluride to Primos, Penn.

Idaho

Coeur d'Alene District

Bunker Hill & Sullivan—Fire broke out anew in the workings of this mine after it had apparently been brought under control, and threatened to exceed its former proportions. Five helmeted rescuers were caught on the 1200-ft. level, but by using their supply of oxygen managed to escape through a tunnel.

Green Hill-Cleveland Mining Co.—This company has been organized by William R. Leonard, the estate of James Leonard, of Denver, J. M. Jamieson and C. L. Matthews, of Spokane, and the Federal Mining & Smelting Co. The Green Hill claim of nearly 20 acres holds a continuation of the Mammoth vein from which much ore has been taken since it was purchased by the Leonards and Wilson & McKay for $2,500,000. Never having been on the shipping list, the new property is to send out ore in carload quantities at once, production being now under way. The orebody exposed is 10 ft. wide, of which three feet is solid, marketable silver-lead ore, the remainder being concentrating ore. Harry L. Day is president; William R. Leonard, vice-president, and Francis H. Brownell and C. L. Matthews are directors. The Standard-Mammoth mill of the Federal company, having a daily capacity of 600 tons, has been leased by this company.

Idaho-Continental — The wagon road from Porthill to the mine is now completed to within three miles of the camp. Conservative estimates place the cost at $65,000, more than $3000 per mile. The road is being built with a view to operating large capacity motor trucks for transporting ore to the railway at Porthill, and it is believed that eventually it will be utilized for a railway line, as the maximum grade is less than 2%. The company has plans and specifications for a 300-ton concentrating plant.

Tamarack & Custer Consolidated Mining Co.—This company, successor to the Tamarack & Chesapeake and Custer Mining companies, and which recently leased the old Rex mill and tram, has a force of 75 men at work remodelling the plant, transferring the tram and clearing the Custer tunnel preparatory to beginning operations on an extensive scale. The tram line is being connected with the mill from the Custer tunnel, the right of way having been cleared last week, and rails for a horse-car line are being laid from the tunnel portal to the face of the drift. A 500-ft. raise connects the Tamarack workings with the Custer bore, through which the ore from both properties will be removed.

Idaho County

American Eagle—The station in the No. 2 tunnel, where the new 500-ft. shaft will be sunk, is nearly completed and the raise will be begun soon. The raise will be put through to the surface, coming out at the portal of the No. 1 tunnel, where the hoist will be stationed.

Rio Tinto—A shoot of ore four feet wide, assaying $25 per ton, was recently cut in the lower tunnel.

Dixie Chief Gold Mining Co.—The No. 1 tunnel has been driven 300 ft. on the Blue Bucket vein and has cut the oreshoot. The pan shows four feet of good ore.

Brown Bear—A new tunnel has been started on the east side of Red River, approximately 100 ft. lower than the old tunnel. The company expects to increase its force soon and resume work on the west side of the river.

Majestic Gold & Silver Mining Co.—Stockholders from Washington, D. C., accompanied by an engineer, recently visited the property to make plans for increasing the force and continuing the development work during the winter.

Michigan

Iron

Tully—A 6x7-ft. concrete conduit for pipes and wires is being built from the engine house to the shaft. The old temporary engine house has been torn down.

Bengal—At this new Pickands, Mather & Co. mine, a brick engine house is being built. Shaft sinking is still in progress; about 50 ft. more remains to be sunk before drifting is started.

Berkshire—Stockpile shipping is in progress at this mine, of Oglebay, Norton & Co. The ore runs about 54% iron, which is high grade for the Iron River district.

McPherson Exploring Co.—This company has begun exploratory work on the Greenhoot lands, Section 7, 42-34, south of the DeGrasse property of the Verona Mining Co. This is at the extreme southern end of the Iron River district, as so far proven. The work is being done for John T. Spencer and H. A. Martin, of Ironton, Ohio.

Kloman—It is reported that the option on the mine, at Republic, has been relinquished, and that, for the time at least, experimenting with the Jones step furnace will be discontinued. The machinery and furnace equipment will be left at the mine for the present. The main reason for the failure of the Jones furnace to date is attributed to the fact that it has been impossible to find material for lining that will resist the action in the furnace for more than four hours at a time.

Imperial—This mine, at Michigamme, leased from the Michigan Land & Iron Co. by the Cleveland-Cliffs Iron Co., is to be reopened, after being closed for a year. The lease expires in 1920. About 100 men will be given employment. This mine, producing a yellow ochre or low-grade iron, high phosphorus and high moisture, has never been very profitable. It is the only mine in the Michigamme district to be operated during the winter. The steel has arrived for the new steel headframe and crusher plant.

Cascade Mining Co.—Diamond drilling still continues under the direction of L. D. Cooper, of the Longyear company. One of the drills has been moved westward near the Starwest line.

Cortland—The spur from the Chicago & Northwestern Ry. is nearly completed to the mine, and is being hurried as much as possible, as the company desires to ship 20,000 tons before the season closes.

Davidson—At this mine, in the Iron River district, the stockpile has been cleaned up. Preparations are being made to erect additional dwelling houses for the employees.

Minnesota

CUYUNA RANGE

Barrows Iron Co.—At a recent meeting it was decided to proceed at once with development work on the property near Barrows. Several drills will be started in a short time.

MESABI RANGE

J. H. Hearding, assistant general manager of the Oliver Iron Mining Co., is quoted to the effect that iron-ore shipments from the Head of the Lakes will probably total 46,000,000 tons for the season, the highest previous record being 44,000,000 tons. He states that the rumors of there being an "ore famine" at the Pittsburgh furnaces before shipping is resumed next spring are not warranted.

St. Louis County iron-mine owners are protesting to the state tax commission against a threatened raise in assessment. The change also includes a new scheme of classification. A raise of about 5% is proposed by the tax commission in the case of about 100 iron properties, including a number of the Great Northern ore properties. The proposed change in classification, the protestants claimed, also adds to their assessment. The total assessment as returned on the iron properties in St. Louis and adjacent counties is about $287,000,000, a slight increase over two years ago.

Oliver Iron Mining Co.—At this company's Genoa mine, at Gilbert, the 1,000,000-ton mark in ore output was recently passed, and it is expected that before the season closes, 1,250,000 tons will have been shipped from the shaft and open pit. This is the largest production for any season that has been made from this mine.

Montana

BUTTE DISTRICT

Bullwhacker—Construction work has been started upon the leaching plant at this mine, east of the East Butte company's Pittsmont property. The buildings will be ready for the solution tanks and crushers in about one month, and will be in operation about the first of the year. The initial capacity will be about 50 tons per day, but crushers of 300 tons capacity will be installed. Miners are now operating the mine under lease, and shipping about 150 tons of ore weekly to the East Butte and Washoe smelteries. As soon as the plant is completed they will increase their output to 50 tons per day. It is at present the intention of the company to allow the lessees to continue the operation of the mine on a royalty basis after the leaching plant is completed. There is a wide vein of low-grade carbonate ore in the property, and if the leaching scheme proves practicable, the output will eventually be increased to at least 300 tons of ore daily.

Davis-Daly—A good body of ore, heretofore overlooked, has been opened on the 1200-ft. level of the Colorado mine. It was believed that this portion of the mine had been completely worked out, but recently the management decided to drift on a small stringer of ore showing in the crosscut. After following it about 100 ft. in a westerly direction, the ore widened suddenly and a diagonal drift through it showed a width of 12 ft. of ore, averaging about 5% copper. On the 1900-ft. level development work is going on with good results. A vein was recently cut, which is being driven upon; occasional bunches of ore being mined and hoisted. The crosscut is being continued to intersect a second vein, which is believed will be reached in about 30 days. Lessees working the Silver King claim on the western end of the property, are sinking a winze from the 300-ft. level on the orebody recently opened there, in order to determine its extent. Steady but slow progress is being made upon the crosscut being driven on the 1900-ft. level of the Gagnon mine of the Anaconda company into the western part of the Davis-Daly

BEAVERHEAD COUNTY

Penobscott Mining Co.—This new company is a reorganization of the old Elkhorn Copper Mining Co., which abandoned the Elkhorn mine after working it for several years. The new company has purchased the old Hecla mine, which has been worked only by lessees during the last 10 years. The mine is 16 miles west of Melrose at an elevation of 9000 ft. Many improvements will be made, the first of which will be a 3000-ft. tunnel to get under the orebodies at a low level. No ore will be taken out until the latter part of next year. Engineers are already surveying for the tunnel, and estimating the quality and quantity of the ore now in sight. There are three incline shafts on the vein. Manager J. Bowden leaves for the East in a few days to purchase new machinery and supplies. The machinery will be operated by electricity supplied from the Butte Electric & Power Co. plant on the Big Hole River.

FERGUS COUNTY

Gold Acres Mining Co.—This company has been incorporated to operate a group of claims adjoining the New York property. The incorporators, most of whom are interested in the Rheingold Mining Co., operating the New Year mine, are A. B. Knowlson, John A. Goode, Archibald McDonnell, Thomas Friant, and P. W. O'Connor, of Grand Rapids, Mich., and Josiah McRoberts, and William Burry, of Chicago. During the last year a mill was built at the New Year mine and it will be used to treat ore from the Gold Acres property.

GRANITE COUNTY

Royal Mining & Milling Co.—This company, which is operating a copper property at Maxville, has completed a leaching plant similar to the one being built at the Bullwhacker mine in Butte. It has been in operation for two or three weeks and is giving entire satisfaction, according to a statement of John D. Fields, chief engineer of the company. The crushed ore is placed in tanks and brought into solution under constant agitation, as copper sulphate. It is then passed through a refining cell 10 ft. long, under the action of a 3000-amp. current, at five volts. The cell contains 360 sq.ft. of both anode and cathode surfaces, 30 cathodes in the cell, which collect a total of 300 lb. of electrolytic copper per 24 hr. The company is now installing two additional cells, which will triple the present daily output.

Nevada

COMSTOCK LODE

Ophir—The new cyanide plant, built to treat 30,000 tons of accumulated tailings has been started, and is giving satisfactory service. Exploration work continues on the 2500 level of the mine.

Mexican—The second tube mill has been installed at the mill. On the 2500 level of the mine, the ground has been cut out for sheaves for the electric hoist for the new incline winze in the vein, and the winze has been timbered. Sinking will be resumed soon. The ore recovery from the mine last week was 576 tons, of a gross assay value of $27,023.

Union Consolidated—A west crosscut has been started on the 2500 level at a point close to the north boundary line, from the north drift, to determine if the rich ore uncovered in Sierra Nevada extends southward into Union ground. On the surface, No. 1 air compressor is being overhauled preparatory to pumping out the joint winze with Sierra Nevada, for the purpose of carrying on work below the 2500 level.

Sierra Nevada—An important ore development has been made in driving north on the 2500 level, the drift being the continuation of the exploration northerly through Union Consolidated ground from the Mexican stope. About 60 ft. north of the south boundary line, the drift cut across a vein having the same northeasterly course as the east vein and dipping 70° east. Included in the vein is a rich streak, and the whole vein, from two to three feet wide, inclusive of the high grade, will average between $40 and $50 per ton. This ore is believed to be in the Mexican ore channel on the same level. The strike is important, as it is farther north and east than where such high-grade ore has heretofore been discovered on the Comstock, and is 600 ft. east of any former workings. The crosscut will be turned to follow the vein.

EUREKA COUNTY

Buckhorn Mining Co.—A few men are at work in the property of this company. The ground is soft and much trouble from caving is experienced. Plans are being made for building a mill in the spring.

Mineral Hill Mining Co.—This company is operating its mill on ore from the old dump. The capacity of the mill is 200 tons per day.

LANDER COUNTY

Jersey Valley Mines Co.—At this company's mine, 40 miles from Battle Mountain, an exploratory tunnel is being driven. A small prospecting gasoline-driven compressor of sufficient size to operate one 2¼-in. rock drill was recently installed; W. M. Pinkham, superintendent.

Hilltop Mine Co.—This property at Kimberly, 20 miles from Battle Mountain, is operating the mill one shift, treating about 25 tons of ore per day; J. G. Smith, general manager.

Pittsburgh-Red Top Mines Co.—The mill at this property, at Maysville, has been in operation for two months, and is treating about 35 tons of ore per day. Operations are being hindered on account of the scarcity of water; W. J. Grindle, general manager.

LYON COUNTY

Mason Valley—From Oct. 7 to 14 a total of 8155 tons of charge was treated, of which 7289 tons was ore. From this resulting in a total production as matte resulting in a total production in matte of 449,438 lb. of copper. An average of 1019 tons of charge was treated per day, resulting in a daily average of 66.3 tons of matte containing 42.32% copper. Of the total tonnage treated, about 3000 tons was Mason Valley ore. The company recently posted a notice of a voluntary increase in wages to miners of 25c. per day, which took effect Oct. 1, this price to apply during the high quotations for copper.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Oct. 12, are as folows:

Mines	Week	Year to Date
Tonopah Mining	3,750	137,449
Tonopah Belmont	3,173	98,101
Montana Tonopah	1,016	42,385
Tonopah Extension	1,071	41,007
West End	900	31,022
Midway	100	670
MacNamara	155	15,074
North Star	48	218
Mizpah Extension		10
Jim Butler	300	2,500
Totals	10,513	368,439
Estimated value	$262,725	

Tonopah-Belmont—The report for September, states that 12,405 tons of ore was milled, producing 3499 oz. of gold and 352,742 oz. of silver, yielding a net profit of $170,496.

Halifax—Ore is being developed on the 1000 and 1400-ft. levels; it is spotty and of irregular width.

WHITE PINE COUNTY

The strikers in the Ely district are in an ugly mood, the state police having been called out to control the situation; two strikers were shot on Oct. 17 by deputies.

Oregon

MARION COUNTY

Savage—A one-stamp mill will be built at this mine at once, and it is said more machinery will be added next summer. E. Maund and Thomas Winters, of Gates, are interested.

Mayflower—A light two-stamp mill is in operation on high-grade free-milling gold ore. It is reported that the ore in the new shaft is improving; R. J. Monroe, of Gates, proprietor.

Portland—Don Smith and Mack Clery of Gates, owners of this mine, expect to build a two-stamp mill in the spring. A vein of free-milling gold ore about seven inches wide has been uncovered.

BAKER COUNTY

Old Gem—This mine is to be reopened. Pumping machinery will be purchased. Frank and Edward Geiser, of Sparta, are the owners.

Utah

BEAVER COUNTY

Moscow—The main shaft is 500 ft. deep, with an incline of about 250 ft. on the limestone bedding. Zinc ore has recently been opened, and shipments to Kansas City are being made.

Hub—Driving has been done southwest from the shaft on the 500-ft. level, and ore carrying lead, with some silver and gold, was cut at about 150 feet.

Atlas—A shaft is being sunk on this property by Park City operators, to reach some carbonate ore opened by lessees from the bottom of the 400-ft. inclined shaft.

St. Mary—A small force of men is being employed by Duluth men, and a tunnel is being driven. Several shipments of copper ore have recently been made.

South Star—Assessment work is being done on this group of eight claims, and 2½ ft. of ore, carrying copper, gold and silver, has been cut in the short tunnel.

Majestic—According to an official of the company, shipments are covering all expenses and giving a surplus for the first time. Operations have been on a profitable basis, since the beginning of July, and 136 cars have been shipped. Besides silver-lead ore, some copper ore, running about 2½% copper, with an excess of iron, is being shipped.

Beaver Bonanza—It is reported that this company and others near the Sheep Rock are considering the erection of a mill, capable of handling 200 tons of ore daily.

Beaver Butte—A shaft has been sunk 75 ft. on a vein, which can be traced for 600 ft. along the surface. Crosscutting will be started at 100 ft. The vein is mineralized throughout as far as opened.

Sheep Rock—This mine is closed down, the Robinson brothers' lease having terminated Sept. 20. Another lease will probably be given on the property

South Utah—This mine has closed down, owing to a strike for higher wages

IRON COUNTY

Bull Valley Gold Mines—A tunnel is in 85 ft. at this property, 70 miles south from Modena. A 4-ft. face of ore, running well in gold and silver, is reported. High assays of free gold have been found on another claim in the neighborhood.

JUAB COUNTY

Tintic shipments for the week ended Oct. 11 amounted to 193 cars.

Opohongo—A dividend of 2c. per share, or $20,000, was declared Oct. 15. This company paid its first dividend a little more than one year ago, since which time, with the payment of the present dividend, the total amount disbursed will be $60,000. The ore on the upper levels is holding out well. A drift to the southeast on the 300-ft. level is opening up promising ground, and there is a good showing in the raise from the 600.

Utah Consolidated Mining & Milling Co.—Leases are to be given on parts of this property, where there are small quantities of ore exposed in both old and new workings.

Beck Tunnel—Two cars of ore were shipped during the week ended Oct. 11, most of the ore coming from the Humbug shoot. Driving to the south and crosscutting to the west is being done on this ore.

SALT LAKE COUNTY

Tar Baby—The tunnel is now in 540 ft., with the face in quartzite. Assessment No. 2 has been levied to carry on the work.

Utah Consolidated—Operations were resumed Oct. 9.

Michigan - Utah—During September, lessees shipped 511 tons of ore. The tramway is entirely completed, and in successful operation. One of the leases recently let is on the Grizzly vein, which has produced good ore. Operations will be carried on through the Grizzly tunnel. Another block of ground has been leased on the Lavinia vein, which parallels the Grizzly. Work will be carried on by the company throughout the winter.

SUMMIT COUNTY

Ontario—The Mines Operating Co., which has a lease on the old stopes at this property, has remodeled the old mill, and started operations, according to a new process. About 80 tons daily are being treated.

TOOELE COUNTY

Cliff—The September output amounted to 30 cars of lead-silver ore; this is a desirable fluxing ore. The month is the best in the history of the company, the new railroad having greatly facilitated the marketing of the ores.

Ophir Hill—The mill, which is being remodeled and brought up to a capacity of 300 tons daily, will be completed shortly.

Washington

FERRY COUNTY

Hope—Construction of the mill will be started about Nov. 1. Plans will be completed this month. O. A. Broyles, Spokane, is secretary.

White Elephant—This company is considering the building of a reduction plant, at Orient.

Gwyne—Plans are being made for sinking a shaft, developing water power, and erecting a mill on this group of claims, owned by the Hall Creek Mining & Milling Co., Republic.

Wisconsin

PLATTEVILLE DISTRICT

Frontier Mining Co.—This company is building a magnetic separating plant at the Optimo mine, at Linden.

Straw Furnace Drilling Co.—This local company has been formed to prospect the Straw land, the site of the old Straw lead furnace, within the city limits of Platteville.

B. M. & B.—This company is developing the Biddick land, at Mifflin.

Mineral Point Zinc Co.—The Ryan land, south of Hazel Green, recently purchased, is being opened up and equipped.

Schreier—This company is removing its milling plant to the old Sally Waters mine, southeast of Benton.

Washburn—This company has proved up a new range of zinc ore north of the old workings.

Wyoming

FREMONT COUNTY

Hidden Hand—The shipment of slightly more than 10 tons of ore made to the Globe smeltery at Denver from this mine, at Lewiston in the South Pass district, has returned $7438, or $742 per ton.

Canada

BRITISH COLUMBIA

May Blossom—According to an official report, 22 in. of shipping lead-silver ore has been exposed by a drift in this property, at Ymir. The ore has been left in a block, ready to be broken for shipment. Production will begin as soon as a wagon road is built. G. C. DeHann, of Spokane, is secretary-treasurer.

ONTARIO

Goldfields, Ltd.—Twenty stamps are in operation at this mine at Larder Lake. The electric power plant is running, supplying motive power for the mill and the mine.

Alexo—This nickel mine has shipped 70 cars of ore this year to the Mond Nickel Co., at Victoria. The orebody, which has been stripped for 300 ft., is 12 ft. wide on the surface and in the shaft, at a depth of 47 ft., is 17 ft. wide. The Canadian Copper Co. drilled this property several years ago, but did not take up the option.

Rochester—This company has been reorganized and the former capitalization of $2,500,000 reduced to $1,000,000. New stock will be distributed to the shareholders on the basis of one share for every four old, which will leave a block of new stock in the treasury to be sold to provide funds for development. John Poucher is president, Howard Williams, vice-president, and W. E. Douglas, secretary.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Oct. 18, and for the year to date, were:

Bailey		21.57
Beaver		299.38
Buffalo	30.30	989.50
Casey Cobalt		255.15
City of Cobalt		887.99
Cobalt Lake	23.50	739.55
Cobalt Townsite	36.00	1,462.15
Chamb.-Ferland		362.33
Coniagas		1,673.95
Crown Reserve	19.55	388.21
Drummond		383.05
Hudson Bay	30.85	569.32
Kerr Lake		590.77
La Rose	67.70	2,875.08
Lost and Found	12.80	27.80
McKinley-Darragh	101.93	2,138.50
Nipissing		1,704.50
O'Brien	64.10	560.64
Penn.-Canadian	33.75	63.45
Provincial		22.22
Right of Way		242.82
Timiskaming		893.71
Trethewey		447.79
Wettlaufer		346.45
Colonial		63.14
Dominion Reduction Co		56.64
Totals	420.48	18,065.66

Millerette—At this mine, in the Gowganda district, the new $50,000 mill has been completed. A disagreement among the owners is likely to result in a temporary suspension of operations.

Bartlett—This property, at Gowganda, is being taken over by the Scottish Nigeria Mining Co. It is stated that $150,000 is the consideration.

McKinley-Darragh-Savage—This mine has produced this year 3,240,000 oz. of silver against last years' record of 2,600,000 oz. The mill is being enlarged to handle ore from the Savage.

Lumsden—Pockets of 12,000-oz. ore have been opened in the bottom level.

ONTARIO—PORCUPINE

A contractor doing assessment work on claims owned by G. G. Hyde and F. M. Markey, of Montreal, has brought in some rich gold samples. The specimens were found in a small quartz vein on an island just south of Gold Island, in Nighthawk Lake.

Rea—It is said that this mine will be reopened about the end of the year. A new board of directors is to be elected and arrangements made to finance the property.

Swastika—The mill has been completed in readiness for the machinery, which has been delayed in delivery. Underground work has been suspended meantime.

Newfoundland

Cape Copper Co.—During September, 522 tons of 3¼% copper ore was produced from the East mine; 340 tons of tons of 7¼% ore from the West Bluff 3¾% ore from the South Lode and 100 mines, at Tilt Cove.

Mexico

MEXICO

Esperanza—During September, the mill was in operation 27 days, crushing 7891 tons of ore; 11,402 tons of tailings were treated. The estimated return was $115,168; the net profit, £4835.

El Oro Mining & Railway Co.—During September the mill was in operation 29 days, crushing 19,210 tons of ore, and treating 15,910 tons of tailings, from which bullion worth $168,530 was recovered. The total net profit was $53,880.

SONORA

Lucky Tiger-Combination Gold Mining Co.—It is reported that the bullion stolen several weeks ago by rebels under Inez Salazar, has been recovered.

Australia

TASMANIA

A dispatch from Hobart states that the North Mt. Lyell mine caught fire, Oct. 12, by the blowing out of a motor fuse and that 89 men are entombed; 76 men who had been working on the 700-ft. level escaped to the surface, where one died immediately from the effects of smoke and heat. Rescuers succeeded in reaching the 500-ft. level, but were driven back. A diving gear is being rigged, with which it is thought that the entombed men can be reached and ultimately be rescued.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Oct. 23—Conditions in the coal markets show practically no change. In the West demand is strong and supplies limited by slow transportation. The rush of the closing weeks in the Lake trade is taking some coal off the general markets.

In the seaboard bituminous trade supplies are rather better and conditions a little easier, but the trade is still rushing and prices are high.

The anthracite trade is still behindhand and consumers find it hard to get supplies promptly. The putting in of stocks ahead is out of the question at present, and probably will be until the coastwise trade is satisfied and the shoalwater ports get their winter supplies.

Coal and coke carried over all lines of the Pennsylvania R.R. east of Pittsburgh and Erie, nine months ended Sept. 30, short tons:

	1911	1912	Changes
Anthracite........	8,489,450	7,387,837	D. 1,101,613
Bituminous......	30,504,343	34,114,059	I. 3,609,716
Coke..............	7,880,607	9,671,343	I. 1,790,736
Total...........	46,874,400	51,173,239	I. 4,298,839

The total increase this year over 1911 was 9.2%, anthracite alone showing a decrease.

British Coal Trade—Exports of fuel from Great Britain, with coal furnished to steamships in foreign trade, nine months ended Sept. 30, in long tons:

	1911	1912	Changes
Coal..............	47,618,690	45,750,423	D. 1,868,267
Coke..............	711,697	680,713	D. 30,984
Briquettes....	1,236,582	1,115,631	D. 120,951
Total exports...	49,566,969	47,546,767	D. 2,020,202
Steamer coal.	14,346,947	13,202,091	D. 1,144,856
Total...........	63,913,916	60,748,858	D. 3,165,058

Imports for the nine months were 16,738 tons in 1911, and 183,197 tons this year.

Iron Trade Review

New York, Oct. 23—The iron and steel markets continue generally active. There has been a definite decrease in contracting for some important steel products, notably bars, plates and shapes, because the mills are already practically sold up for the first half of the new year. Indeed, it is now said that if specifications keep up some of the business closed for second-quarter will result in deliveries in the third quarter. Mills are seriously considering further means for curbing the buying tendency.

Specifications against this year's contracts show no abatement, but have increased in some cases, notably in sheets, in which branch specifications thus far this month have been far in excess of shipments. Tinplate for next season is looking up, but is not especially active.

Price advances in the regular steel products appear to be about over, according to the attitude of the mills at present. The concern is to preserve the present very favorable conditions. Without any further price advances, profits next year will be much larger than this year, for it is still largely low-priced business which the mills are delivering. In the majority of lines, mills will carry over Jan. 1 specifications for from two to three months of work, which, of course, will be lower priced than the regular contracting basis for first quarter.

It is now generally realized that the demand for iron and steel products has grown up to the capacity, and has even overshot it. After the panic of October, 1907, the common remark was that a period of years would be required for demand to grow up to capacity, being increased as it was then by the erection of many additional plants. That new capacity came in, but relatively little in addition, and five years intervening would be amply sufficient, according to the rate of growth observed in the past, to take up all the slack. One theory of the present pressure upon the mills is that it is merely a case of growth having taken place, and finding the steel industry with insufficient rather than excess capacity. Another theory, of course, is that the pressure upon the mills at the present time is due to buyers specifying their full tonnages under low-priced contracts made long ago, when mills did not expect the full contract tonnages to be taken out.

Pig iron continues in active demand, and the advances in price generally made do not seem to check the business. The production continues to be limited by the coke supply. No more pig iron is being made than three years ago, and coke-making capacity has been increased, particularly by the erection of two plants in Alabama, one at South Bethlehem and one at Gary, with an extension to the Joliet plant; but the supply of coke is no larger, and the divergence is attributed to scarcity of labor in practically all coke-making fields.

Baltimore

Oct. 21—Exports for the week included 3,051,581 lb. billets and sheet bars to Liverpool; 1,360,815 lb. steel plates to Rotterdam; 1,294,300 lb. steel billets and 999,490 lb. steel skelp to Glasgow; 7,761,754 lb. structural steel, and 2,113,894 lb. miscellaneous iron and steel to Panama. Imports included 23,500 tons iron ore from Cuba.

Birmingham

Oct. 21—There is still much activity in the Southern pig-iron market. The minimum price at which pig iron is selling is $14 per ton, No. 2 foundry, with business for delivery during the second quarter of 1913 not being urged by the manufacturers, who are confident that $15 per ton will be the price. The outward movement and the home consumption are larger than the production. It was expected that by this time the make in the Southern territory would have been increased by at least 500 tons a day, but there have been some delays and the make for the month of October will show but little increase. The home consumption is steady, the cast-iron pipe plants in particular requiring a large quantity of iron. There is a healthy movement of pig iron to the Middle West and a little to the East and Northwest.

There is a steady operation at machine shops and foundries, with the greater portion of the labor troubles in this district settled. Charcoal iron holds at $22@22.50 per ton, with the make about equal to the demand.

Announcement that the visit of a committee of preferred stockholders of the Alabama Consolidated Coal & Iron Co., from Baltimore to the Birmingham district, will probably result in the reorganization of that company and the relieving of the company from its trusteeship, is received with much interest here. The trustee has one blast furnace in operation with coal and ore mines sufficient to supply raw materials. Only $1,500,000 would be necessary to arrange the floating indebtedness and provide working capital.

The Tennessee Coal, Iron & Railroad Co. has received from the Louisville & Nashville R.R. Co., orders for 90,000 tons of rails, and from the Atlantic Coast Line an order for 19,740 tons.

Chicago

Oct. 22—There are no great changes in the iron market from the conditions noted last week. Pig iron continues to be in steady demand, most sales being of small lots, but one local concern has taken 5000 tons, for first-half delivery, and a few other sales go over the 1000-ton mark. The melters are in the market generally for first-half requirements; a few for last-quarter needs. There is no difference in price for the two deliveries, on foundry irons, except that Lake Superior charcoal iron commands about 50c. more for first-quarter, the last-quarter price being about $19, Chicago delivery. No. 2 Northern foundry iron sells for $17.50, furnace, which means about $18 delivered. Southern No. 2 foundry iron brings $14 Birmingham, or $18.35 Chicago, with a range above or below this price of 25 or 50c. on exceptional sales. Some Southern interests hold out firmly for $14.50, but there is apparently a desire now for tonnage on the part of the furnace interests, which may sag prices a little.

The demand for iron and steel products continues large in all lines. Railroad buying is especially heavy, the companies apparently having come to the point where they hesitate no longer about the future; they are placing orders very generally for first-half deliveries of rails and track fastenings. Steel bars are in heavy demand and iron bars also find a large sale, prices being 1.58c. for soft-steel bars and 1.40c. for iron bars. Structural material shows a continuation of the demand, from a large territory, that has existed for several weeks and a pressure on manufacturers for deliveries, which already for the first half are difficult to obtain. Sheets and plates show a like pressure and in every minor line there is eagerness to obtain materials, by manufacturers and dealers. For all producers of iron and steel it is a strong market.

Cleveland

Oct. 21—Short supply of cars continues to delay ore shipments to furnaces.

Pig Iron—The market is a little quieter, but prices are firm, and demand strong. For Cleveland delivery bessemer pig is quoted at $17.90; No. 2 foundry, $16.75; Lake Superior charcoal, $19.25@19.75 per ton.

Finished Material—Demand continues heavy and prices are firm, with a decided upward tendency. Plates, bars and shapes are all called for; in sheets the mills are overcrowded and have hard work to keep up deliveries wanted.

Philadelphia

Oct. 23—Heavy buying of pig iron from all over Eastern territory, which partially subsided a few days ago, has been followed by quite a number of inquiries from all over the East, the total of which is estimated today as upward of 40,000 tons of all kinds of iron. Many of these inquiries are for rather small lots, considering the magnitude of the concern. Some of them expect a recession in prices, owing to a promise of increased output and the fairly well supplied conditions of so many buyers. The furnace opinion is that not only all current quotations will be maintained, but further advances are inevitable. They point to higher ore and higher coke, and to the enlarging requirements of consumer. The situation is a little cloudy among larger consumers all over the East, but it is very clear from the standpoint of the furnace people, who have no thought of yielding until they are brought face to face with conditions which buyers imagine will develop. The confidence of makers in their opinion is shown in recent advances for No. 2 X foundry, and for pipe iron. For the time being, buying will be confined to small lots. No. 2 X foundry is quoted at $17.75 for Northern. Gray forge is $17, basic nominally $17, and low-phosphorus $22.50 per ton.

Steel Billets—Basic openhearth billets are nominally $30, delivered, and forging billets $34, at mill. There is a demand for all the mills are in a position to deliver.

Bars—The bar mills are sold up into January and are therefore holding prices at 1.60c., excepting in large lots. Store quotations have also been advanced under an unusually active demand. Common iron is particularly active and car-building requirements constitute an important feature. Premium prices are frequently paid and quotations for accommodation deliveries are 1.65@1.75c. on steel bars.

Sheets—Under an unusual offering for forward delivery, sheets have moved up at least $1 a ton, and where premium prices are paid, which are frequent, the advance is $2 per ton.

Pipes and Tubes—The activity in tubes threatens a further advance in prices and quite a number of small concerns are endeavoring to arrange with the mills for deliveries extending over three or four months, which will protect them from upward fluctuations.

Plates—The heavy ordering of steel cars and underframes has brought out a rush of inquiries, which has caused an advance that promises to become permanent. There is an immense amount of business awaiting acceptance.

Structural Material—The pressure for structural material, while not so heavy as for plate, is crowding the mills, especially as to early deliveries. An immense amount of new work has been brought to the attention of the mills, but in the main it refers to late deliveries. Prices for shapes have moved up a trifle.

Scrap—Scrap quotations have advanced this week, especially on heavy melting steel, old rails and No. 1 wrought. Quotations on all lines of scrap have advanced and the larger dealers have taken so much on their shoulders that they are having serious difficulties in carrying out their end of the contracts.

Pittsburgh

Oct. 22—The iron and steel market shows no material change from conditions of a week ago, except that mills have fallen somewhat farther behind in deliveries, and are further restricting sales for next year, being already comfortably filled for the first half in several lines. Unfinished steel has become unquotable, there being practically no offerings. Pig iron is quieter, with prices very well held. Deliveries of tinplate bars are not as good as they were, and some tinplate mills have not been able to operate full in consequence. Orders for merchant pipe, with specifications attached, are running ahead of current shipments, and many of the mills are booking no open contracts at all. Wire is fairly active, and sales made are only in accordance with the recent advance, making nails $1.75, although some of the producers do not admit that their official prices have been advanced to this basis.

Pig Iron—The market has been quiet as to actual sales, but has lost none of its strength. Furnaces are fairly well sold up and are not anxious to effect further sales in view of the scarcity of coke, which is bringing $3.75@4 for prompt and spot shipment, and is held at about $3 for first-half contracts and $2.75 for contracts over the whole year. In basic and bessemer some furnaces seem to be disposed to hold the market at its present level, avoiding further advances. Foundry iron is quotable 50c. higher, on the basis of asking prices. We quote: Bessemer, $17; basic, $16; No. 2 foundry, $16.50; forge, 16; malleable, $16, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The contract market is firm at the advanced price of $61, Baltimore, with prompt at about $65, Baltimore, freight to Pittsburgh being $1.95. Prompt material is extremely scarce, and deliveries on contract are understood to be unsatisfactory in many cases.

Steel—There is practically no steel being offered in the form of billets and sheet bars, and the market is quotable as nominal on the basis of last quotations. Mills are making poorer deliveries on contracts, and will have to carry considerable tonnage over Jan. 1, while they show no indication of being able to contract for any deliveries in first quarter. There are many long-term contracts, which nominally cover buyers having them, but there is question whether mills will be able to make full deliveries, as all consumers show a disposition to require the maximum contract tonnages. We quote, nominally: Bessemer billets,

$26@26.50; bessemer sheet bars, $26.50@27; openhearth billets, $27@27.50; openhearth sheet bars, $27.50@28; rods, $29@30, f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—Sheet mills have been receiving specifications in the past fortnight at a rate more than 50% in excess of their shipments, and are accordingly falling more rapidly behind in deliveries. There is less contracting for first quarter, as mills willing to take such business are already fairly well filled, with the portion of this year's business they are practically certain to carry over, and there are some mills quite reserved about making contracts, since they have not covered for their steel. Premiums are readily obtained for any early delivery. We quote: Black sheets, 2.25@2.35c.; galvanized, 2.40@2.50c.; blue annealed, 1.60@1.65c.; painted corrugated, 2.35@2.45c.; galvanized corrugated, 3.45@3.50c. per pound.

Bars—Common iron bars have advanced sharply, mills being well sold up for the next few weeks and being averse to making contracts far ahead. We quote iron bars at 1.60@1.65c., Pittsburgh. Steel bars are held at 1.40c. on contracts, but the large mills are practically filled into next June. Some of the smaller mills, which did not accept any large contracts, are able to offer quick deliveries, and are obtaining 1.60c. up to 1.80c. or higher on single carloads, for delivery within a week.

St. Louis

Oct. 22—While the demand for iron is not as active as several weeks ago, there has been steady buying in small lots. Melters do not seem to feel that iron at $14 Birmingham, is a good speculation and, consequently, have dropped back to a more cautious method of buying, which is only for actual requirements. The market is firm at $14 Birmingham, $17.75 St. Louis, which price covers practically all deliveries, both present and future. Northern iron is being quoted at $18@18.25 St. Louis, with demand fair.

The coke market is high and irregular, good foundry bringing $6@6.25 St. Louis.

Iron Ore Market

It is reported that at least one reservation of Lake Superior ore for next season has been made, and that other inquiries have come in. Sellers of ore are not prepared to do anything yet toward fixing prices for next season, but it is probable there will be advances. This season's prices are, on bessemer ore, base 55% iron and under, 0.45 phosphorus, $3.75 for Old Range and $3.50 for Mesabi; on nonbessemer, base 51.5% iron, $3 for Old Range and $2.85 for Mesabi; all delivered at Lake Erie ports.

Daiquiri ore from Cuba is now offered to Eastern furnaces at 7¾c. per unit, f.o.b. dock at Philadelphia; an advance of 0.5c. per unit over the price last spring.

METAL MARKETS

New York, Oct. 23—The metal markets have been comparatively quiet, but generally firm.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Sept. 1912	$ 568,302	$ 4,200,682	Imp. $3,632,380
" 1911..	2,552,841	[illegible]	Imp. [illegible]
Year 1912	[illegible]	38,780,793	[illegible]
" 1911	18,263,310	45,177,106	Imp. 26,913,796
Silver			
Sept. 1912	6,011,221	3,648,883	Exp. 2,362,338
" 1911..	[illegible]	4,161,706	Exp. [illegible]
Year 1912	[illegible]	36,301,75[illegible]	Exp. 16,046,[illegible]
" 1911..	[illegible]	33,696,43[illegible]	Exp. 15,831,5[illegible]

Exports from the port of New York week ended Oct. 19: Gold, $32,100; silver, $1,630,0[illegible]1, chiefly to London and Paris. Imports: Gold, $2,060,124, principally from London; silver, $318,672, mostly from South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. About $750,000 was taken in London for India, the balance of the supplies going chiefly to the Bank of England.

Iridium—Prices are still high, $68@70 per oz. being asked for the metal.

Platinum—The market is rather more active, but prices show no change. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes under date of Oct. 10 that the market is steady. The demand for platinum is better especially for small lots. The speculators are still buying the platinum of the starateli. New dredges are to be installed on the platinum mines and this will increase considerably the production of platinum. From Ekaterinburg it is reported there is a high demand for iridium but the offer of this metal is insignificant.

The quotations are in St. Petersburg—37,300@37,400 rubles per pood; at Ekaterinburg 9.80 rubles per zolotnik for crude metal, 83% platinum—equivalent to $36.65 and $36.85 per oz. respectively.

Palladium—There has been quite a demand for this metal lately. It is now quoted at $72 per oz., New York.

SILVER AND STERLING EXCHANGE

Oct.	17	18	19	21	22	23
New York	63	63[illegible]	63[illegible]	63[illegible]	63	63[illegible]
London	29[illegible]	29[illegible]	29[illegible]	29[illegible]	29[illegible]	29[illegible]
Sterling Ex.	4.8[illegible]	4.8[illegible]	4.8580	4.8580	4.8610	4.8[illegible]

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The market has not shown any disposition to advance during the current week. It is doubtful if any great advance is likely now to occur, since it is not probable China will be in position to make large purchases in the near future.

Exports of silver from London to the East, Jan. 1 to Oct. 9, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£[illegible]	£8,1[illegible]	I. £1,17[illegible]
China	989,700	993,500	I. 3,800
Total	£[illegible]	£9,11[illegible]	I. £1,17[illegible]

India Council bills in London averaged 16.08d. per rupee.

Copper, Tin, Lead and Zinc

NEW YORK

Oct.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin, Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
17	17[illegible] @17[illegible]	17[illegible] @17.40	49[illegible]	5.05 @5.10	4.87[illegible] @4.92[illegible]	7.40 @7.45	7.25 @7.30
18	17[illegible] @17[illegible]	17.3[illegible] @17.40	[illegible]	5.05 @5.10	4.87[illegible] @4.9[illegible]	7.40 @7.45	7.2[illegible] @7.[illegible]
19	17½ @17[illegible]	17.25 @17.3[illegible]	50	[illegible] @5.10	4.8[illegible] @4.92½	7.40 @7.45	7.2[illegible] @7.30
21	17½ @17[illegible]	17.[illegible] @17.[illegible]	5[illegible]	5.02½ @5.1[illegible]	4.87½ @4.90	7.40 @7.45	7.2[illegible] @7.[illegible]
22	17½ @17[illegible]	17.25 @17.[illegible]	50[illegible]	5.02 @5.10	4.8[illegible] @4.90	7.40 @7.45	7.2[illegible] @7.[illegible]
23	17½ @17[illegible]	17.2[illegible] @17.30	50[illegible]	5.02 @5.10	4.87½ @4.90	7.40 @7.45	7.2[illegible] @7.[illegible]

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and nondesilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Oct.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
17	7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21	2[illegible]
18	76¼	77[illegible]	[illegible]	[illegible]	[illegible]	21	27
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	7[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	81	[illegible]	228[illegible]	[illegible]	27

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅓c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Copper—During the last week business has been almost at a standstill. Of course no sales to Europe could be made under the existing conditions; and domestic manufacturers being fairly well covered (in some cases until the end of this year, and in most cases up to the beginning or middle of December) are not anxious during this time of uncertainty to enter into new commitments. Whether this hesitation is due to the political situation or to other causes will become apparent sooner or later. The largest producing interests maintain the old pegged price and are calmly confident that buyers sooner or later will have to pay them what they ask. Their optimism is no doubt sincere. On the other hand, there are agencies that are willing to sell copper right along for what they can get, being able to cover their sales by purchases of crude material in Chile and elsewhere on terms that leave a handsome profit. The withdrawal of standard copper from the London market for refining here has also been considered. The offerings of electrolytic copper from these quarters at 17⅜c., delivered, usual terms, and at less, have increased, wherefore the market closes easy. Throughout the week the market for Lake copper has been only nominal and the quotations for it are nominal. At the close, Lake copper is quoted at 17½@17¾c.; electrolytic copper in cakes, wirebars or ingots at 17.20@17.30c. Casting copper is quoted nominally at 17.10@17.20c. as an average for the week.

Transactions in the London standard market assumed fairly large proportions. Its tendency during the latter part of last week remained firm, but became easier at the beginning of this week. On the morning of Oct. 23, the market developed great strength, and quotations ruled at £76 7s. 6d. for spot and £77 5s. for three months, but an attack by bear operators in the afternoon broke the market for spot 10s. and futures 15s., so that the close is £75 17s. 6d. for spot, and £76 10s. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 2390 long tons. Our special correspondent gives the exports from Baltimore at 1422 tons fo rthe week.

Visible stocks of copper in Europe on Oct. 15 are reported as follows: Great Britain, 29,020; France, 8330; Rotterdam, 500; Hamburg, 2880; afloat from Chile, 1500; afloat from Australia, 4550; total, 46,780 long tons, or 104,787,200 lb. This is a decrease of 1170 tons, as compared with the Sept. 30 report.

Tin—The market has not alone recovered the ground lost during the Balkan scare of last week, but its advance has made considerable progress. The late activity in the tin market is ascribed to operations by a strong bull party led by a large Viennese metal house. There was a tendency manifest in this market on the part of sellers to underquote the prices sent over from London. Business between these dealers and consumers was fairly activ, and the market closes at £229 10s. for spot, and £228 5s. for three months in London, and about 50¼c. per lb. for November tin in New York.

Lead—Western sellers are persistent in their efforts to market their production, and have made offers as low as 4.87½, St. Louis. This, naturally, has had an effect on the New York market, where lead for shipment from the West was offered as low as 5.02½. The close is quoted at 4.87½@4.90c., East St. Louis, and 5.02½@5.10c., New York.

The demand in Europe has fallen off considerably, and as stocks are accumulating, there is no longer the scarcity of the last few months. On the contrary, lead is pressed for sale both by dealers and consumers, and closes weak at £19 15s. for Spanish, and 2s. 6d. higher for English lead.

The United Metals Selling Co. has appeared in the market as seller of refined lead, representing the International Smelting & Refining Co.

Spelter—The market has been quiet and unchanged. Business is of a retail character, not much anxiety being shown by consumers to anticipate their future wants. St. Louis is unchanged at 7.25@7.30c., and New York 7.40@7.45 cents.

The London market is slightly easier, good ordinaries being quoted at £27 10s., and specials at £27 15s. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—The market is strong and active. No. 1 ingots are quoted at 26½c. per lb. in large lots. Some smaller sales have been made as high as 27@27½c. for immediate shipment.

Antimony—The market is exceedingly strong with good business forward. Prices are strong and advancing. Cookson's is quoted at 10⅜@10⅝c. per lb.; Hallett's is scarce and 9⅝@10c. is asked. For Chinese, Hungarian and other outside brands, 9⅜@10c. is named, with little to be had at the lower figure.

Quicksilver—The market is fairly active, and prices are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets

Platteville, Wis., Oct. 19—The base price paid for 60% zinc ore declined during the week from $58 to $56. The base price paid for 80% lead ore was $63@64 per ton.

SHIPMENTS WEEK ENDED OCT. 19

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	716,600	......	....
Benton	529,500	60,000	670,700
Platteville	487,640	....	220,000
Galena	476,600	.....	....
Hazel Green	230,000	....	....
Shullsburg	168,000	. .	....
Harker	146 130	......	......
Cuba City	130,580	....	112,500
Highland	126,400	.....	....
Linden	118,920	61,940	....
Rewey	84,000	. ..	......
Montfort	80,000	. .	....
Total	3,263,670	121,940	1,003,200
Year to date	161,791,530	6,663,100	29,332,690

Shipped during week to separating plants, 2,141,970 lb. zinc ore.

Joplin, Mo., Oct. 19—The high price of zinc sulphide ore was $61, the base, per ton of 60% zinc, $54@58. Zinc silicate sold on a base of $31@34 per ton of 40% zinc. The average price for all grades of zinc is $55.02. A stronger demand at the week-end, while not advancing prices, indicated that the downward course had reached bottom. Lead sold on a base of $62@64 per ton of 80% lead, with only a few small lots exceeding 80% metal contents. The average price for all grades is $63.36 per ton.

SHIPMENTS WEEK ENDED OCT. 19

	Blende	Calamine	Lead Ore	Value
Webb City Carterville	4,561,060		780,380	$152,765
Joplin	2,776,140	..	304,650	90,257
Galena	841,970	.	313,220	33,526
Duenweg	937 610	.	69,410	28,404
Alba-Neck	892,350	......	16,980	26,404
Miami	175,860	...	336,270	22,693
Carl Junction	384,830	.	......	11,737
Spurgeon	39,660	477,410	39,640	10,890
Oronogo	300,950	. .	.....	8,398
Granby	130,860	271,630	..	8,000
Jackson	221,250	.	109,260	9,696
Wentworth	252 950	..		6,829
Carthage	122 620	. .	.	3,310
Aurora		126,000	.	2,270
Sarcoxie	62,310			1,682
Totals	12,006,420	875,040	1,969,810	$416,861
42 weeks	150,669 560	28,629,530	75 696 090	$11 630 191

Blendeval the week, $338,790; 42 weeks, $12,028,067
Calamine, the week, 15,663; 42 weeks, 451,706
Lead value, the week, 62,408; 42 weeks, 2,150,418

Outputting conditions continue at the best. Better weather could not be ordered, and every effort is being put forth to produce the limit of ore. An effort is being made to secure miners to go to Bingham, Utah, as strike breakers.

MONTHLY AVERAGE PRICES

Month	Zinc Ore Base Price 1911	Zinc Ore Base Price 1912	Zinc Ore All Ores 1911	Zinc Ore All Ores 1912	Lead Ore All Ores 1911	Lead Ore All Ores 1912
January..	$41 85	$44 90	$40 55	$43 54	$55 68	$58.92
February...	40 21	45 75	39 16	43 31	54 46	52.39
March......	39 85	51 56	38.45	49.25	54.57	54.64
April.........	38 88	52 00	37 47	50 36	56 37	54 18
May..........	38 25	55.30	36 79	53.27	55 21	52.45
June.........	40 50	55 88	38.18	54 38	56.49	55.01
July.........	40 75	58 85	38 36	56 59	58 81	58 83
August.....	42 50	55 13	41 28	53.27	60 74	57 04
September..	42 63	59 75	41 29	57 07	59 33	61.26
October	42 38	.. ..	40 89	......	54 72	..
November..	45 40	.	43 25	.	57 19	. ..
December..	44 15	..	40 76	..	62 03	. . .
Year.	$41.45	.	$39 90	..	$56.76	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Molybdenum Ore—Recent quotations are $25 per ton for molybdenite, carrying 25% MoS_2; $100 per ton for wulfenite carrying 25% or over MoO_2; both delivered at railroad.

Vanadium Ore—A recent quotation for vanadinite at mine is 75c. per lb. for the V_2O_5 contained, for ore carrying 10% or over.

Chemicals

New York, Oct. 23—The general markets continue active and firm.

Arsenic—Spot supplies are still scarce and prices a shade higher. Spot arsenic is quoted $5.12½@5.25 per 100 lb., and futures $5@5.12½. It looks as if the stocks which early in the year brought down prices had been largely used up.

Copper Sulphate—Demand is good and the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is quiet and prices a little easier, 2.55@2.57½ per lb. being asked for both spot and future positions.

Sulphuric Acid Rates—A complaint has been filed with the Interstate Commerce Commission by the Goldfield Consolidated Milling & Transportation Co., of Goldfield, Nev., against the rates on sulphuric acid from San Francisco. The company states that it has been compelled to pay $2.14 per 100 lb., and at other times a rate of $1.79, both of which rates are said to be excessive, the reasonable rate being set by the company at 66c. per 100 lb. Reparation of over $11,700 is asked for from the Southern Pacific R.R. and from the Tonopah & Goldfield R.R., on the basis of collections made for former shipments of acid.

MINING STOCKS

New York, Oct. 23—On Oct. 17, the Exchange was uncertain, with alternate advances and recessions. Mining stocks on the Curb were dull and inclined to recede fractionally.

Oct. 18 the Exchange was quiet and showed no definite tendency. On the Curb coppers were in moderate demand, but prices were irregular. Other mining stocks were dull.

Oct. 19 the Exchange was more active and steadier. The large quantity of stocks offered for sale from Europe has apparently been absorbed, leaving the market free for an upward turn. On the Curb mining stocks were dull and inclined to be easier in tone.

Oct. 21 the Exchange declined under large offerings and closed weak. Mining stocks on the Curb were slow and sold off, except the coppers, which about held their own.

Oct. 22 and 23 there was less pressure on the market and the Exchange showed some recovery. The Curb was quiet and mining stocks were inclined to be dull, but with few changes in quotations.

The Curb admitted to quotation the stocks of the West End Consloidated Mining Co., and of the Puebla Smelting & Refining Co. The West End is a Tonopah issue with 2,000,000 shares of $5 par authorized, of which 1,298,572 are outstanding. The Puebla Smelting & Refining Co. has 1,000,000 shares authorized, 650,000 outstanding, the par being $5. There are also $1,000,000 of 6% debentures.

At auction in New York, Oct. 10, a lot of 7500 shares Round Mountain Sphinx Mining Co., $1 par, sold for 8c. per share.

Boston, Oct. 22—It has been a week of heavy market prices for copper shares, outside of Chino, which has made a new high record. It is stated that the directors of this company will meet shortly and declare a dividend at the rate of $4 per annum. Old Colony and Mayflower show some strength on reports from President Fay, who is at the mines, that the drill cores expose rich copper-bearing veins.

Wolverine has suffered another decline to $71, the lowest of the year. No news accompanies this last decline. North Butte, is off to $36.75. Profit taking in U. S. Smelting common has caused a drop to $46 per share.

Amalgamated maintains a fairly firm tone although it is subject to fluctuations with the heavy liquidation on the New York market. The increase in the dividend rate, the second this year, to a 6% basis, was generally expected. The management of the North Lake mine, a former Dow stock, announces that no assessment is likely to be called for six months.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	July	August	Sept.
Alaska shipments	2,224,441	1,242,836	1,726,715
Anaconda	25,000,000	25,250,000	24,500,000
Arizona, Ltd. ..	3,200,000	3,260,000	3,340,000
Copper Queen......	7,708,147	8,040,424	9,103,861
Calumet & Ariz....	4,748,000	4,514,000	4,462,000
Chino.............	2,945,000	3,437,309	3,372,369
Detroit...	2,194,090	1,882,289	1,881,668
East Butte.	1,261,304	1,410,500	1,250,000
Mammoth.	1,818,738	1,802,590	1,834,937
Mason Valley... ..	1,500,000	. .	....
Nevada Con......	6,084,274	.....	....
Ohio..............	617,500	. .	....
Old Dominion....	2,543,763	2,597,896	2,204,000
Ray	2,985,965	2,888,095	....
Shannon	1,446,000	1,400,000	1,142,000
South Utah ...	142,555	224,856	225,568
United Verde*	2,500,000	2,500,000	2,750,000
Utah Copper Co...	10,602,000	11,248,992	6,616,887
Lake Superior*....	19,500,000	21,000,000	19,250,000
Non-rep. mines*..	8,970,000	8,970,000	... .
Total production	105,991,687	....	...
Imports, bars, etc..	25,586,735	23,561,161	....
Total blister.....	131,578,422	....	. .
Imp. in ore & matte	7,748,392	8,544,624	. ..
Total American..	139,326,814	.	...
Miami†............	3,027,710	3,048,750	2,949,150
Brit. Col. Cos.:			
British Col. Copper	1,026,000	941,364	. . .
Granby	1,802,753	1,970,388	... .
Mexican Cos.:			
Boleo†	2,386,480	... .	....
Cananea .. .	4,000,000	4,044,000	3,500,000
Moctezuma	3,094,016	3,229,839	771,844
Other Foreign:			
Cape Cop., S. Africa		. . ..	... .
Kyshtim, Russia...	1,325,000	.	.
Spassky, Russia	795,200	902 720	.
Famatina, Argen..		.... . .	....
Tilt Cove, Newf'd..	. ..	.. ...	... . ..
Exports from:			
Chile	8,960,000	8,512,000	6,048,000
Australia	8,288,000	8,064,000	7,616,000
Arrivals in Europe‡	14,114,240	20,200,320	8,518,720

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911........	115,588,950	57,311,584	50,824,011
X .	118,255,442	64,068,307	60,084,349
XI .	111,876,601	68,039,776	67,049,279
XII ..	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912 ..	119,337,753	62,343,901	80,167,904
II .	116,035,809	56,228,368	63,148,096
III .	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53 252,326
V ..	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII............	137,161,129	71,094,381	60,121,331
VIII .	145,628,521	78,722,418	70,485,150
IX....	140,089,819	63,460,810	60,264,796

VISIBLE STOCKS

	United States	Europe	Total
X, 1911 .	140,894,856	191,945,600	332,840,456
XI .	134,997,642	176,825,600	311,823,242
XII............	111,785,188	164,281,600	276,066 788
I, 1912 ..	89,454,695	158,323,200	247,777,895
II .	66,280,643	154,851,200	221,131,843
III .	62,939,988	141,142,400	204,082,387
IV .	62,367,557	136,819,200	199,186,757
V ...	65,066,029	134,176,000	199,242,029
VI .	49,615,643	117 801 600	167,417,243
VII ...	44 335 004	108,186,000	152,521,004
VIII............	50,280 421	113 299 200	163,579,621
X	46,701,374	113,568,000	160,269,374
X.....	63,065,587	107 408 000	170,473,587

Curb trading has been light, but prices maintain a generally firm tone. Nevada-Douglas touched $4 and holds just under this mark. Many of the penny stocks continue to change hands at slightly lower levels.

Assessments

Company	Delinq.	Sale	Amt.
Best & Belcher	Nov. 6	Nov. 25	$0.05
Big Elk, Ida.	Oct. 9	Nov. 10	0.001
Black Bear, Ida.	Sept. 26	Oct. 26	0.01
Black Horse, Ida.	Oct. 18	Nov. 8	0.01
Buffalo, Ida.	Oct. 28	Nov. 28	0.002
Bullion, Nev.	Oct. 16	Nov. 6	0.03
Carney Copper, Ida.	..	Nov. 2	0.004
Eastern Star, Ida.	Oct. 12	Nov. 12	0.002
Exchequer, Nev.	Oct. 30	Nov. 20	0.03
Fox Copper, Ida.	.....	Oct. 30	0.003
Franklin, Mich.	Oct. 18	.....	2.00
Great Eastern, Ida.	Sept. 28	Oct. 28	0.002
Holy Terror, Ida.	Oct. 18	Nov. 18	0.00
Hugo, Ida.	Nov. 9	Dec. 9	0.001
Hypotheek, Ida.	Oct. 14	Nov. 4	0.01
Indiana, Mich.	Oct. 16	....	1.00
Lucky Calumet, Ida.	....	Nov. 8	0.005
Oneco, Mich.	Oct. 10	....	1.00
Ophir, Nev.	Nov. 11	Dec. 9	0.15
Rhode Island, Ida.	Oct. 31	Nov. 30	0.003
Snowshoe, Ida.	Sept. 30	Oct. 30	0.005
Tar Baby, Utah	Nov. 2	Dec. 2	0.002½
Temple, Ida.	Sept. 30	Oct. 30	0.002
Union Con., Nev.	Oct. 15	Nov. 6	0.15
Utah Ideal, Utah	Oct. 9	Nov. 10	0.0½
Yellow Jacket, Nev.	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	..	25.596	24.594	
November	55.635	55.719		25.680	25.649	
December	54.428	54.905	.	25.160	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic 1911	New York Electrolytic 1912	New York Lake 1911	New York Lake 1912	London Standard 1911	London Standard 1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189		12.370		55.170	
November	[illegible]		12.769		[illegible]	
December	[illegible]		13.768		62.068	
Year	12.376		[illegible]		55.973	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.[illegible]	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.[illegible]	42.923	October	41.185	
May	43.115	46.053	November	43.125	
June	44.606	45.815	December	44.655	.
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265		4.139	......	15.332	
November	4.298		4.181		15.841	
December	4.450		[illegible]	......	15.648	
Year	4.420		4.286	.....	13.970	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	..	5.951	.	27.256	
November	6.380		6.223		26.795	
December	6.301		6.151		26.849	
Year	5.758		5.608		25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No. 2 Foundry 1911	No. 2 Foundry 1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.80	13.57	16.03	14.40	15.63
October	15.45	......	13.44		14.34	
November	14.92	..	13.30	....	14.25	
December	15.15		13.10	. ..	13.90	
Year	$15.72		$13.94		$14.49	

STOCK QUOTATIONS

COLO. SPRINGS Oct. 22

Name of Comp.	Bid.
Acacia	.04½
Cripple Cr'k Con.	01½
C K & N	18
Doctor Jack Pot.	05
Elkton Con	65
El Paso	5.40
Findlay	04½
Gold Dollar	18½
Gold Sovereign	.02½
Isabella	.17½
Jack Pot	.04½
Jennie Sample	.06½
Lexington	007
Moon Anchor	01
Old Gold	03½
Mary McKinney.	.71
Pharmacist.	01½
Portland	99
Vindicator	.88½
Work	01

SALT LAKE Oct. 22

Name of Comp.	Bid.
Beck Tunnel	08
Black Jack	10
Cedar Talisman.	01
Colorado Mining.	.15
Columbus Con.	10
Crown Point	01
Daly-Judge	5.90
Grand Central	36
Iron Blossom	1.07
Little Bell	‡ 20
Lower Mammoth	06
Mason Valley	12.75
May Day	15
Nevada Hills	1.57
New York	‡ 01
Prince Con	1.75
Silver King Coal'n	2.95
Sioux Con	.04½
Uncle Sam.	.13½
Yankee	.16

TORONTO Oct. 22

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.00	Foley O'Brien	.15
Hudson Bay	‡63.00	Hollinger	14.50
Temiskaming	37½	Imperial	.02¼
Wettlaufer-Lor	25	Pearl Lake	26
Am. Goldfield	50	Porcu. Gold	22
Apex	01⅞	Preston E. D.	03½
Crown Chartered	04⅞	Rea	25
Doble	‡ 20	Standard	01
Dome	22.75	Swastika	08
Dome Exten.	11½	West Dome	‡ 15

SAN FRANCISCO Oct. 22

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.04	Belmont	9.40
Belcher	.31	Jim Butler	63
Best & Belcher	.05	MacNamara	.22
Caledonia	1.00	Midway	52
Challenge Con.	.07	Mont.-Tonopah	2.20
Chollar	.10	North Star	.34
Confidence	.50	West End Con	1.72½
Con. Virginia	.39	Atlanta	19
Crown Point	.44	Booth	06
Gould & Curry	02	C.O.D. Con.	07
Hale & Norcross	.15	Comb. Frac.	.11
Mexican	2.55	Jumbo Extension	33
Occidental	70	Pitts.-Silver Peak	.85
Ophir	.44	Silver Pick	07
Overman	.47	St. Ives	‡ 30
Potosi	.04	Tramp Con.	.02
Savage	12	Argonaut	‡2.00
Sierra Nevada	.39	Bunker Hill	‡4.50
Union Con	.65	Central Eureka	15
Yellow Jacket	.43	So. Eureka	2.00

N. Y. EXCH. Oct. 22

Name of Comp.	Clg.
Amalgamated	88⅛
Am. Agri. Chem.	58½
Am. Sm. & Ref., com	84⅝
Am. Sm. & Ref., pf.	107¼
Am. Sm. Sec., pf. B	86
Anaconda	44¼
Batopilas Min.	1½
Bethlehem Steel pf	76¼
Chino	46⅝
Federal M. & S., pf.	47
Goldfield Con.	2⅝
Great Nor., ore ctf.	47½
Guggen. Exp.	57½
Homestake	98½
Inspiration Con.	20
Miami Copper	26¾
National Lead, com	65
National Lead, pf.	109
Nev. Consol	22
Phelps Dodge	215½
Pittsburg Coal, pf.	95⅝
Ray Con	21
Republic I & S com	33
Republic I & S, pf.	92
Sloss Sheffi'd, com.	56
Sloss Sheffield, pf	95
Tennessee Copper	42½
Utah Copper	63½
U. S. Steel, com	77¾
U. S. Steel, pf.	114¼
Va. Car. Chem.	48½

N. Y. CURB Oct. 22

Name of Comp.	Clg.
Barnes King	65
Beaver Con	.45
Braden Copper	6⅞
B. C. Copper	4¼
Buffalo Mines	1.65
Caledonia	40
Con. Ariz. Sm.	9/16
Davis-Daly	2⅛
Diam'field-Daisy	7
Ely Con	20
Florence	77
Giroux	4⅞
Gold Hill Con.	5/16
Greene Cananea.	10
Greenwater	04
Internat. S. & R.	‡124
Kerr Lake	2 11/16
Keystone	1⅞
La Rose	2 9/16
McKinley-Dar-Sa	1⅞
Min. Co. of A. new	3
Motherlode Gold.	15/16
Nev. Utah M. & S.	‡ 01
Nipissing Mines	8⅜
Ohio Copper	1⅝
Pacific Sm. & M.	¼
South Live Oak	2
South Utah M. & S.	⅝
Standard Oil (Old)	1110
Stand'd Oil of N. J.	401
Stewart	1 5/16
Tonopah	6 9/16
Tonopah Ex.	2 11/16
Tonopah Merger	1 3/32
Tri-Bullion	11/16
Tularosa	1
Union Mines	‡ 10
United Cop., pfd.	10
Yukon Gold	3 7/16

LONDON Oct. 23

Name of Com.	Clg.
Camp Bird	£1 6s 3d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	2 0 6
Mexico Mines	6 12 6
Oroville	0 5 3
Stratton's Ind.	0 3 1½
Tomboy	1 7 0

BOSTON EXCH. Oct. 22

Name of Comp.	Clg.
Adventure	7
Ahmeek	328
Algomah	3½
Allouez	44¼
Am. Zinc	32½
Ariz. Com., ctfs.	3⅞
Bonanza	.30
Boston & Corbin	6¾
Butte & Balak	3¼
Calumet & Ariz	71⅜
Calumet & Hecla	580
Centennial	20
Cliff	3
Copper Range	56¾
Daly West	3½
East Butte	15⅝
Franklin	11¼
Granby	63½
Hancock	25
Hedley Gold	22½
Helvetia	.90
Indiana	16
Island Cr'k, com	55
Island Cr'k, pfd.	87
Isle Royale	34
Keweenaw	2
Lake	32¾
La Salle	5
Mass	‡7
Michigan	1¾
Mohawk	65
New Arcadian	3
New Idria Quick	5½
North Butte	36½
North Lake	4
Ojibway	3½
Old Dominion	61¼
Osceola	111
Quincy	86
Shannon	15
Shattuck-Ariz	29
Superior	42
Superior & Bost	1 1/16
Tamarack	45⅛
Trinity	5
Tuolumne	2¼
U. S. Smelting	46¼
U. S. Smelt'g, pf.	50¼
Utah Apex	2
Utah Con	12½
Victoria	2½
Winona	4½
Wolverine	72
Wyandot	1½

BOSTON CURB Oct. 22

Name of Comp.	Last
Alaska Gold M.	8¼
Bingham Mines	5½
Boston Ely	1 1/16
Boswyocolo	01½
Butte Central	7
Cactus	09
Calaveras	2¼
Chief Cons	1¾
Corbin	[illegible]
Cortez	[illegible]
Crown Reserve	3¼
First Nat. Cop	1¼
Majestic	45
Mazatan	‡¼
Moneta Porc	04½
Nevada-Douglas.	3⅞
New Baltic	2
Oneco	2½
Raven Copper.	.31
Rhode Island Coal	[illegible]
San Antonio	‡3
Smokey Dev	2½
S. W. Miami	6
South Lake	6½
Trethewey	‡ 30
United Verde Ext.	.52

‡Last quotation

The Engineering and Mining Journal

Vol. 94 NOVEMBER 2, 1912 No. 18

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres Rob't McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C
Unter den Linden 31—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The American Iron and Steel Institute

The meeting of the Iron & Steel Institute in Pittsburgh last week was the first one outside of the yearly meetings which have been so far devoted chiefly to business and conference; and it was the first one under the new program of the institute, which provides for a larger share of time and attention for the technical side. The meeting must be considered a successful one so far as the size and quality of the attendance is considered. It was the means of bringing together a large number of men prominent in the iron and steel industries, both on the business and technical sides. It was notable for the strict attention to business, and the postponement of all outside attractions until after the meeting was ended. The limitation of the sessions to one day, however, cut down the time allotted for discussion of the papers read to a brief space.

Several excellent technical papers were presented, but the business side had a prominent place also, the most notable paper being on "The Buyer from a Manufacturer's Standpoint," which attracted much attention and some discussion. The paper was a fair statement from the seller's side, but seemed to demand more consideration for that side than buyers are ever likely to give. A notable feature in the list of papers is that safety appliances and working conditions, to which the institute had promised to give much attention, were questions that were entirely omitted.

President Gary's address was an adroit one in its careful treatment or avoidance of political and economic questions which would be likely to stir up differences; while enough was said to show that he has not changed his mind as expressed in his former utterances on such points. Perhaps its omissions were more notable than its actual expressions.

Upon the whole it may be said that the institute made in this meeting a fair start upon its professional or technical course. It remains to be seen, however, how much of the purely technical element the institute will attract, and how far its activities in this direction will affect the Iron & Steel Division of the American Institute of Mining Engineers. It may take more of such meetings to remove the rather general impression that the Iron & Steel Institute is more a trade and financial than a technical association.

Notes on Mineral Waste

U. S. Bureau of Mines has recently published a bulletin on mineral waste, by Prof. Charles L. Parsons, late of New Hampshire College, who is a recent addition to the staff of the bureau. This bulletin draws renewed attention to our enormous waste of minerals, and their derivatives, in production and consumption. Professor Parsons' exposition, however, is refreshing in that he does not consider the producers to be the only wastrels, but blames the consumers quite as much, or even more, which is a view that we have previously taken.

But Professor Parsons does not by any means absolve the producers. His discussion of their operations displays in the main the possession of good information and a good deal of common sense, although references to details are open to criticism. Especially may some attention be directed to his remarks about the zinc industry. Zinc is the scapegoat of all the metals. In the eyes of the inexperienced, the zinc smelters of the world are an unscientific, backward lot of metallurgists, who stubbornly adhere to the methods of a century ago with but minor improvements in details, and year after year, suffer contentedly great losses of the metal of the ore that they treat. For our own part, we can say with some positiveness, that the zinc-smelting profession has not stood still and has succeeded in accomplishing a modern practice that is not so very discreditable, even in comparison with the practice in some other metals.

We have constructed a formula that we wish conservationists and general theorists would notice, and ever keep prominently before their eyes. Our formula is the following:

$$X = M - (O + C + 0.1P + 0.06P)$$

In the above formula M represents the value of the metal extractable from a ton of ore of given metallic contents; O is the cost of the ton of ore; C is the direct metallurgical operating cost per ton of ore, including administration and general expense, repairs and renewals of plant, and the cost of the use of money required as working capital; P is the first cost of the plant per ton of ore; the factor of 0.1 representing amortization and 0.06 interest; and X is the net profit per ton of ore. The values of M, C and P are variable within rather wide limits and are correlated, e.g. an increase of P ought to increase M and decrease C, either or both, and probably will do so. The object of the metallurgist, financier, and economist is always to obtain the maximum for X.

We are inclined to take exception to Professor Parsons' statement that "Zinc mining is frequently done on a royalty basis, an arrangement that means great waste, because the lessee naturally takes out the ore paying the greatest profit and leaves the poorest ore behind without reference to its ultimate loss." We infer that this refers to the Joplin district, where the leasing system is especially in vogue. It has not been our observation that the Joplin lessee wastes in his mining very much to the calamity of coming generations, whatever may be his crimes in milling. Nor that the Joplin lessee is greatly inferior to the larger companies of that district. The Joplin lessee is a natural economist. He is under no illusions respecting deferred charges, or fine points between capital and direct operating accounts, or bookkeeping jugglery in general. He operates always on a liquidating basis and aims to liquidate the maximum possible. He mines an ore of extraordinarily low grade, in which he is materially assisted by the tariff that is beneficent to him. The premium comes out of the consumers, i.e., the public generally. Of course, it will occur to economists that the country might be better off on the whole if the zinc miners were not assisted in mining such low-grade ore; and if the occurrences of such ore were disregarded, for the present at least; and if the interest of future generations in this matter were allowed to go hang.

But to return to Professor Parsons' bulletin, we have found it an interesting publication, full of good reading and suggestive ideas, and so engagingly presented that we have no doubt it would have been accepted by one of the big magazines if it had been offered to them.

Affairs in Mexico

The situation in Mexico appears to have been clarified or confused by the Diaz rebellion and its fiasco, according to the point of view. When the news came of the rebellion under the magic name of Diaz, many persons jumped to the conclusion that it was all up with Madero. When the news came a few days later that Diaz had been arrested with ridiculous ease, the opinion was common that Madero had shown unexpected strength and would make short work of the bandits in the north; and that peace would soon be restored in the unhappy country, and that industry would be free again.

However, the question then arose as to whether to shoot Diaz or not to shoot him, and Madero found himself face to face with another crisis. This may nave been passed before these lines are printed. Anyway, the ease with which Reyes, and after him Diaz, have been overcome, lends color to the belief that the serious part of the Mexican people are tired of fighting and are anxious for the restoration of order; and that the disturbances that continue are only the manifestations of bandit activity, which will be quelled before long.

Safety in Mining

One of the most encouraging features of modern mining practice in the United States is the great increase in attention to the safety of the men. Many important companies have organized their own system of inspection and are striving sincerely to reduce the fatality and accident rates. Prominent in this movement are the iron-mining companies of Michigan, Wisconsin and Minnesota, especially the Cleveland-Cliffs, Republic and Oliver companies. This is just as it should be. The proper way to deal with accidents is to prevent them, and it is better to have private inspection than police, i.e., state inspection, although the latter will, no doubt, continue to be necessary. It is especially gratifying that the big companies are taking the lead in the safeguarding of their men and setting examples for the little fellows to copy.

Cyanide Practice

In this issue begins a series of articles by Herbert A. Megraw, an experienced cyanide metallurgist, who lately joined the staff of the JOURNAL, which will be a review of modern American cyanide practice. Mr. Megraw went first to Cobalt and Porcupine to study the methods introduced at those places, especially at Porcupine, where two large mills have been put into operation this year. Thence he proceeded to the Black Hills, where he is now. Afterward he will visit Colorado, Nevada, and, in short, all of the districts of the United States where cyanidation is the important metallurgical process. Mr. Megraw's articles, based upon intelligent and experienced study in the field, will surely be of great value to cyaniders and should excite general interest.

The breaking of steel rails in service is chiefly a question of section, according to Julius Kruttschnitt, director of maintenance and operation of the Southern Pacific, and John D. Isaacs, consulting engneer of he company. A carefully compiled chart was made of breakages of steel rails of two patterns, both being of practically the same quality and of the same weight, 90 lb. to the yard. With rails of the so called standard section with comparatively light web and base there were six breakages in 100 miles in summer, with an average temperature of 75°; and 23 per 100 miles in winter, with an average temperature of 40°. With the new section, having heavier base and web, the average for both summer and winter was only two breakages per 100 miles. Should this record be corroborated by others, it would show that the railmakers were in the right when they claimed that the engineers in concentrating metal in the head of the rail to take the wear, had unduly weakened the supporting members, the web and the foot of the rail.

By the Way

Prof. A. Tollaire, a French economist, who is now in America making a study of the high cost of living and its probable causes, argues that the gold supply has no relation to the increasing cost of living.

A holiday is always declared by the operating companies in Butte whenever the miners' union decides to take a referendum vote, the companies not wishing to appear to prejudice the vote by keeping the men at work.

The son of the principal stockholder had just taken charge of the mine; he was checking up his bill for the equipment of the new power plant and found that 120 pieces were missing. "I've got all but the 120 volts you said would go with the generator," he wrote the manufacturer.

The German emperor, dispatches announce, is giving his personal attention to mine explosions, and hopes by means of chemistry to find a practical safety device. After the mine disaster near Bochum, on Aug. 8, resulting in the abandonment of the Krupp centenary festivities, the Kaiser is said to have appealed to the technical schools of Germany for a remedy. In a speech made on Oct. 23, at the dedication of the "Chemical Institute of the Emperor William Scientific Foundation," he repeated his request, and explained that his idea contemplated "a harmless chemical compound, a change in which would warn miners plainly of the danger of firedamp."

A Crocker-Wheeler representative tells the following story illustrating the danger of technical terminology in the hands of laymen. Meeting the owner of a sweatshop in a large Western city, to whom he had sold a motor six years before, he asked him how the motor was behaving. "I hardly ever see it," said the latter. "It is up on a shelf in the corner of the room, and I don't bother with it, only to turn it on and off." "How often do you oil it?" inquired the salesman. "Oil it? Why, I never oil it. You told me when you sold it to me that the motor was self-oiling!" A lot of "fully paid, nonassessable" mining stock is sold on much the same understanding.

Speaking of the New York Curb market, the Boston *News Bureau* says it was not many years ago when anyone who looked like ready money, and not a few who did not, did business on the Curb unmolested. When a crook was arrested who happened to be working below the dead line, he invariably styled himself "a Curb broker." To the real Curb brokers this was very distasteful and these happenings went a long way toward the formation of the present association. From $12.50 fees per year, the fee of the association for several years, it was raised to $25 two years ago. Under the new rules, a member must pay $250 initiation fee and $25 annual dues.

The *Wall Street Journal* is authority for the following: "One word summarizes the chief reasons for the present vastly improved situation of copper metal and copper securities and that word is a small one spelled with four letters, and thus, R-Y-A-N," said one of the best known copper men in the Street. "Mr. Ryan can justly claim to have brought order out of chaos and it is only fair tribute to his ability to say that the present situation is largely the result of his foresight, genius and hard work. Without in any way overstepping the bounds of right, he brought into a harmony of views, rich, powerful and opposing interests in the copper trade, with a resultant increasing stability to the copper trade and general increased prosperity on all sides."

Recognition of the high cost of living is reflected in more liberal regulations, issued on Oct. 28 by Secretary MacVeagh to cover travel expenses of officers and employees of the Treasury Department. Allowance for lodging and meals in New York and Chicago, has been increased from $5 to $6 per day, with an additional maximum allowance of 50c. for tips. In a score of other large cities a similar tipping allowance is made. Limited laundry charges will be allowed an official absent one week. Railroad porters may be tipped 15 or 25c., while steamship stewards will receive gratuities ranging from $10@15 for an ocean trip. This official recognition of the tipping system will be a blow to the anti-tipping league. The Washington construction of legitimate traveling expenses will be of interest to many persons.

The greatest of recent improvements in Lake navigation was formally opened on Oct. 18. This is the Livingstone channel in the Detroit River, which has been under construction for four years. It is six miles long, from Stony Island to Bar Point light and runs to the west of Bois Blanc Island, making an independent waterway for down-bound vessels and eliminating the possibility of collision with up-bound vessels at the Limekiln Crossing by avoiding it altogether. That crossing was considered extremely dangerous, owing to the narrow channel, swift current, rocky bottom and the congested conditions arising from the number of vessels waiting for passage in both directions. It is called the Livingstone channel in honor of William A. Livingstone, of Detroit, who first suggested it and was active in securing the necessary appropriations from Congress.

The recent trouble at the South New Moon mine, in Australia, arising out of the objection of the miners to being searched, recalls many yarns about gold stealing in Victoria, says a Melbourne paper. Not so very long ago the directors of a mine in a mountainous district of the state, believing that gold stealing was rife at the mine, secured the services of a private detective. The investigator was given employment at the mine. He worked himself into the confidence of the miners, and helped them to sneak the gold from the workings to the surface. It was necessary for someone to go to Melbourne to dispose of the hoard, and so completely had the spy ingratiated himself with the men that he was entrusted with the booty. He has never been heard of since. Of him it may be truly said—he is greatly missed. His loss is deplored by directors and miners alike. "I knew a Cornishman," writes the Melbourne correspondent, "a real old 'Cousin Jack,' a strange mixture of piety, and craft, and downright thoroughness, who used to point to the Scriptures as an authority for gold stealing. He said: 'The Bible says that thee mussent muzzle the ox that treadeth out the corn, and I take my haff-ounce reg'lar!' And he was such a conscientious man that I believe if his weekly 'taking' weighed over the 'haff ounce," he would have foregone the next week's dividend."

The Kennecott Mines Co. has more than paid back its capital this year; this company, capitalized at $2,500,000, owns the Bonanza mine at Kennecott, Alaska, often referred to as the "richest copper mine in the world." This reference, trite from misuse, is true in this instance—if one does not count the cost of getting its copper out of Alaska. The Bonanza mine doubtless contained the highest-grade copper orebody of its size, so far discovered in the world. Since April, 1911, it has shipped about 29,000 tons, containing approximately 40,000,000 pounds of copper, an average tenor of about 70% copper. In February of this year a dividend of $1,000,000 was paid, being the first return on the big investment made in this property and in the Copper River & Northwestern R.R.; now another dividend amounting to $2,000,000, has been declared, making a total of $3,000,000 or $500,000 more than the Kennecott company's capitalization. The stock in the company is closely held by the Alaska syndicate, composed of Guggenheim officials, and the banking houses of J. P. Morgan & Co., and Kuhn, Loeb & Co. The Bonanza mine is now opened to a depth of over 400 ft. In July, this year, the concentrator commenced treating the lower-grade ore; the concentrates contain about the same amount of copper as the high-grade ore. No official estimates of ore reserves are given out but it is understood that there is a five- or six-year supply already developed, and promising deposits on other portions of the company's property are being investigated.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Pacific Smelting & Mining Co.

My attention having been called to a broker's circular, stating that the Pacific Smelting & Refining Co. (meaning the Pacific Smelting & Mining Co.), has signed a contract for the treatment of its ores, and that shipments will begin on Nov. 1, 1912, I hasten to say for the benefit of those whom it may concern, that said statements are premature. As consulting engineer for that company, and as president of its Mexican subsidiaries, I have been investigating the possibilities of doing what has been erroneously announced as a *fait accompli*. The physical position of the company is excellent, and under certain circumstances, involving some further capital expenditure, it can shortly enter the ranks of the producers. When this end may be in sight, due notice will be given by the officers. I make this statement now in vindication of my own position.

COURTENAY DE KALB.

Tucson, Ariz., Oct. 19, 1912.

Basic Copper Converting

I have been interested in reading the correspondence of Messrs. Fairlie and Bone in the JOURNAL of Aug. 31 and Oct. 12, and the editorial comments on the same. With reference to the JOURNAL'S mention of basic copper converting, I am surprised that it spoke of Peirce and Smith as inventors of this process, which I used at the Parrot works and subsequently described in the 1893 edition of Peters' "Modern Copper Smelting," p. 570. This you will observe was years before Peirce and Smith even started their experiments. In view of this fact, and while not wishing to detract in any way from their merit, I do take exception to the statement which quotes them as originators of this process.

HERMANN A. KELLER.

New York, Oct. 17, 1912.

[All copper metallurgists are acquainted with the pioneer work of Mr. Keller in basic converting and appreciate its value. In our recent reference to Peirce and Smith we had no intention to discuss the history of basic converting or to fix credit, nor do we have any such intention in this note. It is incontestable, we believe, that the development of the practice of basic converting, now so generally in use, followed the work of Peirce and Smith, which was the inspiration or spur, even if it were found subsequently that successful practice was the result of "learning how" rather than of any special apparatus. Earlier metallurgists, including Mr. Keller, may have been suggestive and even anticipatory, and their cumulative work may have paved the way to ultimate success, probably did so, but certainly no extension in practice followed the work of any one of them, which of course is not said in any derogatory spirit. This is the history of most great inventions. In many cases it is impossible to name the real, simon-pure originator. In our recent reference to Messrs. Peirce and Smith we did not intend to limit ourselves to such lexicographic precision. Lest we be thus construed generally, we make haste to retract our use of the word "originator" in this instance.—Editor.]

The Situation in Mexico

I have just read in the ENGINEERING AND MINING JOURNAL of Oct. 5, 1912, an editorial on the situation in Mexico. I am glad to see the article as it strikes me it is high time that some of the mining people take up the conditions in that country as they are unendurable. Taking our own district in Chihuahua—our investment represents considerable over $1,000,000, the last item of indebtedness being some new machinery which cost (or will have cost when erected) about $100,000. This has now been lying on the dump ready to be set up at the mine for 22 months. Water has risen in the mine to where it will require hard pumping for some time. We cannot tell just how long, but we have approximately 40 ft. of water which will mean abot 36,000,000 gals. to be pumped before we can resume operation.

At the present time in the immediate vicinity of the mine are about 500 or 600 rebels, although 40 miles away is a heavily garrisoned town. The mine staff is being continually molested by small parties of rebels to take whatever they can use. They do not take more because there is no more to be taken. The Federals make no effort whatever to protect the mines. They are not protecting the ranches, and in fact are doing absolutely nothing toward the re-establishment of order in the country, and the United States is being filled up along the southern borders with men who have been compelled to come across the line to work.

The New York *Times* came out with a long editorial on Sept. 30, 1912, based upon the information of some eminent professor that the Mexican people were competent to rule themselves, disputing the often made statement that 75% of the population of Mexico was unintelligent. Seventy-five per cent. is too low an estimate for the unintelligent people of Mexico. It is true that President Madero has not had a chance, neither has he attempted to do anything. He is now offering amenity to all of the looters who will promptly start looting again as quickly as they can get funds and ammunition.

AN EMBARGO WHICH DOESN'T WORK

In the last paragraph of your editorial you state that the operations of these plunderers have been retarded very properly by the embargo of the American Government upon the shipment of arms and ammunition to them. The United States is expending some millions of dollars in guarding the border. It is also, in spite of its claim of neutrality, allowing the Mexican Government to import arms and ammunition across the border, and it is not stopping the smuggling of arms and ammunition. The entire border is also being watched by spies of the Mexican Government who are allowed to do just what they please, search the houses of American citizens for arms and ammunition, and they are being aided and abetted by the United States Government. The ordinary statements issued both in the United States and Mexico, concerning the situation there, are absolutely false. The large companies cannot take any definite action against the insurrection as there is nobody to back them up. The Mexican Government either cannot or will not, and the United States Government will not do so. In the meanwhile we are still hearing that "everything is quiet in Mexico and peace will soon be restored."

The last paragraph of your editorial, page 626, just hits me right—"Mexico is a disagreeable and dangerous country in which to live." Last week I was notified that it would be safe for me to stay out of the country. If I had an asbestos envelope and asbestos paper I would tell you the rest.

L. A. GODFREY.

Douglas, Ariz., Oct. 10, 1912.

Notes on Development of Mining Law

By H. C. and L. H. Hoover

From the beginning of history until well into the Nineteenth Century, the growth of mining law has been to give individuals wider and wider rights at the expense of the state. The tendency now is to limit the rights of the individual and exalt those of the community.

Note—This is a footnote that appears in Book IV of Mr. and Mrs. Hoover's translation of Agricola's "De Re Metallica," soon to be published.

There is no branch of the law of property, of which the development is more interesting and illuminating from a social point of view than that relating to minerals. Unlike the land, the minerals have ever been regarded as a sort of fortuitous property, for the title of which there have been four principal claimants—that is, the overlord, as represented by the king, prince, bishop, or what not; the community or the state, as distinguished from the ruler; the landowner; and the mine operator, to which class belongs the discoverer. The one of these that possessed the dominant right reflects vividly the social state and sentiment of the period. The divine right of kings; the measure of freedom of their subjects; the tyranny of the land-owning class; the rights of the community as opposed to its individual members; the rise of individualism; and finally, the modern return to more communal view, have all reflected promptly in the mineral title. Of these parties the claims of the overlord have been limited only by the resistance of his subjects; those of the state limited by the landlord; those of the landlord by the sovereign or by the state; while the miner, ever in a minority in influence as well as in numbers, has been buffeted from pillar to post, his only protection being the fact that all other parties depended upon his exertion and skill.

Mining Rights a Shifting Conception

The conception as to which of these classes had a right in the title has been by no means the same in different places at the same time, and in all it varies with different periods; but the whole range of legislation indicates the encroachment of one factor in the community over another, so that their relative rights have been the cause of never-ending contention ever since a record of civil and economic contentions began. In modern times, practically over the whole world, the state has in effect taken the rights from the overlord, but his claims did not cease until his claims over the bodies of his subjects also ceased. However, he still remains in many places with his picture on the coinage. The landlord has passed through many vicissitudes; his complete right to minerals was practically never admitted until the doctrine of *laissez-faire* had become a matter of faith, and this just in time to vest him with most of the coal and iron deposits in the world; this, no doubt, being also partially due to the little regard in which such deposits were generally held at that time, and therefore to the little opposition to his ever-ready pretentions.

Their numbers, however, and their prominence in the support of the political powers *de jure* have usually obtained them some recognition. In the rise of individualism, the apogee of the *laissez-faire* fetish came about the time of the foundation of the United States, and hence the relaxation in the claims of the state in that country and the corresponding position attained by the landlord and miner. The discoverer and the operator—that is, the miner himself—has, however, had to be reckoned with by all three of the other claimants, because they have almost universally sought to escape the risks of mining, to obtain the most skillful operation, and to stimulate the productivity of the mines; thereupon the miner has secured at least partial consideration. This stands out in all times and all places, and while the miner has had to take the risks of his fortuitous calling, the overlord, state, or landlord have all made for complacent safety by demanding some kind of a tithe on his exertions. Moreover, there has often been a low cunning displayed by these powers in giving something extra to the first discoverer. In these relations of the powers to the mine operator from the very first we find definite records of the imposition of certain conditions with extraordinary persistence—so fixed a notion that even the United States did not quite escape it.

Most Laws Designed to Make Mining Continuous

This condition was, no doubt, designed as a stimulus to productive activity, and was the requirement that the miner should continuously employ himself digging in the piece of ground allotted to him. The Greeks, Romans, mediæval Germans, old and modern Englishmen, modern Australians, all require the miner to keep continuously laboring at his mines, or lose his title. The American, as his inauguration of government happened when things were easier for individuals, allows him a vacation of 11 months in the year for a few years, and finally a holiday altogether. There are other points where the overlord, the state, or the landlord have always considered that they had a right to interfere, principally as to the way the miner does his work, lest he should miss, or cause to be missed, some of the mineral; so he has usually been under pains and penalties as to his methods—these quite apart from the very proper protection to human life, which is purely a modern invention, largely of the miner himself. Somebody has had to keep peace and settle disputes among the usually turbulent miners (for what other sort of operators would undertake the hazards and handicaps?), and therefore special officials and codes, or courts, for his benefit are of the oldest and most persistent of institutions.

Between the overlord and the landowner the fundamental conflict of view as to their respective rights has found its interpretation in the form of the mineral title. The overlord claimed the metals as distinguished from the land, while the landowner claimed all beneath his soil. Therefore, we find two forms of title—that in which the miner could follow the ore regardless of the surface (the "apex" conception), and that in which the boundaries were vertical from the land surface. Right here, lest the Americans think that the apex law was a sin original to themselves, we may mention that it was availed of in Europe a few centuries before Agricola, who will be found to set it out with great precision. From these points of view, more philosophical than legal, we present a few notes on various ancient laws of mines, though space forbids a discussion of a tithe of the amount it deserves at some experienced hand.

Of the ancient Egyptian, Lydian, Assyrian, Persian, Indian and Chinese laws as to mines we have no record, but they were of great simplicity, for the bodies as well as the property of subjects were at the abject disposition of the overlord. We are informed on countless occasions of emperors, kings and princes of various degree among these races, owning and operating mines with convicts, soldiers or other slaves, so we may take it for certain that continuous labor was enforced, and that the boundaries, inspection and landlords did not cause much anxiety. However, herein lies the root of regalian right.

First Historical References in Greek Law

Our first glimpse of a serious right of the subject to mines is among some of the Greek states, as could be expected from their form of government. With republican ideals, a rich mining district at Mount Laurion, an enterprising and contentious people, it would be surprising indeed if Athenian literature was void on the subject. While we know that the active operation of these mines extended over some 500 years, from 700 to 200 B. C., the period of most literary reference was from 400 to 300 B.C. Our information on the subject is from two of Demosthenes' orations—one against Pantænetus, the other against Phænippis—the first mining lawsuit in which the address of counsel is extant. There is also available some information in Xenophon's "Essay upon the Revenues," Aristotle's "Constitution of Athens," Lycurgus' prosecution of Diphilos, the Tablets of the Poletæ, and many incidental references and inscriptions of minor order. The minerals were the property of the state, a conception apparently inherited from the older civilizations. Leases for exploitation were granted to individuals for terms of three to 10 years, depending upon whether the mines had been previously worked, thus a special advantage was conferred upon the pioneer. The leases did not carry surface rights, but the boundaries at Mt. Laurion were vertical, as necessarily must be the case everywhere in horizontal deposits. What they were elsewhere we do not know. The landlord apparently got nothing. The miner must continuously operate his mine, and was required to pay a large tribute to the state, either in the initial purchase of his lease or in annual rent. There were elaborate regulations as to interference and encroachment, and proper support of the workings. Diphilos was condemned to death and his fortune confiscated for robbing pillars. The mines were worked with slaves.

EARLY ROMAN OPERATIONS

The Romans were most intensive miners and searchers after metallic wealth already mined. The latter was obviously the objective of most Roman conquests, and those nations rich in these commodities, at that time necessarily possessed their own mines. Thus a map showing the extensions of empire coincides in an extraordinary manner with the metal distribution of Europe, Asia and North Africa. Further, the great indentations into the periphery of the imperial map, though many were rich from an agricultural point of view, had no lure to the Roman because they had no mineral wealth. On the Roman law of mines, the student is faced with many perplexities. With the conquest of the older states, the plunderers took over the mines and worked them, either by leases from the state to public companies or to individuals; or even, in some cases, worked them directly by the state. There was thus maintained the concept of state ownership of the minerals which, although apparently never specifically defined, yet formed a basis of support to the contention of regalian rights in Europe later on. Parallel with this system mines were discovered and worked by individuals under tithe to the state, and in Pliny (XXXIV, 49) there is reference to the miners in Britain limiting their own output. Individual mining appears to have increased with any relaxation of central authority, as for instance, under Augustus.

ROMANS HAD MINING OFFICIALS

It appears, as a rule, that the mines were held on terminable leases, and that the state did at times resume them; the labor was mostly slaves. As to the detailed conditions under which the mine operator held his title, we know less than of the Greeks—in fact, practically nothing other than that he paid a tithe. The Romans maintained in each mining district an official—the *Procurator Metallorum*—who not only had general charge of the leasing of the mines on behalf of the state, but was usually the magistrate of the district. A bronze tablet found near Aljustrel, in Portugal, in 1876, generally known as the Aljustrel Tablet appears to be the third of a series setting out the regulations of the mining district. It refers mostly to the regulation of public auctions, the baths, barbers and tradesmen; but one clause (VII) is devoted to the regulation of those who work dumps of scoria, etc., and provides for payment to the administrator of the mines of a *capitation* on the slaves employed. It does not, however, so far as we can determine, throw any light upon the actual regulations for working the mines.[1]

Despite the systematic law of property evolved by the Romans, the codes contain but a small reference to mines, and this in itself is indirect evidence of the concept that they were the property of the state. Any general freedom of the metals would have given rise to a more extensive body of law. There are, of course, the well known sections in the Justinian and Theodosian codes, but the former in the main bears on the collection of the tithe and the stimulation of mining by ordering migrant miners to return to their own hearths. There is also some intangible prohibition of mining near edifices. There is in the Theodosian Code evident extension of individual right to mine or quarry, and this "freeing" of the mines was later considerably extended. The Empire was, however, then on the decline; and no doubt it was hoped to stimulate the taxable commodities. There is nothing tangible as to the position of the landlord with regard to minerals found on his property; the metals were probably of insufficient frequency on the land of Italian landlords to matter much, and the attitude toward subject races was not usually such as to require an extensive body of law.

MEDIEVAL RULERS ASSERTED OWNERSHIP OF MINES

In the chaos of the Middle Ages, Europe was governed by hundreds of potentates, great and small, who were unanimous on one point, and this that the minerals were their property. In the bickerings among themselves the stronger did not hesitate to interpret the Roman law in affirming regalian rights as an excuse to dispossess the weaker. The rights to the mines form no small part of the differences between these potentates and the more important of their subjects; and with the gradual accretion of power into a few hands, we find only the most powerful of vassals able to resist such encroachment. However, as to what position the landlord or miner held in these rights, we have little indication until about the beginning of the 13th century, after which there appear several well known charters, which, as time went on, were elaborated into practical codes of mining law. The earliest of these charters are those of the Bishop of Trent, 1185; that of the Harz Miners, 1219; of the town of Iglau in 1249. Many such in connection with other districts appear throughout the 13th, 14th and 15th centuries[2].

By this time a number of mining communities had grown up, and the charters in the main are a confirmation to them of certain privileges; they contain, nevertheless, rigorous reservation of the regalian right. The landlord where present was usually granted some interest in the mine, but had to yield to the miner free entry. The miner was simply a sort of tributer to the Crown, loaded with an obligation when upon private lands to pay a further portion of his profits to the landlord. He held tenure only during strenuous operation. However, it being necessary to attract skilled men, they were granted many civil privileges not general to the people; and from many of the principal mining towns "free cities" were created, possessing a measure of self-government. There appear in the Glau charter of 1249 the first symptoms of the "apex" form of title, this being the logical development of the conception that the minerals were of quite distinct ownership from the land. The law, as outlined by Agricola, is much the same as set out in the Iglavian Charter of three centuries before, and we must believe that such fully developed conceptions as that charter conveys were but the confirmation of customs developed over generations.

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[1] Those interested will find ample detail in Jacques Flach, "La Table de Bronze d'Aljustrel: Nouvelle Revue Historique de Droit Francais et Etranger," 1878, p 655; "Estacio da Veiga, Memorias da Acad. Real das Cien. cas de Lisbon, Nova Serie, Tome V, Part II," Lisbon, 1882.

[2] References to the most important of such charters may be found in Sternberg, "Umrisse der Geschichte des Bergbaues," Prague 1838; Eisenhart, "De Regali Metalli Fodinarium," Helmestadt 1681; Gmelin, "Beyträge zur Geschichte des Teutschen Bergbaus," Halle, 1783 Inama-Strenegg, "Deutsche Wirtschaftsgeschichte," Leipzig, 1879-1901; "Transactions, Royal Geol. Soc. Cornwall," VI 155; Lewis, "The Stannaries," New York, 1908

In France, the landlord managed to maintain a stronger position *vis-a-vis* the Crown, despite much assertion of its rights; and, as a result, while the landlord admitted the right to a tithe for the Crown, he maintained the actual posession, and the boundaries were defined with the land.

Old English Law Probably Autochthonous After Roman Evacuation

In England the law varied with special mining communities, such as Cornwall, Devon, the Forest of Dean, the Forest of Mendip, Alston Moor, and the High Peak, and they exhibit a curious complex of individual growth of profound interest to the student of the growth of institutions. These communities were of ancient origin, some of them at least pre-Roman; but we are, except for the reference in Pliny, practically without any idea of their legal doings until after the Norman occupation (1066 A.D.). The genius of these conquerors for systematic government soon led them to inquire into the doings of these communities, and while gradually systematizing their customs into law, they lost no occasion to assert the regalian right to the minerals. In the two centuries subsequent to their advent there are on record numerous inquisitions, with the recognition and confirmation of "the customs and liberties which had existed from time immemorial," always with the reservation to the Crown of some sort of royalty. Except for the High Peak in Derbyshire, the period and origin of these "customs and liberties" are beyond finding out, as there is practically no record of English history between the Roman withdrawal and the Norman occupation. There may have been "liberties" under the Romans, but there is not a shred of evidence on the subject, and our own belief is that the forms of self-government which sprang up were the result of the Roman evacuation.

The miner had little to complain of in the Norman treatment in these matters; but between the Crown and the landlord as represented by the barons, lords of the manor, etc., there were wide differences of opinion on the regalian rights, for in the extreme interpretation of the Crown it tended greatly to curtail the landlord's position in the matter, and the success of the Crown on this subject was by no means universal. In fact, a considerable portion of English legal history of mines is but the outcropping of this conflict, and one of the concessions wrung from King John, at Runnymede, in 1215, was his abandonment of a portion of such claims.

Early Cornwall and Devon had Self Government

The mining communities of Cornwall and Devon were early in the 13th century definitely chartered into corporations — "The Stannaries" — possessing definite legislative and executive functions, judicial powers, and practical self-government; but they were required to make payment of the tithe in the shape of "coinage" on the tin. Such recognition, while but a ratification of prior custom, was not obtained without struggle, for the Norman kings early asserted wide rights over the mines. Tangible record of mining in these parts, from a legal point of view, practically begins with a report by William de Wrotham in 1198 upon his arrangements regarding the coinage. A charter of King John in 1201, while granting free right of entry to the miners, thus usurped the rights of the landlords—a claim which he was compelled by the Barons to moderate; the Crown, as above mentioned did maintain its right to a royalty, but the landlord held the minerals. It is not, however, until the time of Richard Carew's "Survey of Cornwall" (London, 1602) that we obtain much insight into details of miners' title, and the customs there set out were maintained in broad principle down to the 19th century. At Carew's time the miner was allowed to prospect freely upon "Common" or wastrel lands (since mostly usurped by landlords), and upon mineral discovery marked his boundaries, within which he was entitled to the vertical contents. Even upon such lands, however, he must acknowledge the right of the lord of the manor to a participation in the mine. Upon "enclosed" lands he had no right of entry without the consent of the landlord; in fact, the minerals belonged to the land as they do today except where voluntarily relinquished. In either case he was compelled to "renew his bounds" once a year, and to operate more or less continuously to maintain the right once obtained.

The High Peak Mining Community in Derbyshire

There thus existed a "labor condition" of variable character, usually imposed more or less vigorously in the bargains with landlords. The regulations in Devonshire differed in the important particular that the miner had right of entry to private lands, although he was not relieved of the necessity to give a participation of some sort to the landlord. The Forests of Dean, Mendip, and other old mining communities possessed a measure of self-government, which do not display any features in their law fundamentally different from those of Cornwall and Devon. The High Peak lead mines of Derbyshire, however, exhibit one of the most profoundly interesting of these mining communities. As well as having distinctively Saxon names for some of the mines, the customs there are of undoubted Saxon origin, and as such their ratification by the Normans caused the survival of one of the few Saxon institutions in England—a fact which, we believe, has been hitherto overlooked by historians. Beginning with inquisitions by Edward I. in 1288, there is in the Record Office a wealth of information, the bare titles of which form too extensive a list to set out here.[3]

Old High Peak Laws a Saxon Survival

The miners in this district were presided over by a "barmaster," "barghmaster," or "barmar," as he was variously spelled, all being a corruption of the German bergmeister, with precisely the same functions as to the allotment of title, settlement of disputes, etc., as his Saxon progenitor had, and, like him, he was advised by a jury. The miners had entry to all lands except churchyards (this regulation waived upon death), and a few similar exceptions, and was subject to royalty to the Crown and the landlord. The discoverer was entitled to a finder's "meer" of extra size, and his title was to the vein within the end lines, *i.e.*, the "apex" law. This title was held subject to rigorous labor conditions, amounting to forfeiture for failure to operate the mine for a period of nine weeks. Space does not permit of the elaboration of the details of this subject, which we hope to pursue elsewhere in its many historical bearings. Among these we may mention that if the American "apex law" is of English descent, it must be laid to the door of Derbyshire, and not of Cornwall, as is generally done.

It is not our purpose to follow these inquiries into mining law beyond the 15th century, but we may point out that with the growth of the sentiment of individualism the miners and landlords obtained steadily wider and wider rights at the cost of the state, until well within the 19th century. The growth of stronger communal sentiment since the middle of the last century has already found its manifestation in the legislation with regard to mines, for the laws of South Africa, Australia and England, and the agitation in the United States are all toward greater restrictions on the mineral ownership in favor of the state.

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[3] Of published works, the most important are Edward Manlove's "The Liberties and Customs of the Lead Mines within the Wapentake of Wirksworth" London, 1653, generally referred to as the "Rhymed Chronicle", Thomas Houghton, "Rara Avis in Terra," London, 1687; William Hardy, "The Miner's Guide," Sheffield, 1748, Thomas Tapping, "High Peak Mineral Customs," London, 1851.

American Institute of Mining Engineers

The 103d meeting of the American Institute of Mining Engineers convened Tuesday morning, Oct. 29, at the Hotel Statler, Cleveland, Ohio, and indications are for a memorable convention. As is perhaps well known, this meeting of the institute has particular reference to its newly created Iron and Steel Division, and this is well emphasized by the facts that the meeting is being held in Cleveland, an iron and steel center, and a program of 50 papers, most of which have a direct bearing upon iron ore and its manufactured products. The registration is about 150, with the probability of its becoming 200 before the sessions close.

At the opening session on Tuesday morning, D. T. Croxton, chairman of the local executive committee, extended a formal welcome to members of the society, and Mayor Newton D. Baker delivered the official welcoming address on behalf of the city. This was replied to by Prof. James F. Kemp, president of the institute.

STEEL RAIL INSPECTION

"Recent Developments in the Inspection of Steel Rails" was the subject of a paper presented by Capt. Robert W. Hunt, of Chicago. Captain Hunt directed special attention to a new system of rail inspection, which has been adopted by 33 railroad systems operating more than 122,000 miles of track. The system provides for placing inspectors in each department of rail plants, to be on duty during all working hours. All operations are carefully watched. and any serious variation from specifications is brought to the foreman's attention and a record made of the occurrence.

The inspectors' observations are also reported in writing to the purchaser, and, if necessary, to the official in charge of the works, so as to provide for immediate investigation. In this way it will be possible to trace the history of all rails, defective or otherwise. The plan is said to be working satisfactorily. The Chicago, Milwaukee & St. Paul R.R. Co. has ordered 10,000 tons of rails from the Illinois Steel Co., to contain 0.5% copper, in the belief that better results can be obtained.

Other papers presented and discussed at the morning session were: "Notes on Titanium and the Cleansing Effect of Titanium on Cast Iron," by Bradley Stoughton; "The Action of Various Commercial Carbonizing Materials," by Robert R. Abbott; "Measurements and Relations of Hardness and Depth of Carbonization in Case-Hardened Steel," by Mark A. Ammon; "Notes on Ruff's Carbon-Iron Equilibrium Diagram," by Henry M. Howe, and "Translation of N. M. Wittorff's Preliminary Investigation of Primary Crystallization in Iron-Carbon Alloys Containing more than 4 per cent. of Carbon," by Bradley Stoughton and Simon Marcus.

TUESDAY AFTERNOON SESSION

The afternoon session was called to order by President Kemp and the first paper presented was "Blowing in of a Blast Furnace," by R. H. Sweetser, of Columbus, Ohio. Mr. Sweetser described the method which he has used with considerable success, and in one instance the first cast was secured in the remarkably short time of 13 hr. after the blast was turned on. A discussion of "Alloys of Cobalt with Chromium and Other Metals," by Elwood Haynes, Kokomo, Ind., described the extraordinary results obtained by the author with these alloys. One alloy in particular, "stellite," is a combination of cobalt and chromium, the result being a malleable metal. The addition of molybdenum or tungsten in varying proportion, causes this alloy to become hard. The alloy takes an excellent cutting edge, capable of cutting nickel and chrome steel, shavings of which were exhibited, as well as various articles, such as knife blades, machine tools, etc.

The papers which aroused the most interest in the afternoon, however, were a series of three as follows: "Manufacture of Coke," by William Hutton Blauvelt, Syracuse, N. Y.; "Byproduct Coke," by C. W. Andrews, Duluth, Minn., and "The Manufacture of Coke," by F. E. Lucas, Sydney, N. S. Two of the authors were absent and all three papers were read in abstract, discussion being deferred until after the series had been completed.

The discussion which followed was participated in by many, and grew exceedingly technical toward the end. It centered chiefly around Mr. Blauvelt's paper, which treated of byproduct ovens and coke, as opposed to the old beehive method. It was pointed out in the discussion that certain procedures advocated by Mr. Blauvelt are contrary to what has been supposed to be good practice, in the byproduct-oven system.

N. V. Hansell, of New York, read in abstract, a paper on "The Concentration of Iron Ores," in which he reviewed at some length the various methods employed in this country, Canada and Norway, to recover profitably iron from low-grade ores. He also went into the question of crushing, washing, jigging, dry concentration, and finally magnetic separation, as applied to such ores. Interesting data were included on particular plants. His paper brought out some discussion as to why expensive processes are now employed on ores running, say 40% iron, when the old log-washing process was formerly employed satisfactorily on much lower-grade ores. This matter was not cleared up.

The last paper presented at the afternoon session was on "The Effect of Alumina in Blast-Furnace Slags," by J. E. Johnson, Jr., Ashland, Wis. The discussion of this paper was shortened by the lateness of the hour, but it evidently opened up a question of great importance to furnace men.

On Tuesday evening an informal smoker was held at the Statler Hotel, at which moving pictures, entitled "From Mine To Molder" were exhibited by Rogers, Brown & Co., Cincinnati, under the supervision of H. B. Yergason. The business and technical sessions will continue through Thursday, with numerous inspection trips interspersed, and on Wednesday evening a subscription banquet will be given at the Statler Hotel.

Rhodesian Mining Notes

JOHANNESBURG CORRESPONDENCE

The Asp mine, in the Mazoe district, north of Salisbury, is stated to be one of the most promising of the newer developing mines. Along several lines of ancient workings, four separate pay shoots are being opened at the 100-ft. level. The development aggregates 2020 ft. in length with an average value of 10 dwt. over 40 in. If this grade continues in depth, the mine should supply 20 stamps.

The Cam & Motor mine, in the Gatooma district, is undoubtedly the most promising mine in Rhodesia. Ore reserves are now 1,000,000 tons, worth 40s. per ton. On the fifth or lowest level one of the ore lenses along a length of 400 ft. averages 45 ft. in width. In one section the ore is 91 ft. wide, assaying 10.4 dwt. An experimental all-roasting plant on West Australian lines is treating the ore successfully and a large plant is ordered.

The copper-smelting furnaces at the Star of Congo mine, in Katanga, were stopped for some time, owing to an explosion in the flues. Smelting has now been started with coke from Wankies, in southern Rhodesia.

Mr. Maufe, the Rhodesian government geologist, has issued a report on the Victoria tin field, in southeastern Rhodesia. He states that it consists of an area of metamorphic rocks belonging to the epidiorite and banded ironstone groups, bounded on three sides by gray biotite granite. Pegmatite dikes and sills are found along the margins of the granite and are intruded into the metamorphic rocks for some distance. The latter series is more or less altered to greisen and carries much pink and green lithia mica and cassiterite. The former series is unaltered and barren. The whole occurrence is similar to that in the Enterprise district. As regards the tin contents, though blocks of ore weighing 200 lb. have been found, the ore occurrences are patchy and erratic and the average grade must be low. The dikes and flat sills average from six to 15 ft. in width and do hold out possibilities of large low-grade, but payable, orebodies being developed.

The ore mined last year at the Wanderer mine, in the Selukwe district, assayed only 2.61 dwt. and of this about two pennyweights were recovered. The costs were 7s. 6.4d. per ton, including 9.86d. development, but not London office expenses.

Copper River Basin, Alaska

As a result of prospecting in the mountains south of Chitina River, Alaska, copper was found east of Taral in 1898, and a few years later the gold placers of Bremner River were discovered. No copper has yet been produced in the Copper River Basin, according to Fred H. Moffit, of the U. S. Geological Survey, but interest in prospecting and development has been stimulated during the last year by the transportation facilities offered by the Copper River & Northwestern Ry.

Golconda Creek, a tributary of the Bremner River, has yielded most of the gold so far produced in this district, although Little Bremner River has contributed a part. Gold in commercial quantities has not been found near Taral nor between the Chitina and the Bremner, in Hanagita Valley. The total production of the district is not known, but several thousand dollars' worth of gold has been produced each year since mining began. The high cost of supplies and difficulty of access have done much to discourage prospectors.

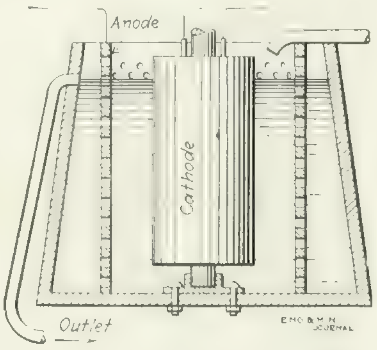
All the gold so far produced in the Bremner River Valley has been obtained from stream gravels. This valley is practically unprospected, so far as lode deposits are concerned. The three parts of the valley of present or prospective importance, because of known placer-gold deposits, are Golconda Creek, Little Bremner River, and the lower part of Bremner, above the Little Bremner.

Electric Smelting of Zinc Ores

The possibility of treating blende in the electric furnace, according to the principle embodied in the precipitation process—by smelting it together with metallic iron without previous roasting—has been recognised by metallurgists since 1907, says the *Mining Journal*, Sept. 28, 1912. More recently Eulenstein has tried to dissolve the iron required for the reaction in the sulphide of iron produced during the precipitation process according to the equation $ZnS + Fe = FeS + Zn$, and to bring the dissolved Fe in the electric furnace into contact with the ZnS, which is also dissolved in the molten sulphide of iron. As a result of Eulenstein's experiments and investigations it appears that the solutions of Fe in FeS affect blende in such a manner that the zinc is distilled off. The influence becomes effective at a temperature of from 1300°c. upwards. With increasing Fe contents in FeS—up to a maximum concentration limit of 45%—the effect of the solution grows stronger, while the minimum limit of efficiency is 5% of Fe. To facilitate the carrying out of the process F. Thomas has constructed a special electric furnace whose length can be regulated as in each case required by the available voltage and the conductivity of the melting-bath.

Lacroix's Electrolytic Cell

In the recently patented electrolytic cell of Fernand Lacroix, of Paris (U. S. pat. 1,019,969,) the attempt is made to get an efficient apparatus with which to deposit, using insoluble anodes. The cathode is a rotating cylinder, and the anode is a concentric perforated plate. The electrolyte is admitted into the tank as near the cathode as possible, and is drawn off outside the anode, after passing through the perforations in it. If there is to be any anodic regeneration of the electrolyte, such as in ferrous-ferric solutions, this insures the complete treatment of all the solution.



LACROIX ELECTROLYTIC CELL

Aluminum Foil and Powder

Specimens of aluminum foil, now being placed upon the market as a substitute for tin foil, have recently been brought to our attention. This foil retains the fine white color of the metal, has a great covering power for a small weight of material, and although somewhat stiffer as rolled than tin foil of the same thickness, it is still highly pliable, and it appears that a great deal of the original stiffness can be removed by careful annealing. Owing to the present high price of tin, it is said that the aluminum foil is largely supplanting it for wrapping cheese, chocolate, and other articles of food.

It required long experimenting before it was possible to make thin sheets, but it is now being rolled as thin as 0.04 mm. (0.0016 in.) in thickness at the La Paz works, France. It is also said that still thinner sheets can be obtained by laying several sheets together and rolling them down as a whole, or by beating them as is done by gold leaf.

It is understood that thin sheets (0.01 mm. thick) produced in this way, are cut into small squares and rubbed to powder, to use for aluminum paint.

Number of Mines in the United States

From the advance sheets of the report on mining in the United States, made by the U. S. Bureau of the Census, we take the accompanying table of the number of mines in the United States, producing and nonproducing:

MINES OF THE UNITED STATES

Kind	Producing	Non-producing
Iron	483	21
Copper	368	13
Prec. Met. Lode	2845	8352
Prec. Met. Placer	880	192
Lead and Zinc	1142	71
Quicksilver	12	28
Manganese	8	9
Asbestos	20	76
Barytes	42	
Corundum	6	
Feldspar	28	1
Fluorspar	15	3
Garnet	4	1
Graphite	20	6
Gypsum	222	6
Magnesite	13	1
Mica	78	4
Mineral Paints	26	
Monazite	4	1
Phosphate	153	33
Pyrites	12	1
Quartz	14	1
Sulphur	4	
Talc	46	
Tungsten	116	84
	6561	8904

Although there is a distribution of operators by states, in the more important industries, there is no distribution of mines on a similar basis, so that it is impossible to break up the above list by geographical divisions.

Westralian 1911 Mineral Output

The value of the West Australian mineral production for 1911 was £6,105,583, a decrease of £416,410 from 1910. Gold furnished 95.36% of this figure, £5,823,075, and also accounted for the decrease by falling off £423,773. Dividends paid by West Australian companies amounted to £826,376.

The gold output was 1,370,868 fine oz. Coal was the next valuable product, 249,890 tons. The other minerals follow in decreasing value: Copper ore, matte and ingots, 10,653 tons; tin ore and ingots, 495 tons; silver, 169,043 fine oz.; lead ore, 1549 tons; pyrite, 9939 tons; wolfram ore, zinc ore and other miscellaneous items, £1422. The mineral exports, exclusive of coal, form 67.61% of the total exports of the colony.

American Iron and Steel Institute

The fall meeting of the American Iron & Steel Institute was held at Pittsburgh, Oct. 26. There were two sessions devoted to business, and a dinner in the evening, at which a number of addresses were made.

PRESIDENTIAL ADDRESS BY JUDGE GARY

At the morning session, after the usual preliminary addresses of welcome and responses, President E. H. Gary delivered his address, in which he referred to the dominating position of Pittsburgh in the steel industry. He also spoke of the success of the institute. The more striking paragraphs of Judge Gary's address were as follows:

"We are here under conditions that are most gratifying. We are in the midst of an era of prosperity never before surpassed so far as it affects our particular lines. These conditions have not resulted from the application of political policies or efforts, but exist in spite of them. They are here because nothing could prevent. In the first place, for the last few years, following the bankers' panic of 1907, there have existed a feeling of uncertainty and a lack of confidence, which have deterred the great purchasing public from entering the market, even to the extent of supplying its necessities. This has been especially true of the railroad companies, which are among our largest patrons. In consequence, the necessities of the consumers have piled up to such an extent that they have lately been forced to increase their purchases materially. When, therefore, the railroad companies and others similarly situated commenced to buy, the general influence and effect were immediately felt, and buying on a large scale has developed. Moreover, the bountiful crops and sound basic conditions of the country have made everyone realize more clearly than ever before that prosperity in this splendid country of ours is to be the rule and not the exception, notwithstanding at times we may be surrounded by adverse influences and unwarrantable interference, which in any ordinary country would bring prolonged distress and suffering. So we are happy today in the knowledge that we have on our books orders which will keep our mills running to their full capacity for months to come. Let us hope and pray that nothing shall be done to interfere with our continued success. . . . .

"But neither the technical questions connected with, nor even the material growth of, our business should be treated as the all-important, or the most important, subjects which must be considered and passed upon by the members of the institute. Questions of great magnitude and concern are at present agitating the minds of the people throughout the world. We may be stubbornly oblivious to some of them, but we ought not to be. We refuse to consider, or at least postpone consideration of many of them. The questions are international, national and domestic; and they involve the welfare of everyone. We are disposed to wrap around ourselves the cloak of self-righteousness; or we proclaim that we rely upon the stability of government or the majesty of the law; and we consider ourselves safe, whether within our vision everything seems to be calm and tranquil, or otherwise. We sometimes forget that it is the masses of the people who determine final results; that they may establish and abolish governments; that they may make and unmake constitutions. Sooner or later they bring about conditions satisfactory to them, even by resorting to destructive measures. They have the might and they can determine for themselves what is the right. They believe in the sentiment, to quote from a French writer on French history, that 'There is a bigotry in politics as well as in religion, and it is the worst of bigotry to reject change as something which is inherently bad. Laws to be permanently useful must vary with the varying condition of man.'

"I am dealing in generalities, not intending to be specific or to make personal reference. The thought I would leave with you is that there is no way of permanently settling any great question involving the welfare of humankind except on the basis of right and justice. Position, wealth, influence, laws are helpless as a means of establishing a rule for human conduct unless supported by principles of justice and righteousness. The unfair or unreasonable or dishonest man, whether in public life or private, may succeed temporarily; but it is only a question of time when he will be discovered and overthrown. The members of this institute have, and will continue to have in an increasing measure, great in-influence in the solution of the problems of today and the future; and you will give good account of ourselves. In our daily walk and conversation, in our attitude and demeanor toward all with whom we come in contact, each of us must be certain he is governed by motives which are honorable and just. You have made and are making great strides in the direction which I have indicated. You have secured and will hold the respect of all who know you, and, better than that, you have the approval of your own consciences."

PAPERS READ

The session continued all day, with only a brief intermission. The first paper read was: "The Buyer from a Manufacturers' Standpoint," by John L. Haines, of the Jones & Laughlin Steel Co., in which the writer urged more regular purchases. The provision for future needs and the consequent prevention of irregular and spasmodic buying and rush demands on the mills. He also deprecated too strict specifications, and advocated a closer adherence to contracts, which should be regarded as positive obligations and not merely as options to take certain materials at specified prices.

J. M. Camp, of the Carnegie Steel Co., described the methods by which that company's salesmen are given a training in the technical side of the business, which enabled them to discuss conditions with buyers in an intelligent way.

A paper, by Stewart C. Cory, of the Youngstown Sheet & Tube Co., on "Electric Power Production and Distribution in Steel Mills," treated of the applications of the electric motor in rolling mills, and discussed at considerable length the relative cost of power production by gas engines using blast-furnace gas directly, and by steam turbines run by steam made in boilers fired with the gas. His conclusions were generally in favor of the steam turbine.

QUALITY OF IRON AND STEEL MADE FROM CUBAN ORES

Quincy Bent, of the Maryland Steel Co., described experimental work with iron made with ores from the Mayari mine, in Cuba, which carry small percentages of chromium and nickel. Good results had been obtained in making steel from this iron and also in castings for rolls and other work requiring exceptional hardness, and in casting chilled work.

Other papers presented were: "The Manufacture of Ordnance at the Bethlehem Steel Works," by E. G. Grace, vice-president and general manager, Bethlehem Steel Co. "Coal-Mine Ventilation in the Connellsville Coke Region," by Austin King, chief mine inspector H. C. Frick Coke Co. Discussion led by Wilson A. Luce, general manager Ellsworth Collieries Co. "Recent Developments in the Preparation of Iron Ores," by J. W. H. Hamilton, mining engineer. "Microscopic Analysis of Steel Sheets," by C. Arthur White, American Sheet & Tin Plate Company.

At the dinner in the evening, no speeches of importance were made. The time was largely taken up by the Rogers-Brown moving-picture exhibit, illustrating the mining of ore and its treatment in the blast furnace.

On Saturday, Oct. 26, parties of members of the institute visited various points of interest in and around Pittsburgh. The new works of the Jones & Laughlin Steel Co., at Alliquippa, were visited by a large party.

Other works were also examined, and some of the members continued their trip as far as Gary.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Loading Cars from Three Track Approach

In the mines of the St. Louis Smelting & Refining Co., in the Flat River district of southeastern Missouri, a three-track approach to the shaft is used as the ground stands well, so that the shaft station may be made extra wide. The ore cars are drawn by an electric motor in trains of 1-ton cars on tracks of 24-in. gage. The loaded cars are pushed in trains ahead of the locomotive, on to the middle track, while empty cars are pulled from the cages and are generally put on the outside tracks, although, in some instances, when it can be done without too much cutting out of ore, the end cars are pushed off the other side of the track from which the loaded cars are put on. The empties run on a track, the grade of which is in their favor, and need no further handling until the trainmen hook them up into trains, when the locomotive, after delivering a loaded train on the center track, has passed around the shaft pillar and begins to gather the empties. The grade of the center track is in favor of the loaded cars, while the grade of the outside tracks is against the empties.

When the loading and pulling off is done from the same side of the shaft, the head end of the three-track approach, which is 100 ft. long in some instances, has to be fitted with a three-way switch, as shown in Fig. 2, at the point where the two tracks make off from the single track. The curves on this track can be made easy, so as to favor the track and the locomotive. In the accompanying drawings the arrangement of the track and the frogs is shown. At the loading end of the three-track yard, as the approach might be called, the crossovers, as shown in Fig. 1, have to be made abrupt, so that the switching from one track to the other may be done in a minimum of space and as near the shaft as possible, to minimize the distance that the cagers must walk to get an empty car and a loaded car off the cage.

In the drawings the dimensions are given that have been found best for loading cages at greatest speed. At first a distance of 13 ft. from the shaft to point of middle frog was tried, but this was found to be too great and was shortened to 11 ft. This has been found to be just about right, as the curving off begins almost as soon as the cars clear the shaft. The distance to the outside rail in the three-track straightway is also 11 ft. This gives plenty of clearance between cars. In the loading crossovers a kick switch is needed to join the middle track with the track that connects it with the shaft. This kick switch, which is thrown with the foot, is shown in Fig. 2 of the accompanying drawing. The cagers throw it with one foot and after running the empty car out on the outside track on the same side of the shaft that it came from, cross over to the center track to get the loaded car.

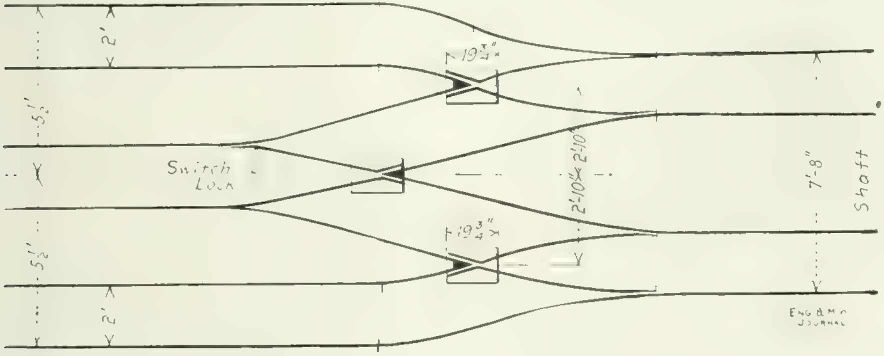


FIG. 1. CROSSOVERS FOR THREE-TRACK LOADING SYSTEM AT TWO-COMPARTMENT SHAFT

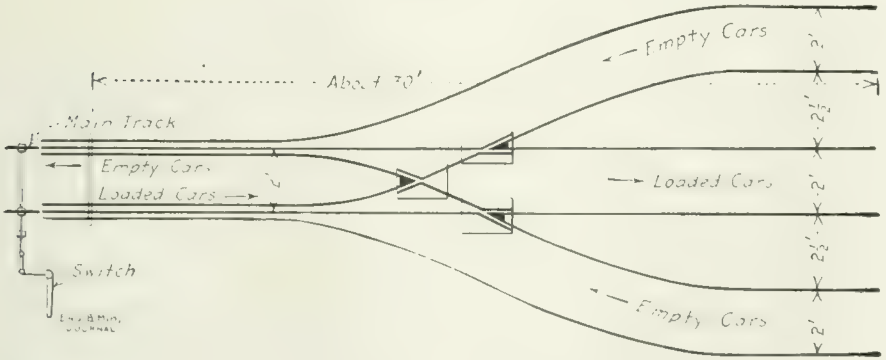


FIG. 2. TWO-WAY SWITCH OR TRIPPLE-TRACK LOADING SYSTEM

The Smoko Gravel Shaker

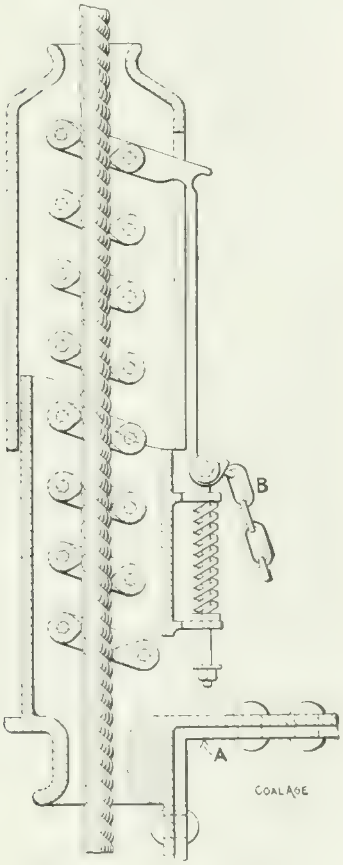
The Smoko No. 2 dredge, in Victoria, is treating mainly a coarse gravel outcrop; it often lost time by the gravel staying too long in the sluice box, as the ordinary supply of water was insufficient to keep the box clear. The apparatus to prevent this is described in the report of the Victoria Secretary of Mines. A perforated box, called a "shaker," has been placed above the sluice box, and when this is agitated, the heavier material discharges over the end, while the finer material is dropped through the perforations to the sluice box.

The shaker is suspended above the sluice box from a timber frame by hinged hangers 20 in. long. Its length is 46 ft., its width 6 ft. and depth about 14 in. It moves with a stroke of 3 in., 135 oscillations per minute, and is worked by eccentrics, belt driven from the pump engine with intermediate gear. A sparge pipe, 5 ft. above the shaker, extends the full length, and water, lifted by a 12-in. pump, is sprayed over the whole surface from the sparge pipe, carrying the fine material through the perforations into sluice box beneath, while the "shaker" discharges the stones at the end. The perforations are round holes ⅜ in. diameter, except in the last 4 ft., where they are ¾-in. diameter. At the end of the sluice box there are two sand shoots, one on either side, each 2½ ft. wide, to carry the fine material and the water 27 ft. beyond the place where the larger stones are discharged from the shaker. The sluice box is hinged at the lower end, so that the upper end may be lowered when the box is to be cleaned.

Originally eccentrics worked the shaker, which were flattened at the ends and riveted to the box, but they were frequently broken, so that bearings were put in on these eccentrics. The first screen holes were 1-in. diameter, but this was found to be much too large. The manager states that about two horsepower are required to work it. The only fault is that flat stones are not turned over as they would be in a revolving screen, and are imperfectly washed if covered with clayey material. The apparatus was made by the Maori Iron Works, Port Chalmers, New Zealand.

Safety Catches for Rope Guides

The accompanying illustration shows a device patented by L. S. Rayner, Gaergwrle, England, designed to answer the same purpose for shafts having rope guides that the ordinary safety dogs do for the shaft equipped with timber guides.



Safety Device for Cages

One end of the apparatus is connected to the cage *A*, while the other end has a spring arrangement and a system of lever connections, which come into action by means of the chain *B*, when the hoisting rope breaks, says *Coal Age*, Sept. 21, 1912. The weight of the falling cage thus causes the device to extend and grip the guide rope, arresting the descent of the cage.

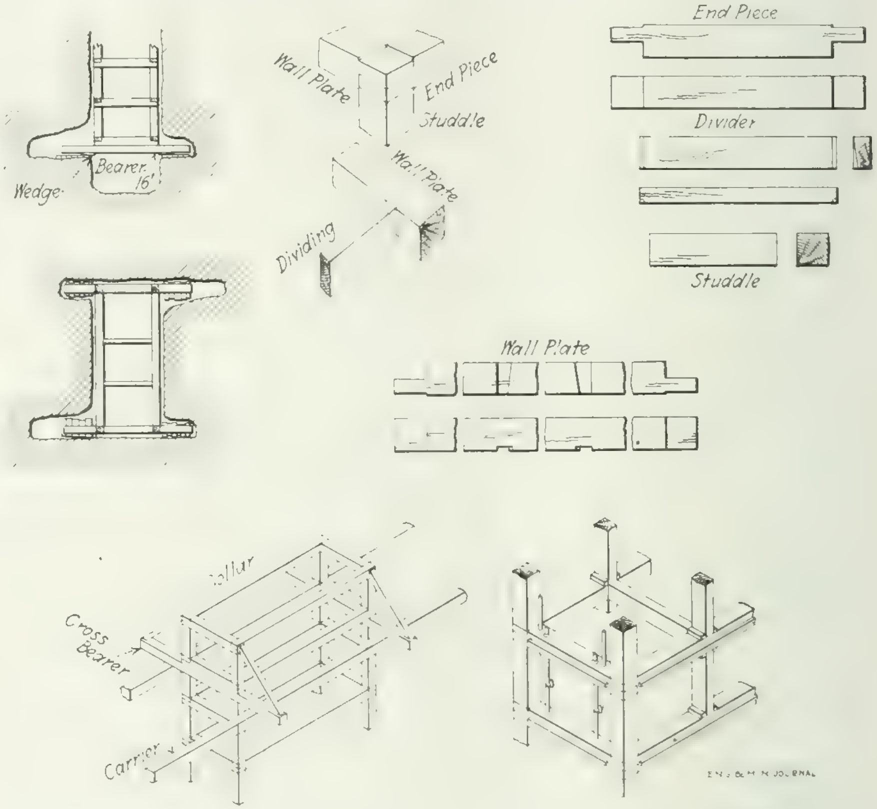
The concrete shaft collar at the No. 6 shaft of the Mohawk Mine, in the Lake Superior Copper district described in the Journal of Aug. 10, 1912, was built in 17 days at a total cost of $3931. The length of the collar was 100 feet.

Shaft Timbering in Minnesota Iron Mines

By L. D. Davenport*

Accompanying are notes and sketches on the timbering of a shaft, 6x18 ft. inside, sunk through surface, sand and ore in the Chisholm district of Minnesota. No water was encountered until the ore was reached and then only a small quantity. The illustrations show the details of timbering.

After the shaft is staked out, two level trenches are dug on surface and two bearing pieces or carriers, 40 or 50 ft. long (2- or 3-ft. flattened timber), are placed in them about 10 ft. apart. These 40-ft. bearing pieces are parallel to the wall plates and when they are leveled up, two cross-carriers 12 by 12 in. by 20ft. are placed perpendicularly across them 18 ft. apart. The first set is then put in place with the end pieces (12 by 12 in. by 8 ft.), resting on the cross-carriers.



Details of Shaft Timbering in the Chisholm Iron Mines

The next set is then put in place below the carriers and the studdles of this set fit into ½-in. joggles, which have been cut in the cross-carriers. These studdles are cut off on account of the cross-carriers, so that the distance between the sets is 3 ft. 11 in. The 12x12-in. studdles in the regular sets are 4 ft. long, but since there is a ½-in. joggle in each wall plate and end piece, the distance between the sets is only 3 ft. 11 in.

The first set below the carriers is like the other sets, held by four hanging bolts of 1¼-in. round iron. Next, the set which forms the collar is placed above the set resting on the carriers, and is diagonally braced to both sets of bearers. Four straight hanging bolts are used here instead of the jointed bolts used in the other sets. The bolts for this collar set are made 1 ft. longer than the regular bolts, which are 6 ft. 8 in. long, on account of their passing through the cross-carriers as well as the end pieces. Collar set end pieces rest on top of wall plates. As the dirt is hoisted it is banked around the shaft collar, and serves not only to steady the timber, but also keeps out the surface drainage.

The middle compartment is used for hoisting and is boarded up as fast as the dividers are put in, so that the bucket will not catch. The dividers are put in as the shaft is sunk, but the last two sets are always left open to allow the wall plates of the next set to be handled. When the end pieces and wall plates are framed, a strip 2x2 in. is spiked on the outside of each piece in the center, to make a bearing for the laths.

The laths are 2-in. plank about 4 ft. 9 in. long and are put in at the corner studdles first and wedged, and then working toward the middle of the end pieces, and wall plates, until there is space for only one lath left. This last lath is fitted to the space and then it is shoved up by the 2x2-in. piece on the upper set, and then pulled down (with a pick) until it bears on the 2x2-in. piece of the lower set, blocking having been placed behind it to hold it in position. Four hanging bolts to each set is usually enough, but in heavy ground one or two more are sometimes used in the wall plates. Divider studdles or center studdles, 6 by 12 in. by 3 ft. 11 in., are put in after the dividers are in, and since these studdles are not "gained in" to the wall plates, small cleats are used to hold them in place.

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*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

The second set of carriers are 12x12-in. timber 16 ft. long, and to put them in place, small drifts, about 3x4 ft., are run in about 8 ft. at the end of the end pieces at two diagonally opposite corners of the shaft. Smaller drifts are run in about 4 ft. at the other two corners of the shaft. The inside corners of these 8-ft. drifts are rounded off, and the bottoms trued up, and short pieces of plank laid crossways in them. A bearer is then brought down and one end is run into the 8-ft. drift. Next it is swung parallel to the end piece and the other end is run back into the 4-ft. drift. The same thing is done with the other bearer and the two rest on the bottom boards of the drifts, directly under the corresponding end pieces. Long, flat wedges are then driven under the bearers on top of the boards and as they are raised against the end pieces, the hanging bolts are tightened to take up the weight. When the bearers are up tight against the set and well wedged, the small drifts are carefully blocked up and the laths put in. The shaft is continued until the bottom rock is reached. The last set is then caught up with short posts placed close together under the end pieces and wall plates.

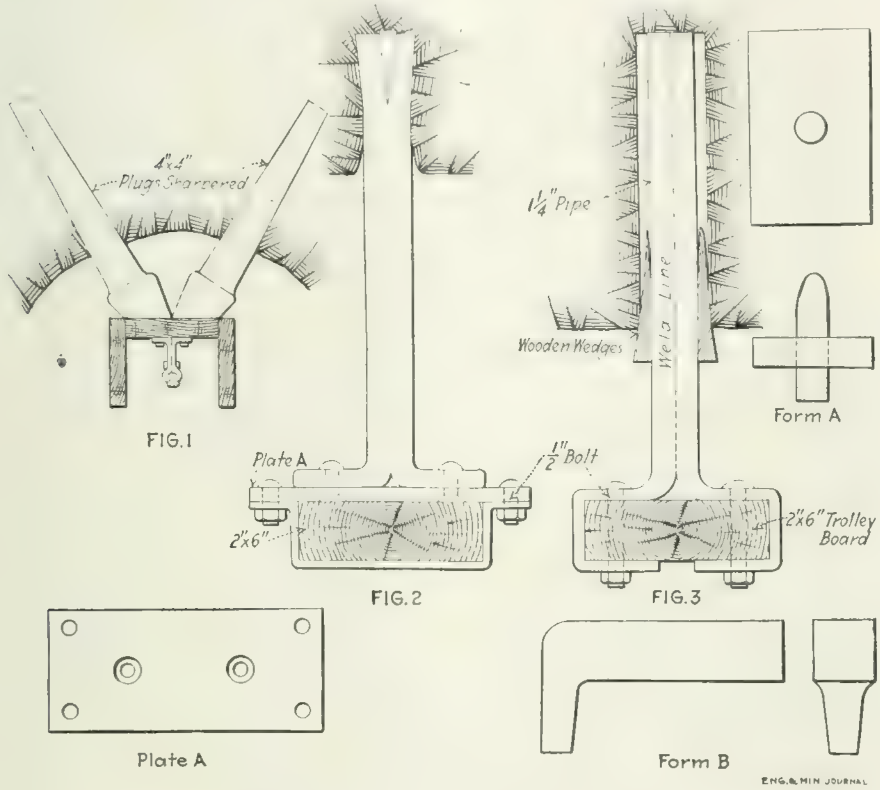


FIG. 1 FIG. 2 FIG. 3 Form A Plate A Form B

Forms of Trolley Trough Hangers

Hanging Troughs for Protecting Trolley Wires

By Claude T. Rice

Contact with live wires underground is liable to be followed by more serious results than at the surface. The miner's clothes, shoes and the ground on which he stands are generally damp, consequently from the same circuit he takes off more current than would be possible under ordinary surface conditions. At Bisbee, men have been killed by contact with 230-volt alternating-current, as well as with 220-volt direct-current circuits. The amperage in both cases was high as the wires were on the power line. On investigation, doctors attributed both deaths to weak hearts and susceptibility to electric shock. In Missouri a miner was killed by grasping one of the wires of a three-phase, 220-volt, alternating, power circuit. He was showing a man who was warning him of the danger that the wires were perfectly harmless. In this case it was surmised that a ground from the wire of the other phase existed nearby so that the miner really got 440 volts.

It is of the utmost importance that miners realize the danger, underground, of these high-amperage circuits, for men have and are being killed by wires carrying only 220 or 230 volts. To guard against such accidents some form of trolley-wire protection is necessary. This usually takes the form of a trough, the sides of which extend down below the wire and keep men from hitting the wire with their bodies or with tools they may be carrying on their backs. At chutes the danger is especially great, but it costs little more and makes the workings far safer to extend the trough protection throughout the mine.

Three different methods for supporting the protecting trough have been suggested. The cheapest is probably a modification of the system used to carry the insulators at the Mascotte tunnel, Bingham, Utah. Here stoping drills put two inclined holes into the adit roof, 12 in. deep and 2½ in. in diameter; 4x4-in. pegs sharpened to fit are driven into the holes. As these two pegs slope away from each other, the trolley trough would be securely held to the roof if it were nailed directly to their squared heads, as shown in the accompanying drawing, Fig. 1. This method is practicable when the roof is of uniform height, so that long plugs are not necessary to keep the trolley board approximately level.

A better method adaptable to all roofs is that used at some of the mines of the Cleveland-Cliffs Iron Co. in the Lake Superior district. Here steel pins are fastened in vertical holes by a wedge driven into the split inner end of the pin, as seen by the accompanying drawing, Fig. 2. The outer end of the pin is also split and bent out to form wings. These wings are flattened and to them is riveted a ½-in. plate carrying four holes through which pass ½-in. carriage bolts which support the straps carrying the protecting trough. The plate is made wide enough for four bolts to allow the troughs to be spliced at the pins. It is just as well, however, to splice the troughs with top or side cleats and so have the wings carry the straps directly without the intervening plate. This makes a strong hanger where the trough has to be carried at some distance from the roof, and it is a good way to use up old drill steel.

At the Cliff shaft of the Cleveland-Cliffs company a somewhat less expensive hanger has been devised by Lucien Eaton, superintendent of the Ishpeming mines of this company. Pieces of 1¼-in. pipe are fastened by wooden wedges in holes in the roof 10 in. deep as shown by the accompanying sketch, Fig. 3. The outer end of the pipe is split, one cut following the weld. This end is then spread out and the wings flattened on forms. The first form consists of a flat piece of iron 1 in. thick, 4 in. wide and 6½ in. long. A pin at the center of the form projects both top and bottom; the top end enters and centers the pipe, while the bottom end is shaped to enter the hardie hole of the anvil and hold the form. The wings of the pipe having been bent down and flattened are bent at right angles over the ends of the form. The pipe with the wings still hot is now completed on the second form. This is merely a 2x2-in. bar of iron with its end bent down and shaped to enter the hardie hole. On this form another right-angle bend, back toward the center of the hanger, is made in each wing.

In this way a 6½x2-in. yoke is formed to receive the top board of the trolley trough. The yoke is bored for two ½-in. bolts, one on each side, by which the 2x6-in. trolley boards are securely fastened. With this system the trolley boards are spliced by the side boards of the trough or by a top cleat. By the use of forms a uniform size and shape of hanger is insured and much time is saved in the blacksmith shop. A good blacksmith can easily make ten hangers per hour. As all scrap pipe and short lengths that are in a fair condition can be utilized, the hangers are relatively cheap and, unless unduly long, are quite strong enough. Measurements are taken at the different points along the drift and the hangers, properly numbered, are made and sent down ready to be put 10 in. into the plug holes and yet bring the trolley board level, so that the trolley will run at approximately the same height throughout the mine, as is desirable for the best operation.

Aside from the advantage derived from the use of the protecting troughs from the standpoint of safety the top board of the trough acts as a guide to the trolley pole should it jump the wire, and thus saves it from injury. The Cleveland-Cliffs company, while it does not use a trough along the entire line, does use a top board, to carry the insulators. Troughs are used only where there is much travel, and near chutes.

Compressed Air Meter

A meter for compressed air is on the market under the name of the Excelsior Airometer. It consists of a series of small fans or turbine wheels alternating with stationary guide-vane rings, the whole being inclosed in a cylindrical casing. The record dials are graduated to read cubic feet of free air. The capacities of the dials range from 10,000,000 cu.ft. on the smallest size to 100,000,000 on the largest.

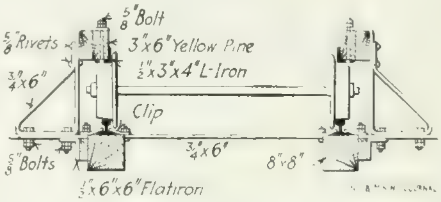
Provision is made for throwing the recording dials in or out of gear so that the airometer may be used for tests of the air consumption of pneumatic tools. This feature will be useful in determining the effectiveness of repairs on pneumatic tools before sending them out from the repair shop.

The airometer is built in eight sizes with capacities of from 125 to 10,000 cu.ft. of free air per minute. It is claimed that the accuracy of the device is not affected by the pressure and that it can be used for pressures of from 50 to 150 lb. per sq.in. The airometer is manufactured by the Excelsior Drill and Manufacturing Company, Empire Building, Denver, Colo.

Track Spreader and Guard Rail Bracket

The type of track spreader shown is particularly useful to keep the rails to gage on timber stringers which have become partially rotten, so that they will not hold a spike securely. Of course, the surest remedy is to replace the stringers, but often the use of a track spreader will keep the skipways in commission until holidays, when stringers can be replaced without interrupting the mine output.

A ¼x6-in. flat iron, bored for ½x2½x4-in. clips, is driven under both rails after sufficient rotten timber has been cut away, as seen in the accompanying illustration. The clips are then bolted to the flat iron. This will keep the track to gage, even though the rails may move to the sides of the stringers. To keep the rails centered on the timber, ½x6x6-in. clips may be bolted to the bottom of the spreader and wood blocks can be driven between the clip and the stringer, the stringers being kept the proper distance apart by the usual 3x6-in. spreader held by a girt rod. To save the cable, rollers are used near the iron spreaders.



Track Spreader and Guard Rail Bracket

Brackets of ¾x6-in. flat iron, to hold the back or guard rail, may be bolted to the projecting ends of the track spreader. The same type of bracket on new skipways is made longer by an amount equal to the depth of the stringer, and bolted to the wall plates, which are usually introduced at 15-ft. intervals.

Laying Up a Boiler

When a boiler is to be out of commission for some time, the following procedure is recommended in *Power* to prevent rusting.

Wash out the boiler with clean water, disconnect the feed-water pipe and after draining off the water remove the safety valve or a manhole on top of the boiler. Then, with a very light fire drive out all moisture and close the boiler up tight. All flues and smoke connections should be thoroughly cleaned, the smoke uptake should be disconnected from the stack and the boiler flues, smoke flues and stack connection should be stopped up to prevent circulation of air from depositing moisture.

Neutralizing Blasting Fumes

By W. H. Mawdsley*

Although the use of compressed air is an efficient way of removing the fumes caused by blasting, and incidentally, other impurities in the air, it only disperses them and, moreover, is not always available. The sulphur fumes, caused by the ignition of pyritic ore in blasting, are in some mines exceptionally severe; in such cases the charges are usually fired only at intervals when work in other parts of the mine has ceased. Doctor Mann states in his report on the gases produced by explosives in mines in West Australia, that there is no means of preventing the sulphur fumes.

A simple and effective way of overcoming this difficulty is by the use of suitable chemicals as tamping. The alkaline hydrates give the desired results and also absorb some of the CO_2; the addition of an oxidizing agent in the tamping converts the CO into CO_2 which can then be absorbed. With regard to sulphur fumes, moist slaked lime has proved invariably effective. A small quantity is placed at the bottom of the hole and more is used on top of the charge in place of the usual clay "cocks." At the instant of explosion the hydrate comes in contact with the nascent gases and immediately absorbs them. Another method is first to pour a little water into the hole and then add some soluble hydrate (such as barium or strontium) which is dissolved in the water; the charge is now introduced, the solution being thus mixed in with the explosive. A further quantity of hydrate is used above the charge in place of the ordinary tamping. The material is made into suitable sized cartridges covered with as little paper or organic matter as possible. This tamping is a convenience to the miner, and by preventing the sulphur fumes, makes blasting in pyritic ore possible at all times. By the addition of an oxidizing agent, the carbon monoxide given off by some explosives is to a large extent rendered innocuous.

Hammer Drills at Premier

Johannesburg Correspondence

One hundred Flottman hammer drills, installed at the Premier mine, are expected to save £4000 per month over the cost of native drillers. In drilling down holes in the blue kimberlite, one machine drilled 31 holes 6½ ft. deep in two hours. In actual work run by natives in three drilling shifts of six hours each, three machines drilled 1000 ft. The machines are of the "plugger" type, being held in the hand. The valve is an oscillating ball thrown over by compression at the end of the stroke. The drills weigh 25 lb., and use 25 cu.ft. of air per minute.

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*Mt. Morgan, Queensland.

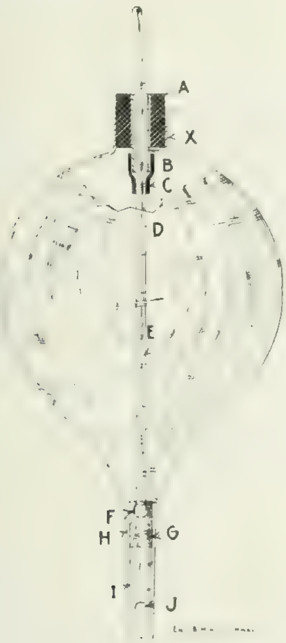
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Automatic Filter Feed

The accompanying diagram shows a device of T. A. Mitchell (*Journ. Ind. Eng. Chem.*, Aug., 1912), for automatically supplying solution to any laboratory filtering medium where a quantity of liquor, or wash water, is required to be filtered. The apparatus is especially serviceable where it is desired to filter over night.

The main body consists of a pear-shaped funnel of the separatory type, minus the glass stopcock. The neck *X* is of such size as will take a No. 3 rubber stopper. The outlet *I* is 6 cm. long and 1 cm. inside diameter, being slightly enlarged at *H* to engage the No. 00 rubber stopper *G*, which is attached, as shown, to the glass rod *E* at *F*. This glass rod should be of a diameter that will pass freely through the 5-mm. glass tube *B*. A nodule is formed at *D* by heating.



Automatic Filter Feed

The upper portion consists of a No. 3 rubber stopper *A*, a glass tube *B*, 3 cm. long and 5 mm. inside diameter, and a piece of 3/16-in. pure-rubber tubing *C*, 15 mm. long. The hole *J* should be about 4 mm. in diameter and determines the level of the liquor in the filtering apparatus below.

In use, the glass rod *E*, with stopper *G* attached, is passed through at *X* and the stopper *G* inserted at *H*. The liquor to be filtered is poured in through *X*, using the protruding glass rod as a guide for the solution, if it be so desired. After the solution has been added, the parts *A*, *B* and *C* assembled as a unit, are slipped over the upper end of the glass rod and the rubber stopper *A* made tight at *X*.

By quickly lifting the glass rod the nodule *D* will enter the protruding rubber tube *C*, resulting in an airtight joint at *C* and a free passage at *H*. The amount of liquor passing through *H* is regulated by the volume of air which enters through the trap *J*. The hole *J* is not absolutely essential, but we find it does away with considerable upward suction of the liquor below, thus assuring a better washing of the residues in cases where that is the desired result. With *E-G* in position the nodule *D* should be about 3 cm. below the tubing *C*.

Hexagonal Trommel for Fine Pulp

After the mill of the Desloge Consolidated Lead Co., in southeastern Missouri, had been remodeled to replace the Harz jigs with Hancock machines, it was found that the fall, in which the fine screening had to be done, was small. The undersize from the 10-mm. trommel was to be passed over a 1-mm. screen to divide it into table and jig feed. A hexagonal trommel had been used in the old mill for fine screening, but it was decided to experiment with a conical trommel to see if better results could not be obtained.

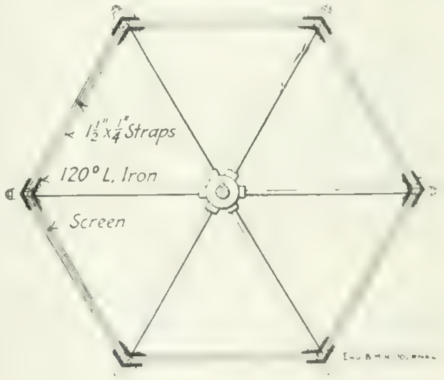
The conical trommel was 96 in. long with diameters of 36 and 48 in. Four interior rings ⅝ in. thick and 2½ in. wide carried the screen, which was set with a fall of ¾ in. to the foot. Each ring was stiffened with six spokes. The speed of the trommel was 20 revolutions per minute.

The hexagonal trommel was 96 in. long and the circumscribing circles had diameters of 36 and 48 in. There were four hubs on the carrying shaft, from each of which six spokes radiated. Longitudinal, 120° angles, fastened to one spoke of each of the four sets, formed the corners of the hexagon and to these angles were fastened the screen plates. The six screen plates had no internal support other than the angles, except at the ends of the trommel, where 1½x1¼-in. straps encircled the screen inside and out to stiffen its edges, as seen in the accompanying drawing. The hexagonal and conical trommels were operated at the same speed, 20 r.p.m. There was a 14-in. fall when the pulp dropped from one face of the hexagon to the other.

The screen used on both trommels had 1 mm. round holes, staggered 2½-mm. centers, punched in No. 22 gage steel plates. An outside spray helped to prevent binding in both cases. The character of the rock and the scouring and pounding action of the large volume of oversize prevented much trouble from binding. Both trommels were fed at the rate of 150 tons per 24 hours.

The tests were carried on for several weeks, so that they show average conditions, and all conditions were as near the same for both trommels as it was possible to keep them, regarding feed, water, speed, etc. The results of the tests are as follows: Oversize finer than 1 mm.; conical trommel, 7.02%; hexagonal trommel, 4.77%; life of jacket, conical trommel, 7.1 days, 1065 tons; hexagonal trommel, 12.85 days, 1927 tons.

The reason for less binding and thus less undersize in the discharge from the hexagonal screen is accounted for by the greater agitation which the pulp gets in this screen.



Section of Hexagonal Trommel

The greater life of the screen on the hexagonal trommel is due to the obstructions which the interior rings of the conical trommel offered to the passage of the pulp. This slight obstruction with the low slope used and the greater weight of pulp that accumulated just above the rings resulted in the screens giving away at those points, generally before they were nearly worn out at others. When the interior rings of the conical trommel were made thinner, the life of the screen was increased, but the life of the trommel itself was considerably shortened.

The life of a fine screen depends on the load which it is carrying, for with the load the friction increases. Owing to the obstruction that the interior rings offer to the flow of the pulp, the load on the conical screen was much heavier than was necessary to pass the same feed through the hexagonal one. It is also well to note that the whole support to a trommel screen should be against outward movement, owing to centrifugal force, rather than against inward distortion. Thus it seems that, for fine screening, the middle and bottom rows of spokes of a conical trommel should have only capping segments to grip firmly and support the screens for a few inches on the inside.

The great advantage of a polygonal trommel for fine screening is that the surface is in sections. It is difficult to patch a hole in a fine screen and with the conical trommel the whole screen has to be discarded. With a hexagonal or octagonal screen, on the other hand, one section is replaced at a time. When the screens are attached between angle ribs rather than on a frame, the labor and cost of changing is also much reduced.

The swish of the pulp that results from the greater lift in the polygonal-shaped screens causes the ore to be passed more rapidly and results in a cleaner discharge than can be obtained with the conical trommel. When the fall that can be allowed in screening is limited, the greater speed at which the pulp will pass through a hexagonal screen, as compared with a conical one, may be the determining factor.

Method for Handling Tube Mill Pebbles

A simple and convenient method for putting the regular daily quantity of pebbles into the tube mill has been devised for the new Nipissing mill at Cobalt. By this method the pebbles are brought in cars to a convenient point back of and above the tube mills. From this point a wooden launder is laid which reaches to the tube mills and terminates directly over the spiral scoop feeder. A hole is cut in the bottom of the launder at this point, and pebbles can be dropped through this hole into the feeder at the moment when the opening of the feeder is coming up under the launder.

This system is believed to be simpler than any yet suggested and avoids carrying and lifting the pebbles directly into the mill and also avoids the nuisance of having pebbles piled up around the mill, a condition which usually obtains when the pebbles have to be lifted into the mill, either at the feed or discharge point.

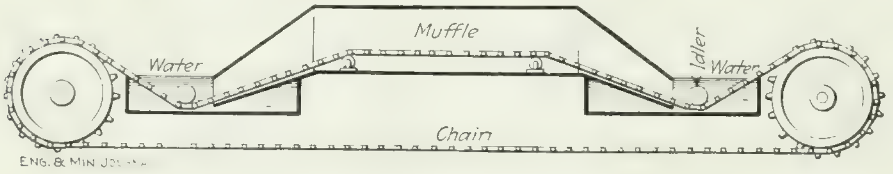
Pebbles placed in the launder, roll by gravity down to the point over feeders and here they are controlled by the operator who feeds them into the mill at the proper moments when the feeder opening can receive them.

Muffle Annealing Furnace

By Donald M. Liddell*

In a recent trip through a large metallurgical plant, I was much struck by the working of a water-sealed muffle-type annealing furnace (patented), used for copper wire. The muffle itself was made of several cast-iron sections, bolted together. The end sections slanted down and ended under water. The copper was carried through the furnace on a double endless-chain belt, and the time the copper remained in the furnace was determined by the speed at which this belt moved.

Control of the temperature was by means of a recording thermo-electric pyrometer. The muffle was coal-fired, and the attendant, who watched several muffles was allowed a range of 100°, from 1000° to 1100° F. There was apparently no difficulty whatever in holding this range of temperature. Indeed, during about 25 min. I did not observe a swing as great as 10° Fahrenheit.



Diagrammatic View, Muffle Annealing Furnace

I was told that no special precautions were necessary when the fire was allowed to go out, to prevent the muffles from filling with water. This would apparently argue that either the bolted joints or the pyrometer holes were not tight, although it was said they were intended to be so. At any rate the leakage of air was not sufficient to tarnish the copper, which came out as bright as when it went in. This is, until the trade becomes educated, one of the objections to the furnace, as lots of wire are occasionally returned to the works, the consignees alleging that the wire is so bright that it cannot have been annealed.

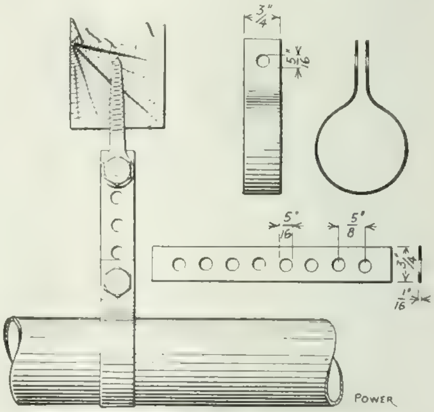
So far as possible the furnaces are kept under fire constantly, as it has been found that it is cheaper to burn coal than to pay the repairs due to too frequently cooling and heating the cast-iron muffles.

The travel of the chain is around the main driving sprocket, down on a slant into the water, under an idler, up an incline through the first section of the furnace, along the level through that part of the muffle directly heated (this section is, of course, above water level), down into the water, under another idler, up over the other large sprocket, and back underneath the furnace.

There are two sets of sprockets and of idlers, and two chains running over them. Iron bars are fixed at intervals running between the two chains, and sheets of copper are laid between these bars. The rolls of wire are then placed on top of the sheets, and go through the furnace in that manner. The illustration is intended only to be diagrammatic and should not be regarded as a working drawing.

Hanger for Light Pipe

The accompanying illustration shows the general details of a convenient pipe hanger for supporting light pipe, from 1 in. up to 3 in. in diameter. It is made up of a V-shaped ¾-in. band-iron 1/16 in. thick, and bent so that the inside diameter is the same as the outside diameter of the pipe it is to support. The flat ends of this piece are punched with 5/16-in. holes, says H. M. Nichols (*Power*, Oct. 22, 1912)



Hanger for Light-weight Pipe Lines

The second part of the hanger is a flat strip of band-iron in which a number of 5/16-in. holes have been punched about ⅝ in. apart. The strips can be made up in random lengths and when used broken off to the desired length.

Eye lagscrews are used to fasten the pipe hangers to the ceiling. These lagscrews are most easily put up before the pipe is put in place. The bands can be put on the pipe and clamped loosely to the straight strips with ¼-in. bolts. After the pipe is lifted into place it is only necessary to bolt the straight strips to the lag-screws with ¼-in. bolts. This type of pipe hanger is particularly convenient when it is necessary to run a line of pipe on a slant.

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*Associate editor, Engineering and Mining Journal.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Thoria Recovery

A means of preparing pure thoria by phosphorous acid is given in by F. Wirth (*Zeit. f. Angew. Chem.*, p. 1678, 1912). A cold saturated solution of disodium phosphite, $Na_2HPO_3,3H_2O$, is added, drop by drop, with stirring, to a boiling solution of thorium and trivalent earth metals (e.g., that obtained by the decomposition of monazite sand), which should contain 15 to 20% of free sulphuric acid, and, after some hours, the flocculent precipitate of thorium phosphite, which at once separates, is brought on to a hardened filter, washed with water containing sulphuric acid, rinsed into a dish, dried on the water-bath, and oxidized by treating with 20 c.c. each of fuming nitric acid and concentrated sulphuric acid (for 0.2 to 0.25 grams of precipitate); the nitric acid is then completely removed by evaporation, the mixture of sulphate and phosphate dissolved in 800 c.c. of water, and the thorium separated by adding excess of oxalic acid to the cold solution. The phosphite precipitate may also be decomposed by prolonged boiling with potassium-hydroxide solution, the hydroxide precipitate being dissolved in dilute hydrochloric acid and the solution precipitated by oxalic acid.

Stage Charging in Openhearth Process

F. W. Paul, of Glasgow, before the Iron and Steel Institute, under the title "Manufacture of Openhearth Steel with Reference to Improvement in Yield," stated that he had obtained yields much nearer the theoretical amounts by charging about 10% of the required pig iron, melting it, thereafter charging the remainder of the pig iron into the molten bath, which is kept liquid substantially during the entire period of charging.

After the pig iron is all charged and the silicon sufficiently reduced to allow superheating the metal without loss, the steel scrap is charged at the maximum rate at which bath can be kept liquid. The method of dealing with fractions of the charge, with equivalent portions of iron oxide, allows the elimination of the silicon at a low temperature, and so avoids fluxing of the banks, thus affording, in the basic process especially, means of working with low-sulphur pig iron, and greater latitude as regards silicon content.

The pig is desiliconized by the iron ore at a low temperature without loss of carbon, or volatilization of iron as brown oxide, and the recovery is raised by 5 to 7%. The brickwork of the furnace is not subjected to extreme fluctuations in temperature. The free unobstructed passage of the flame is not so destructive to linings and roof as when the flame is deflected by striking against piled-up material in the furnace. There is less scouring and fluxing of the furnace banks, and consequently the furnace needs less repairs. Owing to the much decreased loss of iron as oxide, there is less cleaning of the gas and air chambers required, and owing to diminished fluxing action, because of the lessened deposit in them, they will last about twice as long as with ordinary working. The process has been tried out on a 70-ton furnace.

Hybinette Copper Extraction Process

The following process for the extraction of copper from sulphide ores is given by N. V. Hybinette in French pat. No. 440,712. The ores are roasted with from 2 to 20% of sodium sulphate, and then leached with dilute sulphuric acid.

If desired, a preliminary extraction with water is given to the roasted mass in order to avoid the solution of iron. The solution, which contains the sulphates of sodium, copper, iron, and possibly of nickel and zinc, is then subjected to electrolysis with insoluble anodes. The acid electrolyte is used for successive leachings until too strongly charged with sulphates. It is then used instead of fresh quantities of sodium sulphate to add to the charges of ore before roasting. The loss of sodium sulphate is thus small, and is made up by the addition of common salt. When the concentration of zinc and nickel becomes sufficiently great, these metals are separated either by electrolysis or by precipitating with soda or lime.

Erkens' Aluminum Solder

Charles R. Erkens, of New York, has patented (U. S. pat. No. 1,033,565) an aluminum solder which he claims can be used with an ordinary soldering iron. He melts block tin, 60 parts; zinc, 15; lead, 10; antimony, 5; bismuth, 5; chromium, 5 parts, and when melted and thoroughly mixed cleans the melt by introducing (preferably) 35 grams of salicylic acid and 10 grams of calcium for each five pounds of alloy, although other acids and oxidizers will perform the same function. Afterward he throws on about two grams of sulphur to facilitate removal of the dross.

A small amount of the oxidizing and cleansing agents (about 5%) will be retained by the alloy and take the place of the acid or flux used in ordinary soldering processes. [Calcium and salicylic acid are not usually considered oxidizing agents. We merely quote from the patent.—EDITOR.]

Heavy Electrolytic Nickel Deposits

The question of obtaining thick deposits of nickel has been investigated recently by A. Holland, of Paris (*Bull.* Soc. d'Encouragement pour l'Ind. Nat., July, 1912). The difficulty in getting thick deposits seems to lie in the evolution of hydrogen at the cathode, so his endeavors have been along two lines: to oxidize the hydrogen as set free; to prevent its formation. The best baths found along the first lines were: (1) Crystallized nickel sulphate, 45 grams; ammonium chloride, 10 grams; sodium persulphate, 5 grams; water to make up to 400 c.c. Or, (2) Crystallized nickel sulphate, 40 grams; crystallized magnesium sulphate, 40 grams; boric acid, 7 grams; sodium persulphate, 5 grams; water to make up to 400 c.c. Or, (3) Crystallized sulphate of nickel, 40 grams; crystallized magnesium chloride, 40 grams; boric acid, 6 grams; water to make up to 400 c.c. There was no gas evolved with this last bath, using a 0.3 amp. current on a 42-sq.cm. cathode and anode, in spite of its lack of oxidizers.

However, by far the best results were obtained with nickel-fluoborate solutions. The natural idea is that boric acid can be dissolved in hydrofluoric acid, and the mixture neutralized with nickel carbonate. However, the preparation of the best bath possible is by no means a simple matter. To make up two liters of solution, take 350 grams of sodium carbonate in one liter of water, and pour it warm into a lukewarm solution of 600 grams of nickel sulphate in 5.5 liters of water, and stir well. The precipitate must be washed by decantation, stirring up well after each addition of water, until there is no longer any sulphate-of-soda reaction with barium chloride. This washed nickel carbonate must then be dissolved while fresh.

Mix 250 grams of boiling water with 130 grams of boric acid, cool, and add to it, while stirring, 285 grams of 43 to 46% commercial hydrofluoric acid, a little at a time. Then add the carbonate of nickel. When no more gas is given off, stir until there is a homogeneous milk of nickel carbonate left. These operations cannot be performed in glass, but after this point it may be put in glass and should be introduced into a laboratory shaker, where it should be shaken for 20 hours. Filter and wash to make up to two liters.

Even this carefully prepared bath often requires electrolyzing with a cast nickel anode for three or four days to get the best results in cammercial plating.

The St. Helens Mining District

The St. Helens mining district in Washington was described by Horace G. Winchell, in a paper read at the Cleveland meeting of the American Institute of Mining Engineers.

To the inexperienced prospector, who cannot tell specular hematite from galena, or gray copper from a mixture of pyrite and arsenopyrite, it would probably be attractive, and as a result of weeks and months of labor he could procure an occasional specimen for exhibition or assay. But the prospector of experience would notice that there are no placer deposits, that there is a universal absence of quartz in vein matter and float, that there is no gossan or iron hat.

There is no increase of mineralization at depth, there is no ore in commercial quantity, there is no softening and alteration of the country rock adjacent to joints and seams, such as would exist in the neighborhood of mineral deposits. The joints are associated with and enlarged by deposits of epidote, tourmaline and magnetite. Tourmaline is a pneumatolytic mineral, and must have been deposited before the rocks were cold, and before vein solutions could exist, and pneumatolytic copper deposits are rarely big enough to make good copper mines.

In short, Mr. Winchell's verdict is overwhelmingly unfavorable to this district, the genesis of which is described as follows: "From the enthusiasm born of ignorance, and solely through the reports and specimens of two German farmers, the prospecting fever spread so rapidlv that within three years there were 500 men in the district, and locations were made without number. The proprietors of a German newspaper in Milwaukee became interested. They furnished the capital; and under the advice of their expert, who was naturally one of the discoverers of the district, spent many thousands of dollars in prospecting work. Mining companies of large capitalization were organized and stock sold broadcast. Thousands of feet of tunnel were driven for the purpose of penetrating and exposing to view the enormous bodies of ores—supposed to be demonstrated by the tourmaline seams on the surface. The developments were not altogether satisfactory even to the dream-blinded journalists, and they finally concluded to take a moderate price by selling for a few paltry millions to an English syndicate. Then came the first inspection of the district by a man of some knowledge, and a report which suddenly stopped the expenditure of money."

Gold in the Texas Eocene Deposits

At the Cleveland meeting of the American Institute of Mining Engineers, E. T. Dumble reported on work he had done on reported discoveries of gold in the Texas Eocene deposits. Several years ago specimens were sent him alleged to have been concentrated by a rocker from the sands of Gazley Creek, a stream which empties into the Colorado River just north of Smithville. On personal investigation he found no samples giving over a trace of gold by fire assay, and obtained colors in only a few pannings.

Near Harwood on the Gonzales branch of the Galveston, Houston & San Antonio Ry., various wells disclosed a stratum of argilaceous sand carrying glauconitic matter and pyrite which showed gold on assay. One well, in which samples were taken every foot for 38 ft., gave 32 samples carrying 16c. to $8 per ton. The geological relations here are the same as at Gazley Creek, and all are connected with the Lignitic stage of the Eocene.

The composition of the beds suggests the granite area of the Llano region as the origin. Gold and silver are known to occur in the porphyries and micaceous schists of the Llano region, and gold is found in the sands of the creeks flowing over or through these rocks. Placer gold has been found in the Big Sandy, and in the sands of the Colorado as far south as Austin. The nature of the occurrence is judged by Mr. Dumble to warrant further investigation.

Nickel Extraction in Norway

Although there are many deposits of nickel in Norway carrying about 2% Ni, they were incapable, for many years, of competing with the rich ores of Canada, says *Metaux et Alliages*, and during the closing years of the nineteenth century the annual Norwegian production did not exceed seven tons.

Since 1900, however, the industry has revived, and in 1909, the Evje works treated 5770 metric tons of ore, carrying 1.1% Ni. Each 100 tons of ore gave 2.77 tons of matte, carrying about 40% Ni and 25% Cu. This matte is refined at the Christiansand electrolytic refinery.

The matte is said to be used as anode in a feebly acid solution, from which pure copper is deposited. When the nickel in the bath reaches a certain limit, the current is cut off, and the small amount of copper remaining is thrown out by sulphuretted hydrogen. The iron is also precipitated at this point, but no information is given as to how this is done. The nickel solution is then heated and nickel deposited, using insoluble anodes. The current consumption is said to be large, so that the success of the process depends on a cheap supply of power, such as is to be had in Norway.

Precipitation of Carbon in Copper Analysis

The use of various organic "dopes" has long been recommended in copper analysis by electrolysis, in order to produce good deposits. Although it has been known that carbon could be coprecipitated with nickel and iron by electrolysis, it has always been thought that carbon was not precipitated with copper.

However, in a paper before the International Congress of Applied Chemistry, Messrs. Spear, Chow and Chesley claim that carbon has been found by them in the deposit obtained from electrolyzing a copper-sulphate solution containing a little nitric acid and small amounts of gelatin (*Proc.* vol. XXI, p. 93).

It was more difficult to obtain carbonaceous deposits with stationary than with rotating electrodes. Carbon is only thrown down when nitrous or nitric acid is present in the electrolyte. Reducing agents prevent its deposition. The paper apparently shows a hitherto unsuspected possibility of error in electrolytic analysis.

Purification of Zinc Solutions

It is suggested by Edouard Flügger (*Revue des Prod. Chim.*, July 10, 1912), that alkaline-zincate solutions can be purified by boiling zinc dust with these solutions. This will throw down all other metals than zinc as a flocculent precipitate, and the purified solution can then be precipitated by hydrogen sulphide for the production of an absolutely white zinc sulphide. The zincate solutions should be concentrated, only about one part of water per part of alkaline hydroxide, they should be boiling, and the boiling should only be continued until a flocculent precipitate is formed.

Improved Mercury Cathode

The use of the mercury cathode for electrolytic analysis has been attended by the disadvantage that the mercury did not wet the containers and a film of electrolyte was trapped under the cathode. It is said in the JOURNAL of *Physical Chemistry* that this can be avoided by using a platinum dish previously plated with mercury deposited from a cyanide electrolyte.

Cyanidation in the Cobalt District

By Herbert A. Megraw

Rich silver ores are treated by cyanidation. The treatment offers many problems comparatively new to cyanidation. The ores are picked, jigged and concentrated and the tailings cyanided. The Nipissing new mill will dispense with concentration. Agitation is performed generally in Pachuca tanks, though some mills use tanks with flat bottoms and mechanical agitators. Zinc-dust precipitation is favored. Vacuum filters are used, though not well adapted to the heavy granular nature of the ore. The metallurgy is not settled and developments may be expected.

The mining district of Cobalt in Ontario, Canada, is one of the newer areas in which economic mining has proved possible. In common with most new camps the first output was high-grade material, but it differs from many in the fact that the average content of the mineral has continued up to this time to be higher than is usually the case when work has been carried to the extent that it has here. The valuable metal is silver which occurs native and in combination. It is found as sulphide, arsenide, antimonide and in combination with manganese, nickel and cobalt. Small proportions of copper are also found in some of the ores and in at least one, the Nipissing, mercury has been definitely proved to exist. In regard to the latter many engineers are skeptical, having never encountered any indications of it even in the higher grade mineral but the work of the metallurgists who experimented upon the ores of the Nipissing mine has been sufficient for them to state positively that a small quantity of mercury does exist as a mercury-silver amalgam.

ORES HARD AND TOUGH

The ores occur in narrow fissures in a country rock of fine grained conglomerate, slate or diabase. They are all hard and tough and are not easily ground to a fine state. The experience of the camp has been that when the ores are ground extremely fine, even to a point where they will pass a 200-mesh screen, the product is largely granular and has the property of settling quickly, the light, flocculent product generally called true slime being conspicuous for its rarity. In addition to this, the mineral is extremely heavy, so that the difficulty of obtaining a product which may be treated as a total slime is greater than is usually the case with silver ores. The power and care required to keep it in suspension is comparatively great.

Most of the mills in the Cobalt camp are concentrators and due to the character of the mineral, which is favorable to concentration, good results have been obtained from this system of treatment. The silver occurs, as has been mentioned, in heavy minerals which give up a large percentage of their silver content on the concentrating table. Nevertheless, the tailing discarded by the concentrating mills contains sufficient silver so that its extraction, or partial extraction, by cyanidation while the pulp is in motion through the mill, might be expected to repay more than the additional expense of cyanide treatment. It is altogether likely that the average tailing from a concentrator treating 25- to 35-oz. ore will contain not less than five to eight ounces of silver per ton. Most of the operators will not admit that the tailing runs so high, but a consideration of the conditions, together with some frank conversation with operators leads me to believe that these figures do not overstate the case.

If this is true, then cyanide treatment of the table tailing should be economical in view of the fact that most of the work has already been done on the ore and the additional cost of regrinding plus the cost of chemicals and labor would be more than met by the additional silver recovered. I have already said that the ore, even when finely ground, is difficult to agitate, but this does not conflict with the idea that cyanidation would be economical, because it is conceivable that the fine sand might be leached at a cost which would be less than that of agitating them. I am unable to discover that any exhaustive experiments have been carried out on leaching a concentrate tailing, but I do not know of any good reason why it would not be possible, particularly in those mills where concentration has already been installed. It may be true that a new mill designed for cyaniding the entire product would give the most economical result eventually, but that is no reason why mills now operating as concentrators could not increase their profits by cyaniding the table tailing in some way. The analysis of the ores support this view in so far as showing that the higher grade ores contain most of the elements considered rebellious, while the lower grade ores are comparatively free from them, making cyanidation cheaper on the low-grade minerals. In the accompanying table is presented a statement of the comparative content of the extraordinary elements in Cobalt ores of various grades, *A* representing the high-grade, *B* the medium-grade and *C* the low, or milling-grade ores.

NEW LOW-GRADE MILL OF THE NIPISSING MINING CO., LTD.

FOUR MILLS PRACTICE CYANIDATION

Four of the Cobalt companies have undertaken cyanidation in some form and degree. These are the Nipissing Mining Co., the Buffalo Mines Co., the Dominion Reduction Co. and the O'Brien[1]. The Buffalo mill[2] treats partly by concentration and partly by cyanidation. The ore is broken through crusher and rolls and is partly reground in a high-speed chilean mill, the crushing and grinding being done in water. The slime is separated, thickened in a Dorr thickener and cyanided in Pachuca tanks, the sand being concentrated in water. The tailing is stacked and may be retreated at some future time. Of the sand reground in the chilean mill, only about 5% is slimed, the total quantity of slime cyanided being only 18 to 20% of the total ore crushed. The —200-mesh product is considered as slime and it is largely a granular product, there being very little colloid in it.

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[1] The O'Brien is the property of one man, is not incorporated and is known simply as the O'Brien mine.

[2] Eng. and Min. Journ., Aug. 3, 1912.

The mill of the Dominion Reduction Co., formerly known as the Nova Scotia[3], crushes with stamps in cyanide solution. The mill was erected for cyanide treatment alone, small allowance being made for concentration, but having lately entered the custom-milling field it was found necessary to reconstruct the mill, due to the different character of ore to be treated, and this work is now in progress, a system of careful concentration being interposed between the grinding and cyaniding departments. The regrinding in this mill is done in tube mills. Under the reformed system the pulp will be passed through a Callow screen with a 30- or 40-mesh wire cloth, the undersize going to sand tables and the oversize being reground and returned to the Callow screen. Thus all the pulp will have to pass the screen eventually. From the concentrators it will be sent to a modified Dorr classifier where the sand will be drained and taken out, receiving a wash of cyanide solution in the classifier, and will then be discarded. The slime, which carries the greater part of the valuable content, will be subjecter to cyanidation by agitation.

At the O'Brien mill the ore is crushed, jigged and stamped, jigging being done in water and stamping in solution. Recrushing is done in Hardinge conical mills. Concentration is practiced, but to a less extent than usual in the Cobalt mills, the pulp receiving only one passage over the tables. The reground pulp is treated as slime, about 75% of it passing a 200-mesh screen.

Nipissing Building New Mill

The Nipissing company has under construction a mill for treating its so called low-grade ores which assay from 25 to 35 oz. silver per ton. This mill, which is scheduled to begin operations in November of the present year, will be a purely cyaniding one, the only variation being a jigging of the crushed ores. The high-grade rock will be removed on a picking belt, and this, together with the rich jig product, will be treated in the present high-grade mill which will be maintained in operation, as at present, for taking care of the high-grade mine ores and the rich product obtained by the picking and jigging methods. There will be no concentration, no tables or vanners having been included in the design of the mill. There will be 40 stamps of 1500 lb. each and four tube mills, 6½x20 ft. Dorr classifiers are to be used for removing the sand which will be tube milled, the entire product being treated by agitation as slime. Zinc-dust precipitation will be used, the standard Merrill triangular press being installed to collect the precipitate. The standard Butters filter will be used for filtering the residue.

The agitation tanks to be used have the flat bottoms and mechanical agitators usually employed by the Butters engineers. The tanks are fitted with decanters and treatment will be by the intermittent or charge system. It is stated that these agitators, while not perfect, will give as good results as can be obtained by the newer forms at costs which are entirely satisfactory in comparison. It is noteworthy that in the face of the more modern forms of agitators, for which higher efficiency and lower costs have been claimed, the older type of agitators are being installed in this modern mill, and also that in spite of the advantages claimed for continuous processes, the charge system will be employed, and all of this sanctioned by a body of engineers which, while not infallible, is fully competent to weigh the advantages of all classes of machinery and make use of the best. The difference of opinion is remarkable and goes to show that neither form of machinery nor method has been able to demonstrate so clearly its superiority as to make it universally accepted. It seems almost certain that one or the other of two forms of machinery, or even of processes, must be the better, the only explanation of the varying opinions being that different ores must give different results when handled by the different processes. Neither is the personal equation to be eliminated, for operators accustomed to a certain class of machinery and certain methods of working, do not relinquish them with facility, and it is often the most difficult thing in the world to convince an operator that there is some better way of doing things than the particular one he is using.

The Question of Stamps

The persistent use of stamps for reducing rock to various degrees of fineness is an example of the general disinclination to dispense with a form of machinery which has been in use a considerable length of time and which, all things considered, has given a vast amount of satisfactory service. It is difficult to censure the profession for sticking to a device which has served well, but it is nevertheless true that circumstances alter cases, and a machine ought to be considered in the light of the work it is expected to do. When the primary object was to crush ore to a point necessary to liberate its mineral and make it susceptible to amalgamation, then the stamp was a good medium to use. It did the work at one step, and had advantages for amalgamation. It made comparatively little slime, and this was an advantage, particularly in the days when cyanidation was first used and leaching was the accepted practice. The slime was a nuisance and was hard to handle and therefore any machine which produced a minimum of it was considered efficient. With the advent of the total-slime treatment it would seem likely that some other machine might be used which would do the work of reducing ores to a fine state seen, with a pyroclastic bed, the stagessary to keep the production of slime down to a minimum. .

Mill of the Dominion Reduction Co., Cobalt

In spite of this circumstance, the stamp continues to be the standard machine for primary crushing, although there is little doubt but that some other form of machine would be more economical in use. This condition exists all over the mining world and Cobalt is no exception. In preparing ores for cyanidation there is no other object but to crush them to the required point, usually a total slime, in the quickest and cheapest way. Yet most mills use stamps for the purpose and in Cobalt the stamp is used except in one instance, the Buffalo mill. All over the world investigations are being made on this detail and in some cases the stamps have been displaced with distinctly good results. I think that if some trials were made on the Cobalt ores these economies would be manifested there also. The Cobalt ores are hard, but not too hard to

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Eng. and Min. Journ., Jun. 8, 1912.

be crushed through rolls, and a stage crushing through crushers, rolls and tube mills would seem to indicate the most economical method. It is to be hoped that the system will be given thorough trials on the ores of the camp for such a system would remove many vexations in addition to introducing economies.

Tube Mills Generally Used

Tube mills are used for regrinding in the majority of the mills in the Cobalt camp. The Nipissing, new and old mills, the Dominion and the O'Brien mills have installations of them while the Buffalo, as has already been mentioned, uses a high-speed chilean mill. There is no data at hand for comparing the results of the two forms of machines, but it is probable, on this ore, that the tube mill will give more consistent results. The Hardinge conical mill, as used at the O'Brien mill, has not proved to be altogether satisfactory. The mill is apparently good as a granulator, reducing the rock to a state of medium fine sand with efficiency, but it does not grind fine enough. In this regard the ordinary tube mill is more satisfactory. It is possible to slime the rock in the Hardinge mill, but to do so would reduce its capacity so far as to remove it from consideration as an economical machine. It is possible that the hardness of the ore has something to do with this result for, as has been mentioned, the ore is extremely difficult to slime.

Pachuca Tanks for Agitation

Pachuca tanks are used generally for agitation except in the cases of the Nipissing company, and at Dominion mill where Trent agitators are at present in use. The Pachuca tanks used in the district are somewhat modified, not conforming exactly with the standard sizes and proportions used in Mexico and in the United States, the difference being that they are not so high in proportion to the diameter. While this reduces the capacity, there is no effect upon the agitation except, perhaps, that it requires less power to accomplish the desired result.

The Parral type of agitator is to have a trial in the camp at the new high-grade mill of the Buffalo company, now under construction. This plant, which is, in the main, similar to the corresponding plant of the Nipissing company, contains some details which are considered to be improvements and will be referred to later. In view of the fact that it has been difficult for metallurgists to agree upon the most satisfactory tank for agitation, it will be interesting to have a comparative exhibition of the three classes, Pachuca, Parral and mechanical, at work in the same camp and upon the same material. It is to be hoped that full details of the results will be obtainable.

Lime in General Use

Lime in some form is used at all the cyanide mills in the camp. At the O'Brien mill the dry lime is added in the batteries and in addition caustic soda is used in the solutions. Caustic soda is not usually considered a good agent to use for securing alkalinity as it tends toward dissolving some compounds which would be better left untouched. There are, however, some cases where its use is justified in spite of its chemical conduct and its cost. The alkalinity at the O'Brien is carried at 3 lb. in terms of NaOH. At the Dominion mill dry lime is added to the ore going to the mill at the rate of about 6 or 7 lb. per ton. The lime is in fine lumps, not powdered, as it is desired to take advantage of the alkalinity developed by the slow solution of the lumps. At the Buffalo mill lime is added in powdered form to the treatment tanks at the rate of 7 to 8 lb. per ton of dry ore. The addition of the lime to the treatment tanks in this case is due to the fact that the pulp here meets the cyanide solution for the first time, the preceding operations being carried out in water.

O'Brien Mill, Cobalt, Ont.

It will be noted that there is a great deal of difference in the manner of using lime in this district, every operator having some special ideas of the most efficient way. Naturally, the lime will be used in the way which seems to be best adapted to each particular ore, but in this case the use of it typifies the state of cyanide practice in the district. It is as yet unsettled, and the best methods for economical results have not yet been definitely determined.

Lead Salts Not Favored

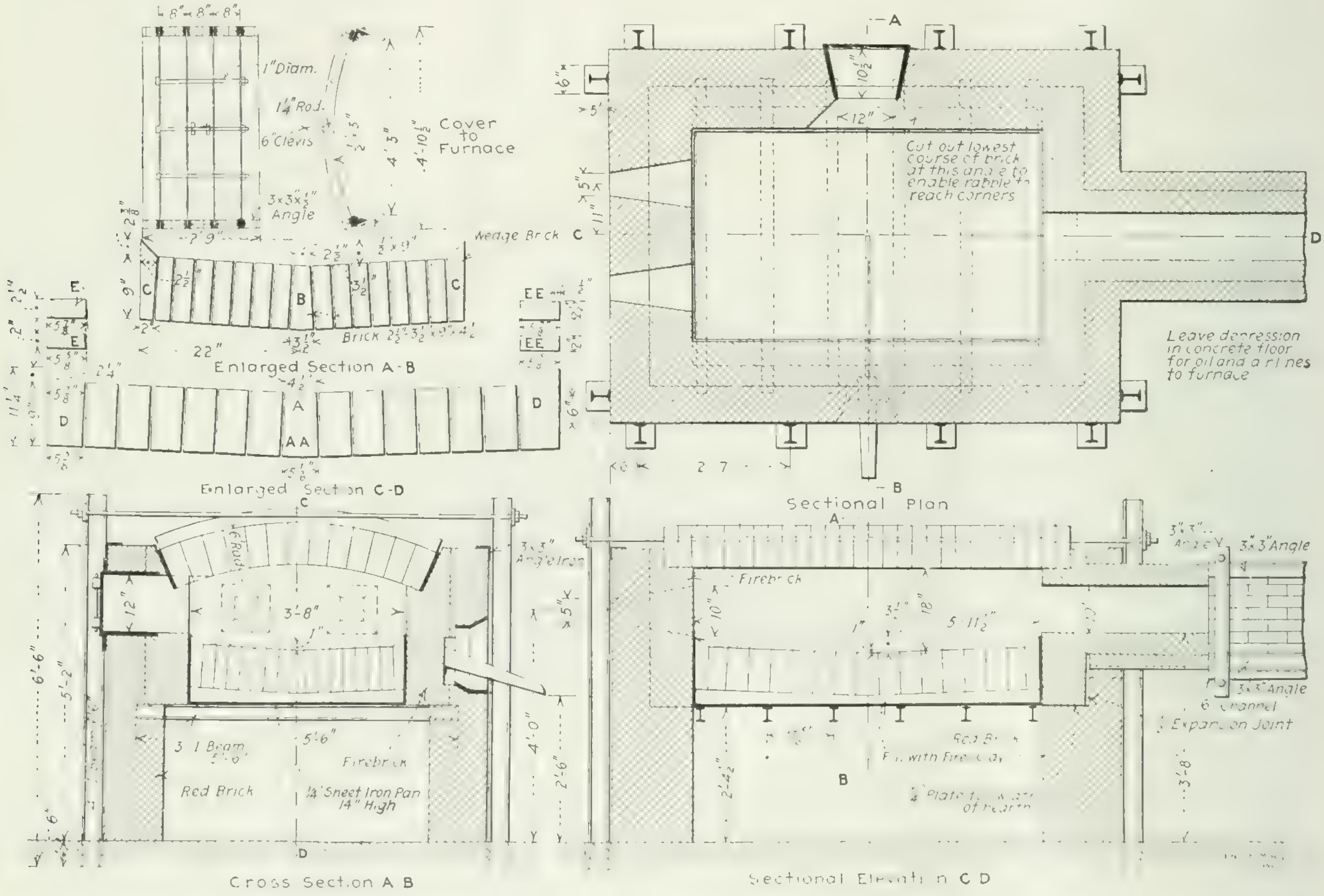
The use of lead salts is varied and spasmodic. There seems to be no definite information as to whether or not they are required and their use, even in the same mill, is not systematized. The general tendency seems to be to dispense with their use. At the Buffalo mill it is claimed that there is no noticeable difference in results whether the lead salts are used or not, and the same is true at the O'Brien mill. Solution analyses at the O'Brien have convinced the operators that the sulphur, which exists in appreciable quantity in solution, is in the form of sulphocyanide. This would indicate that the soluble sulphides, which are undoubtedly first formed, have been transformed by action of the metal elements extracted from the ore and subsequently by the cyanide solutions themselves. If this is true it shows that a portion of the cyanide is removed from its primary object of dissolving silver and is tied up with the sulphur, forming a compound which, while having a certain solvent action upon silver, would certainly not be intentionally formed for such purpose. It would apparently be more economical to remove the sulphur definitely from the solution, if possible, leaving the cyanides free to carry out their designed function. It is probably true that the Cobalt ores carry elements which themselves form insoluble sulphides with the dissolved sulphur and remove them, at least partially, from the solutions.

The consumption of cyanide is much the same in all the mills, leaving out, of course, the Nipissing high-grade mill, which is not to be considered with the mills treating large quantities of lower grade ores. From 3 to 6 lb. of KCN per ton of ore treated is the average consumption, when treating ores running from 20 to 35 oz. of silver. At the O'Brien mill the consumption for the year 1911 was 5 lb. KCN per ton of ore treated, while for the present year the records up to date show a consumption of 3.8 lb. per ton. At the Buffalo and Dominion mills the consumption will average about the same and at the Nipissing high-grade mill the figures are reserved from publication, but the consumption is probably high.

Extractions are Variable

The percentage recovery of silver seems to vary a great deal in the different mills of the camp. From 80 to

90% is about the saving that is attained by cyanidation, except in the Nipissing mill. In the latter a saving is made by amalgamation of 97% and in the subsequent cyanidation a small additional saving is made. The head content of silver at this mill runs about 2500 oz. silver and the tailing is said to be as low as 20 to 30 oz. per ton. The extraordinary percentage of extraction is, of course, accounted for by the richness of the ore treated. At the O'Brien mill concentration and cyanidation reduce 20-oz. heads to a tailing which averages 1 to 1.5 oz. per ton in silver. At the Buffalo mill where only the slime is cyanided the extraction on the material is from 80 to 85%, but this is by the cyanide treatment alone and no comparisons can be made between this result and the results obtained at the other mills in the district. At the Dominion mill no extraction results are obtainable at this time due to the fact that a change of method is being made, and while the mill is actually in operation, the newer method is not yet fully installed and no statement can be made.



Reverberatory Refining Furnace at Buffalo Mill, Cobalt, Ont.

It is generally conceded that the percentage extraction depends largely upon the fineness to which the ore is ground, the finer grinding giving a better recovery of metal than the coarser. This is to be expected in view of the density of the ore which does not permit penetration of the cyanide solutions into the ore particles and requires extreme subdivision in order to expose the maximum amount of the silver to the action of solutions.

Temperature has also a great effect upon extractions. In the winter season the cold solutions lower extractions to a large extent and it is often necessary to warm the solutions in order to obtain normal results. At the Buffalo mill steam coils are placed in the treatment tanks in order to bring the solutions up to normal efficiency. In this case the warming is particularly necessary, for there is a constant introduction of cold water into the treatment circulation from the grinding department. At other mills where the circulation is entirely cyanide solution, a thorough heating of the mill during the winter season suffices to keep the solutions active.

Zinc Dust Favored as Precipitant

The precipitant most favored is zinc dust which will ultimately be used in practically all the mills. At the Buffalo mill the precipitation is at present by zinc shavings, three wooden boxes of the ordinary type being used. At the Dominion mill zinc dust is used and the regular Merrill triangular filter press is installed for collecting the precipitate. The consumption is in this case 1½ of zinc to one of silver precipitated, by weight. At the new mill of the Nipissing company the same process will be used and the resultant precipitate will be sent to the refinery of the high-grade mill which has already been described.

At the O'Brien mill the process is the same mechanically, but zinc dust is replaced by aluminum powder. It is stated that the aluminum powder will precipitate three times its weight of silver and has a lesser fouling effect upon the solutions. The claim is also made that the resulting precipitate may be melted in the ordinary oil-fired tilting furnace without any flux, giving a bullion of high purity. The cost of the aluminum dust, which is 32c. per lb., compared with the cost of zinc, about 7c. per lb., does not indicate any appreciable economy in the use of aluminum even with its increased efficiency, unless there are some advantages not clearly understood. It is probable that further experiments will be made on the use of this material so that some definite facts may become known and comparisons established with the results accomplished with zinc dust.

Vacuum Filters Not Efficient

Vacuum filters are at present in use in all the mills, the Butters and Moore types being the ones preferred. At the

Nipissing, both the high-grade mill and the new low-grade mill are equipped with Butters filters of the standard type. The Dominion mill has a Moore filter as has also the O'Brien mill. In all these mills a high efficiency is claimed for the filters in washing out dissolved silver, but from the looks of the installations it is rather difficult to understand how high efficiencies can be claimed on any of them. The great weight of the pulp and its granular condition make it necessary that the filter tank be equipped with air lifts in order to keep the solids in suspension, and a rather violent action is necessary to do the work. The filters cannot be operated at all without the air lifts as the heavy solids would settle immediately making operation impossible. From the nature of the ore and the condition of the filters in the Cobalt camp I should think that pressure filters would be likely to give much better results than those operated on the vacuum system. Pressure systems, like the Merrill, would take a definite quantity of pulp and make a fairly homogeneous cake at once, and would tend toward a condition which would facilitate proper washing of the cake. With the vacuum filters some segregation must naturally take place, and a filter cake which is not homogeneous cannot be washed perfectly. The pressure filter would, in my opinion, be a decided improvement over vacuum systems in the Cobalt camp, due to the weight and granular character of the solids in the pulp treated.

Costs Not Generally Obtainable

The cost of treatment in the Cobalt camp is not obtainable in the majority of cases, due to the fact that some of the mills are treating custom ores and consequently do not care to make public that essential part of the business. It may be stated that the treatment of the mill or low-grade ores costs from $2.50 to $4.50 per ton. This seems to be a rather wide variation of cost on ore which is practically identical and which is treated on more or less the same scale. The variation is wide indeed, but, as has already been mentioned, there are so many different ideas and so many different methods in use in the camp that there is bound to be a variation in cost. Probably the cost for cyanidation is less at the Buffalo mill because of the small extent and simplicity of the treatment, most of the charge for reduction being made against the concentration department. At the Buffalo, the cost may be said to be about the lower figure given, while at the other two mills costs varying at or about the higher figure may be taken as representing the average. At the Nipissing no costs at all are divulged, but the report of the company for the year 1911 shows that the cost per ounce of silver at the high-grade mill was 1.14c. At this rate, considering the average ore treated as assaying 2500 oz. per ton, the cost per ton of treatment would be $28.50, which seems to be a fair average figure for an operation of this sort. It seems likely that the majority of this cost consists of cyanide consumed and mercury lost, the other charges being of comparatively less importance.

The cost of material at Cobalt is about as follows: Cyanide, (KCN universally used) 15c. per lb.; zinc dust (90% metallic zinc) 6.5 to 7c. per lb.; pebbles (imported) $20 per ton. Power varies somewhat in cost, the original contracts being made on a basis of $50 per horsepower-year, but the contracts now being made are at the rate of one cent per kilowatt-hour, due, I understand, to a change in the policy of the power companies which serve the district. The cost items in general are not excessive and work should be done at reasonable cost.

Buffalo Company Constructing a High-grade Mill

The Buffalo company is erecting a small mill to treat its high-grade mine product and concentrates, similar to the installation at the Nipissing. The differences are that the tube mill is larger, 5½x22 ft.; the agitation will be performed in tanks of the Parral type; a concentrator with a copper top will be installed over which the pulp will be passed after amalgamation in order to recover any floured quicksilver, and filtration will be performed in a large Perrin plate-and-frame filter press having a capacity of about 20 tons of dry solids. Refining will be performed as at the Nipissing, in a reverberatory furnace, which by courtesy of H. G. S. Anderson, superintendent of the Buffalo mill, I am able to present in detail in the accompanying drawing. The system seems to be well adapted for this class of work and it is not impossible that its use might be profitably extended to other cyaniding installations.

MATERIAL FOR REFINING FURNACE AT BUFFALO MINES, LTD.

Material	Dimensions	Quantity
Red brick . . .	. . . .	4000
Fire brick	4½x9x2½ in.	1200
Firebrick.	4½ and 4x9x3	375
Firebrick "A". . . .	4½ and 5¼x9x2½	14
Firebrick "AA". .	4½ and 5¼x9x2½ 3½	1
Firebrick "B"	2½ and 3½x9x4½	12
Firebrick "C". . . .		26
Firebrick "CC".		2
Firebrick "D". . .		28
Firebrick "DD".		2
Firebrick "E". . . .		2
Firebrick "EE". .		2
I-beams	3 in.x5 ft. 6 in.	6
I-beams.	4 in.x6 ft. 6 in.	12
Angle iron.	3 in.x3 in.x8 ft. 6 in.	2
Angle iron.	3 in.x3 in.x6 ft. 3 in.	2
Rods	¾ in.x8 ft.	8
Rods	¾ in.x10 ft. 3 in.	4
Plates	¾ in.x4 in.x6 in.	12
Oil burners, "Monarch"		2
Fire clay, cu.ft. .		10
Sheet iron (pan) .	3 ft. 8 in.x5 ft. 11½ in.x 14 in. high	. .

Cyaniding Details Not Yet Settled

The details of cyanidation of the Cobalt ores have not yet been definitely settled and the metallurgy is in a state of evolution such that little is really known. There have been few points definitely settled and I expect to see most of the mills make radical changes before settling down to routine work. Many methods are in use which do not seem altogether suited to the conditions and it is likely that these will be gradually changed as some systems prove their superiority. Results obtained in extraction are not yet reliable, as most of them are based on estimates, and the same is true of costs, which are so varied and indefinite as to be not suitable for comparison. There are many skillful metallurgists at work in the district who may be relied upon to work out the processes in time and I have no doubt that the district will reach a state of settled and satisfactory cyanidation after time has been given to allow the problems, which are many and difficult, to be worked out.

TYPICAL ANALYSES OF COBALT ORES OF DIFFERENT GRADES

	A	B	C
SiO_2	4.51	2.88	
Fe	2.34	2.80	7.00
CaO	9.05	10.00	3.00
Al_2O_3	1.42	0.87	15.00
MgO	6.22	7.13	
Ni. .	6.62	8.78	
Co.	7.11	8.42	
As	29.88	34.48	0.50
Ag. (oz. per ton). . .	4786.1	2014.00	71.27

Oil Switch for Small Plants

The smallest oil switch manufactured by the General Electric Co. for switchboard mounting was developed particularly for use in isolated and small plants and will provide adequate protection on alternating-current circuits up to 200 amp. and 3300 volts. The general characteristics of the switch, known as type *F*, form *K* 13, are similar to the larger and more expensive switches for switchboard mounting made by this company.

The entire mechanism and oil tank, except operating handle on front of board, are suspended from a single frame. The oil vessel is of heavy sheet metal lined with an insulating material and provided with barriers between poles. The contacts provide two breaks in each phase and open by gravity. They are of the well known sliding wedge construction, which not only gives a wiping motion to the contacts on opening and closing, thus keeping them clean, but also protects the actual current-carrying surfaces from damage in breaking the arc.

It is reported (*Chem. Trade Journ.*, Oct. 12, 1912), that the Chairman of the Parliamentary inquiry into the question of lead poisoning, speaking at Lancaster, Eng., on Oct. 6, said that the committee would report in favor of the total prohibition of lead in paint.

The Iron Ratio for Converter Cost Comparisons

By David H. Browne*

In order to compare the cost of converting copper matte at one plant with the cost of the same operation at another, we have to consider the relative amounts of work done in order to produce blister copper from the grade of matte supplied to the converters. Direct comparison of matte grade is misleading. A converter working on 40% matte performs less than half the work per ton of copper done by a converter working on a 20% matte. Direct comparison by the percentage of iron removed is also erroneous. But direct comparison of the ratios of copper to iron and sulphur in both mattes is accurate and fair to both plants.

These ratios are easily calculated. We must prepare first, a table showing the percentage of copper to sulphur and iron in pure copper mattes and from this prepare a table of ratios.

From Tennessee matte as an illustration, the accompanying table may be constructed.

IRON-SULPHUR-COPPER RATIOS IN MATTE

Cu %	Fe %	S %	Fe : Cu	S : Cu	Fe+S:Cu
10	56	25	5.60	2.5	8.10
15	52	25	3.45	1.67	5.12
20	48	25	2.4	1.25	3.65
25	44	25	1.76	1.00	2.76
30	40	25	1.33	0.83	2.16
35	36	25	1.03	0.71	1.74
40	32	25	0.80	0.62	1.42
45	28	25	0.62	0.55	1.17
50	23	25	0.46	0.50	0.96

The sulphur in these mattes varies very slightly. The 10% matte has about 26%, the 50% matte has about 24%. If we call the average sulphur 25% as is done above, we will be near enough for all purposes. But while the percentage of sulphur varies very little, the ratio of sulphur to copper varies greatly, as shown by the table. The added ratios of Fe and S to Cu show the relative total amounts removed per unit of copper.

This shows that for example, on 20% matte we have 3.65 tons of Fe and S to remove per ton of Cu, while on a 40% matte we have only 1.42 tons to remove. Therefore the comparison of work is obtained by dividing 3.65 by 1.42, which gives 2.57. The plant working on 20% matte is doing 2.57 times as much work per ton of copper as the plant working on a 40% matte.

Now in copper converting, certain factors such as air are a function of iron plus sulphur. Other factors, as flux, silica, etc. are functions of iron alone. Suppose the 20% plant pays $1 for air per ton of blister copper, while the 40% plant pays 50c. The ratio figures given above show that to make the costs the same in both cases, the plant working on a 20% matte would have to get its air for 1/2.57 the price paid by the plant using 40% matte, which is 50/2.57 = 19½ cents.

But on the other hand we may wish to compare the work and not the cost. Then admitting that the superintendent of the plant working on a 40% matte is doing good work in converting at a cost of 50c. for air per ton of blister copper, it follows that the superintendent of the plant working on a 20% matte would be doing equally good work if he paid 50 × 2.57 = $1.28 for his air. But he pays only $1. Therefore he is really doing better work in regard to his air costs than the other man.

We can thus work out from the complete ratios as found by analysis or calculation just what factor to use in multiplying figures of costs, or flux weights, in order to compare the work done at various smelteries, or at various times in the same smeltery. Comparisons at best are odious, but at the worst they should be fair.

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*Metallurgist, Canadian Copper Co., Copper Cliff, Ont.

South African 1911 Mineral Output

The mineral output of the Union of South Africa for 1911 was: Gold, 8,251,240 fine oz.; diamonds, 4,891,999 carats; coal, 7,594,944 tons; copper concentrates and matte (47.46% Cu), 23,098 tons; tin concentrates (67.26% Sn), 3534; lime, 79,389 tons; silver, 896,538 oz.; salt, 40,498 tons; asbestos, 1266; flint, 2395 tons. The value of no other single item, excluding certain ceramic products, exceeds £1500.

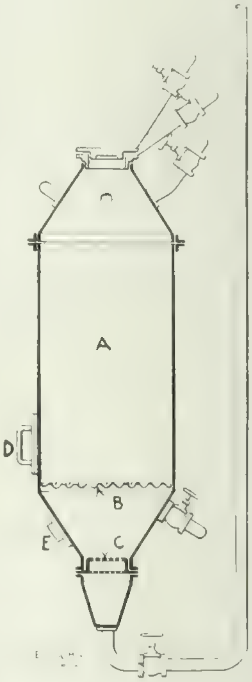
In December, 1911, there were 10,383 stamps and 259 tube mills at work in the Transvaal, as against 9800 and 197 for December, 1910. The Transvaal produced 8,249,461 oz. of the total gold output, milling 24,918,648 tons of ore. The Rand produced 7,910,034 oz. of this gold.

The silver was all produced either from gold bullion, or from base-metal ores. Of the diamonds, 4,758,307 carats came from mining, and 133,691 from alluvial washing. The Messina Development Co. remains the only copper producer of importance in the Transvaal, concentrating 16,475 tons of ore into 1856 tons assaying 50.45% Cu. The Cape Copper Co. and Namaqua Copper Co. in Cape Colony are the largest producers of copper, smelting 136,335 tons of ore producing 17,760 tons of 50.21% matte, and also producing 1058 tons of 30% picked ore and 37 tons of 79% precipitates.

Gadomsky's Copper Leaching Process

A process for leaching copper from slags or from calcined ores has been patented by Antony Gadomsky, of Tiflis, Russia. (U. S. pat. 1,014,868.) The apparatus consists of an upright square sheet-iron prism *A*, divided into three parts by a grate, *B*, and a filter, *C*. The material to be treated is crushed to about 1 mm. and introduced into *A* through the top, and after closing the apparatus equal parts of a 4% solution of ammonium carbonate, and a 4% ammonia solution are introduced. The combined weight of these solutions is about one-quarter the weight of the material to be treated.

A vacuum is then produced under the filter *C*, which draws the finest material with the solution through the grate *B*. These fines are stopped by the filter. If the solution which passes the filter is strong enough, it is then distilled. If too weak, it is run over the ore again. Air is admitted to the upper part of the cylinder during the filtering, in order to oxidize any unoxidized copper. When the solution is distilled, the ammonia and carbon-dioxide are caught and condensed, while a pasty mass of copper oxide is left in the still, which is then smelted in a blast furnace. The treated coarse and fines are removed through the cleaning doors, *D* and *E*.



Gadomsky's Leaching Apparatus

The exports of petroleum from Baku for the first half of 1912 are given by the *Petroleum Review*, Sept. 7, 1912, at 3,048,083 metric tons as against 3,040,800 metric tons exported during the corresponding period of 1911.

The Ore Deposits of Goldfield—II

By Augustus Locke*

The lode possesses a number of curious curves in the Goldfield district. Pre-mineral faulting in the plane of the lode is obvious and the ore is localized in fault fractures which constitute mineralizing channels. The relatively small sheet-like orebodies are scattered. The ore is not free milling.

The Mohawk, the Red Top, and the Combination properties, of the Goldfield district, possess along their strikes some remarkable curves. These have strengthened the general suggestion of discontinuity of ore in the quartz; for when the miner, in drifting, has come to such a curve, he has been likely to run on into the soft rock, especially if the boundaries of the quartz are ill-defined, and he has been likely to conclude that he has reached the end of the lode.

THE MOHAWK CURVE

The most important of the curves (most important, because, together with its limbs, it has yielded three-quarters of the output of the district) is that which exists in the Mohawk. The simplest conception of this curve is as a wrinkle or anticline (though it is not properly either) the axis of which pitches 30° or so easterly; the south limb strikes northeast and dips 30°, and the north limb strikes nearly west and stands nearly vertical. The north limb extends for a strike distance of about 250 ft. and then joins a portion of the lode having the normal 30° dip and the same strike as the south limb. The curve is possessed not only by the lode, but by the dacite-latite contact, even in the upper levels where this contact is far in the foot wall.

The curve is plainly visible between the 350- and 750-ft. levels. On the 900-ft. level there are strong traces of it, but because of the meagerness of the exploration, the data are inconclusive, and on the levels below they are even more so. The complication of the lode structure obscures the curve in the upper levels.

The situation, then, is this: On the Mohawk levels, between the depths of 750 and 350 ft., the lode is known to curve sharply around from northeast to northwest, and then, in 200 or 300 ft. to turn back again toward the east. The northeast-striking parts dip flat; the northwest-striking part is steep or vertical. And the dacite-latite contact duplicates the curves of the lode.

No one can study the situation carefully without being puzzled by the Mohawk curve. It is actually difficult at first to realize that the parts of the lode on the opposite sides of the curve are continuous. Exploration, for example, on the 600-ft. level revealed a steep "vein" carrying ore, lying not far north from the flat "vein" and striking at about right angles with it. Orebodies were exploited in both at the same time. Miners looked on the steep "vein" as possibly a spur of the other, but certainly a most inexplicable one.

The steep "vein," it should be said, has a dacite north wall and a latite south wall for a considerable distance below the 600-ft. level, perhaps for as much as 100 ft. The presence of vertical dacite-latite contacts in Goldfield is good evidence of faulting. And surely enough, throughout the whole known extent of the vertical "vein," there exist strong vertical gouges, accompanying and paralleling it; beyond the ends of the "vein," on line with it but out in the country rock, there are additional strong vertical gouges. Altogether, the coincidence of the curve with a fault is sufficiently well established.

FAULTING CHIEFLY PRE-MINERAL

That the fault preceded silicification and ore mineralization is proved by the fact that ore and quartz occur along it, but the gouges next to the lode sometimes carry rolled pebbles of quartz, and the lode quartz itself is much brecciated. Evidently there was some movement later than the lode mineralization. The amount of this movement, however, was small; for at the junctions of the steep "vein" with the flat "vein," the lode is not noticeably dislocated.

The faulting, then, was chiefly pre-mineral. Evidently, it displaced the channel of mineralization which, as we shall see later, was itself a fault, dipping flatly to the east. The ascending mineralizers came up not only on the original channel, but also on the cross fault which joined its dislocated ends.

The direction and magnitude of the faulting were such that the country to the north of the fault was apparently either depressed a distance of about 150 ft. or moved westward a distance of about 250 ft. The actual direction of movement is not known.

The curve in the Combination is less striking than that in the Mohawk because

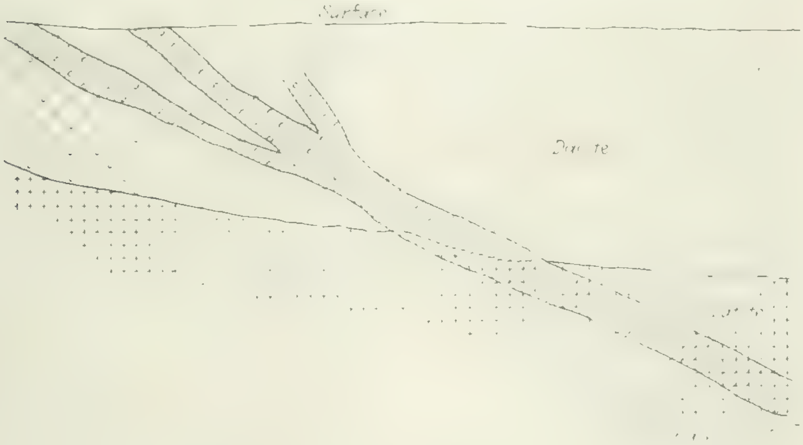


FIG. 1. DIAGRAMATIC VERTICAL SECTION, SHOWING LODE ON LINE OF MOHAWK, CLERMONT AND GRIZZLY BEAR SHAFTS

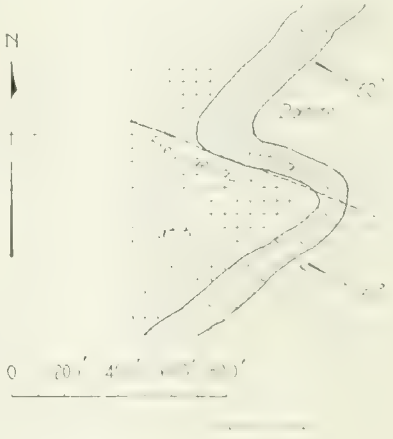


FIG. 2. DIAGRAMATIC PLAN OF LODE CURVE ON MOHAWK 600-FT. LEVEL

Note—The work on which this article is founded was done under the direction of Henry Lloyd Smith, professor of mining and metallurgy, Harvard University, and while Mr. Locke was a holder of a Sheldon fellowship from Harvard University.

*Mining geologist, Apartado 34, El Oro, Mexico.

in its vicinity the lode is complex and because the curve therefore is recognizable less in the shape of the lode than in the shape of the dacite-latite contact.

The curve is best seen on the bottom, the 380-ft. level. It is noteworthy that the conditions existing in the Mohawk are here almost duplicated, the main portion of the lode strikes northwest and dips flatly northeast, and the portion of the lode immediately beyond the curve strikes southwest and is vertical.

The vertical dacite-latite contact here again creates a strong presumption that faulting has taken place. And the presumption is supported by stronger auxiliary evidence than is the case in the Mohawk; for the region of the supposed fault shows a zone of exceptionally strong gouges and breccias. On the strike of this zone, there occurs a similar vertical dacite-latite contact in the Clermont shaft, 1600 ft. distant, while the vertical plane connecting the fault in the Combination with the Clermont shaft intersects, in the mine workings, abundant evidences of movement.

The considerations concerning the direction and magnitude of the movement on the Mohawk curve apply here also.

THE JANUARY CURVE

The lode in the January stands steep and, on the whole, is well defined. The curve which it describes for nearly 180° with a radius of not much over 100 ft., is one of the most astonishing details of the Goldfield geology.

The exploration on the dacite-latite contact in this vicinity is meager; no proof has been found of the existence of any faults whose presence would explain the curve. Moreover, it is difficult to see how such a half ring of quartz could be directed by faulting.

Ransome[1] believes that the January follows, not a number of intersecting fissures, but a curved line of continuous fissures, and though it is a fact that fissures tangent to the main curve come in from the walls, Ransome's conclusion is altogether the most satisfactory one. The January is probably localized by curved cracks. What caused them to be curved, and, above all, what caused them to be curved in their extraordinary semicircle, we do not know. They are excellent examples of the eccentricity in detail of the Goldfield lode structure. The Florence probably possesses a curve which is convex eastward.

The quartz, after it comes down to the dacite-latite contact, follows it for considerable distances, both on strike and dip. This fact is best illustrated on the 600-ft. level of the Mohawk, where the hanging wall of the lode is dacite and the foot wall is latite for a strike distance of several hundred feet and for a dip distance of perhaps as much as 200 ft. Not far above the 600-ft. level, both walls are dacite; 50 ft. above the 750-ft. level, both walls are latite. Another, but less perfect illustration is afforded by the lower levels of the Combination.

These conditions suggest that the contact was for a certain distance the localizer of the silicification. But there are some serious difficulties attending the acceptance of this hypothesis. In the first place, if the contact was the localizer of the quartz, then it would seem to be in general a good place to prospect. But prospecting here has been fruitless; the contact is often entirely barren of quartz.

Again, the Mohawk quartz (the east-dipping body, not the spurs which depart upward from it) has a straight dip from the upper levels down to the bottom of the mine, the 1200-ft. level. In its descent, it disregards and is undeflected by the rock contact. On the other hand, the contact looks much as though it were itself deflected by the lode; for both above and below the lode the contact is flatter than it is at the place where it coincides with the lode. On the Combination, the situation is similar.

The hypothesis demanded by these conditions is one of lode-faulting. Now, that there has been post-lode movement in the plane of the lode is obvious. The quartz is filled with fissures, fissures not of entirely irregular tendencies, but having a general parallelism with the lode walls, and constituting so definite a feature that when the boundaries of the quartz are vague, they frequently reveal its real trend. Further evidence of post-lode movements is yielded by breccias almost everywhere characteristic of the lode, and consisting of hard quartz units in a matrix which is chiefly pulverized quartz, alunite, and kaolin.

The evidences of pre-lode movement are harder to see, but no less convincing. The fact that the rock contact follows the lode for a certain distance and steepens when it does so, suggests that the contact was faulted by the lode. And again, the very existence of a lode with a straight dip, traversing at an acute angle and ignoring a contact between successive flows of volcanic rocks, and persisting for a dip distance of at least 2000 ft., is presumptive evidence of previous faulting.

MAGNITUDE OF LODE-FAULTING UNCERTAIN

The only measure which we have of the lode-faulting is its displacement of the dacite-latite contact. In the Combination, this is determined to be about 300 ft., as measured on the dip. (The points at which the contact steepens and flattens are known only approximately.) In the Mohawk, my only positive knowledge concerning the amount of the displacement is that it is between 40 and 200 ft. as measured along the dip.

I have not been able to prove that the vertical or steep quartz bodies follow faults of any considerable magnitude. These bodies, it will be noted, do not pass down through the dacite-latite contact. Until exploration is carried on below them in the contact locality, the question of their throw must remain unanswered.

Ransome maps what he terms the "Columbia Mountain Fault" some distance north of the producing locality but situated on the prolongation of its strike. The fault strikes northerly and dips easterly 20° to 55°. Ransome concludes that its displacement may be as great as 1000 ft.; that the greater part of its movement occurred before the dacite and after the latite had consolidated; that a minor portion of it occurred after the dacite had consolidated, and that this portion was probably the movement which localized the lode quartz.

It is difficult to avoid the conclusion that the lode movements are a southward prolongation of the Columbia Mountain fault movements. But I cannot see any convincing proof that a part of the Columbia Mountain fault movements took place before the consolidation of the dacite. The smallness of the observed displacements in the dacite constitutes no such proof; for it would be expected that in a rock so exceedingly decomposed as the dacite, the movement would be diffused rather than concentrated; that, therefore, no large displacement would be visible in any one place.

THE LOCALIZATION OF THE LODE FAULT

A fault of such flatness and persistence as that which localized the lode in the Mohawk must be regarded as extraordinary. Persistent, flat fissures are known elsewhere, but they either occur in brittle rocks, as at Grass Valley, or they coincide with some structural feature, such as a rock contact. But in Goldfield, the bulk of the rock is soft; the lode ignores the rock contacts, and there is no easily visible structural feature with which it can be connected.

The quartz, as has been before stated, is not "open space" material, but material produced by the alteration of rock. And it possesses peculiarities which denote its lineage; silicified dacite is usually distinguishable from silicified latite. Above the dacite-latite contact, the lode material is universally silicified dacite. Below this contact, the lode, though chiefly silicified latite, has a narrow portion of superior hardness and richness which is not latite.

For some time I was inclined to believe that this portion was a greatly altered dacite dike. It has a width of one-half to 20 ft.; it has the dark color and flinty character of the typical dacite quartz; occasionally it carries phenocrysts of quartz and always it is easily distinguishable from the softer silicified latite which constitutes its walls.

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[1] U. S. Geological Survey, Professional Paper No. 66, "Geology of Ore Deposits."

But although to the unaided eye, it appears to resemble dacite, under the microscope it shows no characteristics which would tend to identify it as such excepting the possession of the quartz phenocrysts. Moreover, it is exceedingly decomposed and silicified, it contains many small fragments of shale and granite, and it frequently has a marked fragmental structure.

There exists, then, in the interior portion of the lode, where the lode lies in latite, a narrow dike-like or vein-like body of quartz, derived by silification from a rock whose characters are observed by alteration, but which looks fragmental. It must be confessed that the evidence contained within this body of quartz is difficult to interpret. But in the latite outside the lode, there are occurrences of similar material whose characteristics are much plainer, and these furnish the key to the riddle.

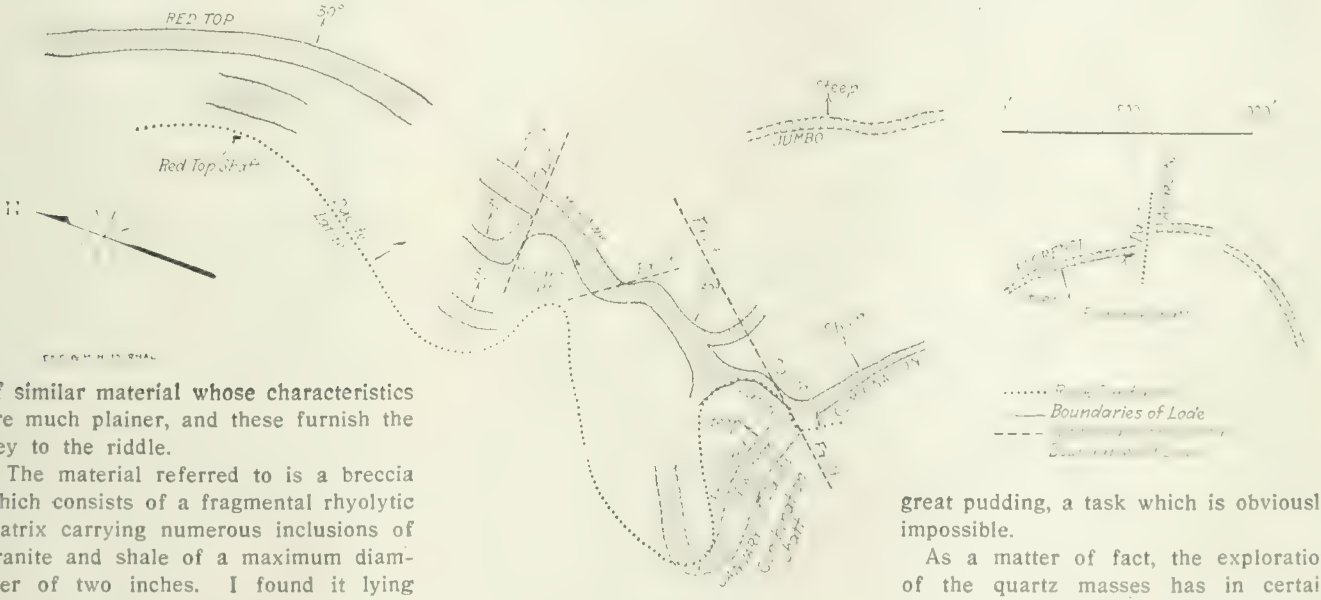


FIG. 3. PLAN OF GOLDFIELD LODE AT DEPTH OF 350 FEET

The material referred to is a breccia which consists of a fragmental rhyolytic matrix carrying numerous inclusions of granite and shale of a maximum diameter of two inches. I found it lying in several tabular bodies not over two feet wide which are apparently limited in extent and detached, yet they usually strike and dip parallel with the lode.

The material is plainly pyroclastic. Being pyroclastic, its existence means that the latite was deposited in successive flows, intercalated with rhyolitic ash. Once it is realized that the latite has a bedding parallel with the lode, it is hard to escape the conclusion that it was this bedding which localized the lode faulting.

The puzzling interior portion of the lode is then a pyroclastic bed. This does not mean that the lode everywhere in latite coincides with a pyroclastic bed; it is known so to coincide only for a distance of about 500 ft. on the dip and of about 500 ft. on the strike. Perhaps, beyond the present exploration, the bed is non-persistent, or perhaps the lode actually leaves it. A not inconceivable situation would be that in which the lode would jump from one bed to its parallel, and not far distant, neighbor.

UPPER PORTION OF LODE COMPLEX

I have sought pyroclastic beds in dacite but have not succeeded in finding them. How then was the lode faulting localized here? I look upon the lode faulting in the dacite as the upward projection of the movement, directed by the latite structure. The lode is more complex in its upper or dacite portion than in its lower or latite portion. It appears that in the latite the fracturing was simple because of the presence of the latite structure, and that in the dacite it was complex because of the absence of any such structure. This does not prevent the acceptance of the hypothesis that the fracturing in dacite owes part of its superior complexity to the superior lightness of the load under which it occurred.

We have in Goldfield a copy with blurred outlines and on a reduced scale, of the Comstock. In it, the east-dipping lode fault corresponds to the great footwall Comstock fault, and the steep, upspringing branches to the hanging-wall branches of the Comstock. That the Goldfield lode exceeds the Comstock in irregularity of outline is perhaps due to the smallness of the lode-fault movement, to the softness of the rocks in the area of solfataric decomposition, or again, to the absence of "open-space" quartz and to the original absence of well defined and extensive spaces for the circulation of silicifying mineralizers. (These conditions could of course be inter-related.) It will be recollected that the Comstock has brittle rocks, "open-space" quartz in enormous quantity, and a lode-fault displacement of several thousand feet.

ORE DISTRIBUTION NOT ENTIRELY ERRATIC

The old simile of plums in a pudding illustrates fairly well the distribution of the orebodies within the quartz masses. It applies as accurately to Goldfield as it does, for example, to the Comstock. But we shall widely miss the truth if we conclude that the distribution is entirely erratic, that exploratory work beyond the end of an orebody finds one part of the lode as inviting as another. In the latter part of 1910, the aggregate lode areas revealed in all the levels of the Goldfield Consolidated amounted to about one and one-half million square feet. Of this slightly over 6% was occupied by ore. Now, if the discovery of one orebody gave no clue to the position of its undiscovered neighbor, the task of finding the plums would involve the eating of the whole great pudding, a task which is obviously impossible.

As a matter of fact, the exploration of the quartz masses has in certain cases been almost ideally simple. The exploration of the Jumbo, for instance, was a matter of sinking on ore and drifting on fractures. In certain other cases, a large amount of drifting and crosscutting in barren material has been necessary. Thus, the Mohawk quartz in the upper levels possesses several spurs whose connection with each other is even now not completely traced; the orebodies which inhabit them were at first well hidden.

But even in the Mohawk, the isolation of one orebody from another is more apparent than real. The stopes from which the bulk of the Mohawk and Clermont production has come occur in succession from the 250 to the 1000-ft. level (the distance along the dip of the ore is about 1500 ft.) and are so situated that a straight line can be carried through them. At present, these stopes have the appearance of lying in several discrete orebodies. Had the miner been content to exploit them with less impatience, working gradually from the top downward, he would in all probability have found them continuous.

The haphazard suggestion in the distribution of the orebodies is exaggerated by the frequent fickleness of the gold content. A drift penetrating an orebody may give little indication of the quality of its ore. Important stopes grow from most unpromising indications and, on the other hand, promising indications lead to nothing. Ore cannot be accurately estimated until it has been broken. Because of these conditions considerable time is required to prove the connection between the several parts of a single orebody, and meanwhile the several parts may look like erratically arranged individuals.

OREBODIES RELATIVELY SMALL

The orebodies of Goldfield are smaller than those of the Comstock; they have no such extent along the strike as is possessed by the orebodies of the Mother Lode in California, or even by some of those in Cripple Creek. The least extensive are excellently described by Ransome as follows: "Small, irregular, isolated bunches of ore, often of high grade, are rather characteristic of the district."

DIMENSIONS OF PRINCIPAL OREBODIES IN GOLDFIELD DISTRICT

Name	Situation	Maximum length on strike. Ft	Maximum length on dip. Ft.	Thickness Ft.
Hampton	Combination mine N. from shaft	100	250	10–60
	Combination mine immediately S.E. from shaft	300	230	5–40
701	Clermont mine 750 foot level	150	200	20
	Combination mine N.E. from shaft	100	180	5–20
	Jumbo	500	200	1–20

The largest are typified by the orebody on the 750-ft. level of the Clermont which has a strike length of 300 or 400 ft., a dip length of at least 200, and a thickness from wall to wall of 20 ft. The small ore bunches described above have played but a small part in the history of Goldfield. The bulk, even of the richest ore, has come from the larger bodies. A most important peculiarity of Goldfield has been the occurrence of rich ore, $30 to $100 per ton, in bodies of considerable size. This peculiarity has had much to do with the sudden growth and maturity of the Goldfield mining industry; for it has promoted rapid extraction.

OREBODIES POSSESS SHEET-LIKE TENDENCIES

The following is from Ransome: "In general, the pay shoots are fully as irregular as the ledges with which they are associated. Some of them are roughly equi-dimensional masses, others are lenticular; some are approximately spindle shaped with the large axis nearly vertical, and still others are tabular or plate-like, although such sheets are often curiously twisted or warped. The striking feature of the orebodies as a whole is the absence of, rather than any approximation to, any regularity of form."

I regard the above as a most vivid description of the conditions of irregularity which exist in certain of the orebodies. Yet I am convinced that, in general, it fails to fit the conditions revealed by the more perfect outlining of the orebodies through recent stoping. The larger orebodies are now known to have usually two dimensions, and always one, parallel with the longer dimensions of the quartz bodies in which they lie. In other words, they are extended along the strike and dip of these quartz bodies, and possess sheet-like tendencies.

The most marked sheet-like tendencies are visible in the Jumbo, in the January, in the Red Top, in the portions of the Mohawk which are below the 600-ft. level, and in one or two of the Combination orebodies. The Jumbo stopes look like those of any locality of narrow, well defined veins.

There are a few stopes in Goldfield in which one wall, usually the hanging, is a gouge seam. But visible, well defined walls of this sort, or, indeed of any sort, are rare. The boundaries of the ore are crooked. The miner can seldom count on stopping his work along a given line; bunches of ore protrude out into the wall. Again, the boundaries are not visible. Only diligent sampling can prevent waste from being broken with ore. It is easy to shoot down 10 ft. of $21 material instead of five feet of $40 material.

But that the boundaries are invisible does not mean that they are vague. One of the finest orebodies in the district was barely missed by an exploratory crosscut which passed it at a distance of four feet without detecting the faintest scent of it. The change from high grade to low grade is remarkably sudden; there is no general gradation between ore and waste; and considerable bodies of intermediate tenor ($5 to $10) do not exist.

FEEDERS EVIDENT WITHIN THE LODE

Frequently, there occurs within the orebody a seam, one to six inches wide, of high-grade sulphides. The immediately adjacent ore may carry less than an ounce of gold to the ton. Often such a seam occupies the medial portion of the orebody, and parallels it on dip and strike. Sometimes, it hugs one of the walls. Always, it coincides with a fracture or with a group of fractures which have more continuity than the fractures inhabiting the lower-grade material, and on the whole, it is more tabular than this material.

Now the somewhat vaguely tabular orebody with the more perfectly tabular rich seam in its interior is the situation which would result from the original advent of the ore mineralizers through the seam and their permeation of its walls by metasomatism or through restricted openings. In certain cases, there may have been a subsequent enrichment along cracks within orebodies. On the whole, however, I am inclined to regard the rich interior seams as ore feeders.

The persistence of the rich portions of the seams is not much greater than that of the orebodies themselves. Yet in quartz outside the orebodies (where the quartz is a derivative of dacite) what appears to be the extension of the feeders is traceable for long distances as barren or low-grade, and usually mineralized, cracks. In the Combination mine, for example, the orebody immediately southeast from the shaft is not known to exist below the depth of 230 ft; but on the 280-ft. level immediately below it, and extending in the direction of its strike, a well defined vertical crack, or sheeted zone of parallel cracks, one to four feet wide, is known for a distance of several hundred feet. The crack or cracks are abundantly mineralized with alunite and pyrite. Often they include breccia whose interstitial spaces are filled with secondary minerals, or they contain bodies of secondary minerals, having diameters as great as a foot. Gold occurs only in spots. On the 380-ft. level the mineralized crack or cracks exist with diminished persistence.

These cracks "feed" up directly into the orebody above. Moreover, they serve to form a direct connection along the strike between the orebody just mentioned and one situated several hundred feet further to the southeast. I do not know that there is any absolute proof in this case that the cracks are older than the orebodies, but their distribution inclines me strongly toward this conclusion.

FEEDER WALLS BARREN

An excellent example of the simple medial feeder is afforded by the Combination orebody which extends from the depth of 230 ft. to the depth of 300 ft. on a dip of 20° to 30°. Here the feeder portion was exceedingly rich, excellently defined, and had a width of several inches; it contained much tough gouge and, though possessing many fragments of quartz, it consisted for the most part of material in a much finer state of division than that of the lower-grade ore. On the 230 and 280-ft. levels the feeder issues from the orebody as a gouge-bearing and pyritiferous seam. To the south, on the lower level, it soon enters latite, and within 100 ft. it is lost. To the north, it joins and is deflected by the strong vertical gouge which constitutes the northeast wall of the main Combination quartz body. As it comes up to the 230-ft. level it steepens until it is approximately vertical, and, as a steep seam, it is traced north for 200 ft. until it mingles with steep cross seams associated with the faulting referred to in the discussion of the Combination curve. South of the orebody it is traced for 400 ft., part of the distance in soft rock.

In its extensions beyond the orebody, the seam carries gold for but short distances, and is distinguishable by a usually well defined gouge. On the 180-ft. and 130-ft. levels it has much the same characteristics as on the 230. The deepest of the ore feeders, and the one which has most certainly been the path of primary ore mineralization, is that on the 1000-ft. level of the Clermont. This is known for a strike distance of about 500 ft. and it has a rich orebody on its southwest end, and a lower grade "base" orebody about 100 ft. from its northeast end.

As has been explained in the description of the lode, the hard quartz of this locality is a silicified pyroclastic bed, lying within a vaguely defined body of rather soft silicified latite. The hard quartz and the feeder coincide. The feeder is excellently shown at the depth of 925 ft. Here its width is one-half to one foot, its dip is 25° easterly, and its black color and flinty hardness distinguish it sharply from the softer and whiter latite-quartz which constitutes its walls. Altogether, it has a strikingly dike-like appearance. But the distinction between feeder and walls in appearance is no more striking than the distinction in value; for while the feeder carries several ounces to the ton, the walls are conspicuously barren.

From the lower levels, the feeder extends upward into the great orebody of the 750-ft. level. I am convinced that from here it rises into the orebodies of the 600-ft. level (though the connection has not been proved) and thence, finally, to the orebodies above.

Feeders Guide Exploration

To trace a feeder requires, as a rule, a great deal of skill. In latite quartz, feeders are usually ill-defined or discontinuous; in dacite quartz, they are often exceedingly complicated, merging with fissures, and weakening or quitting where the quartz softens or where it becomes brecciated. Sometimes to find the feeder is more difficult than to find the orebody. There have been several places, however, where feeders have led the way directly to discoveries, and I believe that with careful study, they could be made to constitute useful guides for exploration.

The richer ore frequently contains pebbles of silicified rock, surrounded by envelopes of ore minerals and quartz. (See Figs. 4 and 5.) The rounded shapes of the ore pebbles have several possibilities of origin: (1) They are waterworn, or (2) they have undergone fault-attrition, or (3) corrosion. The feeder on the 1000-ft. level of the Clermont has excellent pebbles and, as it dips flatly and coincides, as we have seen, with a pyroclastic bed, the suggestion is strong that they may be waterworn. Similar pebbles occur, however, on the upper levels in vertical or steep orebodies, where the chance that they could be waterworn is exceedingly small. For the first possibility, then, there is no convincing argument.

Fig. 4

Fig. 5

Fig. 4 Rich-ore pebble From interior outwards: (1) Altered latite; (2) crust of sulphides (pyrite, bismithinite, famatinite and pyrite) with visible gold; (3) crust of chalky material (silica and alunite) banded.

Fig. 5. Pebble breccia (low-grade ore), Mohawk 450-ft. level. Pebbles are altered dacite (chiefly quartz with subordinate, alunite and pyrite), each pebble being partly surrounded by an envelope of quartz: immediately inside the quartz is a band resembling rhyolite flow, proving the occurrence of some alteration since time of brecciation. Matrix is fine-grained alunite and quartz with a few sulphides. Dots represent black sulphides.

But the feeder of the 1000-ft. level coincides not only with a pyroclastic bed but also with a plane of some movement. The pebbles are conceivably attrition products, and it is entirely certain that the shapes of some of them, such as those shown in Fig. 4 for example, have resulted largely from movement. We may be sure, too, that a certain rounding off or corrosion of corners has taken place since the time of the movement. The low-grade ore (see Fig. 5) shows the beginning of this corrosion. The high-grade ore shows it at its completion. And it is a noteworthy fact that perfect ore pebbles are by far the most common in high-grade ore where mineralization and, therefore, corrosive action was probably most intense.

Post-ore Faults Difficult to Detect

The conditions are such in Goldfield that post-ore displacements are difficult to detect. Where the ore has crooked boundaries, for example, and where the rock outside the quartz is soft and full of curved gouges, there exists no feature by which such displacement can be marked or measured. In those places, however, where a displacement of the ore would be plainly visible, as where there is a well defined feeder or wall, the only considerable known movement is that in the Florence, where Ransome states that the Engineers' orebody is probably displaced from another orebody a distance of 50 ft. The largest post-ore fault which I have seen exists on the 250-ft. level of the Mohawk, and amounts to 10 ft. It is a notable fact that the faults to which the Mohawk and Combination curves are due pass through ore without displacing it and are themselves ore-bearing. Altogether, the evidence favors the conclusion that post-ore movement has been small.

The lease workings of the mines now owned by the Goldfield Consolidated were chiefly within 250 ft. of the surface and their average yield was slightly over $86 per ton. This is no index, however, of the average richness of the ores of the upper 250 ft.; for the leasers left behind much material of lower grade. Up to March 1, 1911, the ore extracted from above the depth of 600 ft. in the properties of the Goldfield Consolidated, both before and after consolidation, constituted four-fifths of the total production, and yielded $44 per ton. That extracted from below the depth of 600 ft. constituted one-fifth of the total production and yielded $80 per ton.

It is of course likely that $80 is a much higher grade than that which these lower levels will produce in the future. But it must be concluded that there is at present no indication of a general lessening of grade with depth.

Ore Not Free Milling

The gold amalgamates poorly and battery-plates are not used in milling. The richer ores contain a small percentage (in certain cases as high as 2%) of tellurium, but while visible gold in these ores is common, visible tellurides are uncommon. Oxidation does not render the gold free milling. The refractoriness of the gold may be due to its extremely fine state of division.

The concentrates of the unoxidized ore are chiefly native gold, pyrite, bismuthinite (Bi_2S_3), and famatinite ($Cu_3[Sb,As]S_4$). There are occasional small bodies of "base" ore, containing several per cent. of copper and zinc. There is no indication of any considerable increase of "baseness" with increase in depth, excepting, of course, that the sulphide ores are more "base" than the oxidized ores. The lower limit of oxidation is at an average distance of 150 ft. below the surface. The silver content is insignificant. The ore, except when exceedingly rich, is not practicably sortable.

The characteristics of the orebodies which have chief importance in the determination of the mining methods are as follows: (1) The hanging wall is heavy. (2) Many of the orebodies have a dip so flat that ore will not run on it. (3) The ore is high grade. (4) The orebodies are moderate in size.

The heaviness of the hanging wall necessitates its support during stoping. The stopes are usually too wide for stulls, and the use of square sets, with subsequent filling, is almost universal. The flatness of many of the orebodies necessitates much shoveling of ore and the frequent use of foot-wall drifts. The richness of the ore necessitates careful and therefore costly, stoping. If the grade were low, the boundaries of the stopes would doubtless be much straighter; for in that case the diligent pursuit of protuberances of ore into the walls would be unprofitable.

The moderate size of the orebodies prevents the use of many labor-saving methods, such as mechanical haulage and the mechanical handling of ore in stopes. It is a suggestive fact that the Goldfield Consolidated company is producing less than 1000 tons of ore per day from seven shafts, while the Douglas Island mines are producing several times as much from four or five shafts.

OREBODY EXPANDS UPWARD

There are two known periods of fracturing, the first producing the fractures which localized the lode quartz, the second producing those which localized the ore within it. It seems that the movement of the second followed the same paths as the movement of the first, and was a renewal or continuation of it. The strains which induced the lode faulting, and of which the Columbia Mountain fault is the most clear cut manifestation, were effective over a period which comprehends the periods of solfataric alteration and of ore deposition.

The only useful generalization I can make concerning the reasons why the gold was precipitated where we now find it is derived from the fact that the ore locality expands upward. There is no known coincidence, for the example, between ore and cross fractures. And the fact that the ore locality expands upward forces me to the conclusion that superficial conditions, those of relatively low temperatures and pressures, were the conditions which caused the gold to deposit. This conclusion is most unsatisfactory to the miner; for he would not only have his orebodies prolonged downward, but he would also possess knowledge of some easily recognized sign, indicating definitely the whereabouts of ore.

We have seen that feeders extend beyond the limits of orebodies as seams carrying some gold, but often barren. There is no warrant, under the hypothesis of precipitation which we have been just now considering, for the belief that even the barren parts of the seam were not at one time the paths of ore mineralizers. And I can conceive of an opening not over a few feet long and perhaps now entirely devoid of gold, as having constituted the channel for the mineralization of the whole district. In other words, the absolute disappearance downward of a Goldfield orebody, or, eventually, of all the goldfield orebodies, is not to be regarded as an unsolvable mystery.

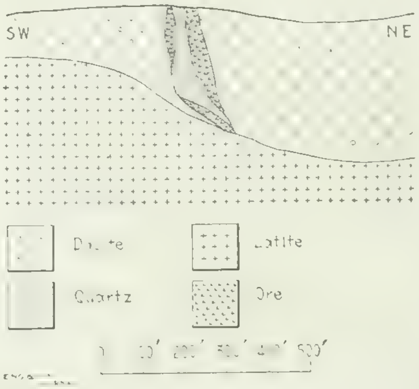


FIG. 6. GENERALIZED VERTICAL SECTION THROUGH THE COMBINATION

The classification of Goldfield as belonging to the group of gold-ore districts having relatively shallow precipitation brings up the large contrast between the new gold deposits and the old, those of Tertiary age, like Goldfield, Cripple Creek, and the Comstock, whose ore expands upward and is high grade, and those of pre-Tertiary age, like Douglas Island and the Mother Lode of California, whose ore occurs without any known dependence on depth, and is low grade. So far, there is little knowledge concerning the precipitation of gold which is of use in mining. Perhaps this large contrast, which was long ago noted, may, at some future time, serve as a basis for such knowledge.

The ore was everywhere localized by fractures which constituted channels for the passage of ore mineralizers. The only materials having sufficient brittleness to afford such channels are quartz and fresh rock. But fresh rock occurs but rarely in the Goldfield district, and the quartz, which in its fractured condition, Ransome vividly likens to a sponge, is the only possible ore container. But why, then, do certain quartz bodies, situated near the western edge of the area of alteration, monopolize the ore?

FRACTURES, THE THIRD INVARIABLE CONDITION OF ORE OCCURRENCE

I do not believe that these ore-containing quartz bodies differ essentially from the hundreds of barren ledges lying further to the east, or that they possess any intrinsic quality which renders them more hospitable to ore minerals. But, as is probable, it happens that they were fractured in such a way that channels connecting with sources of gold were opened up within them. And these fractures are to be regarded as the third invariable condition of ore occurrence.

Ransome concluded that the solfataric alteration of the rocks was chiefly an acid alteration, effected by the accession of sulphuric anhydride and sulphur, and the removal of lime, magnesia, soda and some potash, and that probably the quantity of silica and iron added was small, the original silica of the rock being sufficient to furnish the silica for the now existing quartz, and the present pyrite gaining its iron from the broken down iron-bearing minerals.

"Open-space" quartz, such as exists in enormous quantity in the Comstock and in the veins of the California Mother Lode, has, in Goldfield, but a meager development. In fact, the largest body of such quartz which I have seen in Goldfield measures not over two inches in thickness. Now, the ore minerals are chiefly an "open-space" filling, and only subordinately a metasomatic deposition. As in Cripple Creek, it is cracks, and not the walls of cracks, which carry gold. And, as in Cripple Creek, this gold was not greatly diluted during deposition by simultaneously deposited gangue materials. Perhaps the smallness and paucity of the cracks had something to do with the richness of the ore.

ORE YOUNGER THAN THE QUARTZ LODE

General considerations enable us to dismiss the possibility that the "open-space" mineralization is older than the replacement mineralization—in other words, that the ore is older than the quartz in which it lies. The possibilities presented, then, are: (1) The quartz lode and the ore were of simultaneous deposition. (2) The ore is younger.

The first possibility regards extensive silicification as a property of ore mineralization. It explains the general parallelism of ore and lode by the supposition that the lode was formed with the ore and that the ore remained chiefly within cracks, while the silicifying mineralizers, separated out by osmosis, wandered off into the containing rocks. It will be noted that this is the hypothesis usually employed to explain the limitation of ore minerals to cracks in the solfatarically altered rocks of Cripple Creek.

To this hypothesis there are serious objections. I have seen a number of ore pebbles composed of a hard breccia of quartz fragments and carrying external crusts of ore minerals. Here, ore deposition was plainly later than silicification and cementation, and there is nothing whatever to indicate that the ore minerals are not primary. Moreover, the large facts of ore distribution constitute an argument in the same direction. As we know, the locality of softened rock coincides broadly with that of silicified rock; their coextensiveness suggests strongly that softening and silicification were contemporaneous. But the locality of ore occurrence is vastly smaller than that of silicified rock, and is in no sense coextensive with it.

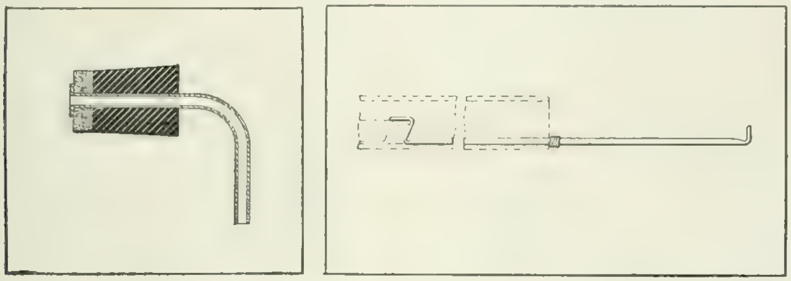
Ore mineralization, then, was not a general accompaniment of silicification; the presumption is that it belonged to a distinct period. And, again, the probability of an osmotic separation of the sort which would account for the sharp boundaries between ore and waste, is vaguely understood. No such separation has ever been conclusively proved to have taken place in ore deposition, and to assume that it had taken place here would be rash. These considerations being taken into account, together with the altogether pertinent fact that the ore minerals inhabit cracks in the quartz, it must be concluded that the second hypothesis is the correct one.

An interesting fact in connection with the production of coal in the United States, from figures compiled by the U. S. Geological Survey, is that in each successive decade the output has been practically doubled.

Rapid Determination of Sulphur in Roasted Blende

The following method is suggested by C. C. Nitchie as a rapid method for the control of blende roasting (*Journ. Ind. Eng. Chem.*, January, 1912). It is stated that results can be obtained in 10 min. from the time of sampling, hence a charge of roasted ore can be analyzed and its exact disposal determined, before it is put into storage. The method depends upon heating the blende in a current of air, absorbing the oxides of sulphur evolved in standard alkali, and titrating the excess.

In blende roasting, some of the original sulphides are left unchanged, while a small part of zinc, some of the lead, and all of the lime are converted to sulphates. On heating the roasted ore in a current of air to a bright red, all of the sulphides are oxidized, giving metallic oxides and SO$_2$ and SO$_3$. Sulphates of zinc and lead are decomposed, but calcium sulphate is not, at the temperatures ordinarily reached. However, as the results are to furnish an index as to the completeness of the roast, and as calcium sulphate is not decomposed in roasting furnaces, the results obtained by this method, which may be termed "false sulphur," are the sulphur which, under proper conditions, might have been eliminated in the roast.



Rapid Determination of Sulphur

In the determination there is a copious evolution of zinc-oxide fume as long as any sulphur remains unoxidized. The cessation of this fume furnishes an accurate index to the completion of the reaction. This fume is not appreciably dissolved by the standard alkali, and hence does not vitiate the results. Phenolphthalein is used as indicator, as it is sensitive to both sulphurous and sulphuric acid.

Combustion is carried on in an electric tube-furnace, with a fused silica combustion tube. The ends of the tube are cooled by wrapping them with strips of cotton gauze, which dip into distilled water. Tap water should not be used as it forms a crust of salts over the gauze, decreasing the cooling effect. To avoid burning the rubber stoppers in the ignition tube by radiant heat, these are protected by disks of asbestos, as shown in the illustration, that are held in place by upsetting the ends of the glass tube.

A convenient means for introducing the boat without the necessity of looking to see that it is not overturned, is also shown in the illustration. The device is made of heavy, not easily corroded wire (such as nickel). One end is flattened and so bent that the end projects over the end of the boat, and is in contact with it when both boat and wire are resting on the bottom of the combustion tube. The other end is bent at a right angle to make a hook for withdrawing the boat, and also to indicate when the rod is in the proper position to keep the boat upright. A notch is filed on the nickel wire, or a fine wire wrapped around it as a guide at the point which is flush with the end of the tube when the boat has been pushed to the middle of the tube.

The solutions are simply standard sulphuric acid and sodium hydrate, and the most convenient absorption vessel was found to be the Murray potash bulb.

The car of blende, as brought from the kiln, is sampled in two places by a spear sampler; this sample is cut down with a riffle to about 50 grams, and ground with a few turns of the muller in a Buck's mortar. Fine grinding is undesirable, as it prolongs the time necessary for the analysis by restricting the free circulation of air through the ore.

Details of the Combustion

A measured quantity of standard alkali, seven to 10 c.c. will usually suffice, is run into the absorption bulb, and diluted sufficiently with distilled water to a volume that will bring the solution into the fifth bulb when the air current is passing. The bulb is then attached by a bent glass tube to the exit end of the furnace.

One gram of ore is placed in a combustion boat and introduced into the furnace, which has already been heated to about 1000° C. A moderately rapid current of air, freed from carbon dioxide by caustic potash or soda lime, is passed through the apparatus until the sulphur is completely driven over into the alkali solution. This usually requires about six minutes. When the zinc-oxide fume has completely disappeared from the large bulb of the absorption vessel, the air current is stopped. The absorption vessel is disconnected, washed out into a beaker, phenolpthalein added, and the solution titrated. If total sulphur is desired, add to the "false sulphur" in per cent., four-sevenths the percentage of lime.

Attempts to use the method for the determination of sulphur in raw ores have led to low results, either from failure to absorb the larger quantity of sulphur gases or from condensation of part of the sulphur trioxide on the cooler portions of the tubes.

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20,507 — LUBRICATION — Economical Lubrication. W. W. Davis. (Lake Superior Min. Inst., Aug. 1912; 10 pp., illus.)

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20,518—RAPID METHODS of Technical Analysis. Frank D. Aller. (Colo. School Mines. Mag., Oct., 1912; 3¼ pp.) Continuation of article previously indexed.

20,519—RARE EARTHS—The Quantitative Separation of Lanthanum from Yttrium. C. James and T. O. Smith. (Journ. Am. Chem. Soc., Sept., 1912; 3 pp.) 80c.

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20,522—ATMOSPHERIC NITROGEN—Oxidation of Atmospheric Nitrogen and Development of Resulting Industries in Norway. Samuel Eyde. (Journ. Ind. and Eng. Chem., Oct., 1912; 3 pp.) Lecture before Internat. Congress of App. Chem., Sept., 1912. 60c.

20,523 — SULPHURIC AICD — Calculation of Sulphuric Acid Stock by Approximate vs. Accurate Methods. A Special Slide Rule for this Purpose. H. C. Moore. (Journ. Ind. and Eng. Chem., Sept., 1912; 2¼ pp., illus.) 80c.

20,524 — SULPHURIC ACID — Contact Sulphuric Acid from Brimstone. G. W. Patterson and L. B. Cheney. (Am. Fertilizer, Oct. 5, 1912; 2½ pp., also Journ. Ind. and Eng. Chem., Oct., 1912; 2 pp.) Paper before Internat. Congress of App. Chem., Sept., 1912.)

20,525— WATER PURIFICATION in Power Plants. (Coal Age, Sept. 7, 1912; 2 pp., illus.) 20c.

MATERIALS OF CONSTRUCTION

20,526—CONCRETE—Oil-Mixed Portland Cement Concrete. Logan Waller Page. (U. S. Dept. of Agriculture, Bull. No. 46, 1912; 28 pp., illus.)

20,527—FIREBRICKS — Manufacture of Firebricks by Intercolonial Coal Mining Co. (Can. Min. Journ., Sept. 15, 1912; 1¼ pp., illus.) 20c.

20,528—PORTLAND CEMENT—Electricity in the Portland Cement Industry. F. C. E. Burnett (Proc. A. I. E. E., Sept., 1912; 24 pp., illus.)

20,529 — PORTLAND CEMENT —The Australian Portland Cement Co.'s Works, Geelong, Victoria, Austral. (Min. and Eng. Rev., Aug. 5, 1912; 2 pp., illus.) 40c.

20,530—TESTING CEMENT—Technische Prufungsmethoden von Zement. Hentschel. (Chem. Ztg., July 18, 1912; ½ p.) Technical testing methods for cement. 20c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Edwin J. Collins has returned to Duluth, Minn., from a 10 days' business trip in Nevada.

H. A. Linke, manager of the Nevada Central Copper Co., left Chicago, Oct. 24, for the camp at Cedar, Eureka County, Nevada.

Quincy A. Shaw, president, and Rudolph L. Agassiz, vice-president, of the Calumet & Hecla Co., are visiting the mine on their semi-annual tour of inspection.

Frank M. Terry, resident director of the Butters mining interests in Salvador and manager of the Creston-Colorado Co. in Mexico, is spending a few weeks in New York.

George D. James, of Salt Lake City, has made a professional trip to the mining districts west of Milford, Utah, for the purpose of investigating the resources of that section.

Stephen R. Birch in charge of Morgan-Guggenheim copper interests in Alaska has been elected vice-president of Braden Copper Co., succeeding Edgar J. Meyer, deceased.

Harold C. E. Spence left, Oct. 21, for the northwest of Newfoundland and the south coast of Labrador, to examine large oil shale and other deposits. He will be absent for a month.

Alfred Oughton Vale, who, when last heard from, had just left Dove Springs, Calif., for British Columbia, is requested to communicate with his relatives in Birmingham, England.

C. Dawes Clark left New York recently for New Mexico, where he will examine a mining property for W. Rowland Cox & Staff, returning to New York about the middle of December.

Jean Brustlein, of Unieux, Loire, France, has arrived in this country to study American methods of steel making, and is now attached to the Midvale Steel Works, Philadelphia.

James Cronin, of Spokane, Wash., has been appointed general manager of the Standard silver-lead mine, at Silverton, B. C., owned principally by the John A. Finch interests, of Spokane.

Charles Butters arrived in New York last week after an absence of several months in Europe. He will leave shortly for Cobalt, Ont., to be present at the commencement of operations at the Nipissing mill.

Edwin O. Dane, of Denver, Colo., and El Oro, Mexico, has returned to Denver after making mine examinations in the Kingman district, Ariz. He will leave Denver shortly to examine Colorado properties for Eastern investors.

T. M. Schumacher has resigned as traffic manager and director of the American Smelting & Refining Co., and has been appointed vice-president of the El Paso & Southwestern R.R. Co., which is controlled by the Phelps, Dodge & Co. interests.

Dr. J. A. Holmes, director of the U. S. Bureau of Mines, is in San Francisco on official business. Doctor Holmes will consider several features of the bureau work while in San Francisco, and may visit some of the important mining districts of California.

C. M. Derby for several years manager of the Natomas Consolidated, of California, operating dredges on the American River at Natoma, has resigned from that position and will be connected with the W. P. Hammon dredging interests in an engineering capacity. Mr. Derby resides at Berkeley.

L. D. Hopfield, who for some time has been assistant superintendent of dredge operations and construction at Natoma, Calif., has been promoted to general superintendent of the Natoma division. Mr. Hopfield has been employed by the W. P. Hammon interests in the dredging fields in the Yuba and Natoma divisions for several years.

William M. Tilderquist, who, for the past two years, has been superintendent of the Hibbing district west end mines of the Oliver Iron Mining Co., has resigned because of ill health, and will remove to Duluth. He will be succeeded by William F. Pellenz, who formerly held the position of superintendent of the Sellers mine.

Paul E. Morse, who has several years been employed as superintendent of construction of dredges operated by the W. P. Hammon dredging interests in California, has been promoted to the position of general superintendent of construction. Mr. Morse has superintended the construction of a number of dredges, the prominent ones being Yuba No. 13, and Natoma No. 10. The latter was put in commission at the end of September, and is the first all-steel placer gold dredge built and operated in California.

OBITUARY

J. D. Jordan, a well known mining engineer, of Kingman, Ariz., died last week at Los Angeles, Calif., where he had gone for treatment for cancer of the stomach.

James C. Loughead, one of the oldest citizens of Sarnia, Ont., died, Oct. 24, at the age of 72. He was born in Ireland, and, in 1860, settled at Oil Springs, Lambton County, Ont., where he was one of the pioneers in the oil-producing business. For over 40 years he operated in oil in various parts of Lambton County. He visited Australia in 1885, where he was engaged in sinking wells. He had been an invalid for some years before his death.

Maunsel White died at New Orleans, Oct. 22. He was born in Louisiana and graduated from Georgetown University, at Washington. He was well known as a metallurgist and was one of the inventors of the Taylor-White process of hardening and tempering tool steel. He was a close student of the methods of steel treatment and wrote several papers on the subject. At one time he was connected with the Bethlehem Steel Works, and took part in the sale of armor plate by those works to Russia. He was manager of the New Orleans Iron & Roofing Works. He was a member of the American Institute of Mining Engineers and of the Iron & Steel Institute.

Societies and Technical Schools

Iron and Steel Institute, Great Britain—The following changes have taken place on the council of the Iron and Steel Institute, consequent on the death of W. H. Bleckly, honorary treasurer: W. Beardmore, vice-president, has been appointed honorary treasurer, and J. M. While, member of council, has been elected a vice-president, to fill the vacancy thus created. Lord Airedale of Gledhow has been elected a member of council in place of Mr. While.

Society of Chemical Industry—The regular monthly meeting of the New York Section was held Oct. 25. The proceedings included an address on the life and work of the late Prof. Morris Loeb, by Prof. M. T. Bogart. James B. Douglas and J. F. Connor described the system of rendering aid to men injured, suffocated or overcome by noxious gases, as applied under their direction in the plants of the United Gas Improvement Co. They showed a pulmotor and demonstrated its operation, describing the results obtained in saving life.

Colorado School of Mines—The students of this school entered a series of mining floats in the industrial parade of the Mountain and Plain Festival, in Denver, on Oct. 15. There were 12 floats arranged in the logical sequence of mining operations, showing placer mining, the prospector's windlass, single and double hand drilling, machine drilling, hoisting with a 12-ft. headframe, sampling, assaying, stamp milling, coal mining and rescue and relief. The necessary machinery and teams were furnished by some of the large business firms of Denver, including Hendrice & Bolthoff Colorado Fuel & Iron Co., Mine & Smelter Supply Co., Morse Bros., Denver Fire Clay Co., the S. H. Supply Co., and others. The work of arranging and preparing the floats was done by the students under the direction of C. A. Allen, assistant professor of mining. A prize was awarded the exhibit.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 24—Within the last two or three years there have been several cases in the courts of California involving the right of ownership of lands that had in the early days been patented to the Central Pacific R.R. Co. A recent action brought in the superior court of Eldorado County, similar to other cases of the same character, will probably be compromised. The involved property is near Latrobe, eight miles east of Folsom and is known as the Catlin Ranch. The action was based on mining locations filed upon lands in Sec. 13 and 23, T-9 N., R-8 E., by the White Rock Land, Mine & Dredging Co. The lands had been passed to the Central Pacific R.R. Co. by patent and had been sold by the company to individuals. The plaintiff in the case, the mine and dredging company, had taken advantage of the clause reserving mining and mineral rights and claimed the right to file mineral locations upon the land. It was quite well known that mineral-bearing gravel underlaid the surface of the land, and under the strict ruling of the government the mine and dredging company was entitled to the claim of location of the mineral rights. The present possessors and occupants of the land, Jane Cothrin *et al.* held that the land had passed from the ownership of the railroad company, and is now vested in themselves as innocent purchasers, who have held undisputed possession for many years. They have paid the taxes estimated upon the agricultural value and justice to them would seem to give them the right to continue in possession. The court urged, when the matter was brought to trial, that the parties to the suit agree upon a compromise arrangement which would give to the occupants of the land some compensation for the taking over by the mine and dredging company of the land to which, under the strict construction of the act, the company seems to be entitled. The fact is quite apparent that the courts of California are not inclined to settle the matter of priority of right, and the litigants in such cases do not endeavor to spend the necessary money to carry these controversies to the higher courts. It is quite likely that this particular case will be settled by the payment of commensurate compensation to the defendant, and that the question of precise legal rights of either of the parties will not be settled.

Denver

Oct. 26—The coal-rate war between consumers and the railroads hauling coal to Denver from the northern fields (about 20 miles) was settled today by Judge Greely Whitford, of the district court, who sustained the railroad commission which ordered charges reduced. The decision, if sustained by the supreme court, to which appeal has been taken, means that the railroads may have to refund to shippers from $300,000 to $500,000 rebate for excessive hauling charges. But this is not the end, for if Judge Whitford's decision is upheld by the state supreme court, the railroads will take the case to the United States Supreme Court, the result being that the rates established by the commission's order two years ago may not become effective for at least five years, and that in the meantime no actions for reparation growing out of overcharges in the period in which the order has been in existence will be possible. Counsel for the railroads declare the rate fixed to be confiscatory, and that they will not stop until the United States Supreme Court has passed on the matter, both as to the power of the state railroad commission to make freight rates, and also on the reasonableness of the rates decreed.

At the annual meeting of the Colorado Fuel & Iron Co., the old board was reelected with one exception; S. G. Pierson, purchasing agent, was elected director, to succeed the late Edwin F. Hawley. During the year the gross earnings were $24,268,452, and the operating expenses $20,496,170. The total income from all sources, including the earnings of the subsidiary companies, was $4,448,974, while $2,647,746 were paid for taxes, interest and other charges, leaving a balance for surplus account of $1,259,672. With this addition, the surplus now is $3,060,900, which is more than double the amount needed to wipe out the deferred dividends on the $2,000,000 of preferred stock. These dividends were suspended in February, 1903, but last summer a payment of 5% was authorized, half being paid Sept. 1, 1911; and the other half is payable in February, 1913. The earnings are the largest in the history of the company.

The subsidiary companies holding their meetings were the Crystal River R.R. Co., Colorado & Wyoming R.R. Co., Rocky Mountain Coal & Iron Co., Colorado Realty Holding Co., Rocky Mountain Timber Co., Colorado & Wyoming Telegraph Co., Minnequa Cooperage Co., and Minnequa Land & Water Co. J. F. Welborn was elected president of these companies. The net earnings for the first quarter of the present fiscal year are said to be in excess of $1,000,000, and the Rio Grande, Burlington & Missouri Pacific R.R., which formerly purchased from the U. S. Steel Corporation, have placed large orders for rails with the Minnequa plant, at Pueblo, the unfilled orders being sufficient, it is stated, to keep it running at full capacity until next summer.

Butte

Oct. 23—For the purpose of developing the Cottonwood oil fields, 25 miles southwest of Billings, several Butte and Billings men have incorporated the Billings Oil Co. with a capitalization of 150,000 shares of $1 par value. The incorporators and directors are: L. Duggan, E. F. Murphy and J. J. McGreevy, of Butte; and J. G. Link, J. V. Dwyer, L. B. Woods and F. H. Rockow, of Billings. The company has obtained a large area adjoining the holdings of the Yellowstone Oil & Gas Co., which has been doing development in that territory for some time under the direction of H. J. Connolly, a well known oil man.

The stockholders of the North Butte Extension Co., which has holdings east of the Butte & Superior property, in the northern part of the Butte district, recently held a meeting at Portland, Maine, and elected as directors, Capt. A. B. Wolvin, N. Bruce MacKelvie, Keith Stewart, Arthur J. Ronaghan, C. W. Peters, E. L. Adams and David Agnus. The Butte & Superior Mining Co., of which Mr. Wolvin is president, and Mr. MacKelvie, a director, owns a controlling interest in the North Butte Extension Co.

A meeting of the members of the Butte miners' union was held, Oct. 20, at Butte, for the purpose of considering plans to assist the miners and smeltermen on strike at Bingham, Utah, and Ely, Nev. Mr. Lowney, who, with President Moyer, of the Western Federation of Miners, has had charge of the union men since the beginning of the strike, about a month ago, was present at the meeting, and spoke at length upon the situation, and appealed to the Butte union to aid the cause by a donation. A motion was made and carried that the members of the Butte union each donate the proceeds of one day's work, or $4, and the matter was left to the result of a referendum vote. The balloting resulted in a refusal of the union men to assist the strikers.

Salt Lake City

Oct. 24—The situation at Bingham is rapidly improving. Operations are being resumed at more mines and the forces are being increased. Work has been resumed by the Utah Copper Co.; Eleven steam shovels are being worked, and more will be put in operation within a few days. About 11,000 tons of ore is being mined and shipped daily. Two more units have been added at the Magna mill, there being eight in operation. At the Arthur mill, nine units are being worked. Operations have been started at the Ohio Copper, with about 125 men. The Utah Apex began work, Oct. 21, with 25 former employees. The old Jordan and Telegraph mines, of the United States Co., have resumed operations with a large number of the old men. The Bingham Mines Co. has started work. The Jay Gould and Starless properties, owned by Col. E. A. Wall, began work Oct. 22. These properties announced that the increase of 50c. per day would be granted, but that the union would not be recognized. The Utah Consolidated began work Oct. 9, with men from outside, and recently some of the old employees have returned to work. The aërial tram between the mine and the Tooele smeltery is running, and up to 400 tons daily is reported to have been shipped. It is proposed to put on a night shift before the end of the week.

There is reported to be no increase in wages or recognition of the union at many of the properties, the Sept. 1 wage scale being in force. There are still some idle miners in the camp, and these have been given allowances by the Bingham Union No. 67, of the Western Federation of Miners. Married men draw $6 per week, and the unmarried $3.50. The strike is practically broken, and the men have lost. While some of the strikers are still "agitating," the operators express themselves as pleased with present conditions, and from all appearances things should be back to normal before long.

Globe, Ariz.

Oct. 21—Improved conditions in the copper industry are reflected in the increase in prospecting and mine development, and in general business, that has occurred in the last few months, and which is still continuing in the Globe and the Miami districts. The amount of freight hauled in by the Arizona & Eastern R.R. last month was nearly 40% greater than for the corresponding month of 1911, most of the increase going to Miami, seven miles west of Globe. The old McMorris and Irene silver mines are being reopened and many smaller copper and silver prospects are being developed.

There is a scarcity of labor in both the Globe and Miami districts, owing to the fact that natives of the Balkan states are leaving on every train to take part in the war.

An electric railroad, to connect Globe, Miami and the Inspiration Consolidated mines is a probability of the near future. N. L. Amster, president of the Shannon Copper Co., at Clifton, owner of the R.R.R. mine, at Patagonia, and who has extensive interests in Globe, including the Globe Light & Power Co., was in Globe last week in connection with the promotion of a company for building such a line. A franchise was submitted to, and approved by a meeting of, the citizens, and a committee was appointed to secure signatures to a petition to the board of supervisors, asking that a special election be called, at which the question of granting the franchise will be submitted to the voters of the county. Many citizens have agreed to take stock in the company if a franchise is granted.

Duluth

Oct. 25—Relative to the much discussed plans of the Hill interests and associates in the administration of their ore lands when released by the Steel Corporation, it is thought that the Pillsbury-Bennett-Longyear mines will be operated by their owners. These holdings, owned by Minneapolis men, comprise a good-sized fraction of the so called Hill lands, and were included in the lease to the Steel Corporation because of the close relations of their owners with the Great Northern interests. The Pillsbury-Bennett-Longyear lands under lease to the Steel Corporation are scattered from Chisholm to Coleraine on the Mesabi Range. One of the largest of the mines to be released is the property, one mile north of Keewatin, to be known as the Bennett mine, credited with an orebody of 40,000,000 tons. The Pillsbury-Bennett-Longyear interests, long identified only with the exploration end, are getting into the operating of mines. They have been operating the Pearce mine on the Mesabi, and recently formed the Cascade Mining Co., in conjunction with C. A. Smith, of Minneapolis, which has taken over the extensive lands of the Pittsburgh & Lake Superior Iron Co., in the Cascade district in Michigan. A mine is now being developed on these lands, and it is planned to develop two more where drilling has shown favorable results. In the Crystal Falls district, Michigan, a large ore deposit has been found on the Mastodon property by the Longyear company, and it is reported that this will be operated by a mining company formed by the Minneapolis men interested. O. B. Warren, of Hibbing, who has had charge of the fee interests of the Pillsbury-Bennett-Longyear lands, is gradually transferring this work to others, and is looking after the mining operations of the company. It is likely, if the Great Northern interests build furnaces to take care of their ore output, as it is rumored they will, that the Pillsbury-Bennett-Longyear mines will dispose of their product there.

The annual report of the mine inspector for St. Louis County, Minn., including the majority of the mines of the Mesabi and Vermilion ranges, shows that surface and open pit mining is more dangerous than underground work. The number of fatal accidents for surface mining during the last year was 3.83 per 1000 men employed; for underground mining, 2.69 per 1000 men employed. The total number of fatal accidents was 51, and the total number of men employed was 15,389, making 3.26 fatal accidents per 1000 men, both underground and surface, a reduction of 16% over the previous year. Of the 15,389 men, 7044 were employed underground, 2571 were employed on surface, 3200 were employed in open pits and stripping. The ore output from underground working was 10,624,147 tons; from surface workings 10,125,752 tons, making a total of 20,749,899 tons. For all classes of labor, the average wage paid per day was $2.60; the scale ranged from $6.66, the average wage paid to steam-shovel runners, to $2, the wage paid to change-house men and janitors. The reduction of 16% in fatal accidents and 35% in serious, non-fatal accidents, over the record of the year previous, is attributed to the enforcement of safety precautions and the installation of safety devices by the mining companies. All the larger companies now have rescue stations and crews trained by an expert in the use of the fire helmet and pulmotor.

Toronto

Oct. 25—The 60-day limit set for filing disputes against the applications for claims in the Gillies Timber Limit expired Oct. 21. Over 90 disputes have been filed and the hearings will require much time. To facilitate matters Mining Inspector E. T. Corkill, acting on the suggestion of Mining Commissioner Price, has made an inspection of some of the claims, as to discoveries, staking, etc.

The discovery of a rich gold-bearing quartz on an island in Nighthawk Lake has resulted in a rush of prospectors to that region, and many claims have been staked on the adjoining mainland. The discovery location is owned by Markey & Hyde, of Montreal, and through it passes an aplite dike from which the samples were taken, which crosses the narrow channel and reappears on the mainland, where it contains quartz stringers. All the claims staked are situated in Case township.

The Mining News

The Current History of Mining

Alaska

Excitement has been caused by a strike of rich placer gold on Boulder Creek, about five miles from Nome.

On Oct. 17 the U. S. Assay Office at Seattle received $300,000 in gold, $100,000 from Nome and the remainder from the Iditarod district.

The Copper River & Northwestern R.R. was reopened to Kennecott, Oct. 29, after suspension of service due to washouts attending floods.

Arizona

GREENLEE COUNTY

Shannon—N. L. Amster says: "We are opening up a large area of ore 100 ft. below any point at which it has ever before been mined and are taking out ore averaging between 4 and 5% copper. We have proved the extension of the orebody to a point below the level of the Carter tunnel, which is a very important development. Production for September was below normal because of the freezing of one of the furnaces, and this month's production will also be smaller than usual, but is now increasing, and next month will show a decided increase. We have been doing considerable development work during the last six or eight months, and are now spending from $7000 to $8000 per month for that purpose, all of which is included in the operating costs."

MARICOPA COUNTY

Vulture—No. 2 well has recently been drilled several hundred feet deeper, and the water supply for the mill considerably increased. The 20-stamp mill is running at full capacity, as well as the cyanide plant and concentrating tables, and it will not be necessary to build a pipe line from the Hassayampa immediately, although the line is being surveyed.

Max-Delta Mining Co.—This company, operating a mine seven miles south of Phœnix, has recently installed a hoist and compressor, and is sinking a shaft. Probably a pump will be required at an early date.

Kay Copper Co.—This company will use auto trucks for hauling ore; the contract with Tisdale & Lewis has been canceled. Active development work is being continued. There is some talk of building an electric line from Phœnix to the old New River stage station for the purpose of hauling ore from the mines in this and other districts to the railroad for shipment to the smelter.

Roosemoore—At this mine, 30 miles southeast of Mesa, there are five men at work taking out ore for shipment to the smeltery. The ore carries copper, gold and silver.

MOHAVE COUNTY

Boundary Cone Gold Mines Co.—The property of this company has been attracting local attention during the last year by rich strikes. Several weeks ago a shoot of ore was encountered on the 450 level west, which is now reported to be increasing in width and value as the heading advances. Samples taken over a width of about 16 in. gave assays of $150 to $200 per ton in gold. J. M. Vassar is superintendent. The mines are west of the Tom Reed mines, and in the same mineral belt. The development of the property to date consists of a shaft 475 ft. deep, 1318 ft. of drifts, 126 ft. of crosscuts and 30 ft. of winze. At present the shaft is equipped with a small gasoline hoist, capable of hoisting from a depth of 600 feet.

Arizona Venture Corporation—W. D. Grannis, president, recently put a force of men at work on the property, at Deluge Wash, in the Cedar Valley district. The company also owns a group of claims near the Tom Reed mines. B. F. Holcomb, a mining geologist, of Detroit, has just made an examination of both properties. It is the intention of Mr. Grannis to develop the Deluge Wash as rapidly as possible. A map was made of this group of claims and other data secured by Mr. Holcomb, and he has returned East to interest Easterners in the company.

Needles Mining & Smelting Co.—This company recently advertised for bids on sinking the Tennessee shaft from the 700- to the 800-ft. level. It is anticipated that the railroad spur will soon be completed to the mine and shipments of ore to the Needles smeltery will then be resumed.

SANTA CRUZ COUNTY

R. R. R.—N. L. Amster, who, with associates, purchased this mine several months ago, says: "We have just cut a new orebody, parallel to the one on which we have been working and 100 ft. from it, which is 23 ft. wide and averages between 8 and 10% copper, and we are now drifting on it. On the first orebody, two stopes from 70 to 80 ft. long, have been opened for a width of 40 ft. in ore that will run better than 10% copper. The winze is down 110 ft. and has 9% ore in the bottom. We are putting in a set of scales and by Oct. 20, will be shipping 100 tons per day of ore averaging between 8 and 10% copper, and this may later be increased to 150 tons per day. We are employing about 70 men."

YUMA COUNTY

Republic Smelting Corporation—This company has obtained control of copper claims, near Parker, and contemplates the erection of a smeltery. F. C. Fenner is president, J. A. Chestnut, manager, and A. L. Engledow, superintendent.

California

AMADOR COUNTY

The board of supervisors has agreed to grant rights of way and build the necessary bridges for the road connections with the state highway.

Plymouth Consolidated—The cleaning out of the Pacific shaft is about completed. At the 1950-ft. level an 18-in. vein has been disclosed, in which the ore assays about $9 per ton. On the level below this there has been discovered evidence of a raise started by the former operators, which indicates that this ore was known by them. The prospects are said to be good for the successful reopening of the mine. J. F. Parks, of Plymouth, is superintendent.

BUTTE COUNTY

Gold Bank-Golden Queen—The final payment has been made on the purchase price of these mines by the Forbestown Consolidated Gold Mines. The rebuilding of the old Gold Bank mill is completed; the shaft repairs are practically completed. The property was recently examined by C. K. Colvin, of Denver. It is not stated who the principals are, but should a sale of the property be consummated, the development and extraction of ore will be on an extensive scale, and the 20-stamp mill will be enlarged. M. J. Cooney, manager.

CALAVERAS COUNTY

Lightner—The company will be reorganized and fully provided with capital for more extensive development than has been caried on since the mill was shut down several months ago. It is the purpose to deepen the 1000-ft. shaft to 2000 feet.

Calaveras Engineering Co.—S. R. Fox, Louis Demartini and William Casey, officials of this company operating near San Andreas, have been convicted in the U. S. district court at San Francisco, of unlawful hydraulic mining.

HUMBOLDT COUNTY

Rich surface quartz has been uncovered in the Willow Creek district at the base of Horse Mountain, where the recent new discoveries were made. It is reported that there is no present evidence that the pay ore goes deep, though numerous new locations have been made. Several prospectors have gone to the district. There is no good reason for a rush. The winter climate will not permit much development. Phillip McDonald, Alexander Dewar, R. Mitz and N. C. Halliday, of Eureka, are confident, however, that the camp will prove interesting in the spring.

MODOC COUNTY

Forest Service agents have located a site near Rattlesnake Butte, near Alturas, in which it is reported 50,000 acre-feet of water can be impounded.

Yellow Jacket—The Lucky Dutchman lease shaft is down 30 ft., and the new shaft house has been completed. The vein is reported to be about 18 in. wide. The lease has been acquired by A. L. Arnold, of the Spearmint Mining Company.

Modoc—A new shaft house is being erected by Shepard & Cook on a lease adjoining the town of Highgrade. A living house will also be erected.

Peterson—Winter supplies are being secured in order to carry on development work. Good milling ore is being extracted. Reynolds and Van Bellen, of Klamath Falls, Ore., are owners.

Sunshine—The main tunnel on leases 6 and 7 is being driven at the rate of one foot per day. The vein, which was formerly on the hanging wall, is now on the foot wall. Twin Leasing Co. is lessee.

NEVADA COUNTY

Sultana—A new electric hoist and pump have been installed on the 800-ft. level. The compressed-air machinery formerly operating the hoist and pump will be used to operate the drills. The new hoist has a capacity of 2000 lb. at 1000 ft.; the pump has a capacity of 150 gal. per min. at 400-ft. lift. A new 150-hp. compressor will also be installed. Good milling ore is being extracted from the stopes and winze. The new pump and hoist were built by the Taylor Foundry & Engineering Co.

Oustomah—An electric plant will be installed in place of the water-power plant, including hoist, pump and motors for the operation of the compressors. The shaft will be deepened from 1050 to 1500 ft. Edward C. Klinkner is manager.

Golden Point—The shaft has been retimbered to 230 ft. and a new 1200-ft. hoist installed at this mine, near Grass Valley. Alfred Onn has a bond on the property.

Salmon—A steam hoist has been ordered for this mine, at Badger Hill. The grade of ore encountered is sufficient to encourage development. Charles Salmon is owner.

Arctic—The installation of electrical machinery, which has been hauled from Emigrant Gap with auto trucks, is progressing.

PLUMAS COUNTY

Droege—Ten stamps of the old mill have been reconstructed, and five are dropping. New stopes are being opened. W. E. Cahill, of Greenville, is superintendent.

Altoona—A 30-ton chilean mill has been installed for development milling. The shaft is 100 ft. deep and the drift on the vein has advanced to the 900-ft. point. A hoist will be installed. L. P. Wisewaid is superintendent.

Engle—The frame for a 7500-ft. tramway, extending from the mine to the 100-ton furnace recently installed, has been erected and is ready for the wire. The successful operation of this copper mine depends upon whether or not the smoke can be economicaly neutralized. W. Engle, of Taylorsville, is the manager.

Plumas Eureka—While this mine has recently been closed for lack of water, a small cyanide plant is operating on the tailings. D. J. Lawton, of Johnsville, is superintendent.

SISKIYOU COUNTY

Wolverine—An electric plant will be substituted for the gasoline engine to operate the five-stamp mill, which is employed in developing the mine, at Anderson Ferry, on Klamath River. High-grade ore is reported in a crosscut run to find the walls. The property is owned and operated by Montana men. Mr. Rossman, one of the owners, is manager.

Siskiyou Mines Co.—The new 12-mile flume from the intake, on Thompson Creek, four miles above Nolton, to the hydraulic mines, is completed. The construction required 650,000 ft. of fir logs averaging 40 in. in diameter. The company formerly operated a mine on the wagon road from Happy Camp to Nolton. The plant of this mine has been removed to the present location, at Williams Point.

TEHAMA COUNTY

Deer Creek Power Co.—This is a new company, incorporated by Chico and San Francisco men, with capital stock of $50,000. The directors are: Martin Polk, C. L. Crowder, Park Henshaw, of Chico, and L. M. Fletcher, of San Francisco.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Virginia City—Lessee Roberts, in this mine on Lincoln Mountain, has opened a vein of ore 10 to 16 in. wide which is stated to carry $145 per ton in gold and silver. He thinks he has a continuation of the shoot that in the early day produced ore worth as much as $300 per ton.

Idaho Bride—This company will take over the Seaton mine on the same vein as the Bride. This will give the company 3000 ft. on the vein. Connection will be made with the Newhouse tunnel which intersects the Seaton vein 1500 ft. below the surface, where a lateral has been driven 400 ft. on lead-zinc ore.

Frontenac Consolidated Gold Mining Co.—According to the report for August 5100 tons of ore was treated in the Black Hawk mill. The stope ore assayed $8.50 per ton; the development ore, $6; the latter being 770 tons of the total. Smelter returns for concentrate shipped, were $30,500; expenditures on revenue account, $18,500; net profit for month, $12,000 and expenditures on capital account, $7800; July profit was $8550. Sir Charles Allen, chairman of the board of directors, and Lieut-Gen. French, of the British army, are now at the mine near Central City.

EAGLE COUNTY

Ohio Group—This group in the Mt. Egley district, D. H. Thomas, manager, will be worked all winter with five men in a crosscut tunnel now in 3100 ft. About 700 ft. of drifts and raises have disclosed fine gold and copper ore. The tunnel is to be driven 1500 ft. to cut several veins which make a good showing on the surface.

LAKE COUNTY-LEADVILLE

The zinc-carbonate ore lately opened in one of the Little Jonny shafts, is responsible for increased activity by lessees, on Breece Hill, and there are now but few shafts idle. Properties now working include the Penn, Chippewa, Little Bertha, Bobby Burns, Highland Chief, Eliza, Big Four shafts, St. Louis tunnel, Fanny Rawlings, Garbutt, Rattling Jack and Nevada.

American & Washington—These claims on Missouri Hill will be worked by Maupin Bros., who will sink shafts and then drive for low-grade, free-milling gold ore.

Sugar Loaf Consolidated—The output from the tunnel is about 20 tons per day of fair grade, and the breast which is being steadily carried into the hill is in good ore; 12 men are employed.

Adelaide—In a raise started recently by Peck & Sehrt, lessees, operating through the Yak tunnel, a good streak of ore has been opened.

Mandy May Mining & Milling Co.—Tests of the ore carrying lead, iron and copper from the tunnels on East Lake Creek, are being made by A. Y. Stubbins, manager, with a view to determine the best kind of separating machinery to install.

PITKIN COUNTY

It is reported that owing to the fire which has been burning for 15 years in the Smuggler, the mine and mill will be closed down until a 400-ft. drift can be driven around the bulkheaded fire zone. Rescue car No. 2 of the Bureau of Mines arrived at Aspen, Oct. 22, in charge of Prof. G. C. Roberts, who, with eight experts, will endeavor to extinguish the fire.

TELLER COUNTY-CRIPPLE CREEK

Mabel M.—The 12th level is now being developed and the grade of the ore is said to be even better than that mined on the eleventh. The shaft has been sunk to water level and a new drift will be driven from that point.

Midget-Bonanza Mining & Milling Co.—J. F. W. Doepke, president, is in the district and said to be investigating the local mills, looking toward the erection of a 100-ton cyanide mill to treat the low-grade ores from the dump and mine.

Mary McKinney—The regular quarterly dividend of 2c. per share amounting to $26,000, was paid Oct. 26.

Granite—This company has been especially benefited by the water recession in the Gold Coin shaft due to the deep drainage tunnel. The recession continues at the rate of six inches per day, with 8780 gal. per minute flowing from the tunnel portal. It will be possible to mine on the eleventh level in a short time.

Idaho

COEUR D'ALENE DISTRICT

The mines, on Nine Mile Gulch, are making extensive plans for next year, and already signs of increased activity are appearing. The Custer, the Callahan and the Puritan have increased their forces of men and have placed orders for new machinery. There are now 70 men at work at the Interstate-Callahan. A large number of these are at work on the new mill, which is being built. The work is being pushed as rapidly as possible, in order that it may be finished before winter sets in. The tramway leased from the Rex by the Tamarack-Custer company is nearly ready for use. The machinery orders placed by these mining companies are large. The Puritan company has ordered one 300-cu.ft. Ingersoll-Rand compressor and a 50-hp. Westinghouse motor. The Tamarack-Custer company has ordered one 1200-cu.ft. compressor and a 200-hp. Westinghouse motor. Also the machinery for a sorting plant, including two 9x15-in. Blake crushers, one Franz washing screen, shaking grizzlies and two picking belts. The Callahan company has ordered one 800-cu.ft. Ingersoll-Rand compressor and one 150-hp. Westinghouse motor. The machinery for the mill is being ordered from local firms. In the crushing end, there will be two 9x15-in. Blake crushers, two sets of 12x14-in. rolls and one set of 12x36-in. rolls. The fine grinding will be done in one 6-ft. Hardinge conical pebble mill. The tables will be the Wilfley and Franz models. Franz traveling screens will also be installed.

Silver Rock—This company has let a contract for another 100 ft. of tunnel, to be begun as soon as the present contract is finished. The tunnel is now in 275 ft. and has attained a vertical depth of 175 ft. The showing is continually improving as depth is gained, and some good samples of gray copper have been brought out.

Winter Lead—This company, operating property below Osburn, is considering the construction of a mill. The vein is extensively developed and is opened to a depth of 1200 ft. There is 4 ft. of good-grade galena ore. Two shifts of miners are employed and plans are perfected to continue the work throughout the winter.

Caledonia Mining Co.—During October 18,391 tons of ore mined returned $989,454 gross; $612,308 net. The net profit was $115,767 of which $52,100 was paid out in dividends. The ore was mined from the Omaha lease and from the Caledonia and O'Conner claims at Wallace.

IDAHO COUNTY

Elk City Mines Corporation—Manager J. T. Omo has announced that the company will at once begin the erection of a mill of 100 tons capacity to treat the ores from the South Fork mine. The present mill, consisting of five stamps, plates and one James table, has a capacity of about 12 tons daily. It is situated on the mountain side 700 ft. above the river. The new mill will be placed on the river. A hydro-electric plant to have an initial capacity of 125 hp. will be installed, which is expected to reduce the power cost considerably. The present power cost, using wood for fuel, is $510 per horsepower-year.

Moore Group—An English syndicate, represented by A. S. Burch, of Denver, has taken an option and working bond on this group of mines near Edwardsburg.

Gold King—Dan McRae, B. F. Goldman, and A. B. Lucas have sold the Gold King and Gold Queen claims adjoining the Eagle mine, to Salt Lake men for $150,000. Supplies are being shipped to camp in order that work may be continued all winter.

Ex-Ray—A rich strike was made at this mine in the Florence district. Three feet of free-milling ore assaying $200 per ton was opened in the new crosscut.

Michigan

COPPER

Allouez—Shipments of about 1500 tons daily are going to the mill, about 600 tons of this amount being supplied from No. 2 shaft. Nine-ton skips are in service and the entire equipment is satisfactory. Production is on the increase and the ore contains more than 16 lb. of copper per ton.

Mayflower—No. 22 drill has encountered a copper-bearing formation at a depth of about 1024 ft. which is over 80 ft. through and is well mineralized. Results of the drilling have shown the formation to be faulted, but the results are being carefully platted and it is probable that sufficient data will be obtained in the near future to warrant the management to proceed in shaft sinking.

Calumet & Hecla—This company has installed an electrically driven centrifugal pump of about 1000 gal. per minute capacity at the 600-ft. level of the Red Jacket shaft in the crosscut that was driven a few years ago to open the Pewabic lode. The construction work at the stamp mills is going on satisfactorily, being materially aided by the exceptionally fine weather that has prevailed for the last few weeks. The steel work at both the power plant addition and the new regrinding plant has been completed and the building has been inclosed. The company is building the tube mills and other apparatus to be used in this mill.

IRON

Munro—This low-grade mine, of Rogers, Brown & Co., at Norway, has been closed for the season, after shipping about 20,000 tons of ore. Most of the men were transferred to the Rogers mine, at Iron River.

Buckeye—At this mine, of Oglebay, Norton & Co., at Commonwealth, Wis., a steam shovel is being used to ship from the stockpile, although the underground workings are idle.

East Norrie—At this mine, of the Oliver Iron Mining Co., at Ironwood, a large hoisting shaft is being sunk, which will eventually replace the old "C" shaft. The shaft will be lined with steel and concrete, and several years will be required to finish the work.

Cascade Mining Co.—A geared hoist has been received from the Imperial Iron Works, in Duluth; a six-drill air compressor from the Ingersoll-Rand Co.; two Kewanee boilers, and two smokestacks. This equipment will be used in sinking the shaft. The shaft is about 30 ft. in rock, and has gone through the Goodrich quartzite into diorite. The shaft will be concreted for 60 ft., 20 ft. of which will be in surface soil. It was found necessary to concrete into the rock which is altered and broken. The office building has been completed, also the temporary dry-house. A temporary engine and boiler house is being erected east of the shaft. This building will have space for a third boiler, to be installed later if necessary. The permanent buildings, to be erected later, will be of concrete, and will be situated on the hill north of the shaft. A survey has been made for a branch railroad from the Chicago & Northwestern Ry., which passes near-by, and which will be built next season.

Minnesota

CUYUNA RANGE

Cuyuna - Mille Lacs — The Cuyuna Northern Ry. tracks have been extended to this property, and five cars of manganese ore have been shipped to the furnace, at Ashland, Wis. The rich manganese ore was found on the 126-ft. level of this mine, and drill records show it to be 420 ft. deep. The company expects to ship six cars per week all through the winter.

Mangan Iron & Steel Co.—A. F. Gross, president of this company, which is developing iron and manganese properties, states that at the No. 1 property, which adjoins the Cuyuna-Mille Lacs, manganese ore extends clear across the "forty." The ore assays from 8 to 30% manganese. The No. 2 property adjoins the Armour No. 1 on the north. It is essentially an iron-ore property, but assays as high as 11% manganese.

MESABI RANGE

The mines of the Hibbing district are still making heavy shipments, and it is expected that it will be possible to continue until well into November.

Madrid—The Virginia city council is discussing the question of attempting to prevent A. B. Coates, who is operating this property, from mining under the streets, claiming that there is danger of the streets caving.

Section 30 Mining Co.—This company recently cleaned up its stockpile. Shoveling was begun late in June and 150,000 tons of ore has been shipped. Of this ore 50,000 tons was purchased by the Zenith Smelting Co., and all but 10,000 tons has been delivered.

Zenith—The Oliver Iron Mining Co. stockpile, at this mine, is nearly cleaned up. Up to Oct. 15, 180,000 tons of ore had been shipped.

Pioneer—About 15,000 tons of ore remains in the stockpile. It is expected that all of this ore will be disposed of before the season closes.

Montana

BUTTE DISTRICT

Tuolumne—The shaft is now 2000 ft. deep and a station is being cut at this level. Sinking is going on steadily with the intention of going to the 2800-ft. level. Stations will be cut and development started on the 2000-, 2200-, 2400-, 2600- and 2800-ft. levels. The ore on the 1800-ft. level does not contain as much copper as that on the 1600 ft. level, corresponding in this respect to the North Butte and other adjacent properties, which passed through a lean zone at about the same depth. It has been proved, however, that below this zone the copper tenor is greater. About 75 tons of first-class ore mined between the 1400-, and 1600-ft. levels, and a like amount of second-class ore mined on the 1800-ft. level, are being shipped daily.

CASCADE COUNTY

Fair Play—At this mine near Neihart a drift recently opened one foot of ore assaying 82 oz. of silver per ton. The mine adjoins the Broadwater mine, which has produced over $3,000,000, and is traversed by the same vein. A tunnel being driven into the Fair Play, has reached a depth of 250 feet.

DEER LODGE COUNTY

Southern Cross—The new machinery ordered for this Georgetown property of the Anaconda Copper Mining Co. has arrived at Silver Lake, and as soon as the remaining 1½ miles of rails of the new railroad being built into the camp have been laid the machinery will be transported to the property. The electric-power line from Flint Creek Falls to the mine is rapidly nearing completion, and as soon as the power can be utilized operations will be started on a large scale. In anticipation of this the force is being augmented from day to day.

FERGUS COUNTY

Kendall—This famous gold mine has been worked out and closed after 13 years of continuous operation, during which time dividends to the amount of $1,425,000 have been paid. H. T. Kendall purchased the claim in 1899 for $650, and soon after bought the Klondike claim adjoining for $1500. Operating in a small way, he shortly opened a large body of ore. In 1900 Finch and Campbell, of Spokane, purchased the property for $400,000 and have operated it since then at a profit of more than $1,000,000.

Whiskey Gulch—Eastern men, organizers of the Boston Mining Co., are taking steps to acquire this property near Gilt Edge. It has been worked intermittently for several years and some high-grade gold ore has been mined. Nearly $250,000 has been expended for the erection of a mill, and development of the mine. Several companies have undertaken to operate the mine, but all were forced to suspend operations for the lack of funds for systematic development work. The new company will pay off a few judgments standing against the property, and then begin a thorough campaign of development.

JEFFERSON COUNTY

Mount Washington — During recent weeks the output of ore from this property, consisting of six claims near Wickes, has been in the neighborhood of 50 tons per day. The shaft is now 200 feet deep and plans are being made to sink deeper.

LEWIS & CLARK COUNTY

Piegan-Gloster—The Barnes-King Development Co., which recently purchased the Piegan-Gloster mines in the Marysville district from the judgment creditors of the Piegan-Gloster Consolidated Mining Co., has paid $25,000 on the purchase. The price of the property is $125,000 in deferred payments extending over two years; or in the event the company decides to pay the debt by next March, a saving of $25,000 will be made. It is probable that this will be done. Crosscutting to the orebodies is being done as fast as possible.

MADISON COUNTY

Blowout—The Corbin Copper Co., operating a copper mine in the Corbin district of Jefferson County, recently took over the Blowout mine in the Rochester district. The shaft has been unwatered, and a crew of men is now engaged in sinking to the 300-ft. level. When this depth is reached, crosscutting to the veins will be started. T. A. Varden, superintendent of the Corbin Copper Co., is preparing to move his office from Corbin to Rochester.

Nevada

COMSTOCK LODE

Hale & Norcross—The lessees have shipped two railroad cars of average-grade ore to the smeltery.

Crown Point—Milling continues at the Yellow Jacket mill, and 661 tons was treated recently in one week. The gross production of the mine was 515 tons, assaying about $4000.

Ophir—The new cyanide plant is being operated three shifts per day, excellent results being obtained. Adjustments, of course, have to be made, but the entire plant is running smoothly.

Union Consolidated—On the 2500-ft. level, the west crosscut, just south of the north boundary line, has cut through quartz stringers, but surveys show that the heading is east of the point where the rich oreshoot, recently cut in the Sierra Nevada, might be picked up.

Mexican—The ore extraction in a recent week was the greatest so far made from the stopes, 624 tons giving a gross assay of $41,000. Of this production, 530 tons was taken from the stope on the 2500-ft. level, and averaged $71 per ton. This is the largest week's production ever taken from the deep levels of the Comstock, the bonanzas all being on the upper levels. The mill treated 451 tons, of a gross assay value of $22,707. The new tube mill has been installed and placed in operation.

Sierra Nevada—A north drift has been started on the vein that was cut last week by the crosscut from the 2500-ft. level, and the advance made shows that the vein is steadily widening. A recent report shows that the fissure is 5 ft. wide, with 2 ft. of solid quartz, and 3 ft. of a mixture of porphyry and quartz. In the top, a foot of rich ore is coming in. The ore was carefully segregated, and considerable specimen ore saved from seven inches that sampled close to $1000 per ton. One car ran $50 per ton, and another was of milling grade.

EUREKA COUNTY

Mt. Hope Mines Co.—This property, which was worked 30 years ago, when the Eureka smelteries were running, is now being operated by W. B. Gillingham and Edward Whittmore, the owners.

Eureka Windfall Mining Co.—This company is operating its remodeled mill, treating 100 tons of ore per day.

Diamond Mines Co.—This property has recently been closed down.

Credo-Eureka Mining Co.—A little development work is being done at this property.

LANDER COUNTY

Austin-Manhattan Consolidated Mining Co.—William A. Marshall, receiver for this company, will sell its real and personal property at auction, in Austin, Nov. 18, 1912. The liabilities exceed $90,000.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Oct. 19, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,550	140,969
Tonopah Belmont	3,576	101,680
Montana-Tonopah	993	43,378
Tonopah Extension	1,066	42,073
West End	850	31,872
Midway		670
MacNamara	465	15,539
North Star	48	266
Mizpah Extension		40
Jim Butler	300	2,800
Totals	10,848	379,287
Estimated value	$271,200	

The total output of the Tonopah mines for September was 43,530 tons.

Tonopah Mining Co.—The report for September states that 14,806 tons, averaging $18.77 per ton, was milled for a net profit of $154,073.

Tonopah-Merger—The railroad spur to the ore dump has been built, ore bins are being built, and shipments will commence in a few days. Stopes are being opened on the 980-ft. level, where the west drift shows 6 ft. of ore, averaging $110 per ton. The west drift on the 1060-ft. level shows 6 ft. of ore, averaging from $50 to $80 per ton.

North Star—A second shipment has been made of 48 tons of ore from the 850- and 1250-ft. levels that, it is estimated, will return over $100 a ton.

MacNamara—The clean-up for the first half of October produced 1000 lb. of bullion, valued at $12,000.

Tonopah Extension—The clean-up for the first half of October produced 2385 lb. of bullion, valued at $27,300.

Pittsburgh-Silver Peak Gold Mining Co.—The report for the six months ended June 30, states that gross earnings were $613,883 and net profits $146,743.

Dexter White Caps Mining Co.—Lessees on this Manhattan property have milled 6168 tons for a gross production of $176,948. The mill is treating 50 tons of ore daily.

WHITE PINE COUNTY

The strike in the Ely district has been called off, and the operators have refused to recognize the union. The Nevada Consolidated started two steam shovels at Copper Flat, Oct. 24. By Oct. 25, 4000 tons of ore was shipped to the Steptoe smeltery, and it has been predicted that shipments will be about normal within a fortnight. Because of the strike, it is unlikely that Nevada Consolidated will this year pay an extra dividend, as was rumored some time ago.

Oregon

LANE COUNTY

Lucky Boy—Porter Bros., railroad contractors for the Southern Pacific, let their option on this property expire. It is owned by Portland, Ore., men, who will soon start up the mine and mill. There is a power plant on the property, and it was thought that the Southern Pacific wanted the property for the power.

Reed—J. V. Reed, of Eugene, Ore., owner of this property, will install milling equipment and develop the property this winter. He states that he has made arrangements for treatment apparatus with the Gold & Platinum Extraction Co., of Los Angeles, Calif., and that he will use their chemical process for the treatment of sulphide ores. The equipment consists of redwood tables and tanks, but the manner of using them is not made public.

Treasure—Dan McAllen, of Portland, Ore., with some other Portland men, has just secured the controlling interest in this property, and will commence active work soon. The machinery is all installed, and although the property has been idle for several years, the plant and mine are in good condition.

South Dakota

LAWRENCE COUNTY

Trojan—This company is adding one of the most complete machine shops in the Black Hills district to its equipment. The building has been completed. The machinery has been delivered, and is now being installed. The company has recently put in operation the second gasoline locomotive, manufactured by the Milwaukee Locomotive Works. The first was described in the JOURNAL of Sept. 30, 1911. These locomotives are operated over a track a little more than a mile in length, having a 4% maximum grade. The regular load is 11 or 12 one-ton loaded ore cars. They have pulled as many as 22 loads, but this is considered excessive. The mill is being operated steadily at a capacity of about 175 tons per day. It is planned to increase the capacity to 400 tons daily next spring.

Golden Gate—A crew of men is rapidly getting the shaft in shape for operation of the electric hoisting plant, which will be installed.

Homestake—Royalty payments to C. W. Merrill have ceased, his final contract, which covered the slime plant, having expired Aug. 12.

Mogul—Shipments of about 75 tons per day are being made from the Lucille mine of this company to the Lundberg, Dorr & Wilson mill, at Terry. Lessees are operating at two or three other places. Leases have also been given to allow the lessees to secure what gold they can on the site of the two mills, which were destroyed by fire. One of the mills was located at Terry and the other at Pluma.

Wasp No. 2—This property is operating at its usual rate. Dividend for October was 2c. per share, or $10,000. New steel zinc-boxes have just been installed in the precipitation room.

Utah

JUAB COUNTY

Tintic shipments for the week ended Oct. 18 amounted to 170 cars. There has been a car shortage to some extent, caused by the hauling of sugar beets, and other traffic at this season.

Mammoth—The copper ore opened from the 600-, 700- and 800-ft. levels has been followed above the 600 and it is thought from the present showing that it may continue through to the upper levels. Driving is being done on the 400, toward where this ore is expected. About 300 ft. more work will be required to reach this ground. Nearly 5000 tons of dump ore has been shipped recently.

Iron Blossom—Lead-carbonate ore has been opened above the 500 level of the No. 1 workings. Two raises are being cut for this ore, which is about 180 ft. above the level. Copper ore has been opened on the 600 in the No. 3 workings, and a winze is being sunk on this ore The copper ore is the first found in the north end of the Iron Blossom.

Yankee—Prospecting is being done from the west drift of the 1800-ft. level, the work being almost directly underneath the old workings from which zinc ore is being mined. New zinc ore has been opened during the last few weeks, and about two cars weekly are being shipped.

Swansea—An old winze sunk 65 ft. below the 940-ft. level has been cleaned out, and work will be continued here, as soon as a donkey-engine can be installed.

Beck Tunnel—Thirty tons of ore is being shipped daily. The company is more than meeting expenses.

Opohongo—Steady shipments are being made, and earnings are stated to be in excess of dividend requirements.

East Tintic Development — Lessees have recently shipped a car of zinc ore.

Tintic Smeltery—Two cars of ore that have been stored in the bins since the time of the closing down of the smeltery were shipped the week ended Oct. 18.

SALT LAKE COUNTY

Ohio Copper—Operations were resumed Oct. 15 at the mine, and one section of the mill has been started.

Utah Copper—The output for September was cut down nearly half on account of the strike. The production was 6,965,144 lb. of copper, as compared to 11,248,992 lb. in August, and 10,502,000 lb. in July. The production for the quarter was 28,816,136 lb. Eleven of the 22 steam shovels were at work Oct. 24.

Michigan-Utah—All arrangements of buildings and surface equipment for the winter have been made, and shipments are being made over the new tramway; 100 tons was sent down, Oct. 16. About 35 men are working on leases at the City Rocks end of the property. A visit of inspection was recently made by the directors.

Alta Consolidated—Surface improvements are being made, including new quarters for the men. M. J. Dailey, formerly superintendent at the Silver King Coalition, at Park City, has been elected a director, and E. A. Culbertson has been chosen treasurer.

South Hecla—Operations with a full force of men have been resumed at this property.

Intermountain Transportation — Articles of incorporation have been filed by this company, which has been organized to provide transportation facilities for any camps or mines, that can afford a sufficient tonnage. Several motor trucks are stated to have been ordered. F. V. Bodfish is president.

Canada

ONTARIO

Strathcona—The Canadian Copper Co. has relinquished its option on this nickel property after drilling eight holes. It is in the township of Levack, adjoining the Levack mine. The owners of the Strathcona will continue drilling this winter.

Murray—Seven drills are now at work on this mine, recently purchased by the Dominion Nickel-Copper Co. It is reported that large ore reserves are being opened on an extension of the orebody to the northwest. Smith & Travers, of Sudbury, are doing the drilling for the company.

Tam O'Shanter—The Canadian Copper Co. will commence drilling on this property, on the South Range, east of its Creighton mine.

North Star—The Mond Nickel Co. is planning to reopen this mine, which has been closed for several years. It adjoins the Creighton on the east and has yielded some rich ore.

W. D. 38—This lot, on the North Range, is being developed by Messrs. Laforest and Bennett, of Sudbury. The same men are doing some work on Clear Lake, at the east end of the district.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Oct. 25, and for the year to date, were:

Bailey		21.57
Beaver ...		299.38
Buffalo		989.50
Casey Cobalt		255.15
City of Cobalt.		887.99
Cobalt Lake		739.55
Cobalt Townsite	117.25	1,579.40
Chamb.-Ferland	32.80	395.13
Coniagas		1,673.95
Crown Reserve....		388.21
Drummond ..		383.05
Hudson Bay		569.32
Kerr Lake ..	60.40	651.17
La Rose	32.60	2,907.68
Lost and Found		27.80
McKinley-Darragh	44.22	2,182.72
Nipissing.		1,704.50
O'Brien................		560.64
Penn.-Canadian........		63.45
Provincial .		22.22
Right of Way		242.82
Timiskaming		893.71
Trethewey		147.79
Wettlaufer		346.45
Colonial...............		63.14
Dominion Reduction Co		56.64
Totals..	287.27	18,352.93

Cobalt Townsite—One hundred and twenty men employed by this company went out on strike, on Oct. 19, on being refused a reduction of the working hours from ten to nine per day.

Wettlaufer—A report for the quarter ended Sept. 30, shows that 4765 tons was milled, producing 195,273 oz. of silver, worth $125,841. The expenses were $48,444, leaving profits of $77,396. Fred Hellman, consulting engineer, reports that as 658,647 oz. of silver had been extracted in the first nine months of the year, the silver in sight at the end of September was about 341,300 oz., and that unless further discoveries of ore are made in the near future, the present rate of dividends cannot be maintained much longer.

Pan Silver—This mine will be unwatered and operations resumed, the management having decided to mine on deep levels.

Crown Reserve—A new branch of the Office vein has been encountered in a crosscut on the 200-ft. level. It shows 2 in. of calcite and cobalt and is reported to assay 3500 oz. of silver per ton.

Kissinger—A plant has been ordered for this property, in South Lorrain, where the shaft is now down 100 ft. The vein dipped out of the shaft at a depth of 50 ft. and development will be undertaken at the 100-ft. level to pick it up.

ONTARIO-PORCUPINE

Hollinger—Since the commencement of operations this mine has shipped a total of 29 bars of bullion of the value of $464,000.

McEnaney—The main shaft is down 415 ft. and a station has been cut at the 400-ft. level. The rich vein cut at 200 ft. has been picked up on the 100-ft. level.

Vipond—C. H. Poirier, manager, has returned from a visit to New York and Toronto and has secured data which will determine the type of cyanide plant to be installed, as experience has shown that amalgamation does not give a sufficiently high recovery.

Tough Claims—In the course of development on these claims, in the Swastika district, two more rich, but narrow veins have been discovered.

Dixon—A large hoist is being installed at the No. 9 shaft. When this work is finished, underground operations will be resumed on a large scale.

Dome—On account of water shortage in Simpson Lake, this company finds it necessary to put in a new pipe line to Porcupine Lake, about 2½ miles distant.

Mexico

SONORA

Lucky Tiger-Combination Gold Mining Co.—During September, ore, concentrates and bullion were produced of a total realizable value of $85,620; net profits amounted to $27,888. In the old mill, which was in operation 61% of the time, 1500 tons of ore was crushed; the stamp mill was in operation 75% of the time, crushing 2767 tons of ore. The cyanide plant treated 4150 tons of current and 1125 tons of dump tailings. The low profit for September was due to the effects of the presence of bandits in the vicinity of the mine, as the metallurgical results were better than in any previous month.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Oct. 30—The coal-trade situation in the West is not improving, and better conditions are hardly expected for a month yet. The closing of the Lake trade will then release a number of cars, which can be used in the general coal trade.

The Seaboard bituminous trade is still active, with prices strong. Supplies are a little better, but the coastwise trade is calling loudly for coal.

The anthracite companies are slowly catching up with demand, but the trade is still behind on deliveries to consumers. Some sizes, both domestic and steam, are scarce.

United States Fuel Imports—Imports of coal and coke into the United States, eight months ended Aug. 31, long tons:

	1911	1912	Changes
Anthracite	....	30	I. 30
Bituminous	844,959	1,025,388	I. 180,429
Coke	51,225	61,156	I. 9,931
Total	896,184	1,086,574	I 190,390

Canada furnished this year 916,453 tons coal and nearly all the coke; Australia, 84,554 tons coal; Japan, 18,616 tons coal. Imports are nearly all on the Pacific Coast and in the far Northwest.

United States Fuel Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, eight months ended Aug. 31, long tons:

	1911	1912	Changes
Anthracite	2,294,005	2,186,330	D. 107,675
Bituminous	8,642,859	9,668,352	I. 1,025,493
Coke	651,450	556,583	D. 94,867
Bunker coal	4,406,351	4,943,257	I. 536,906
Total	15,994,665	17,354,522	I. 1,359,857

Canada took this year 8,836,946 tons of coal; Cuba and the West Indies, 1,238,045 tons; Panama, 312,227 tons; Mexico, 224,561 tons.

IRON TRADE REVIEW

New York, Oct. 30—The iron and steel trade continue in extremely active condition. There has been, however, less talk of advancing prices, and quotations have, for the most part, been stationary.

There has been a decrease in buying of steel products for far-forward delivery, although it is difficult thus early to determine the cause of the decrease. In specifications against contracts there is also a decrease, as compared with 30 days ago, but the tonnage being specified is still very large

There are two distinct markets in many steel products, the prices at which the larger mills will sell, if they sell at all, and the higher prices at which smaller mills will sell for early delivery. As to the lower range of prices, the prediction is now made that there will be no further advances for some time, or until the future can be more clearly seen. A couple of exceptions are made in this prediction, referring to shafting and tinplates, which may be advanced $2 a ton within the near future.

The scarcity of unfinished steel is increased, and there are practically no offerings from any quarter for the balance of this year, while the mills adhere to their recent declarations that they will not open their books for first quarter, being already oversold with the heavy requirements of their own finishing mills and their regular long-term contracts for billets and sheet bars, against which consumers are specifying the maximum tonnages allowed. It is becoming more and more clear that barring accidents some of the independent finishing mills will not be able to run full in the early months of the new year. The loss of production may be small in proportion to total tonnage, but it is a striking fact that there should be finishing capacity idle when the market could absorb its product.

Buying of pig iron has been heavy, the demand for foundry and basic pig being insistent. It does not seem to be at all discouraged by the advances which most furnaces are asking on new contracts. The coke situation seems to be a little easier, but it is still a question whether further expansion in iron production is possible without a larger supply of fuel.

United States Steel Corporation—The statement for the quarter ended Sept. 30, gives net earnings after deducting operating expenses and ordinary renewals, as follows:

	1911	1912
July	$8,750,167	$9,322,142
August	10,710,445	10,583,377
September	10,062,113	10,157,993
Quarter	$29,522,725	$30,063,512
Depreciation, sinking fund, etc.		$9,286,047
Interest on bonds		5,683,964
Total charges		$14,970,011
Surplus for the quarter		$15,093,501
Dividends paid		12,658,700
Balance		$2,434,801

The usual dividends of 1¾% on preferred and 1¼% on common stock were declared. The total net earnings for the nine months ended Sept. 30, were $72,992,800, which compares with $81,150,448 for the corresponding period last year. The decrease shows the effect of low prices.

Baltimore

Oct. 28—Imports for the week included 793 tons ferromanganese from Liverpool; 480 tons ferromanganese from Rotterdam; 250 tons steel scrap from London; 5336 tons manganese ore from Batum, Russia; 24,700 tons iron ore from Cuba.

Birmingham

Oct. 28—Southern pig-iron manufacturers are selling their product right along but not to any extent beyond the first quarter of 1913. The quotations are on a minimum of $14 per ton, for No. 2 foundry, with $14.50 per ton asked for next year. Some companies are selling at $14.50 for delivery during the first half, while others are not selling at all for the second quarter, preferring to wait. Efforts are being made to make full delivery on orders received some time ago and as far as can be learned there is little, if any delay. Another blast furnace has been put in operation in Alabama. The home consumption promises to be active throughout the coming year.

Following an announcement a few weeks ago that two additional pipe plants are to be erected at Anniston, Ala., the formal organization of a new pipe company with practically all local capital has been perfected in Birmingham and a plant will be erected during the next 12 months at Boyles, just outside Birmingham. Machine shops and foundries continue busy with prospects of a steady run through the Winter and Spring at least.

It is given out officially that orders are in hand that will warrant the operation of the Bessemer rolling mills steadily for several months. The Tennessee Co. owns the Bessemer mills. The big steel plant at Ensley will most likely break some records as to output during this month.

Charcoal iron still sells at $22 and over with the production about equal to the demand. Scrap iron is in good demand with plenty of stock to meet the demands.

Chicago

Oct. 29—Sales of pig iron continue moderate and prices are firm; the demand for iron and steel products makes the market for them active; a flood of orders pours in constantly and presses hard on the productive capacity of the mills. With all this promise of future as well as present business, pig-iron sales continue only moderate. Many of the larger melters are well covered for their requirements of the first half; others are buying for that time in small lots; no sales have been made beyond the first half, though some inquiries are coming in.

Southern No. 2 foundry iron holds to $14@14.50, Birmingham, which means $18.35@18.85, Chicago. Northern of the same grade sells at $17@17.50, furnace, making the delivered cost about $17.50@18. In general, the pig-iron market seems strong and the aggregate of orders maintains a good tonnage showing each week. Lake Superior charcoal iron is in good demand at $17.75@18.25 on deliveries to the end of the first quarter.

The finished-material market is everywhere strong. Railroad supplies are being very largely bought, rail orders being numerous and for large tonnage. Structural material is sought to such an extent that mills cannot supply the demand, for first-half deliveries, advances in prices seeming to have no effect on the demand. Bars likewise suffer no check from higher prices and the problem is to obtain the material in time. Sheets and plates are hard to get for first-half delivery and minor lines show a similar pressure on the producers.

Cleveland

Oct. 28—Lake ore movement is very heavy and it looks like an unprecedented tonnage in October.

Pig Iron—Sales continue large, and prices firm, with an upward tendency. Bessemer pig is quoted $17.90 and No. 2 foundry $17@17.25, Cleveland delivery.

Finished Material—The main feature is the pressure on the mills for deliveries. On new orders, especially for bars, plates and structural steel, it is hard to get definite assurances as to time from most mills. Structural steel is especially in demand.

Philadelphia

Oct. 30—Prices are advancing slowly in all kinds of pig iron, due largely to the heavy purchases of crude and semi-finished steel. Inquiries have increased during the past week for next year's delivery as late as summer. Basic has been particularly active in large lots and the inquiries now pending indicate that consumers are anxious to supply remote wants. There are some intimations that the topmost level of prices is in sight, but this gratuitous inference is not supported by any reasonable evidences in sight. The buyers of foundry iron have been piecing out in small lots. The demand for forge is heavier than for months and will probably continue, as the mill people have not covered forward requirements to the extent that has been done by other consumers. Outside prices for No. 2 X foundry are $18.50; No. 2 plain, $18; forge, $17.50; basic, $18; low-phosphorus, $23.50 per ton.

Billets—Billets are in active demand once more, at $30 for rolling, and a good business is now in sight.

Bars—Refined is in active demand at 1.60c., delivered in small lots, and newcomers are facing higher quotations and the difficulty of getting iron delivered when they need it. Common iron is more active than for months.

Sheets—Sheets have advanced in many cases as much as half a cent, and even a further advance for forward deliveries is in sight. Blue annealed sheets are quoted at 1.80c. as a minimum.

Pipes and Tubes—Delayed shipments of tubes have caused some inconvenience. Merchant pipe has been advanced.

Plates—It is difficult to give quotations for plates. The requirements crowding in from day to day are causing the makers much concern. About 1.75c. is the nearest safe price for early delivery. Much business is done at 1.60@1.65c., where some liberty is accorded as to deliveries.

Structural Material—The volume of business in structural material is heavy at 1.65@1.75c., according to delivery, and inquiries are presented for large supplies for first and second quarters.

Scrap—Recent heavy dealings have practically cleaned out all the available scrap of the higher grades, and even in the lower grades stocks are smaller than they have been for months.

Pittsburgh

Oct. 29—Pressure upon steel mills for delivery is unabated, and in lines like bars, plates and shapes this is forcing an increasing tonnage of new business to the smaller mills, which did not fill up, and can, therefore, make early deliveries, at prices ranging from 1.60 to 1.80c., Pittsburgh. The regular market, for far-off delivery, is quotable at 1.40c. for bars and 1.50c. for plates and shapes. The Steel Corporation, however, which has evinced a disposition lately to curb the advancing tendency, is quoting from 1.40@1.45c. on plates and shapes, but it picks its customers very carefully. It has figured largely in the sale of material for the large car orders placed this month, at 1.40c. for plates, which gives the car shops the concession from open-market prices, to which they consider themselves entitled. Car orders placed in October total about 30,000, a quantity almost equal to the orders placed during all of the three preceding months. At their present rate of operating, about 60% of capacity, the car shops are now easily filled through the first quarter of the new year.

Pig Iron—Sales of bessemer iron aggregating over 40,000 tons have been put through, at $17, Valley. These include one lot of about 5000 tons a month over the first half, and other lots of about 10,000 and 5000 tons, for delivery during the first half. Sales of basic iron have been made at $16.25, Valley, 5000 tons for first quarter and 2500 tons for second quarter. This establishes the market, which had been quotable roundly at $16@16.25, there having been sales at $16, followed by one or two reported at $16.15. Foundry grades have been quiet, it being hard to arrange deliveries, with furnaces already behind, while buyers have been less keen since the sharp advances. Occasional small lots have gone at prices above the regularly quotable market. We quote: Bessemer, $17; basic, $16.25; foundry, $16.50@16.75; forge, $16; malleable, $16.25@16.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The contract market is strong at $61, Baltimore, for 1913 delivery, freight to Pittsburgh being $1.95. Prompt lots are very scarce indeed, and are quotable in general at $70@75, Baltimore, with very little material available. Consumers are very well covered on contracts, but are not getting good deliveries.

Steel—There is no prospect of any loosening up in the supply of billets and sheet bars for months to come. Consumers are ready to buy for first quarter, but cannot find any sellers. For early delivery some steel could be sold, though possibly no large tonnage, but there are practically no offerings, and it remains a question between producers and consumers of deliveries on contract. These are fairly satisfactory, but occasionally production is lost by finishing mills through inadequate shipments. We continue to quote the market as follows, though prices are necessarily largely nominal: Bessemer billets, $26@26.50; bessemer sheet bars, $26.50@27; openhearth billets, $27@27.50; openhearth sheet bars, $27.50@28, f.o.b. maker's mill, Pittsburgh or Youngstown, with rods at $29@30 for delivery from the same points.

Sheets—For any delivery within the next 60 days, mills have no difficulty in securing premiums of $2 a ton on black and galvanized sheets, while a premium of $1 a ton on blue annealed is also obtainable. Mills have actual specifications to operate them an average of 10 to 12 weeks. Sales for next year have decreased somewhat, the mills which were free sellers being now fairly well filled through first quarter, while others, not so well filled, are refraining from selling on account of uncertainty as to their steel supply. We quote the market as follows:

Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.50c.; blue annealed, 10 gage, 1.60@1.65c.; painted corrugated, 2.35@2.45c.; galvanized corrugated, 3.45@3.50c., Pittsburgh.

St. Louis

Oct. 28—The market for pig iron has been very strong during the past week. The demand for finished products has been better than for years. All of the car plants and steel foundries are on full time. Labor, however, on the East Side is very scarce, which is attributed largely to the departure of numbers of Greeks and other people from southern Europe for the war. Southern No. 2 foundry remains at $14, Birmingham, or $17.75, St. Louis. Producers predict a price of $15 before long. Northern iron is bringing around $18.50, St. Louis.

Coke is very scarce, foundry coke from the Connellsville region bringing $6.25@6.50, St. Louis. Byproduct coke is coming into its own and more is being used than ever before.

Iron Ore Trade

Imports and exports of iron and manganese ores in the United States, eight months ended Aug. 31, long tons:

	1911	1912	Changes
Iron ore, imp.......	1,177,896	1,358,881	I. 180,985
Iron ore, exp......	484,578	729,082	I. 244,504
Manganese, imp....	110,382	153,364	I. 42,982

Imports this year incuded 903,665 tons from Cuba; 243,605 from Sweden; 80,145 from Spain; 75,260 from Newfoundland and Labrador; 46,864 from Canada; 9342 from other countries. Exports are chiefly to Canada.

United States Foreign Trade

Exports and imports of iron and steel and of machinery in the United States for eight months ended Aug. 31, are valued as below by the Bureau of Foreign and Domestic Commerce of the Department of Commerce and Labor:

	1911	1912	Changes
Exports......	$159,113,290	$190,411,532	I. $31,298,242
Imports......	20,224,223	18,509,648	D. 1,714,575
Excess,exp.	$138,889,067	$171,901,884	I. $33,012,817

Increase in exports this year, 19.7%; decrease in imports, 8.5%. The leading articles of iron and steel were, in long tons:

	Exports		Imports	
	1911	1912	1911	1912
Pig iron............	85,378	172,697	107,999	77,671
Scrap...............	57,596	72,962	13,423	11,373
Billets, blooms, etc	161,424	199,947	21,366	12,100
Bars....	95,143	141,627	19,195	16,793
Rails..........	311,732	312,894	523	2,495
Sheets and plates..	219,210	361,854	1,548	2,440
Structural steel....	143,173	192,324	281	1,584
Wire-rods..........	11,096	42,123	11,284	9,635
Wire...	139,635	167,609	.....	.... .
Nails and spikes	48,727	68,304	.....	......
Tinplates..........	36,095	60,100	12,662	1,296
Pipe and fittings .	130,147	172,270	.....	. .

Imports of wire not reported in quantities; values were $929,759 in 1911, and $705,700 in 1912. Exports of mining machinery were valued at $4,615,572 in 1911, and $4,930,930 this year.

METAL MARKETS

New York, Oct. 30—The metal markets continue generally strong, but have been rather quiet during the week.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Sept. 1912..	$ 568,302	$ 4,200,682	Imp. $3,632,380
" 1911..	2,352,861	4,704,096	Imp. 2,351,235
Year 1912..	43,728,274	38,789,793	Exp. 4,938,481
" 1911..	18,263,310	45,177,106	Imp. 26,913,796
Silver			
Sept. 1912..	6,011,221	3,648,883	Exp. 2,362,338
" 1911..	4,940,391	4,161,706	Exp. 778,685
Year 1912..	52,347,946	36,301,752	Exp. 16,046,194
" 1911..	49,527,961	33,696,430	Exp. 15,831,531

Exports from the port of New York, week ended Oct. 26: Gold, $70,100; silver, $820,585, chiefly to London. Imports: Gold, $1,162,288, principally from London, silver, $480,658, largely from Central and South America

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Supplies went chiefly to the Bank of England and to Paris.

Platinum—The market is again a little more active, but prices show no change. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Iridium—Prices are firm and unchanged at $68@70 per oz., New York.

Palladium—There is some demand for this metal, and $72 per oz. is quoted.

Silver—The market has fluctuated between small limits, closes todav at 29d. in London. It is expected that the Autumn requirements for the India Mint may give more firmness to the market.

SILVER AND STERLING EXCHANGE

October	24	25	26	28	29	30
New York...	63¼	63	63⅛	63	63¼	62⅞
London . .	29 3/16	29 1/16	29 1/16	29 1/16	29 1/16	29
Sterling Ex..	4 8600	4 8570	4 8570	4 8575	4.8575	4.8580

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Oct. 17, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£6,950 300	£8,591,500	I. £1,641,200
China	989,700	993,500	I. 3,800
Total ..	£7,940,000	£9,585,000	I £1,645,000

Coined silver in the United States Oct. 1, as estimated by the Treasury Department: Standard dollars, $565,424,367; subsidiary coins, $167,248,119; total, $732,652,486. Of the dollars $495,214,000 are held by the Treasury against silver certificates outstanding.

Copper, Tin, Lead and Zinc

NEW YORK

Oct	Copper		Tin	Lead		Zinc	
	Lake Cts per lb.	Electrolytic Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis Cts. per lb.	New York, Cts. per lb.	St. Louis Cts. per lb.
24	17½ @17¾	17 20 @17.30	50¼	5 00 @5 05	4.85 @4 90	7 35 @7.40	7 20 @7 25
25	17½ @17¾	17 20 @17 30	50¼	5 00 @5 05	4 85 @4.90	7 35 @7 40	7 20 @7 25
26	17½ @17¾	17 20 @17 30	50¼	5 00 @5 05	4 85 @4 90	7 35 @7 40	7.20 @7.25
28	17½ @17¾	17.15 @17.25	50⅜	5.00 @5.05	4 80 @4 85	7.30 @7.40	7 15 @7.25
29	17½ @17¾	17 15 @17 25	50⅜	5.00 @5 05	4 80 @4 85	7 30 @7.40	7 15 @7.25
30	17½ @17¾	17 15 @17 25	50⅜	5 00 @5 05	4 80 @4.85	7 30 @7 40	7 15 @7 25

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Oct.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
24	75⅝	76⅛	81	230	228¾	19¼	27½
25	75⅝	76⅛	81	230	229	19¼	27½
26	....	....	....	......	......	....	...
28	75⅝	76⅛	81	231¼	230½	19⅜	27½
29	75¼	75⅞	80¾	230	229¼	19⅜	27⅜
30	74¾	75⅜	80¼	229	228¾	19¼	27⅜

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper—The market continues to be extremely quiet, domestic consumers holding aloof and foreign supplying themselves out of European stocks. The larger agencies maintain the old price and make no attempts to effect sales. Other agencies, however, are willing to meet the market and take what they can get. But so far no pressure to make sales has been exerted. The market closes very quiet, with an easier tendency. Lake copper is quoted nominally at 17½@17¾c.; electrolytic in cakes, ingots and wirebars closes at 17.15@17.25c. Casting copper is quoted nominally at

17.05@17.15c. as the average for the week.

The standard market, which, up to Oct. 28, held fairly steady to firm, became weak on Oct. 29 under liquidation and bear sales. A further decline took place during the morning exchange of Oct. 30, after which a slight reaction set in, but the market closes barely steady at £74 15s. for spot and £75 7s. 6d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 6992 long tons. Our special correspondent gives the exports from Baltimore at 594 tons for the week.

Copper production in Russia, for the half year ended June 30, is reported as follows: Urals, 8885; Caucasus, 4623; Siberia, 2056; chemical works and refineries, 580; total, 16,144 long tons. This is an increase of 4709 tons, or 41.2% over the first half of last year.

Tin—The London market presented an unusually steady appearance during the past week, fluctuations there hardly exceeding £1. Reports from abroad continue of a very bullish character and a further large advance in price is being predicted. Notwithstanding all these advices, interests on this side are not willing to accumulate stocks, but were rather anxious to effect sales. Inquiry on the part of consumers was active, and they were able to purchase their supplies at from ⅛ to ¼c. below importation point. The market closes easy at £229 for spot and £228 15s. for three months in London, and about 50⅛c. here for November tin.

Lead—The market was flooded with offers, emanating from Western smelters and dealers, and the demand, which was fairly good, was taken care of at ever-receding prices. The American Smelting & Refining Co. still maintains its price of 5.10c. for New York delivery, but outside lead, in consequence of the low Western price, is offered much below that figure. The market closes weak at 4.80@4.85c., East St. Louis, and 4.95@5c., New York.

The weakness in the European market has made further progress. While the selling pressure has abated somewhat, the demand has also fallen off, and the market closes dull at £19 5s. for Spanish lead and £19 7s. 6d. for English.

Spelter—While the demand for this metal has remained slight, there was some anxiety displayed by sellers to market their product. In consequence thereof, prices have suffered and the market closes at 7.15@7.25c., f.o.b. St. Louis, and 7.30@7.40c., f.o.b. New York.

Reports from Europe are to the effect that the demand over there has also fallen off somewhat, and that the tone of the market is easier. The close is cabled at £27 7s. 6d. for ordinaries and £27 12s. 6d. for specials.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¼c. per lb., New York.

Other Metals

Aluminum—The market is strong and active, and business seems to have been stimulated by the higher prices. Current quotations for early delivery are 27c. per lb. for No. 1 ingots, New York; while up to 28@29c. per lb. is asked for futures.

Antimony—The market is strong and business has been on a good scale. Offerings by producers are light. Cookson's is quoted at 10½c. per lb. and Hallett's at 9⅞@10¼c.; while 9¾@9⅝c. is paid for Chinese, Hungarian and other outside brands.

Quicksilver—Business is good and the market is steady, but with no material change in prices. New York quotations are $42@42.25 per flask of 75 lb., with 60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price is £8 per flask, with £7 17s. 6d. asked from second hands.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Imports and Exports of Metals

Exports and imports of metals in the United States, eight months ended Aug. 31, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess
Copper, long tons	247,592	119,815	Exp. 127,777
Copper, 1911....	236,787	100,923	Exp. 135,864
Tin, long tons....	371	35,440	Imp. 35,069
Tin, 1911........	863	32,327	Imp. 31,464
Lead, short tons.	46,126	61,857	Imp. 15,731
Lead, 1911.....	71,366	60,656	Exp. 10,710
Zinc, short tons..	6,442	4,463	Exp. 1,979
Zinc, 1911......	4,244	1,303	Exp. 2,941
Nickel, lb........	17,708,424	26,573,202	Imp. 8,864,778
Nickel, 1911....	16,078,387	19,551,900	Imp. 3,473,513
Antimony, lb.....	40,982	11,432,269	Imp. 11,391,287
Antimony, 1911.	160,844	6,982,003	Imp. 6,821,159
Platinum, oz.....	......	68,187	Imp. 68,187
Platinum, 1911.	95	77,505	Imp. 77,410
Aluminum, lb....	211,086	12,029,888	Imp. 11,818,802
Aluminum, 1911	....	....	....
Ores, etc.			
Zinc in ore, lb...	13,480,634	18,930,781	Imp. 5,450,147
In ore 1911....	14,624,226	22,844,827	Imp. 8,220,601
Zinc oxide, lb. ..	23,223,275	....	Exp. 23,223,275
Zinc oxide, '11..	18,105,264	....	Exp. 18,105,264
Zinc dross, lb....	403,918	....	Exp. 403,918
Zinc dross, '11..	5,608,110	....	Exp. 5,608,110
Chrome ore, l.t..	....	36,646	Imp. 36,646
Chrome ore, '11	5	27,568	Imp. 27,563

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Quantity of zinc ore imported in 1912 was 27,517 tons; exported, 15,279. Imports of aluminum were not reported previous to July 1, 1911. Exports of manufactures of aluminum were valued at $844,681 this year. The metal exports given above, include re-exports of foreign materials.

Zinc and Lead Ore Markets

Platteville, Wis., Oct. 26—The base price paid this week for 60% zinc ore was $56@57. The base price paid for 80% lead ore was $64 per ton.

SHIPMENTS WEEK ENDED OCT. 26

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville...........	871,240	84,600	126,000
Mineral Point.........	819,100	....	....
Highland..............	607,100	.. ....	....
Galena................	328,800	....	....
Benton................	309,700	64,100	525,600
Shullsburg............	224,000	......	....
Hazel Green...........	180,000	60,000	....
Cuba City.............	136,550	....	57,300
Harker................	82,020	59,460	......
Linden.	58,680	....	....
Livingston............	......	60,000	......
Montfort..............	......	80,000	....
Total.................	3,617,190	408,160	708,900
Year to date..........	165,408,720	7,071,260	30,041,590

Shipped during week to separating plants, 2,170,700 lb. zinc ore.

Joplin, Mo., Oct. 26—Prices of zinc-sulphide ore are unchanged from last week, $61 high, the base $54@58 per ton of 60% zinc. Zinc silicate sold unchanged on a base of $31@34 per ton of

SHIPMENTS WEEK ENDED OCT. 26

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,173,180	.....	1,118,860	$152,090
Joplin	2,447,500	......	249.120	78,824
Duenweg....	921,560	......	37 440	26,963
Alba-Neck....	875,940	......	......	25,402
Galena.	704,090	......	141,320	24,517
Miami	270,730	......	261,010	15,260
Oronogo.....	514,240	. .	63 750	14,131
Spurgeon .	143,860	346,500	25,000	10,896
Laeton.......	255,310	.....	......	7,404
Granby	180,700	192,590	24.890	6,850
Carl Junction	214,520	......	.....	6,543
Jackson	178,360	....	7,060	5,215
Aurora	57,580	131,040	......	3,915
Quapaw.....	129,900	......	......	3,377
Springfield...	. ..	......	88,000	2,900
Cave Springs	61,100	......	21,290	2,380
Carthage ...	64,210	.....	.....	1,753
Sarcoxie......	62,000	......	......	1,674
Wentworth...	... .	62,620	......	1,000
Davis, Okla..	33,180	......	......	830
Totals......	11,287,860	732,750	2,037,740	$391,924
10 mos. .. .	461,957,420	29,362,280	77,733,830	$15,022,115

Blende val., the week, $316,508; 10 mos., $12,344,575
Calamine, the week, 11,297; 10 mos., 463,003
Lead value, the week, 64,119; 10 mos., 2,214,537

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January....	$41 85	$44 90	$40 55	$43.54	$55 68	$58.92
February..	40 21	45 75	39 16	43.31	54 46	52.39
March......	39.85	51.56	38.45	49.25	54.57	54.64
April........	38.88	52 00	37 47	50.36	56 37	54 18
May..........	38.25	55.30	36 79	53.27	55 21	52.45
June........	40.50	55 88	38 18	54 38	56.49	55.01
July........	40 75	58 85	38 36	56 59	58 81	58 83
August	42 50	55 13	41 28	53.27	60 74	57 04
September ..	42 63	59 75	41 29	57 07	59 33	61.26
October......	42.38	.....	40.89	......	54.72	.....
November...	45.40	......	43.25	......	57 19	.. ...
December...	44.13	....	40 76	......	62 03	......
Year.....	$41.45	..	$39.90		$56.76	.. ..

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

40% zinc. The average price, all grades zinc, is $54.54. Lead sold on a base of $63@64 per ton of 80% metal contents. The average price, all grades of lead, is $63.90 per ton.

Increased demand the past three weeks strengthened the market toward the close 50c. to $1 per ton on a few cars of zinc ore. Of the reserve stock, about one-half is sold ahead, while the remaining half is held for higher prices. Shipments are running high and the outputting continues heavy.

Chemicals

New York, Oct. 30—Conditions in the general market continue good.

Arsenic—Spot supplies are still in demand and prices are higher, at $5.25@5.50 per 100 lb. Futures are also harder, $5@5.50 per 100 lb. being asked.

Copper Sulphate—Trade is a little quieter, but the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is fair and spot nitrate is steady at 2.55c. per lb. Futures are a little uncertain, 2.57½c. per lb. being asked for November and December and 2.60c. for January-March deliveries. The advance is due to large German speculative holdings.

Imports and Exports—Imports and exports of chemicals and fertilizers, including raw materials for chemical manufacture, in the United States for the eight months ended Aug. 31, were as follows:

	Imports	Exports		Excess
Copper sulph. lb.	....	5,537,588	E.	5,537,588
Copper sul., '11	....	6,361,920	E.	6,361,920
Bleach, lb.......	48,515,139	400	I.	48,514,739
Bleach, 1911....	55,930,658	17,358	I.	55,913,300
Potash salts, lb..	420,694,461	2,435,452	I.	418,259,009
Potash salts, '11	445,807,384	1,976,950	I.	443,830,434
Soda salts, lb....	8,260,089	328,362	I.	7,931,727
Soda salts, 1911	17,875,570	405,681	I.	17,469,889
Acetate lime, lb	....	54,191,192	E.	54,191,192
Acetate, 1911.	....	53,486,605	E.	53,486,605
Nit. of soda, tons	322,305	6,060	I.	316,245
Nitrate, 1911...	384,359	4,086	I.	380,273
Phosphates, tons	....	836,803	E.	836,803
Phosphates, '11	....	832,732	E.	832,730
Sulphur, tons...	16,854	28,113	E.	11,259
Sulphur, 1911..	14,357	17,888	E.	3,531
Pyrites, tons.....	590,366	....	I.	590,366
Pyrites, 1911...	662,157	....	I.	662,157
Magnesite, lb....	156,017,586	1,927,638	I.	154,089,948
Magnesite, 1911	192,416,872	1,538,695	I.	190,877,877
Sul. ammonia, lb.	62,032,342	357,600	I.	61,674,742
Sul. am'nia, '11	111,568,408	....	I.	111,568,403
Arsenic, lb.......	3,593,721	650	I.	3,593,071
Arsenic, 1911...	3,256,430	3,000	I.	3,253,430

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total quantity of sulphur imported this year was 253,000 tons.

Petroleum

The Standard Oil companies have announced that they will stop the sale of fuel oil after Dec. 1. The reason given is the large demand for gasoline for engines and automobiles, which makes it more profitable to refine the oil than to sell it in crude form. This applies chiefly to the West, where Lima and Indiana oil has been sold largely as crude oil for fuel purposes.

The Interstate Commerce Commission has informed pipe lines that they may defer, until Dec. 1, compliance with the order requiring them to file schedules of their rates with the commission, on the ground that they are common carriers. This originally was made effective Nov. 1. The postponement is taken in order to give the Commerce Court time to pass upon the petition of the pipe lines for an injunction. This petition of the pipe lines is to be argued immediately.

MINING STOCKS

New York, Oct. 30—On Oct. 24, the early dealings on the Exchange showed some weakness and irregularity, but at the close there was a strong tone and general recovery in prices. The curb was rather dull, mining stocks being irregular in price on light trading.

Oct. 25 the Exchange was still under pressure, but rallied a little toward the close. Steel common was especially weak. The Curb dealings in mining stocks were small, at irregular prices.

Oct. 26 the Exchange continued weak and irregular. Mining stocks on the Curb were more active, especially the coppers, which developed some strength.

Oct. 28 the Exchange was notably firmer, but dealings were not heavy. On the Curb mining stocks were moderately active, but price movements were narrow.

Oct. 29 and 30 the Exchange was fairly active, but rather irregular, chiefly on account of the disturbed foreign markets. Mining stocks on the Curb were also irregular, but generally firm, on a narrow business.

Boston, Oct. 29—Continued weakness characterizes the local metal-share market. In fact, the shares of three copper-mining companies reached the lowest levels of the year the past week. Lake broke $8.62½ to $25.62½, Osceola $12 to $101 and Wolverine $4 to $7. Some others are selling very close to the low price for the year. The market is a pre-election one and displays some natural nervousness.

There has been little important news to affect prices, but there has been more or less liquidation in copper stocks.

Notably weak in today's market was North Butte, which touched $32.62½, a loss of $5.62½ for the week. Granby is off $6 to $59.50. The decision of the directors of this company to continue construction work on the mill of the Hidden Creek, rather than to resume dividend payments has had an unfavorable effect on the stock. Calumet & Arizona is off $6 to $75.25 and U. S. Smelting common $2.87½ to $44.87½. It is not believed that people associated with the latter company will be satisfied with control of the former Dow properties alone in Michigan, but will eventually turn up in control of others, possibly Lake Copper.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	July	August	Sept.
Alaska shipments.	2,224,441	1,242,836	1,726,715
Anaconda	23,000,000	25,250,000	24,500,000
Arizona Ltd.	3,200,000	3,260,000	3,340,000
Copper Queen......	7,708,147	8,040,424	9,103,861
Calumet & Ariz....	4,748,000	4,514,000	4,462,000
Chino..	2,945,000	3,437,309	3,372,369
Detroit...	2,194,090	1,882,289	1,881,668
East Butte	1,261,304	1,410,500	1,250,000
Mammoth..........	1,818,738	1,802,590	1,834,937
Mason Valley... ..	1,500,000	...	....
Nevada Con .	6,084,274	.	....
Ohio...............	617,500	.	... .
Old Dominion ..	2,543,763	2,597,896	2,704,000
Ray...	2,985,965	2,888,095	2,978,405
Shannon	1,446,000	1,400,000	1,142,000
South Utah... ..	142,555	224,855	225,568
United Verde* ..	2,500,000	2,500,000	2,750,000
Utah Copper Co	10,662,000	11,248,992	6,616,887
Lake Superior* ..	19,500,000	21,000,000	19,250,000
Non-rep. mines*.	8,970,000	8,970,000	... ...
Total production	105,991,687	. . ..	... .
Imports, bars, etc..	25,586,735	23,561,161	....
Total blister.....	131,578,422	...	....
Imp. in ore & matte	7,748,392	8,544,624	.. ..
Total American..	139,326,814	.....	.....
Miami†..... ...	3,027,710	3,048,750	2,949,150
Brit. Col. Cos.:			
British Col. Copper	1,026,006	941,364	... .
Granby	1,802,753	1,970,388	....
Mexican Cos			
Boleo†...	2,486,480	. .	...
Cananea ..	4,000,000	4,044,000	3,500,000
Moctezuma .	3,094,016	3,229,839	771,844
Other Foreign:			
Cape Cop., S. Africa	.	.... .	... .
Kyshtim, Russia...	1,325,000	.. .	....
Spassky, Russia...	795,200	902,720	.. .. .
Famatina, Argen..	... ...	....	.. ....
Tilt Cove, Newf'd.	... .	. ...	... .
Exports from:			
Chile...............	8,960,000	8,512,000	6,048,000
Australia	8,288,000	8,064,000	7,616,000
Arrivals in Europe‡	14,112,240	20,200,320	8,518,720

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
X, 1911	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII ...	122,896,697	65,988,474	79,238,716
Year...	1,431,938,338	709,611,605	754,902,233
I. 1912.........	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII...	137,161,129	71,094,381	60,121,331
VIII...........	145,628,521	78,722,418	70,485,150
IX........	140,089,819	63,460,810	60,264,796
X...	......	.	......

VISIBLE STOCKS

	United States	Europe	Total
XI, 1911.... ..	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV.	62,367,557	136,819,200	199,186,757
V........	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX....	46,701,374	113,568,000	160,269,374
X.......	63,065,587	107,408,000	170,473,587
XI....	. .	. .. .	

Curb trading has been of fair volume and prices generally weak. Alaska Gold is off to $8.50. Butte Central was the weak feature, breaking to $6.50 on suits to recover pool stock. Incidentally the pool in a block of the stock which expired a short time ago has been renewed.

Assessments

Company	Delinq.	Sale	Amt.
Alpha Con., Nev	Nov. 13	Dec. 4	$0 03
Best & Belcher	Nov. 6	Nov. 25	0 05
Big Elk Ida	Oct. 9	Nov. 10	0.001
Black Horse, Ida	Oct. 18	Nov. 8	0 01½
Buffalo, Ida	Oct. 28	Nov. 28	0 002½
Bullion, Nev	Oct. 16	Nov. 6	0.03
Crown Point, Nev	Nov. 11	Dec. 4	0.10
Eastern Star, Ida	Oct. 12	Nov. 12	0.002
Exchequer, Nev	Oct. 30	Nov. 20	0.03
Franklin, Mich	Oct. 18	....	2 00
Laclede, Ida	Nov. 18	Dec. 9	0.003
Holy Terror, Ida	Oct. 18	Nov. 18	0.00¾
Hugo, Ida	Nov. 9	Dec. 9	0.001
Hypotheek, Ida	Oct. 14	Nov. 4	0.01
Indiana, Mich	Oct. 16	....	1 00
Lucky Calumet, Ida	....	Nov. 8	0.005
Mayflower, Ida	Nov. 27	Dec. 27	0.005
National Copper, Ida	Nov. 15	Dec. 10	0.01
Oneco, Mich	Oct. 10	....	1 00
Ophir, Nev	Nov. 11	Dec. 9	0.15
Rhode Island, Ida	Oct. 31	Nov. 30	0.00½
Sunshine, Ida	Oct. 30	Nov. 30	0.001
Tar Baby, Utah	Nov. 2	Dec. 2	0.002½
Union Con., Nev	Oct. 15	Nov. 6	0 15
Utah Ideal, Utah	Oct. 9	Nov. 10	0.0⅛
Yellow Jacket, Nev	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59 043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53 325	59.207	24.483	24.595	27.284
May	53.870	53.308	60 880	24.797	24.583	28 038
June	53.462	53.043	61.290	24.651	24.486	28 215
July	54.150	52.630	60.654	25 034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53 295	52.440	63 078	24 567	24.209	29 088
October	55.490	53.340	...	25.596	24.594	......
November	55.635	55.719		25.680	25.649	......
December	54 428	54 905	..	25.160	25.349	......
Year	53.486	53.304	.. .	24.670	24.592	......

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12 295	14.094	12 680	14 337	55 600	62.760
February	12.256	14.084	12.611	14 329	51,974	62 893
March	12 139	14.698	12.447	14.868	54.704	65.884
April	12 019	15 741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16 245	54.313	72.352
June	12 385	17 234	12.611	17 443	56.365	78.259
July	12 163	17.190	12 720	17 353	56 673	76 636
August	12 405	17.498	12 634	17 644	56 266	78 670
September	12.201	17 508	12.508	17.698	55 253	78.762
October	12.189	...	12.370	......	55 170	......
November	12.616		12.769	...	57.253	......
December	13.552	..	13.768	.....	62.068	......
Year	12.376		12.634	. .	55 973	...

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	44 519
February	41 [illegible]	42 962	August	43 319	45 857
March	[illegible]	42.577	September	39 755	49 135
April	[illegible]	43 923	October	41.185	
May	43.115	46 053	November	43.125	....
June	[illegible]	[illegible]	December	44.655	.....
			Av. Year	42.281	......

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4.435	4 334	4.327	13 009	15.597
February	4 440	4.026	4 266	3 946	13.043	15 738
March	4 394	4.073	4 238	4.046	13.122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4.373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13.260	17 588
July	4.499	4 720	4 397	4.603	13 530	18 544
August	4 500	4 569	4 406	4 452	14.260	19 679
September	4 485	5.048	4 356	4.924	14 744	22.292
October	4.265	......	4.139	......	15.332	...
November	4.298	......	4.181	......	15.821	. . .
December	4 450	... ..	4 332	......	15.648	. . .
Year	4.420	......	4 286	......	13.970	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23.887	26 642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5 563	6.626	5 413	6.476	23 016	26.048
April	5 399	6.633	5 249	6 483	23 743	25 644
May	5 348	6.679	5.198	6.529	24.375	25.790
June	5 520	6.877	5 370	6 727	24.612	25.763
July	5 695	7.116	5 545	6 966	25.006	26 174
August	5 953	7.028	5 803	6.878	26 801	26 443
September	5 869	7.454	5 719	7 313	27 750	27.048
October	6.102	......	5.951	......	27.256	.....
November	6.380	......	6.223	......	26.795	. . .
December	6.301	......	6.151	......	26.849	. ...
Year	5.758	......	5.608	......	25.281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15 90	$15.12	$14.40	$13.32	$14 75	$14.00
February	15 90	15.03	14 50	13 28	14 81	14.01
March	15 90	14 95	14 65	13 66	14.96	14.10
April	15 90	15 13	14 65	13 90	15 00	14 15
May	15 90	15.14	14 30	13.90	14.72	14.12
June	15 90	15 15	14 06	14.11	14.56	14.22
July	15 90	15.15	14 03	14.38	14 53	14 38
August	15 90	15 43	14 00	14 90	14 47	14 85
September	15 90	16.86	13 57	16.03	14 40	15.63
October	15 43	......	13.44	.....	14.34	......
November	14.92	......	13 30	......	14 25	......
December	15.15	......	13.10	......	13.90	......
Year	$15 72	......	$13 94	.....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Oct. 29 Name of Comp.	Bid.	SALT LAKE Oct. 29 Name of Comp.	Bid.
Acacia	.04¼	Beck Tunnel	08
Cripple Cr'k Con.	.01½	Black Jack	12½
C. K. & N.	.17½	Cedar Talisman	.01
Doctor Jack Pot	.05⅝	Colorado Mining	.15
Elkton Con.	.65½	Columbus Con.	10
El Paso	5.38	Crown Point	01½
Findlay	04½	Daly-Judge	5.90
Gold Dollar	.18¾	Grand Central	61
Gold Sovereign	.02¼	Iron Blossom	1 07½
Isabella	.18⅝	Little Bell	† 20
Jack Pot	.04¼	Lower Mammoth	06¼
Jennie Sample	.06½	Mason Valley	11.00
Lexington	.007	May Day	16½
Moon Anchor	01	Nevada Hills	1.55
Old Gold	.03½	New York	01
Mary McKinney	.74½	Prince Con	1 80
Pharmacist	.01½	Silver King Coal'n	2.85
Portland	1 00	Sioux Con	.03
Vindicator	.87½	Uncle Sam	.12
Work	.01	Yankee	16

TORONTO Oct. 29 Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	‡7 00	Foley O'Brien	‡.15
Hudson Bay	‡63 00	Hollinger	14 50
Temiskaming	38½	Imperial	.02¼
Wettlaufer-Lor	25	Pearl Lake	.24
Am. Goldfield	.40	Porcu. Gold	.23
Apex	01½	Preston E. D	.03
Crown Chartered	04	Rea	.28
Doble	20	Standard	‡ 01
Dome	19 87	Swastika	.08¾
Dome Exten	.11½	West Dome	.13

SAN FRANCISCO Oct 29 Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.25
Belcher	.27	Jim Butler	.63
Best & Belcher	.04	MacNamara	.21
Caledonia	.90	Midway	.47
Challenge Con	.05	Mont.-Tonopah	2.10
Chollar	.03	North Star	.37
Confidence	.45	West End Con	1.65
Con. Virginia	.30	Atlanta	.19
Crown Point	.39	Booth	.06
Gould & Curry	02	C.O.D. Con	07
Hale & Norcross	.14	Comb. Frac	11
Mexican	2.60	Jumbo Extension	.30
Occidental	70	Pitts.-Silver Peak	85
Ophir	.41	Silver Pick	07
Overman	.45	St. Ives	‡ 30
Potosi	.03	Tramp Con	.02
Savage	10	Argonaut	‡2.00
Sierra Nevada	.39	Bunker Hill	‡4 50
Union Con	.63	Central Eureka	.20
Yellow Jacket	.41	So. Eureka	‡2 00

N. Y. EXCH. Oct. 29 Name of Comp.	Clg.
Amalgamated	83
Am. Agri. Chem	57
Am.Sm.&Ref.,com	81¾
Am. Sm. & Ref., pf.	108⅛
Am. Sm. Sec., pf. B	85
Anaconda	41⅞
Batopilas Min	1½
BethlehemSteelpf	75
Chino	45⅛
Federal M. & S., pf.	45½
Goldfield Con	2⅝
GreatNor.,ore.,ctf.	45½
Guggen. Exp	54¼
Homestake	98½
Inspiration Con	19¼
Miami Copper	26⅝
Nat'nalLead,com.	64½
National Lead, pf.	109½
Nev. Consol	21¼
Phelps Dodge	215½
Pittsburg Coal, pf.	92
Ray Con	20⅞
RepublicI&S,com.	31⅜
Republic I & S, pf.	92⅜
SlossSheffi'd,com.	54
Sloss Sheffield, pf.	95
Tennessee Copper	41
Utah Copper	61½
U. S. Steel, com	74¾
U. S. Steel, pf.	114
Va. Car. Chem	46

N. Y. CURB Oct. 29 Name of Comp.	Clg.
Barnes King	.60
Beaver Con	.42
Braden Copper	7
B. C. Copper	4¼
Buffalo Mines	2¼
Caledonia	.40
Con. Ariz. Sm	9/16
Davis-Daly	2⅛
Diam'field-Daisy	6
Ely Con	.19
Florence	.77
Giroux	4¾
Gold Hill Con	5/16
Greene Cananea	9⅞
Greenwater	05
Internat. S. & R.	‡124
Kerr Lake	2¾
Keystone	2
La Rose	2½
McKinley-Dar-Sa.	1 13/16
Min. Co of A. new	2⅞
Motherlode Gold	15/16
Nev. Utah M. & S.	‡ 01
Nipissing Mines	8⅛
Ohio Copper	1 13/16
Pacific Sm. & M.	¼
Puebla S & R	1 11/16
South Live Oak	2
South Utah M.&S.	⅝
Standard Oil (Old)	1110
Stand'd Oil of N.J.	399
Stewart	1 5/16
Tonopah	6 9/16
Tonopah Ex	2½
Tonopah Merger	1 7/32
Tri-Bullion	¼
Tularosa	1 1/16
Union Mines	‡ 10
United Cop., pfd.	10
Yukon Gold	3 7/16

LONDON Oct. 30 Name of Com	Clg.
Camp Bird	£1 5s 0d
Dolores	1 10 0
El Oro	0 15 6
Esperanza	2 0 6
Mexico Mines	6 15 0
Oroville	0 5 0
Stratton'sInd.	0 3 1½
Tomboy	1 5 9

BOSTON EXCH. Oct. 29 Name of Comp.	Clg.
Adventure	6½
Ahmeek	325
Algomah	3
Allouez	39
Am. Zinc	30¾
Ariz. Com., ctfs.	3⅜
Bonanza	.30
Boston & Corbin	6½
Butte & Balak	3⅜
Calumet & Ariz	75¾
Calumet & Hecla	550
Centennial	19
Cliff	3
Copper Range	54
Daly West	3¾
East Butte	14¾
Franklin	10
Granby	59¾
Hancock	23
Hedley Gold	23½
Helvetia	1
Indiana	14⅛
Island Cr'k, com.	54
Island Cr'k, pfd.	86½
Isle Royale	31
Keweenaw	2
Lake	28
La Salle	4½
Mass	5⅞
Michigan	1½
Mohawk	60
New Arcadian	2½
New Idria Quick.	7
North Butte	32¾
North Lake	3
Ojibway	3
Old Dominion	58½
Osceola	103
Quincy	80
Shannon	14
Shattuck-Ariz	27½
Superior	39
Superior & Bost.	1¾
Tamarack	29
Trinity	4⅛
Tuolumne	2½
U. S. Smelting	44½
U. S. Smelt'g, pf.	50¼
Utah Apex	1 15/16
Utah Con	11¾
Victoria	2½
Winona	4
Wolverine	71
Wyandot	1¼

BOSTON CURB Oct. 29 Name of Comp.	Last
Alaska Gold M	8¾
Bingham Mines	5½
Boston Ely	1
Boswyocolo	01½
Butte Central	6 11/16
Cactus	09
Calaveras	2 11/16
Chief Cons	1½
Corbin	.23
Cortez	¾
Crown Reserve	3½
First Nat Cop	1 5/16
Majestic	40
Mazatlan	‡½
Moneta Porc	‡ 04½
Nevada-Douglas	3¾
New Baltic	1¼
Oneco	2
Raven Copper	.30
Rhode Island Coal	22
San Antonio	‡3
Smokey Dev	2½
S. W Miami	5½
South Lake	6½
Trethewey	‡ 30
United Verde Ext.	.52

‡Last quotation

The Engineering and Mining Journal

Vol. 94 NOVEMBER 9, 1912 No. 19

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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Mine Fires

The underground fires that occurred last month in the North Mt. Lyell mine, Tasmania, whereby 45 men were killed, and in the Bunker Hill & Sullivan mine, in the Cœur d'Alene, whereby one man was killed, draw renewed attention to the great danger, both to life and property, from subterranean conflagration. By an opportune coincidence, two important technical papers on this subject have lately been presented, one by George S. Rice (U. S. Bureau of Mines, technical paper No. 24), relating especially to fires in collieries; the other by George J. Young (Bulletin, A. I. M. E., October, 1912), on "Fires in Metalliferous Mines."

The historic fires in the Anaconda, Calumet & Hecla and Homestake mines are in the minds of all. These were especially destructive of property. The Anaconda fire is still burning, and the expectation is that it will continue to burn for many years, or until all the combustible matter in the bulkheaded "fire stopes" has been exhausted.

Referring to the chronology published monthly and annually in the Journal, we find the following memoranda of fires involving loss of life during the last two years:

Jan. 14, 1911. Underground fire in the workings between the Modoc and the Butte & Ballaklava mines, Butte, Mont.; two men smothered.

Feb. 23, 1911. Fire in Belmont mine, Tonopah, Nev., resulted in death of 17 men.

May 4, 1911. Seven men killed by fire in Hartford mine of Republic Iron and Steel Co., at Negaunee, Mich.

Aug. 23, 1911. Fire in new shaft of Giroux Consolidated Mines Co., Kimberly, Nev., resulted in seven deaths.

The above list would be greatly extended if the fires resulting only in damage to property were added. We are now speaking solely of underground fires. Surface fires would constitute a further and long addition, and these may be as dangerous to the men underground as a fire originating in a stope or shaft station. Thus, in 1909 a fire destroyed a shaft house of the London mine of the Tennessee Copper Co. Burning timber fell down the shaft and cut off the egress of the miners, who made their escape through another outlet of the mine, demonstrating emphatically the soundness of the legal requirement that a mine should be provided with more than one outlet.

The causes of mine fires are numerous. In the presence of excessively dry timber, fire may be started by some trifling accident or piece of carelessness, and spread with surprising rapidity. Burning candles left in stopes on the departure of a shift are a danger. Recognizing this, the Anaconda Copper Mining Co. has a corps of inspectors, "fire-bugs" in the vernacular, to go through the stopes after the miners have gone. In the case of the Homestake fire, a piece of smoldering fuse has been given as the cause. In metal mines, blasting is a risk of minor importance, the conditions in this respect being different from those of a coal mine. Professor Young says that he knows of no authentic case where the flame of a blast has been responsible for setting timbers on fire. The short-circuiting and overheating of electric wires is a common accident by which mine fires are started. According to the cable dispatches from Tasmania, the North Mount Lyell fire was started by an electrical accident. On June 11, 1912, the pump room of the Ward shaft, at Virginia City, Nev., was endangered by a fire caused by the short-circuiting and exploding of an oil switch on one of the pumps. In this case no fatalities occurred and no great damage was done. In most cases mine fires are attributed to "causes unknown," which may be paraphrased as "undetermined carelessness."

The safeguards against underground fires are, in the main, those that should be taken against fire anywhere, namely, eternal vigilance and the exercise of common sense. Under the latter head comes the clearing away of combustible rubbish and the avoidance of carelessness with matches, candles and lamps. Experience has abundantly proved that a shaft should not be covered by a combustible building. It is best that it be not covered by any building at all, but where the severity of the climate creates the necessity for such, it should be of incombustible construction and combustible material should be kept out of it. The shaft itself being the main communication with the mine, and being timbered as a rule, should be made as nearly fool-proof as possible. Many shafts are fortunately wet. When they are not, they should be equipped with a sprinkling system, such as is installed in most of the modern factories of New England. The cost of such an installation is moderate and certain of the mining companies in the northern iron country have already adopted it.

Is Mining Languishing?

In view of the large mining-dividend payments, as chronicled elsewhere in this issue of the JOURNAL, we think it somewhat open to question as to how much mining is languishing. But if the alleged decadence of mining be real, we think there are other reasons for it than exhaustion of our mines, the exactions of the smelting trust, the extortions of the common carriers, or Federal interference; or disorder in Mexico.

Neglecting the somewhat uncommon cases in which a plant is built to sell to a trust, the ordinary factory or works is built because the builders like the business, and see in it the chance for a steady income and a gradually developing trade. While there are miners and prospectors of this same order, there are many whose sole object is to develop a good-looking hole in the ground and sell it to a sucker. For these people, owing to the more frequent employment of competent mining engineers to make examinations, mining is not so flourishing as heretofore. We hope it will remain so, and believe that if mining experiences another great boom it will be owing to the efforts of men who like mining, who see in it the chance for a legitimate, profitable business, who are working mines, not tenderfeet, and who wish to hoist ore, not stock quotations.

Ocean Freight Rates

One of the symptoms—perhaps it would be better to say the results—of the present conditions of activity all over the commercial world is the advance in ocean freights. Two or three years ago, tonnage was going begging and charters at low rates were available; but for some time past, a rapid change has been going on, and now the conditions are reversed. Tonnage is hard to get when it is wanted and rates have gone up to a point which is almost unprecedented.

This has especially affected heavy articles, which must be transported in large quantities, such as iron ore. Blast furnaces in the East, which have been accustomed to depend to some extent on foreign ore, will apparently have to cut out such ores from their mixtures for a time. In a recent charter reported of a steamer to carry iron ore from Spain to Philadelphia, the agreed rate was over $3 per ton, which is almost prohibitive Moreover, there seems to be no present prospect of a decline.

The high freights affect other articles, though to a minor degree, as their intrinsic value is greater in proportion to the freight charges than in the instance given. They are sufficient, however, to have at least a perceptible influence upon the markets.

An Educational Aristocracy

The U. S. Civil Service Commission has advertised for a chemist to study the physical-chemistry of smelting operations, specifying qualifications, which, in our opinion, embody wrong ideas. As advertised, the position is to be open only to those of educational training equivalent to that required for the degree of Ph.D. in an institution of recognized standing.

As to who is competent to determine when an institution is of recognized standing or not, we shall not debate at length, but will at least point out that wherever the line is drawn, the fact will remain that an excellent student from a poor institution would be of more value than a mediocre student from a good one. It might further be argued that judging from the storm of protest raised by Doctor Babcock's recent grading of the collegiate institutions of the country, and the explanations of it already found necessary by its sponsors, the time is not yet come when the colleges themselves can be definitely graded in relative status in the way they decimally grade their own students.

But the point remains, we believe, that to establish a preliminary requisite of university training, which would appear to outweigh any technical work and attainments after leaving college, is an unwise policy. In this connection it is worth while to call attention to the fact that many of the world's greatest engineers have been devoid of educational training in any university at all. Their university has been their study (bedroom, kitchen, etc.), illuminated by midnight oil after the day's work in shop or mine. Many of the learned and engineering societies which require high professional qualifications for their members, perhaps even as high as are needed for work in a government bureau, do not stipulate where the learning of their members should be acquired. Is it too much to expect that in gathering together a technical staff, even a government bureau should use common sense?

The British iron trade is showing even more activity than our own. Orders are plentiful and the mills are, as a rule, actively employed. This has been accompanied by a general rise in prices, which are in most lines above the parity of our own quotations. Thus Cleveland pig is quoted at $16.32 and hematite, or bessemer $19.20 per ton; while plates and bars have been quoted as high as $38.50, with other material in proportion. A good part of the increase in demand and prices is due to the great activity in the shipbuilding trade. The orders for new ships have been due to the call for ocean tonnage and the high rates prevailing for some two years past.

Complaints of a scarcity of labor are common in the iron trade at the present time. In finishing mills, at blast furnaces and coke ovens and at ore mines the story is much the same. Operations are limited because men enough cannot be found to do the required work. This does not look like hard times or any immediate anticipation of them. At some works also improvements or additions to capacity are held up from the same cause. The situation seems to be growing more, rather than less, acute.

By the Way

Woodrow Wilson has been elected President. The effect here will be that we will work harder than ever to boom the mining and metallurgical industries.

Passenger traffic was delayed and coal and freight traffic temporarily abandoned on the Bowman's Creek branch of the Lehigh Valley R.R. this morning by a mine cave-in, which swallowed several cars of a freight train, says a Wilkes-Barre dispatch of Nov. 1. The engine of the freight passed safely over, but the trainmen, looking back, saw freight cars disappearing. Investigation showed that they had fallen into a mine cave-in 25 ft. deep. Several cars piled up in this cave-in, and until the company can fill the hole it will be impossible to open the line for coal and freight traffic.

For some weeks back we have been reading in the daily and financial papers that "electrolytic copper is still held with confidence at 17¾c. by leading sellers, but some second-hand lots might be obtained at a shade below that figure." This suggests some new definitions: *First-hand copper*. All that is reserved for 17¾c. Syn., virgin copper, real copper. *Second-hand copper*. All other kinds. Syn., job lots, junk, unreal copper. Both kinds may be turned out by the same refinery, even by the same furnaces, but that does not matter. *Leading sellers*. Those who participate in the concert of price-pegging. *Second hands*. Everybody else. This is not quite complimentary to some agencies.

In the old mining days, writes an engineer, timbermen had to come to surface and select their own timber and ride down in the skip with it. In one of the Copper Country mines there were two gangs of timbermen, one Cornish, the other German, and a great deal of rivalry existed. One day while the "Cousins" were sending down timber, two of the Germans rode down with the first load and at the second level the rope broke. A spectator seeing something was wrong called to the "Cousins" at the collar of the shaft: "What's wrong?" "Skip gone down without the string to it." "Any one in the skip?" "Yes, planks, wedges and two Dutchmen—planks and wedges belong to we."

Some of the sharp-eyed young men employed by the Democratic National Committee discovered that the John D. Ryan who had contributed $5000 to the campaign fund was the president of the Amalgamated Copper Co. It was not officially announced, says the *Evening Post*, but there seemed to be no doubt that, under the eligibility rules, Ryan's contribution would have to go back. It has been stipulated that no money should be received from a corporation, nor from any officer of a corporation likely to need the help of the government in the way of legislation. Ryan, in the course of a few days, will probably receive a polite note in his mail, saying that the committee appreciates his generous spirit, but has to return his check.

The war of words over the present copper market is less sanguinary and more amusing than some others. The Boston *News Bureau* quotes a prominent producer, who has been underbid on recent business, as saying: "We can hold out until Christmas at 17¾, and I believe that this is the sentiment of all the leading producing interests." The situation has been stated in the following words in the *Wall Street Journal*: "The guerillas of the copper market, that is to say, the small and second-hand dealers, are offering electrolytic, delivered, 30 days, as low as 17⅜c. a lb., which naturally renders the 17¾c. peg price of the large interests a nominal quotation"; to which the *Journal of Commerce* adds in reply the question: "What about the highwaymen who hold up consumers for the benefit of copper-security speculators?"

There has been considerable success in the Michigan iron regions during the last few years, in taking over abandoned, "black-eyed" properties, where exploration had been carried on only at shallow depths, and drilling deeper for ore. In this connection, a story is related of the Sherwood exploration, at Iron River. Diamond drilling had been going on for some time with poor results; the holes had struck plenty of iron formation, but the material was too lean to make merchantable ore. When the holes penetrated to the underlying formation, which was altogether barren, they were stopped by the management. On one occasion, the manager was away and no one with authority was present to stop a hole that had got into the underlying formation. The drill contractors, who were paid by the foot, kept merrily on. By the time the manager had returned, the drill had gone through the barren formation into a good-sized body of high-grade ore!

The U. S. Civil Service Commission announces that there will be a physical-chemist appointed for service with the Bureau of Mines in the Western states, at a salary from $1800 to $3000 per year, to conduct investigations in the physical-chemistry of smeltery operations. Applicants will be graded on general education and scientific training, 40 points; professional experience and fitness, 35; published or manuscript reports, 25 points. An educational training equivalent to that required for the degree of Ph.D. in an institution of recognized standing, such training to include special courses in physical-chemistry, and at least one year's practical experience in a chemical or metallurgical laboratory, will be prerequisites for this position. Applicants must be between 25 and 40 years of age. Persons who meet the requirements and wish to apply for the examination should at once apply for Form 304 and special form to the U. S. Civil Service Commission, Washington, D. C., mentioning announcement No. 827, chemical engineer (male), Nov. 25, 1912. To be considered the application must be filed by Nov. 25, 1912, together with all material required.

According to the 13th census, the total acreage of all land in the United States belonging to producing mines was 24,216,000 acres. Not all of this area was in use nor was all of it mineral and oil land, 1,139,000 acres being timber land and 1,662,000 acres were in use for buildings and other purposes. Of the total area above mentioned, more than one-half (12,695,000 acres) was connected with the petroleum and natural-gas industries. Coal land was divided as follows: Bituminous, 7,717,000 acres; anthracite, 465,000 acres. Iron mines were third in extent, the holdings amounting to 1,313,214 acres; the mines producing precious metals controlled 588,263 acres; the mineral land of the copper industry amounted to 126,851 acres, besides which it owned timber and other lands aggregating 148,747; the lead and zinc mines embrace 125,322 acres. Of the total area controlled, 38.8% was owned by the operators, the remainder being held under lease. The percentage of owned land, however, is much reduced by conditions in the petroleum and natural-gas industries, where 94.6% of the land is leased.

The St. Joseph and **Doe Run** lead companies are experiencing an internal rumpus, Robert Holmes, of St. Louis, having issued a circular to the stockholders, charging the management with various sins of commission and omission and asking for proxies so as to fix things; to which President D. A. Jones, of New York, has replied in a pamphlet. Dismissing minor issues, the cause of the trouble is to be found in the unsatisfactory earnings of these companies in recent years and the decline in the value of their shares. It has been well known that they have had to borrow large sums of money, which previously had never been necessary in their long and successful history. This manifestly may be traced back to the same old mistake of corporations, i.e., failure to reckon amortization, living on principal, etc. The day comes when plant has to be discarded and there are no funds to replace it; hence recourse to the money lenders. Besides this the company has expended a large sum in the purchase of new ore lands, wisely in the opinion of its management. The mining, milling and metallurgical improvements that are now being consummated will no doubt put the companies on a good footing again before long.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Colorado School of Mines Experimental Plant

I have read with a good deal of interest and pleasure what you said about our experimental plant in the JOURNAL of Oct. 5, 1912. For the last six years I have been struggling to make a success of the plant and now feel that this success is in sight. We have had many difficulties to overcome and many criticisms to answer. When thoughtful criticisms were made, we have endeavored to adjust our plans so as to remove the cause for criticism.

We expect to have most of our equipment installed by the first of December. Soon after that date we shall be ready to do experiment work. We have arranged so that experimental work can be done either on full-sized commercial scale, or upon 1000-lb. lots, or upon a small laboratory scale. By this means we hope to satisfy any demand that may be made upon us.

VICTOR C. ALDERSON.

Golden, Colo., Oct. 22, 1912.

Settling El Tigre Slimes

In the JOURNAL of Oct. 5, 1912, there appeared an article entitled, "Settling of Slimes at the Tigre Mill," in which the author claims to have discovered various laws governing the settling rate of slimes. The laws, as set forth in this article, are entirely different from the accepted principles of settling and are also at variance with what has been previously published on the subject. The matter of settling is of such vital interest to the metallurgist, engaged in wet methods of reduction, that a discussion of the subject at this time cannot be amiss.

Briefly stated, the general import of the article referred to, is that the settling rate of dilute slime is independent of the depth of the settling vat, that the settling rate of thick slime increases with the depth, and that the settling results, to be expected in mill practice, may be predetermined by laboratory tests.

There seems no reason to doubt that these principles may be true at the Tigre mill; but the settling of slimes is so erratic and varies so greatly at different mills that it seems premature to accept these principles as general for all mills and all kinds of slime. That the principles are not true in some cases is shown by the fact that various writers have noted that laboratory tests generally indicate a much higher rate of settling than can be secured in actual practice. This has become so much the concensus of opinion that mill designers generally disregard laboratory tests and base their calculations, as to settling capacity required, upon tests in full-sized vats, or upon comparisons with other plants treating approximately the same nature of slime.

Two cases of the unreliability of laboratory tests have come under my personal attention. Test 1 was made on a sandy slime, of the nature encountered in an all-slime cyanide plant. The pulp contained 59% moisture before settling commenced. In a treatment vat, 12 ft. deep by 34 ft. diameter, it required seven hours to settle this pulp to 46% moisture. A five-gallon oil can full of this same pulp settled to 46% moisture in 45 min., showing a great advantage in favor of the shallow laboratory vessel.

Test 2 was made on a dilute pulp, derived from the slime overflow of a series of Wilfley tables. The slime contained 90% moisture and was settled in a cone-bottom tank, 16 ft. diameter and 10 ft. average depth. It required 17 hr. to settle to 81% moisture in the vat and only two hours to settle to the same final thickness in a five-gallon oil can. Both the above tests indicate a much greater rate of settling in the shallow oil cans than in the deep settling vats. In these two cases, at least, the principles in the article referred to in nowise hold true.

C. H. JAKIN

Los Angeles, Cal., Oct. 24, 1912.

Parks' Electrocyanide Process

The article, in the JOURNAL of Aug. 10, 1912, descriptive of the Parks' electrocyanide process has given the impression among mining men throughout the West that this process is in use at the Whitman mine. I have had a number of inquiries from Mexico, Texas, Wyoming, and other states asking for information. The only connection this company ever had with the Parks' process was in having a test made on some of the Whitman ore. The process was not adopted, and consequently any information as to the adaptation of this process would be of little value when coming from this source. The article mentioned was extensively circulated and read through the JOURNAL, and I would appreciate the favor very much if the JOURNAL could mention the fact that the Parks' process is not in use at the Whitman mine.

J. M. LILLIGREN.
General Superintendent.

Pearl, Idaho, Oct. 25, 1912.

Selenide of Gold

I do not know whether the following experiments will throw any light on "Selenide's" inquiry, in the JOURNAL of Oct. 19, 1912, but at one time I prepared some material by precipitating $AgNO_3$ with the gas evolved by treatment of aluminum selenide with water.

The precipitated material was dried on a water bath, thoroughly mixed, and 500-mg. portions weighed out for assay. One portion was assayed by wet assay, Gay-Lussac method, another was cautiously roasted and assayed by wet assay, the third run by corrected fire assay, with no allowance for retention of impurities by the assay button.

	Ag found
Wet assay	363.63
Roasted	361.38
Corrected Fire Assay..........	361.64

The correction in the last assay was 13.24 mg., which is abnormally high on assay buttons of that size, while the true loss considerably exceeds what should have been found under the furnace conditions under which I worked. From this one would conclude that selenium does give rise to volatilization losses with silver, and also has some tendency to carry silver into the slags and cupels of an assay, which tendencies would probably be manifested in large-scale working.

Other experiments were performed, taking the Gay-Lussac assay as showing the correct amount of silver present, and making up mixtures consisting of silver selenide and lead foil, and of proof silver equal to the silver contents of the selenide taken, and an equivalent amount of lead foil, and these mixtures cupelled direct. The selenide cupellations lost about 0.45% more than did the checks.

A precipitate was produced by passing H_2Se through gold chloride solution and this precipitate assayed. Assuming the precipitate was Au_2Se_3, although I realize this assumption is open to question, and running proof assays alongside, equivalent to the assumed contents of the Au_2Se_3, the losses were over three times as large in the selenide as in the metal.

SELENITE.

New York, Oct. 28, 1912.

Iridium in American Placer Platinum

By Frederick W. Horton*

The possibilities of an iridium supply in the United States. Analyses of commercial lots of crude platinum from various fields showing predominance of iridium over platinum in certain districts. A comparison of crude platinum from the United States, Russia, Colombia and other countries.

The unprecedented and ever-increasing demand for the various alloys of platinum and iridium, commonly known as hard metal or hard platinum, coupled with the limited production of both the component metals, has resulted in an almost uninterrupted rise in their price. In September, 1908, refined platinum was sold at $17.50 @ 19 per oz., and iridium at about $30 per oz., whereas in the last issue of the Journal platinum is quoted at $45.50 per oz. and iridium at $68 @ 70 per oz. The extraordinary demand which has more than doubled the price of these metals and made iridium over three times as valuable as gold, has come largely from the jewelry trade. The unquestioned superiority of hard platinum as a setting for diamonds, pearls and light-colored precious stones, both from an artistic standpoint and from that of durability and safeness of setting, together with the high price of the alloy, has made it extremely fashionable. This demand on the part of the jewelry trade is now firmly established and is particularly responsible for a demand for iridium that greatly exceeds the supply.

Properties of Iridium and Platinum-Iridium Alloys

As intimated by the name "hard metal," iridium is alloyed with platinum to increase its hardness and strength, and articles made from the alloy are much more durable than those made from pure platinum, which is too soft for many purposes. Iridium not only makes a hard alloy with platinum, but it gives the alloy a greater electrical resistance and higher fusing point than that of pure platinum, and is, therefore, used in resistance coils and also in thermo-couples for the measurement of high temperatures. The proportion of iridium in the alloy ranges from 5 to 25%, rarely exceeding the latter figure except in the case of special alloys where great hardness is desired. Alloys containing less than 10% of iridium are ductile and malleable, while those containing from 10 to 25% are hard and more difficult to work as the proportion of iridium increases. Where the alloy contains 30% or more iridium, it is no longer attacked by *aqua regia*.[1]

Pure iridium is the hardest known metal. It is of a lustrous white color, and about 16% heavier than gold, having a specific gravity of 22.4. Its fusion point, which is extremely high, is variously stated at from 2150° to 2250° C. It is brittle when cold and only slightly malleable at a white heat. Iridium is not attacked by any of the ordinary acids or bases, and is insoluble in *aqua regia*. These properties of extreme hardness, high fusing point, and insolubility render it particularly adapted to certain uses, as, for example, in the making of knife edges for delicate balances, standard weights, pivots, contact points, etc. Pure iridium is, however, difficult to work on account of its brittleness, and is, therefore, generally alloyed with a small percentage of platinum even when great hardness is desired. The natural alloy of iridium with osmium, iridosmine, or as it is sometimes called, osmiridium, is, on account of its extreme hardness, used for watch and compass bearings and for tipping fountain-pen points.

Nuggets of Iridium and Platinum-iridium, Trinity River, California—One-half Natural Diameter

Imports and Production

The iridium used in this country is obtained chiefly from Russian crude platinum, which generally contains from 1 to 3% of the metal. Similar small percentages of iridium are also obtained from the crude platinum which is imported from Colombia, and this amount is supplemented by an annual domestic production of 100 or 200 oz. Formerly, considerable iridium was obtained in Russia from osmiridium coming from placer deposits at Miassk, in the Government of Orenburg, in the Urals. In 1910, however, there was practically no production from these deposits, the output amounting to only 5 oz. Furthermore, the total production of osmiridium in Russia during the last 10 years is officially reported as only 308 oz. According to the Bureau of Statistics, the total imports of "iridium and iridium in native combination with platinum metals" into the United States in 1911 amounted to 3905 oz., valued at $210,616, or about $54 per oz., as compared with imports of 122,390 oz. of unmanufactured platinum, valued at $4,722,752.

In other words, notwithstanding an unsatisfied demand, less than 3.2% as much iridium as platinum was imported, and this because no more could be obtained. Just how small the available supply of iridium is, may, therefore, be readily understood. Nevertheless, the demand for iridium steadily increases, notwithstanding its rapidly advancing price. This fact is borne out by the statement of the Russian correspondent of the Journal, under date of Oct. 10, 1912, that at Ekaterinburg, the primary market for platinum in the Urals, the demand for iridium was exceedingly strong, but that the offering of the metal was insignificant.

---

*Mining engineer, 207 Ouray Building, Washington, D. C.

[1] Moissan, H., Traité de chimie minerale, Vol. V, p. 899.

IRIDIUM MINERALS

Iridium is found associated with platinum and other metals of the platinum group. Rarely it is present as native metal, but more often as an alloy with osmium or platinum. The natural alloy with osmium, iridosmine or osmiridium, has a hardness of 6.7 and a sp.gr. of 18.8 to 21.12. In color it is a tin-white to steel-gray. Two varieties of this alloy have been named, based on its occurrences in Russia, viz., newjanskite, with over 40% iridium, and sisserskite, with less than 30% iridium. Sisserskite has a slightly higher specific gravity than the newjanskite.

The extremely rare mineral, platiniridium, is developed with a large increase in the iridium content of the normal natural alloy with platinum, which does not exceed 5%. Platiniridium sometimes contains over 75% of iridium. It is white, has a metallic luster, a hardness of 6.7, surpassing platinum, and a specific gravity of 22.6 to 23, being thus the heaviest known mineral.

OCCURRENCE IN THE UNITED STATES

While most readers of the JOURNAL know that a small percentage of iridium is generally found in the small quantities of crude platinum which are produced annually in the United States as a by-product of placer mining, I believe that they are, perhaps, not cognizant of the high percentage of iridium associated with the crude platinum from certain districts in this country or the comparatively large amount in which the metal might perhaps be obtained if the potential sources of supply were thoroughly investigated.

The accompanying illustration shows, reduced one-half in diameter, a lot of nuggets, weighing about 27 oz., obtained from a placer mine on the Trinity River, near Junction City, Trinity County, Calif. These are not gold nuggets but nuggets of osmiridium and platinum, and the entire lot, upon analysis, showed 69.7% osmiridium, 22.7% platinum, and 0.4% gold.

The coarseness of the material is exceptional and will surprise those not familiar with the occurrence of crude platinum in this district, and whose ideas as to the size of the grains in which crude platinum of domestic origin is found are based on samples coming from the dredging fields of Butte, Yuba and Sacramento Counties, Calif., or the beach sands along the coast of northern California and Oregon. The largest nugget in the lot weighed over 13 dwt., or almost three-fourths of an ounce, and as far as known is the largest nugget of osmiridium ever reported. The lot as a whole represents the actual run of material as it was recovered from the ground and is not a lot from which the fine material was screened out. The actual constitution of these nuggets is a matter of interest. It was found upon treating one of them with *aqua regia* that it disintegrated; platinum, iron and small amounts of copper and gold, etc., going into solution and leaving a little heap of small, flat grains of osmiridium undissolved. The nuggets, therefore, would seem to consist of osmiridium cemented by platinum. Unfortunately, a more exhaustive analysis was not made on this material, and, therefore, the exact percentage of iridium which was contained in the osmiridium cannot be definitely stated. A complete analysis was, however, made on a second large lot of material obtained from a placer mine, at China Flat, Humboldt County, Calif., about 50 miles down the Trinity River from the place where the lot shown in the illustration was obtained. This lot weighed 535.5 grams, or over 17 oz., and was analyzed as shown in the accompanying table:

CHINA FLAT CRUDE PLATINUM

Metal	%
Osmiridium.	74.883
Platinum	17.640
Iron	6.376
Copper	0.568
Gold..	0.074
Nickel...	Trace
Chromium	Trace
Palladium.	None
Total.	99.541

The osmiridium which was left after treatment with *aqua regia* weighed 391 grams and constituted 74.88% of the original material. It had a specific gravity of 18.53 and was separately analyzed to find its composition, which was as shown below.

OSMIRIDIUM ANALYSIS

Metal	%
Iridium...	55.04
Osmium..	44.28
Iron..	0.59
Silica...	0.09
Rhodium...	None
Ruthenium..	None
Total....	100.00

The high-iridium content of the osmiridium and the specific gravity of the mineral showed that it was the variety known as newjanskite. Particular attention is called to the fact that the osmiridium did not show traces of either rhodium or ruthenium, whereas 12 analyses, as given by Kemp[2], show rhodium in every case and ruthenium in six instances, the percentage of rhodium ranging from 0.5 to 12.30, and the percentage of ruthenium ranging from 0.2 to 8.49. Neither could any palladium be found accompanying the platinum, which is also a point worthy of note, as some small percentage of palladium is almost universally present in platinum. By combining the two analyses given above, the composition of the original lot of crude platinum was found to be as given in the accompanying table:

ULTIMATE ANALYSIS, CRUDE PLATINUM

Metal	%
Iridium..	41.216
Osmium.	33.158
Platinum	17.640
Iron....	6.818
Copper	0.568
Gold	0.074
Nickel	Trace
Chromium	Trace
Silica	0.067
Total.	99.541

It will be noted that the lot contained 41.216% of iridium, as compared with 17.64% of platinum.

Two other samples of crude platinum, one weighing 64.27 grams and one 47.63 grams, obtained from a locality on the Trinity River, about five miles north of China Flat, were analyzed with the following results:

TRINITY RIVER CRUDE PLATINUM

	No. 1 %	No. 2 %
Osmiridium..	73.52	71.33
Platinum	21.20	21.10
Iridium.....	0.27	0.52
Gold	0.07	0.97
Copper	0.19	0.50
Silver	0.04	0.12
Iron....	4.69	5.40
Total....	99.98	99.94

The four analyses given above were not made on picked samples or on single nuggets, but on commercial lots of crude platinum obtained from widely separated localities along the Trinity River, and their results were confirmed by analyses of numerous small samples obtained from other places along the river, viz., near Hawkins Bar, Taylor Flat, French Creek, Big Bar, Helena, etc. The analyses show that the crude platinum from the placer deposits on this river from a point at least five miles above Junction City and thence down stream over 50 miles, contain in general from 69 to 75% of osmiridium, of which over 50% is usually iridium, and that considered as a whole, the crude platinum contains approximately 40% of pure iridium, as compared with 17 to 22% of platinum. In other words, the gravels throughout this area contain almost twice as much iridium as platinum. I also believe this to be true of the gravels in the Hay Fork area, which is situated about 20 miles southwest of Weaversville, Trinity County, and embraces the entire valley of Hay Fork Creek. Unfortunately only two small samples of crude platinum from this region have been obtained by me, and, of course, their analyses do not suffice to confirm this opinion definitely. The two samples which have, however, been analyzed, contained three or four times as much osmiridium as platinum.

There is, then, at least one considerable area and probably two in Trinity County, Calif., where the gravels contain approximately twice as much iridium as platinum. The question immediately arises: Are there any undiscovered deposits that are rich enough to be worked commercially either for iridium, platinum, osmium, etc., alone or in connection with gold?

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[2] Geological relations and distributions of platinum and associated metals. U. S. Geological Survey, Bull. 198, p. 21.

The Trinity River basin has long been noted for its gold placers, which have been worked since the early '50's, and from these placers within the areas containing crude platinum large quantities of iridium, platinum, osmium, etc., have been produced.

Early Miners Threw Away Platinum

The larger part of the output was, however, thrown away by the early miners, who considered this "white metal," as they sometimes called it, worthless, and it has been only during the last few years that the value of these platinum metals has been well understood by the miners. Moreover, the richer gold placers along the Trinity River within the area where these platinum metals occur are at present largely exhausted, and the few hundred ounces that are now produced annually as a byproduct in gold mining go but a little way toward satisfying the domestic demand. However, is there not a possibility that in these areas there are gravels rich enough in the metals of the platinum group to be worked successfully where the gravel could not be mined at a profit for gold alone, and this because the gravels of the region have been prospected only for gold and without reference to their content of the much more precious metals iridium, platinum, osmium, etc., and that gravels well worth mining, particularly at the present price of iridium and platinum, may have been passed over because they contained little or no gold?

ANALYSES OF AMERICAN AND FOREIGN PLATINUM[3]

	Russia									
	Goroblagodat District	Nijni Tagilsk District	Colombia El Choco District	California	Oregon	New South Wales	Borneo	British Columbia	Brazil	Australia. (Probably New South Wales)
Iridium	0.33	2.44	1.44	1.70	0.40	1.30	0.66	1.14	27.79	1.65
Platinum	82.90	76.28	82.70	76.29	51.45	75.90	82.60	72.07	55.44	60.60
Rhodium	1.54	2.37	2.08	1.35	0.65	1.30	0	2.57	6.86	1.68
Palladium	1.24	0.22	0.93	0.99	0.15	0	0	0.19	0.49	1.65
Osmium..	0.54	0.20	0.23	0.33	0	0	0	0	0	0.40
Ruthenium	0	0	0	0	0	0	0	0	0	0
Osmiridium.	1.17	0.73	2.62	9.04	37.30	9.30	3.80	10.51	0	25.50
Gold......	0	0	0.74	0.71	0.85	0	0.20	0	0	1.80
Insoluble	0.17	1.56	0	0	0	0	0	0	0	0
Iron	10.72	13.75	7.60	5.93	4.30	10.15	10.67	8.59	4.14	4.43
Copper	0.56	1.31	0.51	1.91	2.15	0.41	0.13	3.39	3.30	1.10
Sand..	0	0	1.54	1.76	3.00	1.22	0	1.69	0	1.20
Manganese	0	0	0.08	0	0	0	0	0	0	0
Total............	99.17	98.86	100.47	100.01	100.25	99.58	98.06	100.15	98.02	100.01
Number of samples analyzed to obtain average analysis .	3	17	5	4	1	1	1	1	1	2

[3] Kemp—Geological Relations and Distribution of Platinum and Associated Metals U. S. Geol. Survey, Bull. 193, pp. 18-19.

This query applies with equal force not only to the gravels of the district under discussion, but to the alluvial deposits in the entire serpentine and peridotite areas of the coast range, in northern California and southern Oregon. Although the larger part of such deposits are known to be entirely barren of gold, is there not a possibility that if these gravels were prospected, some deposits might be found that were richer in the platinum metals than those of any of the well prospected gold-bearing areas?

CRUDE PLATINUM, OROVILLE, CALIF

	Sample No. 1 %	Sample No. 2 %
Osmiridium	23.36	32.01
Platinum	65.66	56.19
Iridium	0.66	1.02
Gold	0.72	4.16
Total ..	90.40	93.38

For purposes of comparison with the preceding analyses of crude platinum from Trinity County, Calif., the accompanying table of average analyses of crude platinum from Russia, Colombia, Brazil, British Columbia, Borneo, California and Oregon, is given. It will be noted that crude platinum from both the Nijni Tagilsk and Goroblagodat districts, in Russia, as shown by 20 analyses, contain less than 4.5% of combined iridium and osmiridium, and the same is true of crude platinum from Colombia, as shown by the average analyses of five samples from the El Choco district, and also of the one sample from Borneo.

The other analyses of crude platinum from New South Wales, British Columbia, Brazil, California and Oregon, show considerably more iridium and osmiridium, but in no case over 38%. In none of these samples, therefore, does the total iridium content approach that of the crude platinum from Trinity County, California. In general, however, American crude platinum shows a much higher percentage of iridium than crude platinum from either of the world's leading producers, Russia and Colombia, as is shown by the analyses of the five samples from California and Oregon.

The accompanying analyses of samples of crude platinum obtained by me from gold dredges near Oroville, Calif., show that in this district the crude platinum contains a considerable percentage of osmiridium, but, in common with other districts in the United States, less than half as much as the crude platinum of Trinity County.

American Institute of Mining Engineers

On Thursday morning, Oct. 31, the last technical session of the Cleveland meeting of the American Institute of Mining Engineers was held at the Case School of Applied Science. Owing to lack of time, the papers remaining to be read were allotted so many minutes each, and the ensuing discussions were brief. The following papers were presented: "On the Quality of Charcoal Iron, a Preliminary Paper," by J. E. Johnson, Jr., Ashland, Wis.; "Constitution and Melting Points of a Series of Copper Slags," by Charles H. Fulton, Cleveland; "Chemistry of the Reduction Processes in Use at Anaconda, Mont.," by Frederick Laist, Anaconda, Mont.; "Note on the Case Hardening of Special Steels," by Albert Sauveur and G. A. Reinhardt, Harvard University. The above papers were read in abstract while the following were read by title only. "The Development of the Reverberatory Furnace for Smelting Copper Ores," by E. P. Matheson, Anaconda, Mont.; "Our National Resources and Our Federal Government," by Dr. R. W. Raymond, New York, N. Y.; and "Recent Developments in Open-hearth Steel Practice," by N. E. Maccallum, Phœnixville, Pennsylvania.

The chief discussions centered about Mr. Johnson's and Doctor Raymond's papers. The former paper was illustrated with lantern slides and described the results of experiments conducted recently by the author and others on charcoal irons, with the object of determining the reasons, if possible, for the great variations in the quality of charcoal irons made not only in different parts of this country, but in different furnaces in a given district. In steel ingots and other steel products, it is now customary to apply certain accepted terms to particular spots, describing the composition, etc., of those spots. Mr. Johnson attempted to apply some of these terms to charcoal pig iron, and the discussion had to do with this, principally. It was contended by others, Doctor Howe for one, that such application is incorrect. Doctor Howe had prepared written discussion of this paper, which was read in abstract.

E. W. Parker, of the United States Geological Survey, read excerpts from a written discussion of Doctor Raymond's paper, in which he stated that he represented the Geological Survey, and its director, George Otis Smith. He took exception to some remarks of Doctor Raymond, saying that he had been misquoted in connection with statements that he had made in the past regarding the closing of coal mines. He does not advocate the closing of operating coal mines but suggests that new ones shall not be opened until such action is fully warranted.

E. G. Spilsbury, past-president of the Institute, voiced the sentiment of visiting members, when he moved that a vote of thanks be extended to the local committee for the entirely successful manner in which the conduct of the Cleveland meeting, including the comfort and pleasure of those attending, had been provided for. In adjourning, President Kemp remarked that the meeting would most certainly be recorded as an exceptionally strong one.

BUSINESS AFFAIRS

The business affairs of the Institute consumed the entire session on Wednesday morning. Readers of the JOURNAL are undoubtedly familiar with many of the internal business and political troubles that have confronted the Institute recently, as these have been covered fully in these columns from time to time during the last year. Several committees have been appointed within this period to inquire into and to straighten out the affairs of the organization, also to outline, if possible, a future policy. A pamphlet constituting a revised constitution and new by-laws, the work of a committee composed of Joseph W. Richards, chairman, Charles Kirchhoff and Charles F. Rand, was presented to the meeting on Wednesday, with the announcement that while full discussion of the proposed changes was invited, no definite action could be taken until the adjourned business meeting in New York on Nov. 12, 1912.

Before any discussion took place, however, President Kemp gave a brief but comprehensive outline of some of the conditions that led up to the erection of the Engineering Societies Building. Before this, the Institute had purposely not been incorporated, but it became necessary to take such a step in order to acquire the ground on which the building was to be constructed. The present dual organization, objected to by many as being inefficient, is a direct outcome of this condition. Although heavy financial obligations were incurred in the construction of this building, these have been reduced to about $68,000, and it is expected that this will be still further reduced in a few months. President Kemp stated that great progress has been made toward a satisfactory reorganization by Charles Kirchhoff.

Mr. Rand read the most important changes in the constitution and by-laws that are proposed by the committee of which he is a member, and with two exceptions these seemed to be generally acceptable to the Cleveland meeting. However, Art. 4, which provides for the organization of a body to be called "Fellows of the Institute" aroused a discussion that became heated and general. The older members, with a few exceptions, appeared to be in favor of such a step, but the younger men were decidedly opposed to it. The arguments advanced by both sides were interesting and to the point, and in the course of the discussion the Institute was referred to as the "greatest democratic organization of its kind in the country." Whether or not the Institute should so amend its policy as to make it possible to take a positive stand on political questions affecting the mining industry was the cause of much discussion and some mirth, as it appears that the proposal to form the "Fellows of the Institute" will make probable the adoption of such a policy. Against the wishes of the committee, two votes were finally taken: One, that it be the sense of the meeting that Art. 4 be stricken out, was carried; the other, that it be the sense of the meeting that a body of fellows should be created, was lost.

Before this matter was closed, it was stated by a member of the Committee of Five, that its efforts were entirely unselfish, and had solely in view the betterment of the Institute's affairs; that much undue and unjust criticism had been published and heard, including an editorial in the ENGINEERING AND MINING JOURNAL in which the action of the committee, in regard to certain matters, had been characterized as "indecent." In the third by-law, relating to the duties of the secretary, a motion was carried that it be the sense of the meeting that the sentence reading "the Secretary shall devote his entire time to the affairs of the Institute," be stricken out.

The Western members feel that they are not sufficiently represented in the management of the business affairs of the Institute, and one, at least, went on record as demanding that a Western man be selected as the next secretary. It is proposed to remedy these conditions, however, by retaining the management in the board of control, as at present, but with an increase in the council, which, it is proposed, shall contain more Western men, the board to be governed largely by the influence of the council.

ENTERTAINMENT FEATURES

On Wednesday night, a subscription banquet was given at the Hotel Statler, which was attended by about 80 members. The speeches were largely impromptu. The first inspection trip took place on Wednesday afternoon, when a special train on the Baltimore & Ohio railroad took the visitors first to the Central plant of the American Steel & Wire Co., through whose courtesy the train had been provided, and thence to the Newburgh Steel Works, of the same company, where the party was shown through the steel plant and later through the large wire mills of the company at that place.

On Thursday afternoon, a number of automobiles took the members to the plant of the National Carbon Co., and afterward to the ore unloading docks of the Pennsylvania railroad.

September Operations at Goldfield Consolidated

During September, 1912, the total production of the Goldfield Consolidated Mines Co., according to the official report of the general superintendent J. F. Thorn, was 29,752 tons containing $433,938, or an average of $14.58 per ton, of which 28,800 tons was milled with an average extraction of 89.52% and 952 tons was shipped, of an average value of $22.38 per ton, the net recovery from all ore being $13.13 per ton. The total net realization to the company was $200,833, or $6.75 per ton.

GOLDFIELD CONSOLIDATED OPERATING COSTS FOR SEPTEMBER, 1912

Mining, including stoping and development	$3.78
Transportation	0.11
Milling	1.98
Marketing	0.05
General expense	0.48
Bullion tax	0.02
Marketing ore shipped	0.13
Total cost of operation	$6.55
Miscellaneous earnings	0.10
Net cost per ton	$6.45

During the month of September, 1912, 4612 ft. of development work was performed. The total cost of mining, development, transportation, milling, office and general expense was $6.45 per ton, distributed as shown in the accompanying table.

Several discoveries of considerable importance were made during the month. In the Combination mine the 136 BX stope on the second level was extended and produced 700 tons of ore that averaged $18 per ton. The 136-T raise through the western extension of the 136 orebody encountered ore, and 150 tons averaging $32 per ton was mined. The 246-C between the third and fourth levels, 450 ft. east of the shaft, produced 237 tons of ore averaging $140 per ton. While not very large, this orebody will produce several hundred tons of good ore. The 414-C raise produced 76 tons of $31.20 ore.

At the Mohawk, the No. 3 stope through the Sheets-Ish workings produced 3258 tons of ore averaging $12.20 per ton. The 170-stope on the 250-ft. level, and under the Sheets-Ish orebody produced 1395 tons of ore averaging $15.40 per ton. The 348 stope between the third and fourth levels was extended south and produced 340 tons of ore averaging $90 per ton. The 490-R sill being cut on the intermediate, between the third and fourth levels, and about 200 ft. south of the 354 stope produced 611 tons of ore averaging $100 per ton.

At the Clermont, the downward extension of the 510 orebody in 571 drift between the 900- and 750-ft. levels produced 36 tons of ore averaging $38.20 per ton. 700-F stope between the 1200-ft. level of the Grizzly Bear and 1000-ft. level of the Clermont produced 448 tons of ore averaging $42.40 per ton. 603 stope between the 1000-ft. and 900-ft. levels of the Clermont produced 329 tons of ore averaging $26.20 per ton. The 802 stope on the 1300-ft. level produced 302 tons of ore averaging $25 per ton.

The 220 drift on the 200-ft. level of the Jumbo No. 2 was extended 100 ft. north through ore that averaged $50 per ton over a width of five feet. A raise in this orebody produced 100 tons of ore averaging $72.80 per ton. On the 300-level the south drift is being extended to connect with the downward extension of the 220 orebody. The raise through the 115 orebody from the first level of the Red Top, has been extended to the surface, and a glory hole started, which produced 1150 tons of ore averaging $25 per ton.

Mineral Production of Italy

According to official reports, there were 650 producing mines in Italy in 1911, of which 352 were sulphur; 88 zinc and lead; coal and oil shale, 35; iron, 31; graphite, 30; salt, 30; asphalt, 15; borax, 12; pyrites, 10; manganese, copper, mercury, oil and gas, 9 each; all others, 11.

The outputs of the principal items, arranged in order of descending value, were: Sulphur, crude, 2,682,766 metric tons; zinc ore, 139,719; iron ore, 373,786; lead ore, 38,458; lignite, 553,083; mercury ore, 97,803; asphalt and bitumen, 188,133; iron pyrites, 146,124; petroleum, 10,390; copper ore, 68,136; borax, 2648; rocksalt, 43,763; other salt, 17,251; graphite, 12,621 metric tons; natural gas, 9,021,000 cu.m.; copper pyrites (45% S, 1½% Cu), 19,149 metric tons; mineral waters, 35,320; manganese ore, 3515 metric tons.

There were 31,008 men and boys employed underground, of whom 1794 were under 15 years of age, and 15,993 persons employed above ground, of whom 639 were boys under 15; 639 were grown women, 808 classed as female minors over 15, and 121 as girls under 15 years.

Among quarry products, we note marble, 497,741 metric tons, valued at $4,647,000, and talc, 15,620 metric tons, valued at $115,000. Owing to quality, however, this output greatly influences the course of the talc trade.

October Mining Dividends

Dividends from United States mines for October, 1912, reach the extraordinary total of $9,987,861. Metallurgical, coal, iron, holding companies and other organizations allied to the mining industry, paid $5,355,477, and Mexican and Canadian companies paid $2,388,806, the latter also representing a high-water mark.

The copper companies continue their upward march, Ahmeek has gone on a $6 basis; Anaconda to $0.75; Old Dominion (holding), $1.25; Snowstorn, $0.03; and U. S. Smelting, common, to $0.75. These represent increases of from 20 to 50%. In the Canadian field, the holders of Consolidated Mining & Smelting stock were cheered by resumption of dividends on a 4% basis, after five lean years.

Mining dividends paid by United States mining companies making public reports amount to $53,170.274 for the first 10 months of the year, and for American mining, metallurgical and allied companies, to $147,505,868.

United States Mining Companies	Situation	Per Share	Total
Ahmeek, c	Mich.	6.00	300,000
Anaconda, c	Mont.	0.75	3,249,375
Am. Z. L. & S., l.z	U.S.	0.50	82,460
Arizona, pfd. B., c	Ariz.		53,842
Bunker Hill & Sull., l.s....	Ida.	0.20	65,400
Bunker Hill Con., g	Cal.	0.05	10,000
Champion, c	Mich.	1.00	100,000
Chemung, c	Mich.	6.16*	1,231,073*
Colo. Gold Dredging, g...	Colo.	0.25	25,000
Copper Range Con., c....	Mich.	0.50	196,723
Daly West, s.l	Utah	0.15	27,000
Fremont, g	Calif.	0.02	4,000
El Paso, g	Colo.	0.10	49,000
Frontier, z.l	Wis.	2.00	2,500
Golden Cycle, g	Colo.	0.02	30,000
Grand Central, g	Utah	0.05	25,000
Goldfield Con., g	Nev.	0.30	1,067,744
Homestake, g	S.D.	0.50	109,200
Iron Blossom, s.l.g	Utah	0.10	100,000
Hecla, l.s	Ida	0.02	20,000
Kennecott, c	Alas.		2,000,000
Mammoth, g.s.c	Utah	0.15	60,000
Mary McKinney, g	Colo.	0.02	26,185
New Idria, q	Calif.	0.30	30,000
North Butte, c	Mont.	0.50	205,000
Old Dominion, c	Ariz	1.25	205,000
Osceola, c	Mich.	3.00	288,450
Opohonga, g.s.l	Utah	0.02	17,980
Pittsburgh Idaho, l.......	Ida.	0.04	32,120
Pittsburgh Silver Peak, g	Nev.	0.02	55,800
Shannon, c	Ariz.	0.50	150,000
Snowstorm, c.g	Ida.	0.03	45,000
Tonopah-Bel., g.s	Nev.	0.25	375,000
Tonopah Exten., g.s	Nev.	0.02½	23,586
Tonopah Min., g.s	Nev.	0.40	400,000
United Cop. Min., c	Wash	0.01	10,000
United Globe, c	Ariz.	7.50	172,500
Wasp No. 2, g	S.D.	0.02	10,000
Wolverine, c	Mich.	5.00	300,000
Yellow Pine, z.l..........	Nev.	0.02	19,000
Vindicator, g............	Colo.	0.03	45,000

*Dissolution dividend.

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Ag. Chem., com	U.S.	1.00	171,141
Am. Ag. Chem., pfd	U.S.	1.50	275,730
Am. Sm. Sec., pfd. A.....	U.S.	1.50	255,000
Am. Sm. Sec., pfd. B.....	U.S.	1.25	375,000
Consolidation Coal.......	Md.	1.50	299,148
Central C. & C., com......	U.S.	1.50	76,875
Central C. & C., pfd......	U.S.	1.25	23,437
Crucible Steel, pfd	U.S.	1.75	427,638
Gen. Chem. pfd	U.S.	1.50	150,000
Guggenheim Expl........	U.S.	2.50	519,833
Harbison-Walker, pfd	U.S.	1.50	144,000
Island Creek, pfd	U.S.	1.50	75,000
National Carbon, com....	U.S.	1.50	82,500
Old Dominion, c	Ariz.	1.25	366,555
Penna. Salt Mfg	Penn.	3.00	300,000
Pitts. Coal pfd	Penn.	1.75	371,262
Sloss-Sheffield, pfd.......	U.S.	1.75	117,250
U.S. Sm. Ref. & M., com..	U.S.	0.75	263,328
U. S. Sm. Ref. & M., pfd...	U.S.	0.87½	425,530
Westmoreland Coal......	Penn.	3.50	150,000
Va-Car. Chem. pfd	U.S.	2.00	360,000
Vulcan Detinning	N.J.-Ill.	1.75	26,250

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Alacran, g. s.............	Mex	2.00	4,800
British Columbia, c......	B.C.	0.15	88,756
Buffalo Mines, s	Ont.	0.05	50,000
Con. Min. & Sm. of Can...	B.C.	4.00	232,176
Crown Reserve, s	Ont.	0.05	88,441
Dom. I. & S., pfd	Can.	3.50	175,000
Dom. Steel Cor., pfd	Can.	1.00	345,896
Dom. Coal...............	Can.	1.00	150,000
La Rose, s	Ont.	0.12½	187,328
Lucky Tiger, g	Mex.	0.05	35,767
McKin.-Darr.-Sav., s..	Ont.	0.10	224,769
Nipissing Mines, s	Ont.	0.37½	450,000
Nova Scotia S. & C., pfd	N.S.	2.00	20,600
Nova Scotia S. & C., com.	N. S.	1.50	90,000
San Rafael, s	Mex.	0.90	2,160
Santa Maria de la Paz, s	Mex.	2.50	24,000
Standard, s.l............	B.C.	0.02½	50,000
Timiskaming & H. B., s...	Ont.	3.00	23,283
Timiskaming, s	Ont.	0.03	75,000
Wettlaufer Lorrain, s		0.05	70,830

Chronology of Mining for October, 1912

Oct. 1—Wages increased 25c. per day at Mason Valley mines and smeltery in Nevada.—Nevada Consolidated increased miner's wages 25c. per day.

Oct. 2—Miners in Ely copper district, Nevada, went out on strike for increase in wages of 50c. per day and recognition of the Western Federation of Miners.

Oct. 3—International Smelting & Refining Co., refinery at East Chicago, Ind., started.

Oct. 5—Montana coal miners voted to accept the wage scale agreed upon by operators and representatives of the miners, whereby an increase in wages began Oct. 1.

Oct. 8—Fire in the Bunker Hill & Sullivan mine in the Cœur d'Alene district, Idaho; one life lost.

Oct. 9—Utah Copper Co., and other operators in Bingham Cañon resumed operations on a small scale, virtually signalizing the failure of the strike.

Oct. 12—Fire in the North Mount Lyell mine, Tasmania, imprisoned 90 and caused the death of about 45 men.—Kennecott Mines Co., operating the Bonanza mine in Alaska, declared a dividend of $2,000,000, making total dividends declared this year $3,000,000, or $500,000 more than the capitalization.

Oct. 14—Hollinger Gold Mines Ltd., of Porcupine, declared initial dividend of 3% payable Nov. 2.

Oct. 16—Vera Cruz, Mexico, seized by Feliz Diaz who proclaimed a revolutionary movement against the Madero government; only to be captured several days later by federal troops.

Oct. 17—Two Greek strikers killed by guards at the Steptoe Valley smeltery, whereupon Governor Oddie declared martial law in effect and called out state police to maintain order in the Ely District.

Oct. 19—New Ophir mill on the Comstock Lode, Nevada, began operations.

Oct. 20—Cuyuna-Mille Lacs company shipped first ore from the Cuyuna Range in Minnesota.—One hundred twenty men went out on strike at the Cobalt Townsite mine after being refused a reduction in working hours of from ten to nine.—One man killed and one injured by a landslide on the Queen mine property at Ymir, British Columbia.

Oct. 21—Julian Hawthorne, Albert Freeman, Josiah Quincy and William J. Morton pleaded not guilty to charge of using the mails to defraud investors in the Hawthorne mines in Canada.—United Metals Selling Co., entered the domestic lead market as sales agent for International Smelting & Refining Co.

Oct. 23—Owing to the spread of the fire in the North Mount Lyell mine the management decided to flood it.

Oct. 24—Nevada Consolidated resumed steam-shovel work at Copper Flat with two shovels.—Hoisting engineer at the White raise of the Bunker Hill & Sullivan mine in Idaho, lost control of skip and 12 men were dropped 200 ft. to the bottom; two men were seriously injured.

Oct. 25—Representatives of colliery proprietors and miners agreed upon an advance of one shilling per week in wages, affecting about 400,000 men in the collieries of North Wales and England, excepting Northumberland and Durham.

Oct. 29—Strike at Ely, Nev., declared off by an almost unanimous vote, the men to return to work at an advance of 25c. per day as originally offered by the companies.

Mineral Oil Exports

Mineral-oil exports from the United States in 1912 will show a larger total, both as to quantity and value, than in any earlier year. The quantity exported will, according to the latest figures of the Division of Statistics of the Department of Commerce and Labor, approximate 1800 million gallons, valued at 120 million dollars. The distribution of our mineral-oil exports extends over a wider area than perhaps any other single article of exportation. The countries and colonies to which it is exported exceed 80 in number. Europe is by far the largest customer, taking a little more than one-half of the illuminating oil, three-fourths of the lubricating, and over one-half of the gasoline and naphthas exported; while North America (chiefly Canada, Mexico, Panama, and Cuba) takes about two-thirds of the crude petroleum exported.

Of the more than one billion gallons of illuminating oil exported in the fiscal year 1912, the United Kingdom took 166 million gallons; Japan, 109 million; Germany, 92 million; China, 68 million; and British India, 57 million gallons. Of the 202 million gallons of lubricating oil exported in that year, 63 million gallons were sent to the United Kingdom, 25½ million to France, and 24 million gallons to Germany. Of the 171 million gallons of gasoline, naphthas, and other lighter products of distillation exported in 1912, 34 million went to Canada, 27 million to the United Kingdom, and 15 million to Germany. Of the 208 million gallons of crude mineral oils exported, 76 million gallons went to Canada, 37 million to France, 28 million to Panama, and 23 to Mexico.

The petroleum production of the United States made its highest record in 1911—9¼ billion gallons. The United States now produces practically two-thirds of the petroleum of the world.

Transvaal Mining Notes

During 1911, the development footage sampled in the East Rand Proprietary mines was 37,843 ft., which averaged 10 dwt. over 26.1 in. In the first half of 1912, 18,791 ft. were sampled, assaying 12.4 dwt. over 26.7 in. These results show a great falling off from previous years, and the ore reserves are being largely drawn upon to maintain the present profit of between £90,000 and £100,000 per month. The ore being milled is apparently of higher grade than that of the average reserves. The company is preparing to push development in the deep and poorer portions of the mine, and has ordered a set of eight high-pressure and multi-centrifugal pumps of 500 hp., each pump to be capable of lifting 60,000 gal. of acid mine water per hour from 1150 ft. vertical depth. These pumps will be installed in pairs to raise water from the Angelo Deep shaft, from 4000 ft. vertical depth.

A company has been formed to mine and retort oil shale occurring near Ermelo, in the eastern Transvaal. Bore holes and shafts have shown the presence of four seams of oil shale from four to 24 ft. in thickness, occurring with two seams of coal five feet wide to a depth of 450 ft. The shale contains from 27 to 40 gal. of crude oil, which retorts from 60 to 75% marketable oil, and from 45 to 65 lb. of sulphate of ammonia per ton. The mines will afford a splendid market for the oils and the sulphate of ammonia will be most valuable as a fertilizer. There seems a good prospect that this shale can be worked to a profit, as working facilities are excellent and the property of 2400 acres is close to the railway.

Swaziland is a crown colony lying to the east of the Transvaal. Its chief mineral is alluvial tin ore. The Swazi Tin Mining Co. won 280 tons last year by hydraulicking and sluicing.

On the north the continuation of the Barberton gold-bearing series is met and the Piggs Peak mine is proving itself an important producer, the profits of which are increasing. Lately a new orebody was crosscut, assaying 10 dwt. over a width of 40 ft. In a recent month the Piggs Peak mine crushed 3300 tons for a yield of £5200 and a profit of £3160. The mine is worked from an adit 4000 ft. into the mountain. It is equipped with 25 stamps, a tube mill and Wheeler pans, and the ore, which contains much iron and copper pyrite, is concentrated on Buss tables and vanners. Power is supplied from a hydro-electric plant, seven miles distant. A 90% extraction is obtained by cyaniding concentrates and tailings separately. Development is three years in advance of the mill.

The De Beers Co., which owns the Kimberley mines, and has a virtual monopoly of diamond production in British South Africa, outside of the Premier mine, has taken over the Voorspoed mine in Orange Free State. This mine was a promising one, but owing to labor troubles and errors in regard to the treatment plant, work was stopped. The shareholders have their debt of £120,000 paid and get 12s. 6d. per share in 4½% debentures. The mine is, no doubt, worth more than this. It will probably be kept closed at present to regulate the diamond output to suit De Beers.

The City Deep mine, which was the cause of so much disappointment last year, is now giving good results, £20,000 profit being made per month. Last quarter's development on the main reef leader showed a value of 105s. over 20 in. The chairman of the Chamber of Mines stated that the reduced coal rail freights granted by the government would save the mines £200,000 per year, and other reductions another £200,000.

Moore Wins Filter Litigation

The Moore Filter Co. has received notification from the clerk of the U. S. Circuit Court of Appeals, sitting at Philadelphia, that Judge Buffington has handed down a decision in its favor in the case of the Moore Filter Co. vs. the Tonopah-Belmont Development Co., Tonopah, Nev. The case involves the use of the Butters filter and the decision of the higher court reverses the opinion of the U. S. District Court, given at Trenton, N. J., in February, 1912. The latter decision, in which the charge of infringement was not sustained, was reported in the JOURNAL of Mar. 2, 1912. Copies of the recent decision have not yet been received, so details are not available for this issue.

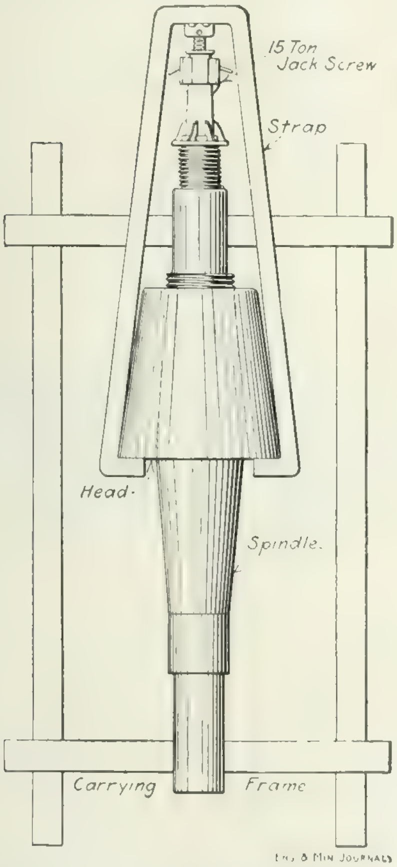
In 1911 there were 93 dredges working in New Zealand, 31 of which were owned by registered companies and paid dividends amounting to £45,198, according to the official report of the minister of mines.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Removing Gyratory Crusher Heads

It is sometimes difficult to remove chilled-iron crusher heads from the spindles as they are usually carried directly on the spider. Manganese-steel heads, however, come off more easily as they are generally carried on an auxiliary cast-iron head. The method most commonly used to remove the chilled-iron heads is to blast them.

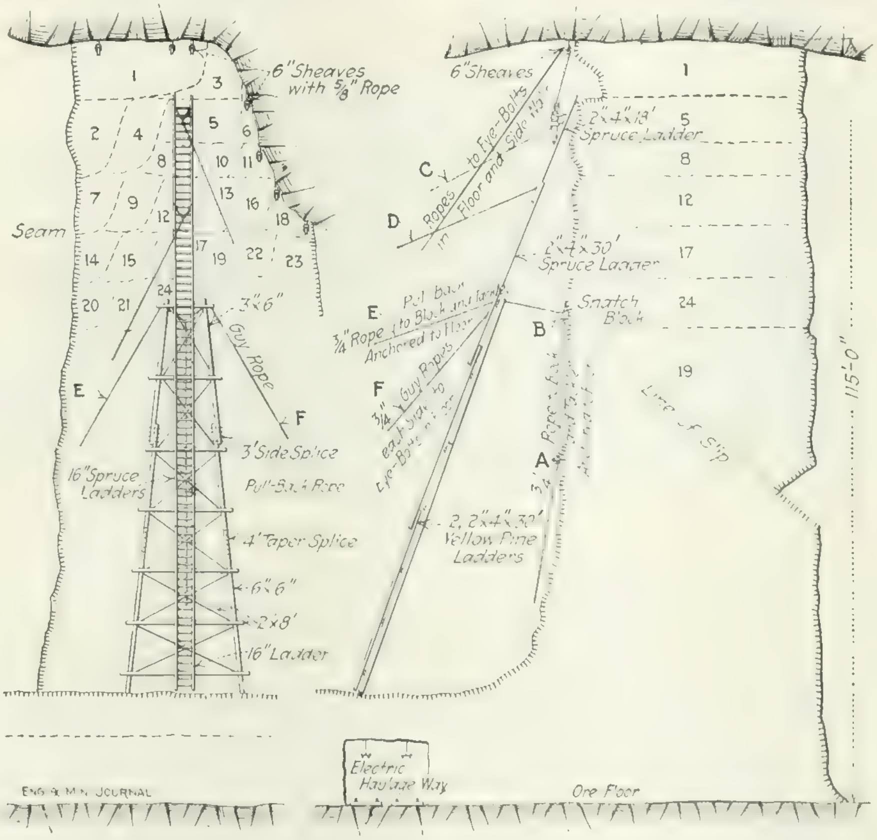


Removing a Gyratory Crusher Head from Its Spindle

The Cleveland-Cliffs Iron Co., in making up a shipment of scrap from the Cliff mine, had occasion to remove some old crusher heads from the spindles, and the operation was carried on in the following manner: The spindle with the head on it was rested in a frame, as shown in the accompanying drawing. A yoke strap, which in this case was a yoke taken from an old Cornish pump, was fitted over the large end of the head and extended a sufficient distance beyond the small end of the head to allow a 15-ton jack screw to be put in between the top of the yoke and the end of the spindle. The blue flame from a kerosene blow torch was played on the head for about 40 min., when one side became heated and the pressure exerted by the jack screw easily removed the head. Railroad iron could be used to form the yoke strap.

Mining a Pillar of Iron Ore

In mining the deposits of magnetite at Mineville, N. Y., the room-and-pillar method is adopted. In an exceptional orebody these pillars may be trimmed down to a floor of over 100 ft. below the back. Often in taking up lower levels, the pillars which are started on the floor above show signs of weakness, due to seams and blocky ground, when rounded on the lower levels. Trimming the pillar or cutting away portions to seams may make the pillar perfectly safe. Again a seam may show which cuts across the entire pillar and at such an angle that blasting near the ground will dislodge portions above the seam.



Method of Mining a Pillar of Iron Ore, Mineville, N. Y.

A particularly seamy pillar in one of the Mineville mines was recently taken down, after it was decided that the danger to the miners working near such a pillar would be much greater than working under the greater hanging-wall span attended by removing the pillar. To mine the pillar, reliable men were selected, A-frame staging and ladders were rigged, and two roofmen (working as machinemen) mined the pillar until the pillar was cut away and lowered below the main slip. The work was supervised by a head roofman. Two miners were kept near the foot of the pillar under cover of the back of the main haulage drift. They hoisted drills, water and tended the guy and pulling-back ropes. The miners on the pillar worked with ropes around their waists. These ropes passed through small sheave wheels held by split and wedge eye-bolts made fast to the hanging wall. Several sheaves, each fitted with a 5/8-in. rope, were hung, and new eye-bolts were fastened to the hanging close to the breast as the cutaway advanced. If any fall from the back should break the staging, the men could have been lowered by the miner at the foot of the pillar, by means of any one of the ropes hanging from the sheaves hooked to the eye-bolt.

The ropes served their purpose, for after one of the first blasts near the hanging wall, the head roofman had climbed the staging to inspect and had started down the back ladder when he heard the back cracking. He climbed back to the small bench, which had just been made by blasting. The fall broke the A-frame and ladders and he was lowered by one of the hanging sheave ropes.

The first drilling on the pillar was done with a block-hole machine; after a small bench had been cut in the pillar near the hanging wall, a 2¾-in. machine was used. Blasting was done by both fuse and battery and holes were pointed in such a manner that little material went in the direction of the staging. Certainly good judgment was exercised by the miners in blasting, for until the pillar was entirely free from the hanging, the roofmen left the complete drilling outfit on top of the pillar during each blast, the machine was never broken and again no part of the staging was broken by blasting, except a few ladder rungs. Before touching the holes, of course, the rigging was pulled back some distance by block and tackle.

A small portion of the pillar came away on the line of the main slip during blasting. This was fortunate, for it made the work much safer. The one block which did slip off weighed approximately 170 tons. The sketch shows approximately the order of blocks removed in freeing the pillar from the back, and also the staging and equipment.

In raising the staging, the following was the procedure. A 30-ft. ladder was raised and an eye-bolt fixed at *A*; 6x6-in. stringers, spliced by 2x8-in. plank, were then raised by block and tackle hung to the eye-bolt. Spliced spruce ladders were then raised on the staging to a point *B*, where another eye-bolt was driven. By means of this and block and tackle, 3x6-in. sticks were then raised, spliced to 6x6-in. stringers, and then strutted with 2x8-in. plank. From here on, ladders were spliced to the bottom length of ladders, and the line was drawn up to the top of the pillar by block and tackle hitched to the 2x8-in. braces, the ladders being guyed by ropes *C* and *D*, and the staging guyed by ropes *E* and *F*.

Compressed Air Storage in Rock

By Frank Richards*

One of the most familiar annoyances or inconveniences in the use of compressed air is insufficiency of storage capacity. In most of the employments of compressed air, especially in mining operations, the air is used intermittently and the rate of air consumption varies over a wide range. At the same time the usual air receiver is so small as to have little effect in maintaining constant pressure.

It has often been proposed and also many times attempted to use old and abandoned workings of mines for air-storage purposes, but in many cases complete failure has resulted on account of the impossibility of making the rock air-tight. It is, therefore, a pleasure to call attention to at least one instance where this scheme has worked successfully. The storage capacity in this case is a hundred times that of the largest commercial air receiver usually furnished.

Fig. 1 shows the essential features of a crosscut and drift on the 700-ft. level of the Center Star mine of the Consolidated Mining & Smelting Co., of Canada, Ltd., Rossland, B. C., which has been fitted up to serve as an underground receiver. In this case the rock was so close grained and free from fissures that the leakage was inappreciable. Fig. 2 is a plan of the workings appropriated for the receiver, the dam being placed as indicated. At this point the rock was notched out so as to give a bearing at least two feet wide all around to take the thrust caused by the air pressure, which aggregated about 450 tons. The dam was made of concrete eight feet thick, reinforced as seen in Fig. 1, by nine horizontal arched rows of 30-lb. rails. A manhole, 14x18 in., was run through the middle of the dam and secured by a cover on the inner face.

Inside the dam, with a space of 35 ft. between, was erected a concrete wall 12 in. thick to form a water chamber between it and the dam. It will be observed that this wall had to resist only the water pressure of four or five pounds at the most, the air pressure being effective equally on both sides, communication being free over the top of the wall.

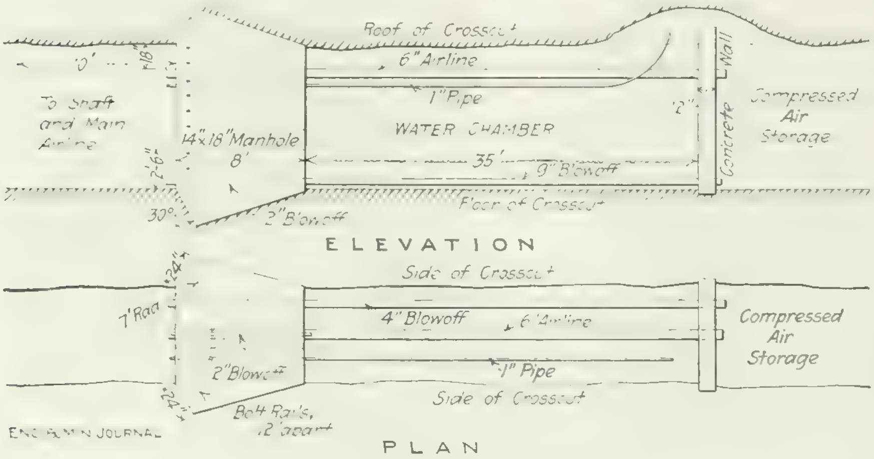


Fig. 1

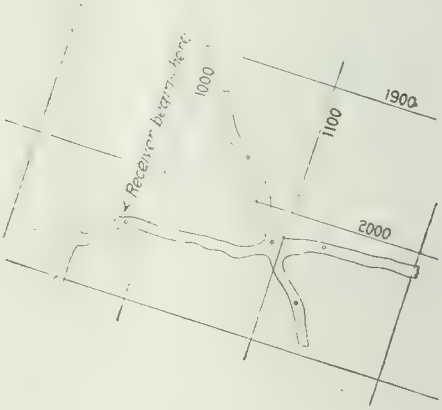


Fig. 2

Compressed Air Storage in Abandoned Drift

The air communication between the main air line and the storage chamber was through the 6-in. pipe, this passing through the water chamber on the way. Any water which might accumulate in the bottom of the storage chamber could be drawn off through the 4-in. blowoff, while the 2-in. pipe would discharge the water from the water chamber when required. The function of the 1-in. pipe is not clear, but it could be used, like a try-cock on a steam boiler, to show whether or not the water was up to the turned-up head of the pipe.

How the water chamber was kept filled does not appear, but a pump must have been required for the purpose. It does not appear in fact how much the water scheme was used, Fig. 1 being from a blueprint made before the storage system was put into use. The air, so far as the storage function was concerned, was entirely independent of the water and we know that the storage is a permanent success. All necessary valves and gages were, of course, provided outside to keep the engineers fully informed and in full control. For the information embodied in this article I am indebted to George A. Ohren, of the Canadian-Ingersoll-Rand Co., Vancouver, British Columbia.

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*Ingersoll-Rand Co., 111 Broadway, New York.

Improvised Method of Sharpening Steel

By G. L. Sheldon*

It is frequently necessary to work at a prospect or mine where there is no bellows or blower available for sharpening the steel. To overcome this difficulty, find or make a 3-ft. perpendicular bank in some gulch or creek bottom, preferably in heavy soil. At the base, dig a small cave or hole in the bank large enough in which to place the fire. On top of the bank, back a foot or more from the face, work out a flue or chimney hole several inches in diameter with a piece of steel and connect the hole with the back part of the fireplace below. Outside, in the face of the bank, and about half way up, make two small horizontal holes, a few inches apart and about the size of the steel, connecting with the flue or chimney.

Place the steel to be sharpened in these holes, so that the points will be in the center of the chimney. Take some dry wood (pitch or pine knots are best) make a good blazing fire, so that the flame will draw out at the top of the chimney, and the steel will become red hot in a short time.

It may be necessary, at the start, to use a wide-brimmed hat as a blower to get the blaze started up the chimney. If the sharpening is done in the evening and the improvised forge is situated in a gulch or creek bottom, a small dirt wing on the lower side of the firebox to catch the draft, which is always down the gulch in the evening, will serve to drive the draft up the chimney. For an anvil, cut down a near-by tree at about the right height on which to work, and if nothing else is available, an 8-lb. hammer sunk into the top of the stump will answer the purpose. An old worn-out stamp-mill die, an inch or more thick, sunk into the top of the stump makes an anvil good enough for months of work. It is light and easily packed.

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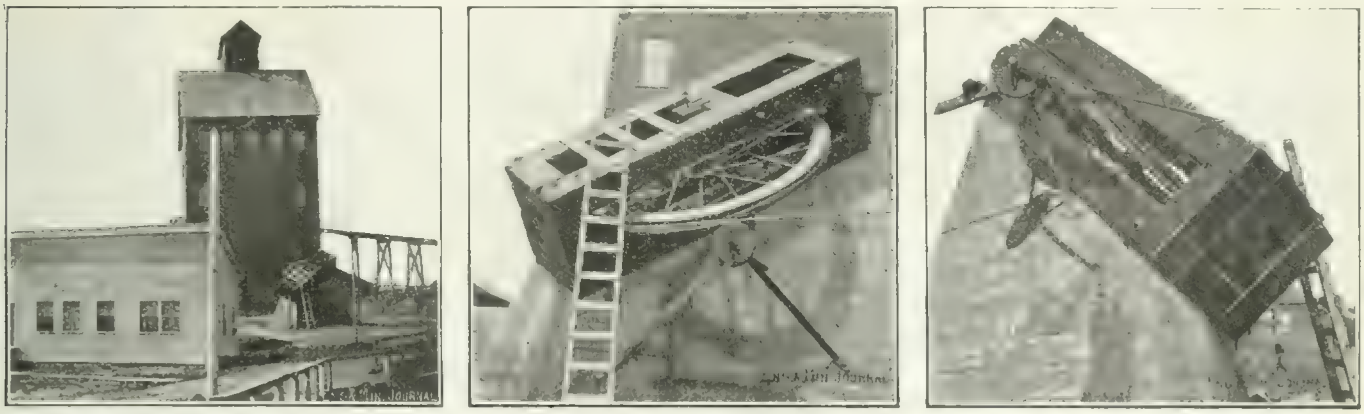
*Box 125, Ely, Nev.

Turn Sheave Location and Support

By C. R. Forbes*

It occasionally happens at a mine that it is necessary to deflect the hoisting rope running from the head sheave to the hoisting engine, by means of a turn sheave, because a suitable situation for the hoisting engine cannot be obtained in a direct line from the shaft, or in other cases because of a centralized power plant, two hoists may be placed in one engine house, which may be out of line with one or both of the shafts.

The accompanying photographs show a rather unusual method of supporting such a sheave at a Lake Superior copper mine. In this case the turn sheave was necessary because a suitable place for the hoisting engine could not be obtained in the line of the shaft, at a sufficient distance from the head sheave to permit the rope to wind properly on the drum of 11-ft. face; a minimum distance of 400 ft. was required and at that distance there was situated an office building and boarding house, and also the character of the ground at this point was not suitable for constructing a hoisting-engine foundation at a reasonable cost. However, at a point to the east of the shaft, a sufficient distance away, there was an outcrop of trap rock which made an ideal place for the foundation, but which necessitated the use of a turn sheave shown in the illustrations.



Turn Sheave Erected on an Oblique Support at a Michigan Copper Mine

The method of supporting this sheave was somewhat out of the ordinary, as the top of the concrete base was made parallel to the plane of the sheave instead of horizontal, as is the more common practice. The timbers supporting the sheave are 14 in. square and are held in place by 1½-in. bolts set in the concrete.

In constructing a foundation of this kind, the most difficult part is in locating and erecting the form for the odd-shaped concrete base. The operation in this case was accomplished as follows. A rectangular frame, as shown on p. 882, was constructed of 2x4's, the frame being made the same size as the top of the concrete base.

Projecting up from this frame, perpendicular to it, were three upright pieces as shown; the length of these pieces was the same as the distance from the center of sheave to top of concrete, which was determined by the size of timbers, the length of hub and shaft of sheave, etc. It was necessary to use these projecting pieces to line in the frame with, as all calculations were made with respect to the plane of the sheave itself and not the top of the concrete.

From a survey, the horizontal angle between the ropes was determined and also the slope of the rope in each direction; and by various calculations, the direction, length and slope of the line from the point of intersection of the ropes to the center of the sheave, were obtained. To locate the frame, the transit was set up in the determined line, and the frame lined in by sighting along the tops of the uprights; by measuring to a plumb line suspended from the top of the middle upright, it was centered correctly and placed at the proper height. The slope in both directions had been calculated, and by the use of two-degree levels set at the proper angles and placed on the frame, it was possible to set it at the correct slope, where it was braced and held firmly in position. The form was then built around it with a batter of 1:4, and the bolts set in position and held by a template until the work of filling in with concrete was completed.

It is possible to locate a sheave of this kind without the use of a transit by simply stretching chalk lines from the point of intersection toward the head sheave and engine drum and lining in the sheave by eye, although this method would not be as accurate as the one described and would take more time on the part of the workmen.

The solution of the turn-sheave problem, although tedious, is comparatively simple and may be accomplished in several ways, probably the easiest of which, and one that involves the use of plane trigonometry only, is shown below. From the survey, the horizontal angle *C′ A B′* between lines of rope is found to be 106°; slope of rope from point of intersection to head sheave, 46°; slope of rope from point of intersection to engine drum, 10°. Diameter of turn sheave 11 ft. Referring to the diagram, it is readily seen how the true angle between the ropes, the angle *CAB*, can be determined. This angle is found to be 93° 32′, and the line from the point of intersection *A*, to the center of sheave, will bisect this angle, but it must be remembered that the projection of this line on the horizontal plane, the line *AO′* in figure, will not bisect the angle *C′AB′*, and further calculations must be made to determine the horizontal angle *O′AG′*. It is next necessary to determine the length and slope of the line *AO;* with the data given in the problem this length is found to be 7.55 ft. and the slope 40° 41′. In order to find the angle *O′AG′*, draw *OG*, a horizontal line in the plane of the sheave. The length of this line can be determined, and as it is equal to *O′G′*, it can be used in solving the triangle *O′AG′*, of which three sides will be known; this angle is found to be 65° 49′.

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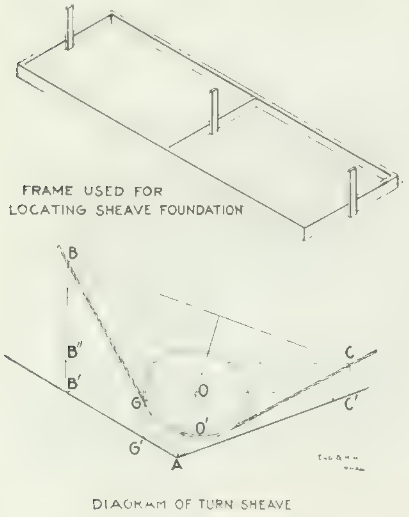
*Professor of mining, University of Missouri, Rolla, Mo.



Turn Sheave Location

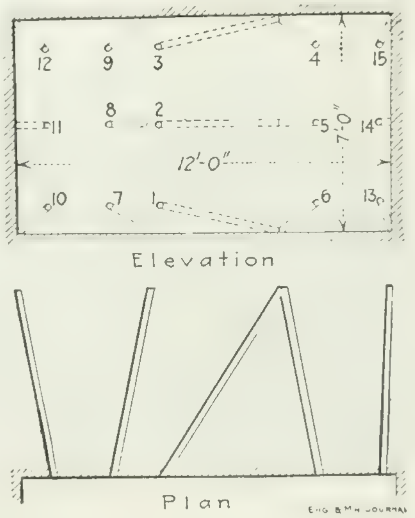
Data Required for Location

The data necessary for locating the sheave then are: Horizontal angle to be turned at point of intersection from line of rope to head sheave, 65° 49′; horizontal distance from point of intersection to center of turn sheave, 5.72 ft.; vertical distance from point of intersection to center of turn sheave, 4.92 ft.; slope of line from point of intersection to center of turn sheave, 40° 41′; slope of line at right angle to previous line (*CB* in figure), 22 degrees.

Rapid Driving at the St. Joseph Lead Mines

The St. Joseph Lead Co. has just completed a drift connecting its No. 1 and No. 7 mines at Bonne Terre, Mo. This drift was 7 ft. high by 12 ft. wide in hard unstratified limestone. A record of 455 ft. was made in 25 working days of three shifts each, or 75 eight-hour shifts. The working force consisted of three machine men, three chuck tenders, two muckers and one mule driver for each shift.

Three Sullivan 2¾-in. piston drills were furnished with air at 90-lb. pressure. The drilling was done from a crossbar to which were attached three arms designed by Assistant Superintendent Monie, similar to those used on columns. This enabled the miners to work the machines one above the other when necessary, and if one side of the drift was harder than the other, one of the machines could be moved over to the hard side so as to drill in any position desired, without interfering with operation of either of the others.



St. Joseph Drift Round

To pull a 6-ft. cut 15 holes were necessary, placed as shown in the sketch. The cut holes were drilled to meet at the points. A vertical row of three relief holes widened out the cut and the six side holes finished squaring the face. When the ground was harder than usual, eight, instead of six cut holes were used.

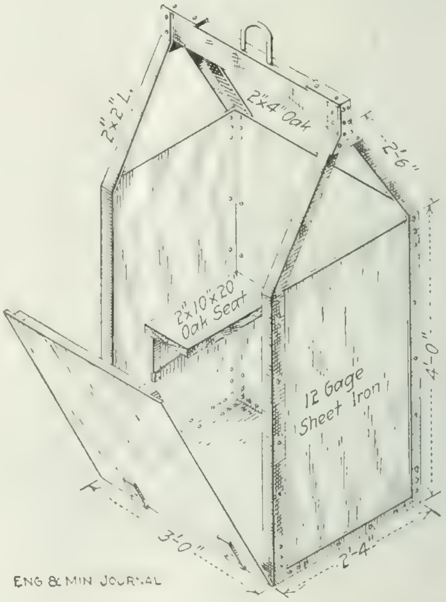
Each of the cut holes, 1, 2, 3, 4, 5 and 6 was charged with six to eight 1½x8-in. cartridges of Forcite 60% gelatin dynamite. Each of the remaining holes received 3, 4 or 5 cartridges of the same explosive, according to the character of the rock encountered, making 80 to 90 cartridges, 62 to 72 lb., for the entire round. This gives an average of 11.2 lb. of explosive per foot, or 1.44 lb. per ton of rock.

The blasting was all done by electricity. Victor electric fuses were used. The No. 5 were first used, but after a trial of the No. 8, these were used exclusively on account of the better work done by the explosive and an improvement in the fumes after blasting. The blasting machines used were the Reliable No. 3 and No. 4. The lead wire was 500 ft. of Duplex No. 14 B. & S. gage. The blasting was done from small chambers cut in the side of drift. The drilling, including setting up and tearing down, took six hours. The blasting occupied about 1½ hours.

Hospital Cage

By L. D. Davenport*

If a miner working on one of the sublevels in the Chisholm district, Minnesota, is injured it is usually easier to hoist him up one of the timber shafts than to take him to the bottom level and hoist him up in the skip. At one time it was customary to use the powder cage for this purpose but the latter was so small and inconvenient that a special type of apparatus was designed for this purpose.



Cage Used for Hoisting Injured Miners through Timber Shaft

The hospital cage as shown in the accompanying sketch is of sufficient height so that an injured man can stand or be supported in an upright position if desired. The large door in the front, which is reinforced with oak cleats, can be swung down to the ground making it easy to place an injured man in the cage. There is a seat on one side and the cage is made large enough to accommodate two men in case it is necessary to have the injured man accompanied by someone. The cage is light and strong and was designed and built under the direction of the master carpenter at the Monroe mine.

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*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

Details of Metallurgical Practice

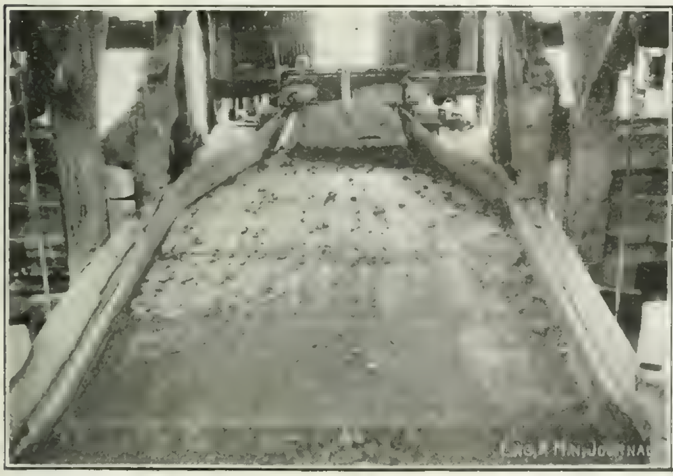
Records of Experience in Ore Dressing, Cyaniding and Smelting

Crushing with Holman Stamps

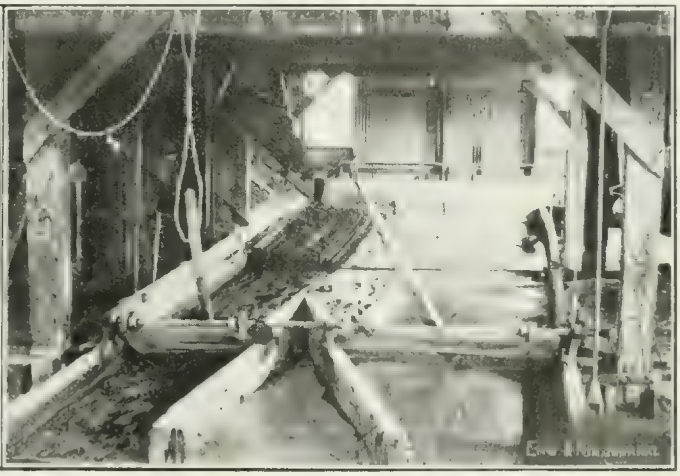
The practice at the Mountain Queen mine, near Southern Cross, Western Australia, in crushing the ore, which consists of soft oxidized material and hard surface ironstone, is described in the *Monthly Journal* of the Chamber of Mines, Aug. 31, 1912. The ore from the mine is dumped on a flat grizzly over the battery bin. Over-size lumps are broken by hand on the grizzly to pass the 2¼-in. openings.

The ore is then fed to a Holman pneumatic-stamp battery, comprising two mortar boxes, each equipped with three 12-mesh screens. Crushing is done in salt water, an average ratio of six of water to one of ore being maintained. The stamps are followed by 5-ft. grinding pans, fitted with Freeman pipe classifiers, which reduce the ore to the necessary fineness for amalgamation and subsequent cyanide treatment. The action of the Holman stamps is as follows: In the walls of the pneumatic cylinder are four rows of holes, two above and two below the center position of the cylinder. Rows two and four are plugged. As the cylinder travels up and down, it traps the air between the piston and the cylinder covers and the air thus compressed acts as a cushion, which, on the return stroke, assists in the propulsion of the stem. As the shoes and dies wear, the holes in rows two and four come into use, the other two rows being plugged.

From 15 to 17 hp. is consumed per head of stamp, falling at the rate of 123 drops per minute, the double unit calling for 30 to 34 hp. This speed is maintained as long as the ore is soft. On hard ore the stamps were run at 135 drops per minute, each head consuming from 22 to 25 hp. In both cases 130 tons of ore were crushed per day. In seven months 24,892 tons of ore were crushed, the consumption of metal in shoes and dies being 11,114 lb., or 0.447 lb. per ton of ore.



Picking Shaker, End Feed. Desloge No. 4 Shaft



Picking Shaker, Side Feed. Desloge No. 3 Shaft

Desloge Picking Shaker

At the different shafts of the Desloge Consolidated Lead Co. in southeastern Missouri, the ore, after passing over a grizzly, to get rid of the undersize, falls on a large shaking apron, called the shaker or picker. Here several men with sledge hammers break the large boulders so that they will go into the crushers easily, and also determine whether the boulders are ore or waste. Owing to the muddy condition of the rock it is difficult to tell whether it is ore or waste until broken. It is thought better to do this sorting at the surface, where the men have better light and the sorted waste is at hand for easy inspection and sampling, than to sort underground where the work would be more scattered and where a large part of the fines from the sledging would be lost on the floor of the workings. The ore is a mineralization of a fairly well bedded dolomite and it breaks readily.

The shakers are 10 ft. wide and from 22 to 29 ft. long. A heavy load accumulates on them when the ore is being hoisted fast; occasionally as much as 15 tons of ore are on the shaker decks at one time. The ore is fed along by means of a shake given by a simple eccentric drive. A differential stroke was tried but this was found to throw considerable strain on the drive wheel of the eccentric shaft. The stroke of the driving eccentrics is about 4½ in. The shakers are given a slope of from ¾ to 1 in. per foot of length; this aids in carrying along the ore. The speed of discharge is regulated mainly by the speed at which the table is moved back and forth. With the shorter shakers a speed of 78 r.p.m. is used on the eccentric shaft, while with the longer ones the speed is 89 revolutions per minute.

The deck is made up of 2-in. planks laid longitudinally on cross pieces of 6x8-in. timber. A covering of ⅜-in. plate is fastened down on top of the deck. This plate lasts about a year as the places subject to excessive wear are protected by a covering of rails.

The shaker at the No. 3 shaft is suspended from overhead beams by means of old hoisting cables, about 5 ft. apart, which are fastened by shackles and clevises to eye-bolts in the cross timbers and the carrying beams. Rods were tried instead of the cables but were found to be too rigid. The driving shaft, 3½ in. in diameter, carries the two eccentrics which operate the shaker through simple connecting rods. The eccentrics are about 3 in. wide; the outer strap or yoke has an outside diameter of 15 in., and an inside diameter of 10½ inches.

In order to absorb the shock that would otherwise be transmitted directly to the driving belt when a car is dumped on the shaker, the picker should be driven by a heavy, webbed driving pulley that will also act as a flywheel. The webbed driving pulley used on the 10x 29-ft. shaker at No. 3 Desloge shaft has a diameter of 5 ft. and a face width of 10 in. The web between the four spokes is 3 in. thick; the rim 1$\frac{5}{8}$ in. thick and the spokes which come out to the full width of the face are 2 in. thick. Those spokes, however, that serve as the splice faces for the two parts of this split drive wheel, are 3 in. thick when bolted together.

The shaker feeds the ore to one or two breakers. Brennan multiple-jaw breakers as well as Farrell-Blake crushers are used. The Brennan breakers have been in use for years and are popular because of the light weight of the different parts which allows repairs to be made more easily.

While the shaker can be fed from the side, it is preferable to dump the ore on it from the end as it is then spread evenly across the deck, making it easier to sort out waste; the initial velocity of the falling ore also sends it ahead in the direction of the feed of the shaker. At the end of the deck are plank chutes for guiding the ore to the mouth or mouths of the crushing equipment. A gate is provided for shutting off the feed to the crushers and when the crusher is heavily loaded, this gate which slants forward toward the head end of the shaker, can be used as a skimmer to regulate the amount of ore being fed to the crushers. Of course such a shaker would be convenient only where there is coarse sorting and sledging to be done. It takes about six horsepower to run the smaller size of Desloge shaker.

Printing Titles on Tracing

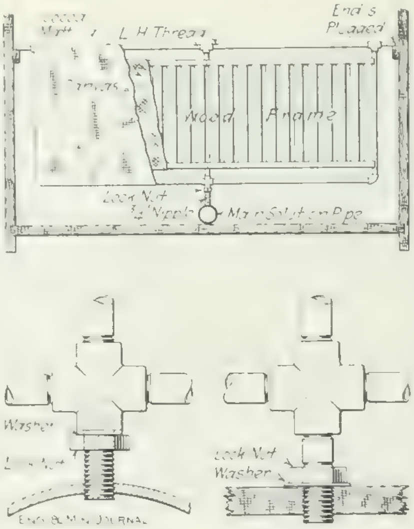
In getting out the enormous number of detail drawings required by the Board of Water Supply, City of New York, it was soon found that to letter all the titles by hand required a large expenditure of draftsmen's time. In a paper read by C. F. Bell at a meeting of the Municipal Engineers of the City of New York is found the following description of the method used in printing standard titles on drawings and tracings:

In printing the titles by the press, the drawing is laid on a rigid horizontal pad, around which a table has been built large enough to allow drawings to be laid out flat without danger of creasing, and the chase in which the type has been set is brought down on this. For a long time a sprinkling of either pounce or magnesia was applied immediately after the printing to hasten the setting of the ink, but both of these got on the men's clothing and gave the work a grayish appearance, while the titles never became either elbow or benzine proof, and it often happened that after much handling, the titles would have to be retouched and sometimes altogether renewed by hand. At one time we tried putting a thin coating of collodion over the titles instead of using pounce, but the resulting gloss prevented good photographic work, while the collodion soon lost some of its transparency and looked dirty. Then we tried using "Fixatif," a liquid used by artists for setting charcoal sketches, and we are still using it with most satisfactory results. A template, made by cutting out the paper proof submitted by the printer, is placed over the title and a light coating of "Fixatif" is sprayed over the printing from an atomizer, no pounce being used. This coating is almost invisible, preserves the black appearance of the ink, which is of great advantage in photographing, and in a few hours (over night) the printed work is finger-proof and practically benzine-proof.

Clarifying Cyanide Solutions

By F. H. Wetherald*

Methods of clarifying solutions previous to precipitation vary in cyanide practice. Frequently they are inefficient when an excessive flow of slimy solution to the gold tanks occurs at times. Often apparently clear solutions carry fine colloidal material and complex metallic compounds to the zinc boxes, where the effect on precipitation is notably injurious.



Filter Leaf for Clarifying Solutions

Vertical gravity filters which I installed in two mills so satisfactorily solved the problem of obtaining clear solutions, that a description of this filtering arrangement may prove of interest.

The filters were devised by W. E. Holderman, in connection with the Holderman process, at Manning, Utah. They consist of canvas-covered frames placed vertically in the gold tanks at intervals of about one foot. Each filter has a bottom connection with a common discharge pipe placed on the bottom of the tank, and since it is subject to a steady gravity pressure only, much less substantial construction is required than for vacuum filters.

The vertical position not only increases the possible filtering area, as compared with a bottom filter, but also allows much of the suspended material to settle between the filters to the bottom of the tank away from the filter surface.

Wooden frames, with 1-in. space strips, inclosed in a canvas envelope, give good service, but for deep tanks or where solutions are persistently clouded, requiring frequent cleaning of the canvas, a more substantial construction is advisable.

In round tanks the filters may correspond in length to the respective chords of the circle, or be built to the length of an inscribed rectangle. The pipe or box conveying filtered solution from the tank is then placed centrally.

A strong frame is made by using $\frac{3}{4}$-in. pipe, arranged as shown in the accompanying illustration. The two horizontal pipes forming the top member of the frame have a T-joint connection with the central vertical stiffening pipe. These horizontal pipes are cut with right- and left-hand threads in order to draw the frame tightly together. The two horizontal pipes forming the bottom member and the lower end of the vertical center pipe are screwed into a cross joint, the fourth or bottom opening of which is stripped of threads to receive loosely the nipple tapped into the main solution pipe. This nipple is provided with a lock nut and washer to insure a tight joint. Where a wooden box is used to convey filtered solution from the tank, the nipple is screwed into the cross, the box receiving the nipple and seating the washer. In the bottom pipe $\frac{3}{16}$-in. holes are drilled to provide means of exit for the solution The inner wooden space frame is covered with cocoa matting and the complete frame inclosed in the canvas envelope, which is rolled and sewed at the top and about the protruding end of the cross.

At one plant, the canvas at the end of two weeks was covered with very light colloidal slime $\frac{1}{16}$ in. thick, although the solutions had always appeared clear. The filters were cleaned as follows: Solution in one of the two tanks was drawn off to a point one-third of the height of the filter, and the canvas scrubbed in the remaining solution with a long-handled brush. The muddy solution was then allowed to settle one hour, and the tank again placed in commission. The total time required for the operation was three hours. The accumulated slime was sluiced out of the tank twice a year.

In another case the tank was drained once a week, and the filter leaves cleaned by sluicing with a small high-pressure stream, the slime being pumped to a thickener. For shallow tanks 8-oz. canvas is satisfactory. The accompanying illustration shows a filter leaf installation and discharge pipe connections for either a pipe or a wooden box.

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*Metallurgist, Virginia City, Mont.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Mount Morgan Operations

According to figures given in the report of the Mount Morgan Gold Mining Co., Mt. Morgan, Australia, for the year ended May 31, 1912, the total dividends paid since the formation of the company, in July, 1886, to date are equal to approximately 44% of the total proceeds. Expenditures on plant and machinery account are equal to about 4.56% of the total proceeds from metal, while depreciation charged against this account amounts to 1.44%; wages and contracts have constituted almost 29% of the total proceeds. For the year materials handled consisted of 166,499 tons of auriferous copper ores, etc., 91,946 tons of Many Peaks ore, 93,413 tons of siliceous sulphide ore, 64,056 tons of limestone flux, 367 tons of ironstone flux, 222,446 tons of waste from open cuts, and 8752 tons of waste rejected underground, a total of 647,488 tons of material handled. About 8.5 tons of overburden or waste was removed in the open cuts for every ton of ore secured, while about 3.7% of the tonnage mined underground was rejected as waste. To produce one ton of blister copper in the reduction works during the year ended May 31, 1912, it required 25.27 tons of Mount Morgan ore, yielding 2.71% copper; 13.95 tons of Many Peaks ore, yielding 2.25% copper; 9.72 tons of limestone flux; 0.05 tons of ironstone flux; 1.88 tons of converter lining and 4.39 tons of coke. During year ended May 31, 1911, it required 26.18 tons of Mount Morgan ore, yielding 3.01% copper; 8.15 tons of Many Peaks ore, yielding 2.26% copper; 12.56 tons of limestone flux; 2.45 tons of ironstone flux; 1.58 tons of converter lining and 4.52 tons of coke to produce one ton of blister copper.

Some South African Costs

During the year 1911-1912, the New Modderfontein mine milled 585,500 tons, valued at 34s. 6d. at a working cost of 18s. 8d. for a working profit of 15s. 10d. per ton, or a total of £478,862; £350,000 was declared in dividends. The total ore reserves and pillars total 4,067,000 tons, assaying 8 dwt., with 723,000 tons of estimated 3 to 4 dwt. content. The famous circular shaft was sunk 1167 ft. during the year on an average rate of under 100 ft. per month. The average stope width was 57 in. Mining costs were: Stoping, 3s. 7d.; timbering and rock walling, 7d.; shoveling and tramming, 3s. 4d.; pumping, winding, etc., 2s. 8d.; development, 1s. 5d.; total, 11s. 7d. per ton. Cyanide pulp assayed 8s. 11d. per ton and residues 9d. per ton.

The Simmer & Jack mine during the year ended July 31, 1912, made a working profit of £529,944. The 320 stamps and seven tubes milled 863,500 tons of the 922,624 tons mined, 528,828 tons came from stopes and 393,796 tons from foot and hanging wall and pillars in old workings. Costs were: Mining, 7s. 0.794d.; development, 3.438d.; surface transport, sorting and crushing, 4.852d.; stamp milling, 11.414d.; tube milling, 7.422d.; sand treatment, 11.712d.; slime treatment, 5.796d.; general, 1s. 0.158d.; maintenance, 0.576d.; total, 11s. 10d. per ton.

On the Sub Nigel mine during the year, 30 to 35% of the ore mined was sorted out. On a stoping width averaging 39.98 in., hammer boys broke 0.082 fathoms per shift; small machines, 0.669 fathoms; large machines, 0.776 fathoms.

Milling at Esperanza

A detailed statement of consumption of mill supplies at the Esperanza Mining Co., El Oro, Mexico, for 1911 shows that 246,968 wet metric tons were cyanided at an average consumption of 0.5 kg. of sodium cyanide (120% KCN) per ton of ore. The lowest consumption, 0.356 kg. occurred in March and the highest in June, when it reached 0.59 kg. per ton. The consumption of zinc dust (93% metallic zinc) used in precipitation ranged from 0.279 to 0.484 kg. per ton of ore, or an average of 0.417 kg. for the year. The average consumption of lime, which contained about 75% CaO, was 6.433 kg. per ton of ore and ranged from 2.714 to 10.676 kg. during the year. Lead acetate was used at the rate of 0.140 kg. per ton of ore and varied from 0.07 to 0.195 kg. Water consumption ranged from 3.370 to 6.421 tons per ton of ore and averaged 4.399 tons for the 12 months.

At the stamp battery 475 new shoes and 604 dies were used. The lowest number of shoes placed was two in July and the highest was 61 in February. The average consumption of shoes equaled 0.177 kg. per ton of ore. The placing of dies per month ranged from 11 to 109 and the consumption averaged 0.132 kg. per ton of ore. In the tube mills a 30% grade of steel liner was used, the consumption being at the rate of 0.768 kg. per ton of ore; quartz pebbles at the rate of 39.989 kg. On the slime filter presses a No. 2 grade of canvas was used and the replacements during the year show an average consumption of 0.02 sq.yd. per ton of ore. Hydrochloric acid consumption, 35% strength, used in cleaning canvas filters equaled 0.081 kg. per ton of ore. In melting precipitates the average consumption of supplies figured on the basis of one kilogram of bullion produced was as follows: Gas oil, 4.476 kg.; borax, 0.957 kg.; soda, 0.505 kg. The consumption on the basis of one metric ton of ore was: Gas oil, 0.312 kg.; borax, 0.067 kg.; and soda, 0.035 kg. A total of 289 crucibles consisting of 211 Dixon and 78 No. 60 was consumed, or an average of 24.08 per month. It required an average of 66.27 horsepower-hours per ton of ore in milling.

Mining Marquette Ores

The following figures give the average cost of mining and delivering iron ore from the Marquette range to lower lake ports during a five-year period, 1906-1910 inclusive. Dr. C. K. Leith describes the hard-ore group of mines as follows: "The ores at the top of the Negaunee formation just below the Goodrich quartzite are throughout the district hard hematites, locally more or less specular and magnetic. In certain mines the basal conglomerate of the Upper Huronian which rests against these ores is also sufficiently rich to be mined and constitutes a part of the orebodies. The orebodies are tabular in shape parallel to the steep-dipping contact of the Negaunee and Goodrich quartzite, though locally folded and faulted. Soft hematite is locally found in these mines in the jasper foot wall. The average depth of the producing mines not weighted acording to tonnage is 1041 ft. These ores have been mined to a depth of 1984 ft. at the Champion and this group as a whole constitutes the deepest of the Marquette mines."

The principal mines in the hard-ore group are: Republic, about 1900 ft. deep; Washington and Barron worked spasmodically for 40 years; American, Volunteer; Lake Superior Hard Ore, operated by the Oliver Iron Mining Co. and estimated by Mr. Finlay to have 2,270,000 tons in reserve; Section 16 of the Oliver company; Champion, Cliff Shaft and North Lake No. 2 orebody. The total valuation of the group as estimated by Mr. Finlay was $12,132,000 on a total expected tonnage of 21,667,000 tons. A summary of the records of the hard-ore mines of the district for the period mentioned shows that the value of the ore shipped was $17,015,407 of which $262,329 was paid in royalties to fee owners. The total net profit of the profitable mines was $4,723,752 and the loss to unprofitable mines $572,825 which includes some developing properties. Basing the average value of the ore at 100% the costs were: Mining, 39.5%; exploration and development, 2.4%; construction, shafts, machinery, etc., 4.4%; general expenses including administration, 3.3% royalties, 1.5%; taxes, 2.8%; rail freight 8:9%; lake freight, 13.4%; commissions, 0.3%; total of 76.5%, indicating that the average profit is about 23.5% of the average value of the ore.

Dr. Leith describes the soft-ore group in part as follows: "The orebodies are located with the Negaunee formation in its middle and lower horizons and show great variety of shapes. In the Negaunee basin it is a greatly folded and faulted sheet with comparatively low pitch to the south of west." In some mines the tabular development is less marked the orebodies occurring in more or less channel-like lenses in the jasper with relatively low pitch with great irregularity and cut by dikes. In drilling the ore has been cut to a maximum depth of 2375 feet. The principal soft-ore mines and properties are: Lillie, Cambria and Hartford controlled by the Republic Iron & Steel Co.; Jackson of the Cleveland-Cliffs company; Mary Charlotte, Breitung-Hematite, Lake Angeline, Mitchell, Rolling Mill, Lake, Negaunee, Salisbury, Maas, Lake Superior soft-ore mines of the Oliver company, Queen, Race Course, Lucky Star and Harvey Lots.

The total value of the properties as estimated by Mr. Finlay was $27,825,000 based on a yearly production of 2,263,000 tons and an expected tonnage of 53,145,651 tons. During the period mentioned the profitable mines earned $12,467,025, while the unprofitable mines lost $255,584. Royalties paid by the operating companies to the fee owners amounted to $1,859,944. The average cost of producing the soft ore including delivery to lower lake ports was as follows, basing the value of the ore at 100%: Mining, 36.4%; exploration and development, 2.1%; construction, shafts, machinery, etc., 3.2%; general expenses including administration, etc., 3.3%; royalties, 4.5%; taxes, 2.1%; rail freight, 8.3%; lake freight, 16.8%; commissions, 0.3%; a total of 77%, indicating an average profit of 23% of the average value of the ore delivered at Cleveland.

Leveling Dredged Ground

An electric winch from a dismantled dredge, in the Oroville district, operating a drag scraper, has made possible cheap leveling of dredged areas. The work, as described by James C. Bennett (*Engineering News*, Oct. 17, 1912), involved leveling a dredged tract to a grade suitable for building lots, making a roadway 60 ft. wide by 600 ft. long, half the width being a cut and the remainder a fill, and filling a large water hole to a grade above the level of standing water. Practically all previous work had been done by owners on force account, and, since the only object to be gained was to level the ground to any convenient grade, no attempt had been made to determine the yardage involved, hence no unit cost was available. The nearest approach was based on the cost per acre, which ranged from $175 to $200 per acre. In this, however, it was impossible to secure any suggestion even as to the approximate yardage represented.

LEVELING COSTS AND DATA

Daily Expenses		
1 Winchman	$5 00	
2 Helpers @ $2.50	5 00	
1 horse (for moving lines, etc)	1 00	
133.33 kw-hr @ 2¼c	3 00	
Total daily cost of		$14 00
Time required		
Days actually scraping	62	
Days moving lines and winch and making repairs	10	
Total days worked		72
Working days in which no work was done	10	
Total time, working days		82
Average length of haul		175 ft.
Average day's duty		247 cu.yd.
Largest day's duty		425 cu.yd.
Average hourly duty		32.2 cu.yd.
Costs		
72 days @ $14.00	$1008 00	
Repairs, materials only	35.00	
4-horse team, man and scraper, surfacing street grade, 1 day	10 00	
600 ft. second hand, 1¼-in. hauling line	54 00	
600 ft. second hand, ⅞-in. back line	30 00	
Depreciation at 10%	120 00	
Total cost		$1257.00

In preparation for the proposed work, an attempt was made to determine the approximate yardage involved by a rough measurement, but without success. Some idea may be gained of the difficulties of making measurements on ground of this character from the statement that, for purposes of railroad construction in this field, it was found necessary to make cross-sections at 10-ft. intervals. An estimate based on previous acreage costs would be unreliable in this instance, owing to the necessity of working to grade. Mr. Bennett and the contractors made a joint estimate of the time required to do the work. As the approximate daily expense was known within fairly narrow limits, this afforded the most equitable basis of cost.

Seventy-five working days was agreed upon as sufficient time to complete the work. This was to include lost time on account of repairs, setting deadmen, moving lines and blocks, and moving machine from one position to another.

The data regarding the operation, given in the accompanying table, was compiled during and upon the completion of the work. As will be noticed, a charge is made against the job for the full cost of the ropes. In doing this, the job is being charged with a little more than is really legitimate, as the same ropes are good for probably two to three thousand yards additional. Also, the depreciation charge is probably liberal, as there is little severe wear and tear on anything but the scraper.

A close tally was kept of the number of trips made, or loads hauled, and, from time to time, the loads were measured. An average of 1¼ cu.yd. per trip is believed to be nearly correct. The total amount of material moved, based on the number of trips made, was 15,300 cu.yd. The actual cost per cubic yard was thus 8.2c. For the 62 days of actual scraping, the average running time was seven hours per day.

Cost of Heating Mills

SPECIAL CORRESPONDENCE

A practical detail of some importance, which seems to have received little attention in general, is the heating of mills. This is particularly of great importance in cold countries and in sections where the cold season is of long duration.

In conversation with some operators at Cobalt and Porcupine, the opinion was expressed that some of the poorly constructed mills there incur a cost as high as 50c. per ton of ore for heating during the cold season. Well built mills do not incur such a high cost, but in any case the expense is too great to be ignored. In the mill of the Timiskaming Mining Co. Ltd., which is a small and well constructed building, the report for 1911 records a cost for the whole year of 13.5c. per ton of ore milled for heating. Calculating this for the actual time during which the heating was done, the cost must have amounted to about 27c. per ton of ore milled during the season when heating had to be done. In view of this important fact, it would seem to be good practice to build with the heating necessities in view and look far enough ahead to reduce heating costs to the lowest practicable point.

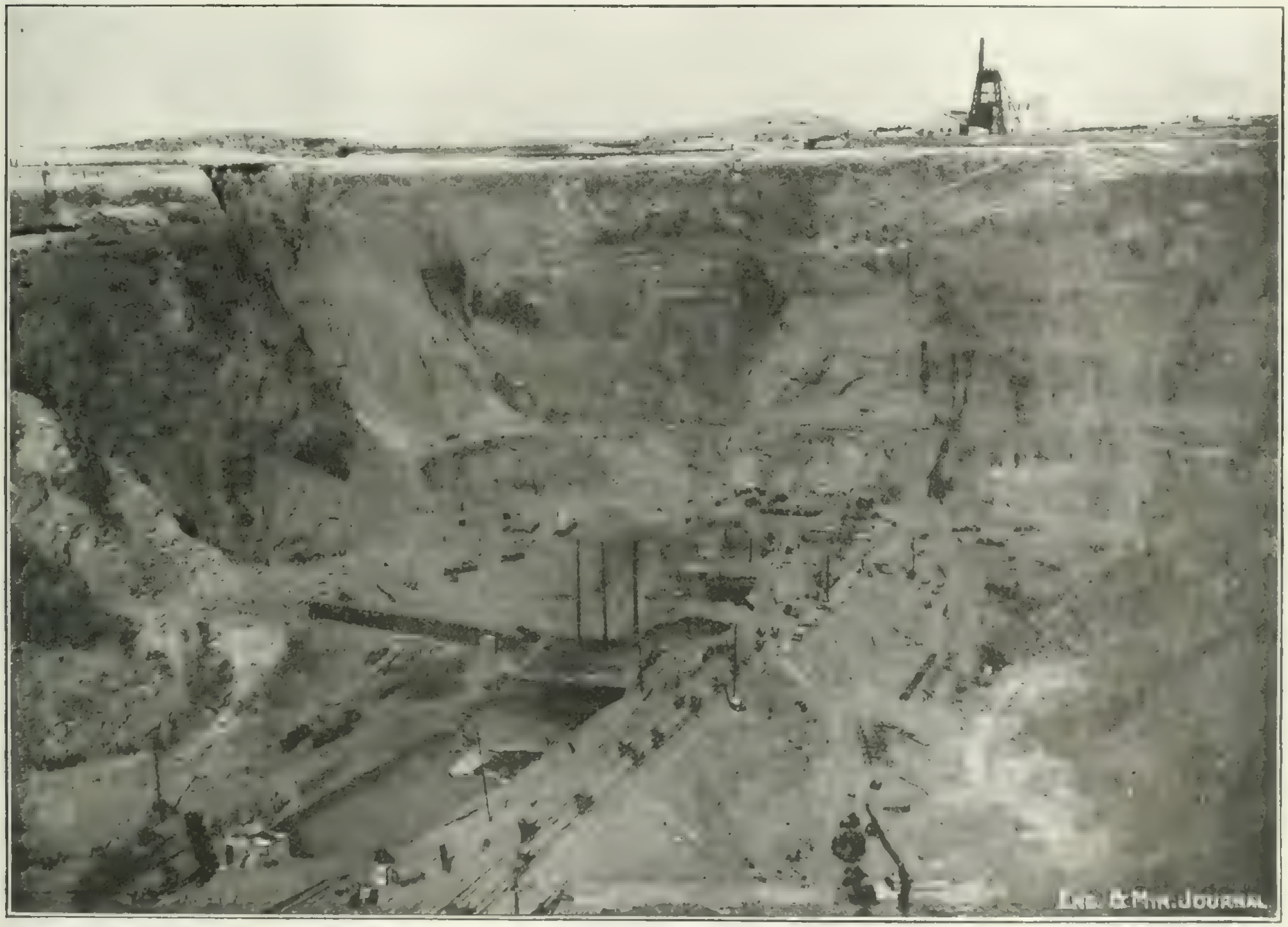
The annual report of the Minister of Mines of British Columbia shows that taking the province as a whole there were 546 tons of ore mined per year for each man employed about the mines. In this respect, however, the districts vary materially as follows: Slocan District, 113 tons; Nelson District, 130 tons; Trail District, 372 tons; and in the Boundary District 1201 tons were mined per man employed.

Mining Methods at Kimberley—I

By John T. Fuller*

The diamond-bearing rock is mined from craters or "pipes" of volcanic origin. Open-pit mining is used to depths of 300 to 500 ft. Vertical shafts are then sunk in rim rock and adits driven to intersect the craters. De Beers system of shrinkage stopes described.

A diamond mine if it survives long enough, passes through four distinctive stages of mining: (1) The open-pit stage, in which the mined material is hoisted by means of "endless-rope" inclines, by "aerial gears," or by both. (2) The open-pit stage in which the mined material is dumped down chutes to an underground main level, from which it is hoisted to the surface through a vertical shaft located outside the crater. (3) The open-pit stage and the underground stage combined. Mined material all handled from one main level and hoisted through vertical shaft. (4) The underground stage alone. It is only with this fourth and last stage of mining that this article is proposed to treat.



First Stage in Diamond Mine Development. Wesselton Open Pit with Endless-rope Haulage to Surface

The following local terms will be used during the course of this article, "pass," meaning an ore chute sunk from the working levels to the main level, "blue ground," meaning the diamond-bearing rock, or ore, "reef," meaning the waste rock, "boy," meaning a native miner of any age. A mine spoken of as an "old mine" is not intended to mean old as reckoned from date of discovery but old in length of time of active and continuous development. When the "oldest" of the Kimberley mines were forced to abandonment as open-pit mines, owing to the heavy caving of the unsupported rim rock surrounding the craters, a number of underground systems of mining were tried, with more or less, principally less success.

Three Stoping Systems in Operation.

The problem was successfully solved about 1888 by Gardner F. Williams, of Washington, D. C., who was general manager of the DeBeers Consolidated Mines from the date of its incorporation until June, 1905, when he resigned. Mr. Williams through his management of this company has probably done more than any other individual man in placing the diamond industry of the world on the firm basis on which it now stands.

The first successful underground system of mining as originally put into operation has been modified and changed from time to time to suit the changing conditions met with as greater depth was attained and to meet the requirements of the vastly greater areas of the newer mines as they were developed.

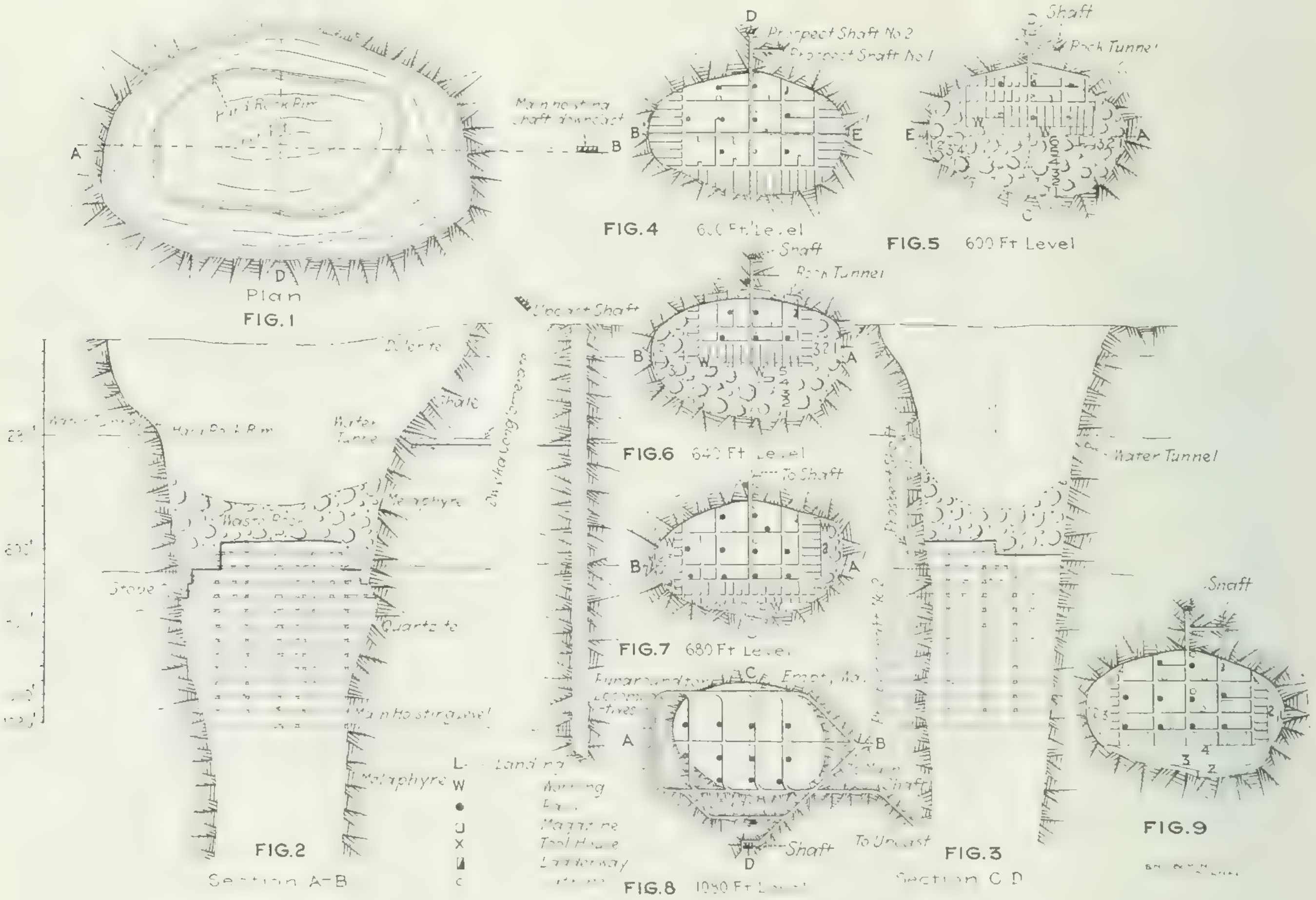
There are now three distinct underground stoping systems in use. For convenience these will be called the DeBeers, the Kimberley, and the Dutoitspan systems, from the mines in which they were developed. As the general development and layout of all of the mines are practically the same, no matter what the stoping system employed, a general description of this will first be given. It is to be noted that the drawings, plans,

*Consulting engineer, Honesdale, Penn., formerly manager of the Dutoitspan diamond mine.

and sections shown in this article are general plans and not taken from the plans of any one particular mine, and could with certain changes and modifications be applied to any one of the five mines of the group.

VERTICAL SHAFTS SUNK IN RIM ROCK.

In anticipation of the underground stage, vertical rock shafts are sunk in the hard rim rock surrounding the craters at a distance of from 1000 to 1500 ft. back from the edge. (See Figs. 1, 2, and 3.) This distance is necessary in order that the shafts may be permanently protected against caving into the open pit; surface cracks due to the caving of the crater sides have appeared at distances of 600 ft. and more from the original edge of the craters.



GENERAL DEVELOPMENT METHODS USED IN AFRICAN DIAMOND MINES

The latest practice is to make these shafts, five compartment, 27 ft. 2 in. by 8 ft. 6 in. outside timbers. They are provided with two skipways 4 ft. 10 in. by 7 ft. in the clear; two cage compartments, each 4 ft. 7 in. by 7 ft. in the clear, and one pipe and ladderway 4 ft. 10 in. by 7 ft. in the clear. The shafts are sunk about 100 ft. below the first predetermined main hoisting level, which in Figs. 2 and 3 is the 640-ft. level. A station containing a large sump, pumping station, and the necessary excavation for loading pockets, etc., is cut and the main-level tunnel driven to intersect the crater. This tunnel may be from 14 x7 ft or 8 ft. to 16x9 ft. in section.

Meantime from the open mine, near the elevation at which it is judged that open mining will have to be abandoned, a tunnel is driven back into the rim rock a distance of from 50 to 100 ft. From the end of this tunnel a smaller shaft, about 10x8 ft. in the clear and having three compartments, two hoistways, one pump and ladderway, is sunk also to the main level. As the sinking progresses in this shaft stations are cut every 40 ft., from which the working levels or sublevels will later be driven. This shaft is known as Prospect Shaft No. 1, and serves as a means of communication for the transporting of men and supplies from the main level to the various working levels during the time required for the development and extraction of the blue ground between the first main level and the bottom of the open mine.

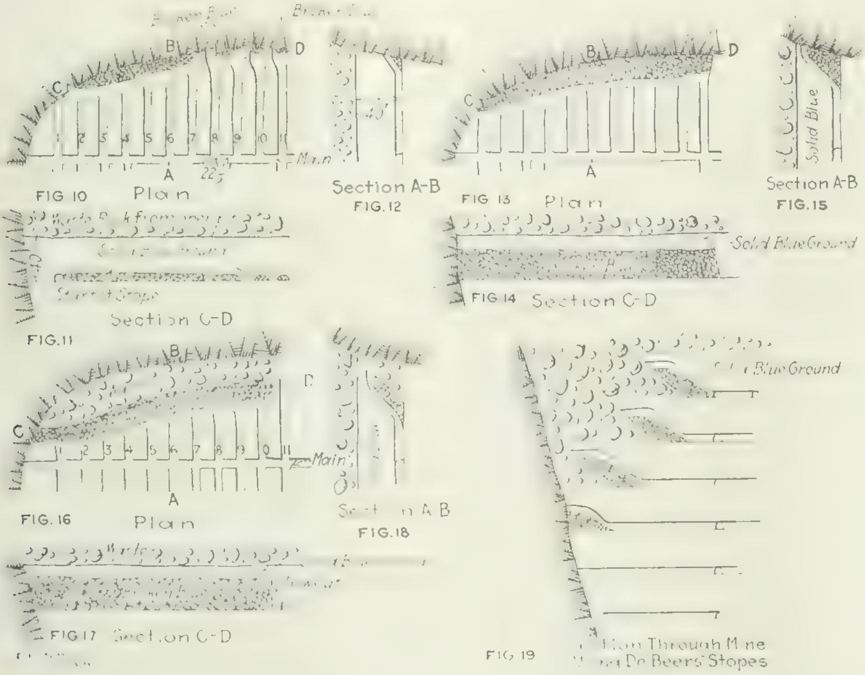
PLAN OF DEVELOPMENT DEPENDS ON HAULAGE SYSTEM

When in sinking the prospect shaft the elevation of the main level is reached, the development of this level is pushed as rapidly as possible and the main tunnel generally started towards the main hoisting shaft and driven until the two faces meet. The plan of development of the main level will depend greatly on whether endless-rope or electric haulage is to be used, also on the shape and area of the mine. In Fig. 8 is shown a main level developed for electric-locomotive haulage.

The sublevels have meanwhile been started from the stations cut in the prospect shaft. Vertical passes six to 10 ft. in diameter are sunk from various predetermined points and carried down from level to level in the crater material or blue ground itself until they reach the main level where they are equipped with "loading boxes." The passes serve as ore chutes, and as quickly as the main shaft and hoisting level can be equipped to handle it, the last of the ground available for mining by the open-pit method is dumped down the passes to the main level and hoisted to the surface through the shaft. Some time before all the blue ground lying above the first main level can be extracted, falls of reef will have covered over the exposed blue in the open pit and brought that mode of mining to an end. The remainder of the block will then be taken out by underground methods.

Anticipating in plenty of time the exhaustion of the blue above the first main level, the main shaft is sunk through another predetermined block which may vary between 280 or 520 ft. A new prospect shaft is sunk and a new set of sublevels, main level, etc., prepared, so that there will be no undue delay in the mining operations when the time comes to "shift the gear." This operation has been accomplished with a stoppage of hoisting operations of but two days, which is a remarkable record when the amount of work necessary is considered. A few of the things that must be done to effect such a change are the cutting through and removal of the heavy timbers forming the "pent house," connecting up the timbering and guides of the two shaft sections, the changing and adjusting of four ropes and a thorough test of the whole layout.

The mine illustrated in Figs. 1 to 9 is mining in the second vertical block below the open pit. The 1080 ft. is the main level and Prospect Shaft No. 2 connects the former main (640 ft.) with the new main and the sublevels. When a mine has reached the stage of exploitation illustrated, it will probably be necessary to sink a second large rock shaft to provide a second means of escape as required by law and to maintain the ventilation system. The second escape and ventilation has been taken care of up to this by the prospect shafts and the open pit; but this opening becomes increasingly hard to maintain and there is always danger of its being completely cut off. One other feature of these mines has also, during the course of the operations described, been attended to, the driving of a drainage tunnel completely around the mine. The necessity for this tunnel will be taken up further on.



The De Beers Stoping System

Sublevel Development Identical in all Mines

The general method of development followed on the sublevels is identical in all mines, no matter which stoping system is used. In Fig. 4 is shown how the 600-ft. level of the mine in question would be developed in preparation for stoping.

The tunnel plan of these levels is based on a checkerboard system, the unit square of which is 22½×22½ ft. All tunnels are driven on 22½-ft. centers or multiples of this number such as 45, 90, 180, etc. The tunnels are driven on a grade of from ½% to 1% from the prospect shaft so that all drainage is towards the shaft where it is conveyed in a large drainage pipe column to the main level and from thence to the sump at the main shaft.

The plan followed in developing all sublevels is the same, the method of procedure being as follows: The rock tunnel from the prospect shaft is continued straight across the crater until it meets the rock at the opposite sides. At regular distances of from 90 to 180 ft., or even greater, depending on the area of the mine, tunnels are turned right and left from the shaft tunnel and from these in turn other tunnels are turned right and left until the level is divided into a giant checkerboard with squares from 90x90 ft. up to say 270x270 ft. The tunnels are all driven on accurate centers established by exact surveying, as it is highly important that every tunnel be vertically over the corresponding tunnels on the levels below, thus throwing the pillars in vertical alignment.

As the points determined on for the various passes and ladderways are reached, these are sunk to the next level 40 ft. below. If it so happens that it is imperative to rush the development, the passes are used as shafts and the development of the sublevels pushed from a number of points of attack. The tunnels driven parallel with the long axis of the mine are designated as "mains" and are numbered consecutively on 22½-ft. centers whether driven or not.

Mine Laid Out on Coordinate System

The shaft tunnel is considered as the dividing line between north and south or east and west, as the case may be; thus in Fig. 4 coming from the shaft the tunnels turned to the right are "mains west," those to the left "mains east." The tunnels driven at right angles to the mains are numbered on 22½-ft. centers starting at either extremity of the mine and are designated as Tunnel No. ——, north, or south, or east, or west, as the case may be, of some main. In Fig. 4 the west side of the mine has been chosen as the base from which the tunnels are numbered, and the tunnel from the shaft is No. 12, and as an example of location the portion of this tunnel between the first main and the shaft would be spoken of as No. 12 north of No. 1 main. Permanent survey points are established as a rule at the 90-ft. junctions and their number indicates their location, thus the number (12) tells the surveyor instantly that he is at the junctions of No. 1 main with No. 2 tunnel and he, of course, knows what level he is on.

Each level is provided with two magazines, one for fuse and caps, the other for dynamite, a tool house and a latrine, all of which are chambers cut in the blue on the line of a future tunnel. The levels are also supplied with fresh drinking water, compressed air, electric light, and fire service through the prospect shaft. Every tool house contains a "first-aid kit" and if the mine is carefully managed, every white man on the level will have taken a course of training in first aid. The mines are lighted throughout with electric light, except in the stopes, where candles are used. A number of experiments have been tried with other forms of light in the stopes, but in the hands of the native the ordinary mine candle has proved the most satisfactory and economical.

No Timbering Required in Drifts

From the tunnels and mains nearest the rim rock tunnels are turned on 22½-ft. centers and driven to the rock (see Fig. 4) and the level may then be considered developed for stoping. The tunnels as driven for development are generally about 6 ft. wide by 7 ft. high, except where double track is required, when they are widened to about 10 ft. The roof is roughly arched and in good ventilation, the 6×7-ft. tunnels will stand indefinitely without timbering, except in a few isolated sections where treacherous ground may make it necessary to put in a few sets.

Tunnels in the blue wider than 6×7 ft. must, as a rule, be timbered throughout with sets consisting of a cap and two posts spaced from skin to skin up to 3- or 5-ft. centers. These timbers seldom exceed 18 in. in diameter on the working levels, the average being about 10 in., as only in special places such as junctions, etc., are the timbers required to support any great pressure, the principal duty of the timbering being to catch and support pieces of roof that may work loose and fall, and for this purpose the timbers are lagged on top and sometimes on the sides also with 2- or 3-in. lagging boards, the space between the roof and the top of the sets being filled with old timbers. Most of the round timbering in the mines is cut from the "blue gum" or eucalyptus tree, which grows in Cape Colony. The squared timbering used for shafts, etc., is generally California redwood, which costs delivered at Kimberley about 92c. per cu.ft. The blue ground obtained in driving the development tunnels is handled by the prospect shaft until the passes are through and the new main equipped for handling it.

SHRINKAGE STOPES USED.

The three systems of stoping used in these mines all come under the general head of overhead shrinkage stopes in which the backs may or may not be caved; in fact, the systems used employ so many features that a descriptive name can not be given without being cumbersome, as will be made clear as the description progresses. As shown in Figs. 5, 6, and 7, the stopes may be started on three sides of the mine simultaneously, retreating toward the prospect shaft; the order in which the various cuts have been made is indicated. Eventually the last line of stopes on any level must be made parallel to the side of the mine opposite the prospect shaft.

To obtain the blue from the last two or three cuts or stope lines, short rock tunnels are driven right and left from the shaft tunnel, as shown, 10 to 25 ft. back from the side of the crater. From these tunnels short offsets on 22½-ft. centers are driven to connect with the corresponding tunnels previously driven in the blue. The blue ground obtained in the last operations on the level after the passes in the blue itself have been covered over, is loaded out through these rock tunnels and dumped down a special rock pass which has been sunk to the main level. See Figs. 5, 6, and 8. As the various passes and ladderways are met by the retreating stope line, they are carefully covered over with heavy timbers and are then only used from the next succeeding level down. As far as possible the stopes are put up in straight lines across the crater so that the retreat may be as nearly uniform as can be made. Owing to the fact, however, that the blue immediately next the wall rock is apt to be treacherous, it is frequently necessary to make the first stope a narrow one not over 10 to 15 ft. wide and following the rock contour. The succeeding stopes are then so located as to bring the line of stopes back to a straight line.

DE BEERS STOPING SYSTEM

The essential characteristic of the De-Beers system is a long overhanging back inclined in the direction of the short axis or width of the stope (see Figs. 10 to 19). The degree of inclination is approximately the angle of repose of the broken ground, 30° to 45°. A stope is started by first measuring back from the rim rock exposed in the 22½-ft. centered tunnels the distance decided on for the width of the stope. (See Figs. 10, 11, 12.) The tunnels are then widened out and heightened until a long gallery is formed the proposed length of the stope, as CD Fig. 10. The surplus broken blue, amounting to 40% to 60% of the total broken, is loaded out, leaving a sufficient amount for the men to stand on to reach the roof.

The stope is then carried up, maintaining the incline and loading out the surplus until it reaches the point shown in Figs. 13, 14, and 15. At this point there remains but a few feet of solid blue between the workers and the overlying waste rock. In other words, the stope is 30 to 37 ft. high. The thickness of this final shell will depend on the nature and weight of the material known to lie above.

It is now necessary to decide, if no miscalculation has been made and the back has not crushed, whether or not "to bring in the stope." If it is known or reasonably inferred that fine reef lies immediately above it will be the best policy to leave the final shell intact, in which case all the broken blue remaining in the stope is loaded out and a new stope started in front of the first. The back or shell of the first stope will eventually crush and fall on top of the stope that will in time be "put up" from the level next below, and from which or subsequent levels it will be eventually partially or wholly recovered. If it is known that crushed blue either from the level above or from the abandoned workings of the open pit lies directly above, the stope will be brought in by placing and blasting, a final extra heavy round of holes. The blue is then loaded out and loading continued until nothing but waste rock, or blue so badly mixed with waste as to make its recovery unprofitable, shows in the loading places. The stope is then abandoned and a new stope started in front.

STOPE RETREATS TOWARDS PROSPECT SHAFT

The second stope, in the absence of a back pillar, the use of which will be explained later, presents a little different problem from the first stope, which is against the solid rock side of the crater. The second stope must be put up against the waste rock that has in the meantime completely filled the old stope. (See Figs. 16, 17, and 18.) The method of procedure, however, is practically the same, the pile of broken blue resting against the reef, which has assumed its angle of repose, and the stope is carried up in the same manner as the first.

In this way, step by step of varying widths, the level is mined out, retreating towards the prospect shaft. While the levels are sometimes stoped from three sides at once, the line of final retreat must be from the side opposite the prospect shaft. When "mud rushes" were an ever present danger in the De Beers mine, a level was stoped from but one side at a time in order to obviate the danger of the miners' retreat being cut off by a side rush.

The stopes shown in the drawings are approximately 250 ft. long; but no stope today either in the De Beers or Kimberley mines can be put up anywhere near this length; in fact, a stope 100 ft. long is becoming a rarity, and stopes but two or three offsets long (45 to 65 ft.) are frequently put up in the two mines mentioned. The reason for these short stopes is the restricted area of these mines, and chiefly, the tremendous pressure of the overlying reef. I have seen stopes crushed in before they had gone up 15 ft. As this is the ultimate object sought, it might at first glance be thought that this would be of great advantage, but all the material to be economically handled must be broken up so that the largest lumps can be easily lifted by two men. When a stope crushes prematurely, a tremendous amount of blockholing and "bulldozing" must be done to break up the large masses of blue, working from the cramped space of the offsets. In addition, if fine reef lies over the crushed stope, it soon filters down into the loading places and becomes badly mixed with the blue. It will take twice as long, if not longer, to recover the blue from such a stope, if indeed it is recovered at all, as from a stope that does not prematurely crush. It frequently becomes necessary in such cases either to timber in, as at Kimberly, or abandon the stope altogether, trusting the recovery of the blue to the level below.

THREE METHODS OF DRILLING USED

In drilling the stopes three methods are used, "hand hammer" single and double, "long jumper" and compressed-air drills, all three being frequently used at the same time in the same stope. Holes vary from two feet up to 10 and 15 ft., and in extreme cases even 20 ft. in depth. The average depth is between two and six feet. Dynamite 30% and 40% manufactured at the company's own plant is used for blasting in the blue. Blasting in stopes and tunnels is done at the end of each eight-hour shift, the succeeding shift loading out the blasted ground and drilling the next round. Bulldozing and blockhole blasting, however, go on at all times, and there are few periods except at change of shifts when the sound of blasting is not heard in the mine. One or two white miners on a level, depending on the extent of the workings, spend their whole time blasting lumps and supervising the loading boys.

All manual labor about the mines such as drilling, loading, tramming, etc., is performed by natives under the direct supervision of white miners. The blue is mined from a level either by contract or by the company. A contract may be let to three men at a specified price per load of 16 cu.ft. extracted, and a specified price per foot for driving tunnels; but the present tendency is to do all this work company account, which is probably the best plan in this class of mines where it is necessary from time to time to restrict the output.

In Fig. 19 is shown a cross section of a mine using the De Beers stopes. It will be noted that the stopes from the levels below come up under the abandoned stopes of the levels above. In no case are stopes ever put up under a working stope above, an interval of at least one and preferably two or three stope widths is maintained to insure the safety of those working above. The 40-ft. interval between levels has been found by experimenting with other intervals to be the most satisfactory and economic that could be adopted.

(*To be concluded.*)

DEPOSITING AND WEATHERING FLOORS FOR THE DE BEERS DIAMOND MINE

Big Creek Gold District, Idaho

BY ROBERT N. BELL*

Mining development by prospectors and small operators that has been quietly carried on for several years past, has reached a stage in the Big Creek district that definitely indicates the ultimate development of an important gold-producing district in central Idaho.

This district is situated 90 miles east of the nearest railway terminal at New Meadows on the Pacific & Idaho Northern R.R., with which it is connected by a well surveyed wagon road that was largely built at state expense. The completion of the Idaho Northern Railroad, now being constructed with a large force of men to Long Valley, will afford another route to the Big Creek district, which will be 77 miles from Thunder City, by which route the district can be made more accessible at a moderate cost of wagon-road construction.

The Big Creek district covers a section of rugged, mountainous country, consisting of high, sharp ridges, and cañons with elevations ranging from 6500 to 10,000 ft. above sea level. It is situated near the center of the great granite batholith of central Idaho in southern Idaho County, between the South and Middle forks of Salmon River.

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*State mine inspector, Boise, Idaho.

Cobalt Compounds as Driers for Paints

The use of cobalt compounds as driers for paints was discussed by V. P. Krauss before the International Congress of Applied Chemistry, a use which seems to open up a promising field for this metal. The present driers on the market are not all adapted to the purpose, as cobalt salts are only active as driers in the trivalent state, while the ordinary compounds of commerce are bivalent and sufficient care has not been given to oxidizing the metal in making up the drier. The best salts are the resinates, oleates, linoleates, oleoresinates and tungates. The cobalt is oxidized by aspirated air, or better, by solid or liquid oxidizers.

The Big Creek mining district is not exactly a new district, for during the unfortunate Thunder Mountain boom in central Idaho about 10 years ago, some of its properties acquired an unenviable reputation by reason of unwarranted wildcatting operations of that period, but not a single instance of intelligent mining development was then recorded, and as a matter of fact 90% of the money raised from the sale of stock based on Big Creek properties during that period was used for promotion purposes and never reached Idaho.

The orebodies of this district in the main are low grade, but of apparent large extent. The principal mineral zone strikes north and south across the upper tributaries of Big Creek and extends over to the South Fork drainage on Profile Creek, covering a distance of fully 15 miles of richly mineralized territory, the principal showings of which, while of a distinct fissured type by their general north and south strike and steep easterly dip with clearly defined wall casings, also fall under the classification of disseminated deposits by reason of their great size and the general dissemination of mineral contents through great widths of ore. The lode widths so far determined vary from 100 to 300 ft.

The principal group of claims, on which work has been done, are as follows: Blaine, Independence, Gold King, Laufer & Davis, Moscow, Ellison and Sunday. The development so far on these deposits consists essentially of crosscut tunnels which are all comparatively shallow and obtain underground face depth on the orebodies in no place exceeding 200 ft. and generally within 100 ft. of the surface. They are invariably, however, run at right angles to the strike of the ore zones and appear to determine one thing, that the ore deposits contain primary unaltered sulphides which on the northerly heavily timbered slopes of these high mountain spurs continue to the surface. On the south slope exposures of these great zones, the surface oxidation and free panning rock is more generally found, but in these cases rarely extend down 50 feet.

The district seems to carry a parallel series of three great lodes, the east lode showing the most free gold, the middle one massive quartz and pyrite, and the westerly one more barren quartz. While the ore is of low grade, the apparent feasibility of local treatment, indicated by several important tests by amalgamation and cyanide methods, together with the evident large extent of these deposits, warrants the anticipation that with sufficient capital for large milling plants, some extensive and fairly profitable gold mining enterprises may be ultimately instituted in this district.

It is true, the district is remote and difficult of access at present, but as an offset for this isolated position the natural conditions for economical adit and crosscut-tunnel development and drainage to great depth, the unlimited timber resources and water-power resources, with which the region is blessed, would form an asset looking toward cheap mining and milling costs.

Knob Hill Report to Stockholders

By B. H. Bennetts*

The accompanying tabulation shows a report issued by the Knob Hill Co. for the benefit of its stockholders. These reports are issued monthly, and are closely studied by the recipients, and in my opinion represent just about what a stockholder needs. This is a practice which might be emulated with profit to the investor by some of the larger companies when making their annual, or semi-annual reports. Explanation of the sheet seems unnecessary. The accounts "real estate," "capital stock," and "reserve" are affected only by entries made at the treasurer's office and are, therefore, not shown on the reproduction, which is the mine sheet. The Knob Hill mine has paid $45,000 in dividends, the last being in May of this year.

THE KNOB HILL CO., REPUBLIC, WASH., SEPT 15, 1912; BALANCE SHEET, MONTH ENDING AUGUST 21, 1912

Accounts	Trial Balance		Inventory	Debits	Credits	Inventory	Net Expense	Earnings
			Aug. 1st			Sept. 1st.		
Blacksmith and Machine Shop	88 90		88 90			83 90	5 00	
Powder	232 50			232 50			232 50	
Fuse	38 00		5 50	32.50			38 00	
Caps	17 75		6 25	11 50		5.75	12 00	
Candles	60 50		16 50	44 00		16 50	44 00	
Drill Steel	363 55		340 45	23 10		352 65	10 90	
Stulls and Timber	83 12			83 12			83 12	
Material and Supplies	1859 13		1835 78	23 35		1798.53	60 60	
Assaying	90 00			90 00			90 00	
Telephone and Telegraph	11 35			11 35			11 35	
Freight and Express	0 60			0 60			0 60	
Postage	4 50			4.50			4 50	
Cartage and Stable	15 99			15.99			15 99	
Traveling Expense	30 00			30 00			30 00	
Stationery and Printing	4 15			4.15			4 15	
Fuel and Light	2 00			2 00			2 00	
Rent	20 00			20 00			20 00	
Power	884 80	108 01	235 30	649 50	108 01	494 82	281 97	
Maintenance, Way and Buildings								
Salaries and Wages	1754 50			1754.50			1754 50	
Smeltery Returns this Month								2761.81
Repairs to Machinery	8 50			8.50			8 50	
Freight on Ore	50 00			50 00			50 00	
Interest on account	2 00			2 00			2 00	
Combined Totals.	5621.84	108.01	2528 68	3093 15	108 01	2752.15	2761.68	2761 81

			Assets and Liabilities	
Closing Inventory			2752.15	
Machinery	3794 92		3794.92	
Drills, "Power,"	1034 68		1034.68	
Ore Bins and Buildings	531 04		531.04	
Office Furniture and Fixtures	423 85		423.85	
Cash	496 76		496 76	
Sundry Debtors	108 01		108.01	
Sundry Creditors				
Mining	89,938 09		92,699.77	
Ore Return		191,973.50		191,973 50
Royalty	47,993 30		47,993.30	
Treasurer	143,980 20	91,317.25	143,980.20	91,317 25
Refund Freight Overcharges.		10,523.93		10,523 93
	293,922.69	293,922.69	293,814.68	293,814.68

Distribution of Pay Roll

	Ore	Developme't	Total
Office			325 00
Superintendent.			175.00
Mining, Hand			
Machine	301.00		301.00
Mucking	365.50		365 50
Timbering	308 00		308.00
Sorting			
Blacksmith			120.00
Engineers, "2".			160 00
Outside			
Surveying			
	974 50		1,754 50

This report only covers the mine office and does not include Treasurer's office of the Company.

Number cars ore shipped during this period, Smeltery 4; Mill 9.

Number cars ore out for which smelters have not remitted, Smeltery 2; Mill 14.

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*Tacoma Wash

The Ontario Iron Mine, New York

By Charles F. Taylor* and William M. Booth†

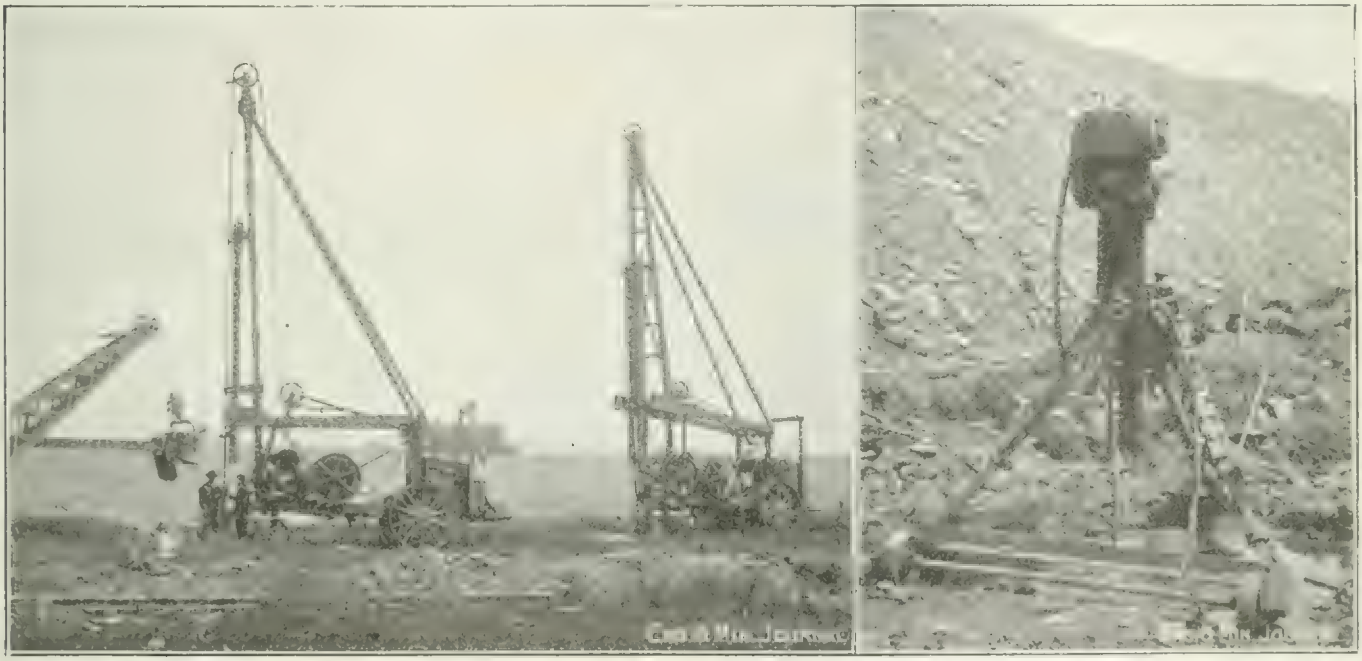
The Ontario Iron Ore Co. owns 108 acres in Wayne County, New York. The ore is soft red hematite, occurring in beds 22 in. thick under 20 ft. of overburden. Keystone drills drive the holes for blasting the overburden, while electric hammer-rotary drills are used in ore. Steam and electric shovels are used in moving and loading loosened material. The ore, averaging 44% iron, is crushed at the rate of 300 tons daily and shipped to furnaces in Pennsylvania.

The property of the Ontario Iron Ore Co. lies about four miles south of Lake Ontario and one mile north of Ontario Center, New York. It includes 108 acres of land, sloping slightly to the north.

Mine Worked as Open Cut

The red-hematite belt from Utica and Frankfort passes through this place from east to west at a depth of about 20 ft. The overburden is loam, clay and gravel with a thin layer of shale immediately above the ore. The ore is about 22 in. in thickness. The face of the bed has been broken by the action of water or ice, leaving eroded masses of ore scattered over an area of several rods, north and south. Some of these weigh from 40 to 100 lb. and contain from 30 to 45% of iron.

The bed ore is soft, dark red in color and weighs about 220 lb. per cu.ft. Analyses of samples taken at three different points are given in the accompanying table. Moisture and iron were determined at 70 stations. The highest percentage of metal found was 50.19 and the lowest 35.80. The average of all tests was 44% iron.



Keystone and Electric Hammer-Rotary Drills Used in Open-cut Operations of Ontario Iron Ore Co.

ANALYSES OF ORE OF ONTARIO IRON CO.

	1	2	3
	%	%	%
Moisture	0.18	3.15	0.35
Volatile	3.79	6.35	6.41
Silica	11.68	16.50	17.07
Sulphur	trace	trace	0.03
Phosphorus	0.51	1.10	0.47
Manganese	trace	trace	trace
Aluminum oxide	3.20	0.00	0.00
Calcium oxide	3.58	9.25	5.60
Magnesium oxide	0.00	3.16	2.53
Iron oxide	77.66	59.00	69.98
Metallic iron	51.56	41.30	48.28
Metallic iron, dry ore	51.65	42.64	48.45

Ground was broken in June, 1907, when a switch was run into the property from the New York Central railway, which forms the southern boundary. Shortly afterward a steam shovel was set up and a cut of about 1600 ft. was made on the northern edge of the orebody. A standard-gage track was laid the entire length of the cut and ore was loaded directly into cars by a gang of Italians.

A few trial shipments proved the usefulness of the product and the equipment necessary to handle a large tonnage was installed.

The plant consists of electric drills, a Marion shovel, an electric shovel, a small steam loader, locomotive, stationary boilers, crusher and repair shop.

The earth is drilled and shot about 25 ft. ahead of the cut and parallel to it. The drilling for the use of explosives in blasting the overburden is done by Keystone drills. Power is furnished by direct current generated by a small generating plant at the entrance to the quarry. The drills have heavy stems and are making from 60 to 100 linear ft. per day, of which about one-third is through shale and limestone overlying the ore. The 6-in. holes drilled by these machines are spaced from 15 to 20 ft. apart and about 50 lb. of 40% dynamite are used in each hole to break up the rock and loosen the material overlying this. These machines are giving good results, at a small cost per cubic yard moved.

The loose earth and rock are removed by a Marion revolving steam shovel, model 250. The boom is 65 ft. long and a vertical lift of 45 ft. is possible. The dipper is of 3½ cu.yd. capacity. This machine will excavate and dump the material a distance of from 70 to 75 ft. from the center of the rotating journal. Two swings per minute are made through an arc of 180° and 2000 cu.yd. can be moved per day of 10 hours.

A Hammer-Rotary Drill Used

The drill used for driving the holes in the orebody was specially designed for this work by the Dulles-Baldwin Electric Drill Co., of New York, being a combination of the well-known hammer and rotary principles. A twist drill of the ordinary type is used, this is held in a chuck on which a blow is struck by an air-cushioned hammer which receives its impetus from an electric motor mounted on the drill. Rotary drills of the ordinary type were tried but proved unequal to the task of penetrating layers of limestone with which the ore is in spots interwoven; it was necessary to introduce the hammer principle to successfully drill this rock.

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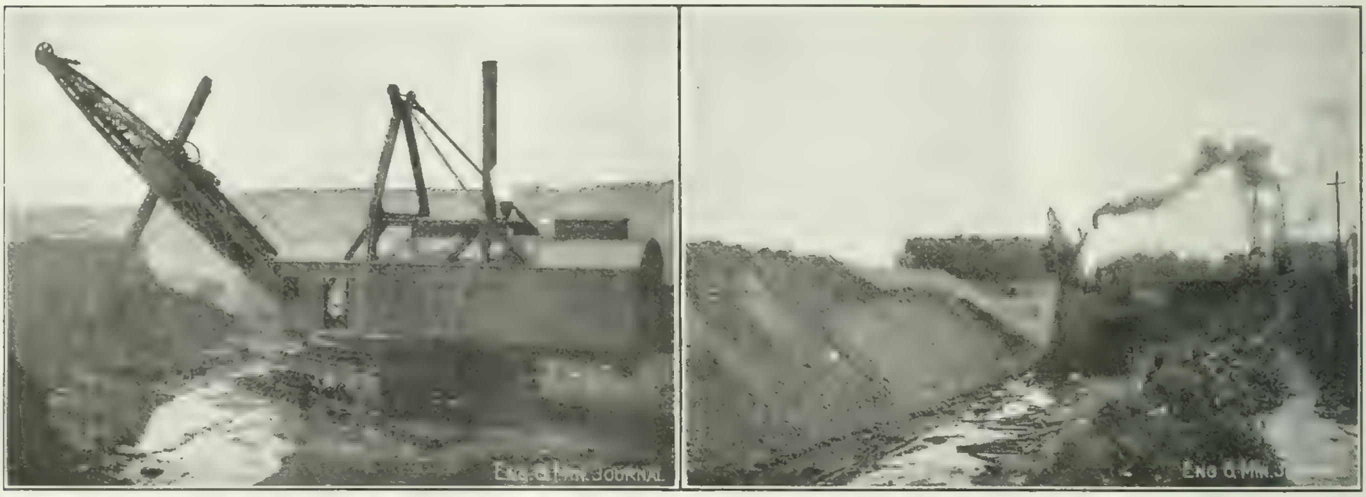
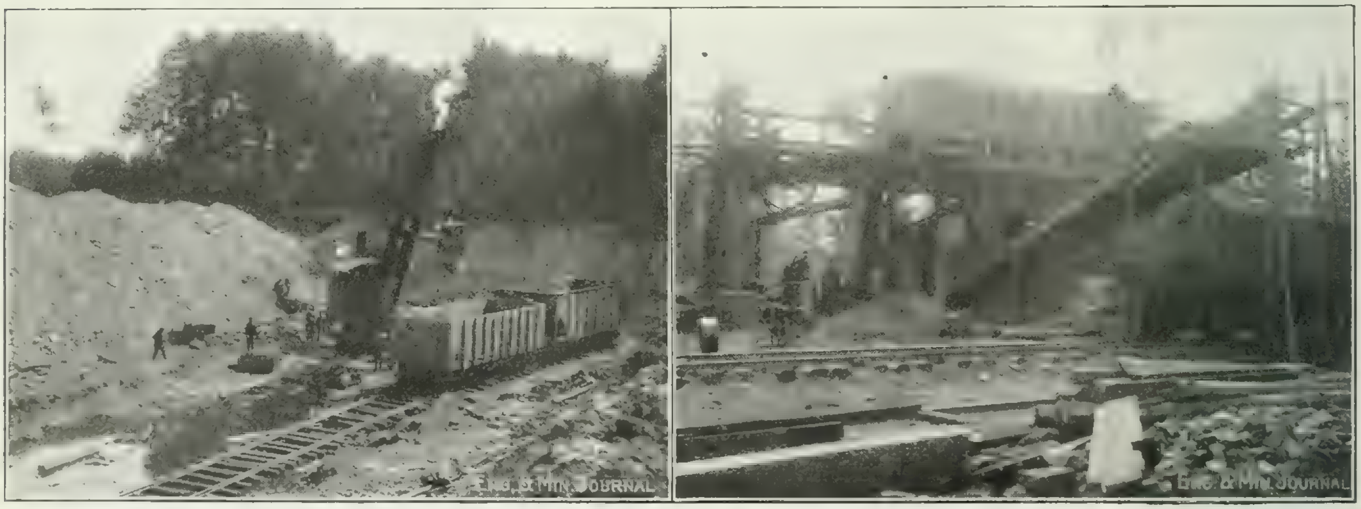
†Chemical engineer, Syracuse, N. Y.

The rotation of the drill steel is continuous, which not only causes the drill to bore into the ore, but also by means of the helix in the steel, to clean the hole of muck. The actual current consumption is about ¾ hp. The feed consists of the ordinary screw and crank running in a guide shell which in turn is mounted on a tripod. The legs of this tripod are set in the corners of a three-wheeled truck, as shown in the accompanying illustration. When the operator has finished his hole, he cranks back the drill and pulls the truck over the level body of exposed ore to the point where he wishes to drill the next hole. Each drill will average about 200 two-foot holes in a working day of 10 hr., the cost per linear foot drilled being less than 1½c., including power, labor, interest and depreciation.

After the ore is broken by dynamite, it is loaded into standard-gage cars by the small shovel. At this point, it is interesting to note the difference in the content of iron in the bed and loaded ore. This difference averages 4%, being greater in the bed.



Moving Overburden in the 1400-ft. Cut at Ontario Iron Mine



Loading and Crushing Operations at Ontario Iron Mine, Ontario Center, N. Y.

Crusher Can Be Run Backward

The ore is hauled to the trestle above the crushing plant. It is unloaded by gravity into the crusher especially designed and planned for this work by Butterworth & Lowe, of Grand Rapids, Mich. The opening for receiving ore is 24x36 in. and the crusher will easily handle 70 tons of ore per hour, if kept in continuous service. Power is furnished by a 30-hp. Westinghouse motor with a controller so that the crusher can be run in two directions as the operator may desire. This has proved a great advantage, as it enables the crusher to be operated when the jaws are plugged so tight with ore as to stop the machine. By reversing the controller and running the machine backward, the plugging can be removed without any trouble or extra labor.

The principal disadvantage in connection with this process is the passing of fine ore from the car into the crusher, as the fine ore carries moisture enough to prevent it from sliding easily down a slope of about 45°. This type of crusher has been in use on this work for about four years and has made a great reduction in the cost of handling by avoiding the use of sledges in a quarry and the breaking down of the ore to the proper size.

Treated Pit Water Used

The water supply of the plant was taken from a small stream which was inadequate in amount and poor in quality. The boilers scaled so rapidly that they required almost constant attention. A new supply was piped from the adjoining property but was also of exceedingly inferior quality for steam purposes. To overcome this difficulty, electric power was installed throughout. This proved expensive and a change seemed necessary. Examination of the creek and pit waters showed little chemical difference, except the presence of enough finely divided ore to color the latter a dark blood red. As several thousand gallons of pit water have to be pumped daily, it was decided to soften this by the lime-soda process. This has been done since last spring.

The plant consists of two 5000-gal. wooden tanks equipped with stirrers and connections. No filters were installed nor are they needed, as the heavy suspended ore particles unite with the precipitated lime and clear the water in about 1½ hr. The boilers are kept clean and free from scale. The locomotive boiler foams under heavy load if not emptied once in two days. The cost of chemicals per thousand gallons is about three cents and the present tanks can just about handle the boilers of the property.

An analysis of the raw water gave the following results, expressed in parts per million: Total solids, 708; chlorine, 45; calcium oxide, 120; magnesium oxide, 50; sulphur trioxide, 193; alkalinity, 230; hardness, 314. The purified water has been softened so that it contains: Calcium oxide, 19; magnesium oxide, 17. A record of the degree of water purification was kept for about two months. Samples were taken from the pit, from the interior of each boiler and from the softening tanks and shipped to the laboratory in quart tin cans. The average of these tests shows the hardness to be best maintained at from 55 to 85 parts per million.

The daily output of ore is about 300 tons, and it is possible to exceed this figure with the present equipment. The ore is shipped to iron furnaces in Pennsylvania. John E. Burke, who was formerly on the Chicago drainage canal, is in charge of the operation.

New Railroad Construction

Some new railroad construction, which is of interest to mining men, is as follows: On the Florence & Cripple Creek R. R., the engineering department is now making surveys for the rebuilding of the narrow-gage line recently damaged by floods. The line may be built to standard gage.

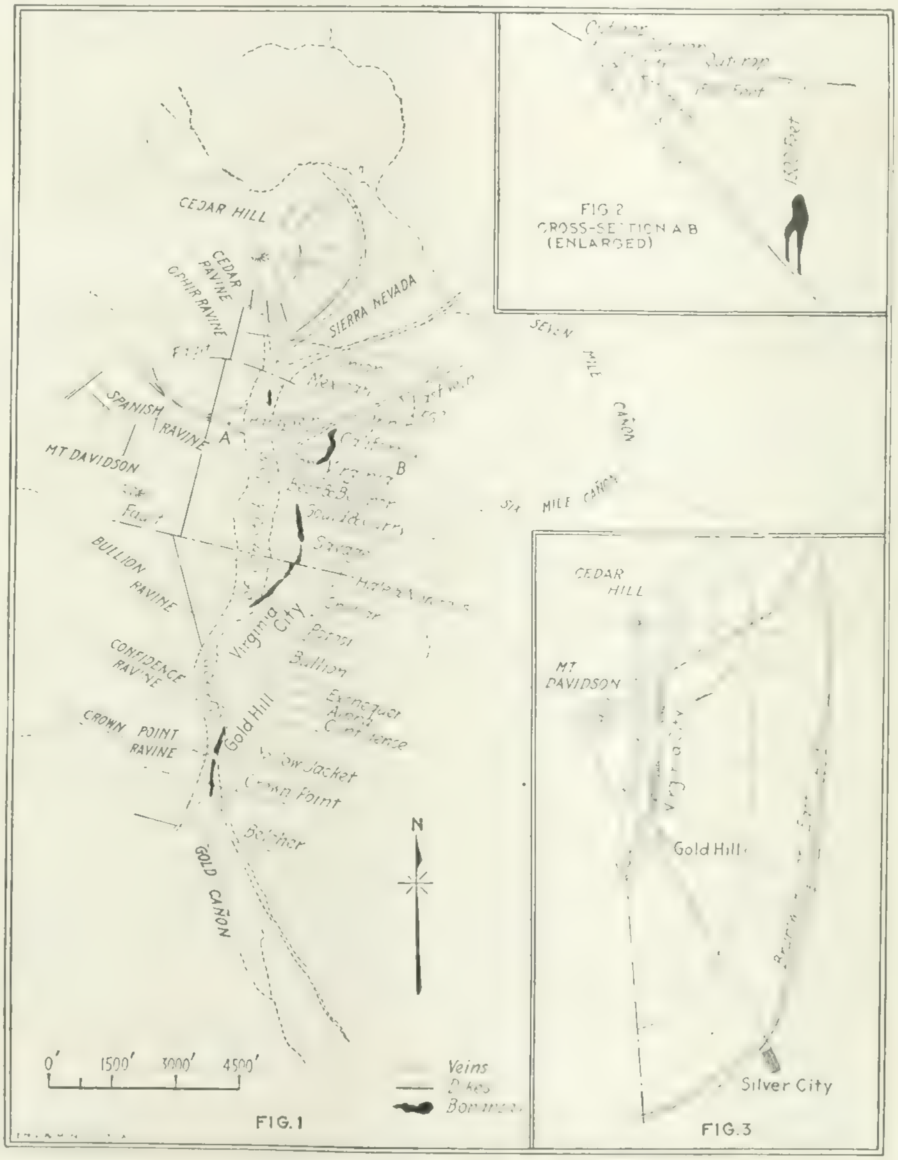
In Nevada, the Southern Pacific intends to tap the southern mining field from Palisade through Goldfield and Tonopah to Keeler and eventually to continue the road to Los Angeles. Preliminary surveys are about to be made. It is said that the line will run from Palisade, Lander County, Nev., on the main line of the Southern Pacific, to Austin, thence down Smokey Valley to Goldfield junction, thence to Tonopah, Goldfield, Cuprite, Ubehebe and finally to Keeler, Inyo County, Calif. It is reported that the Nevada-California-Oregon R.R. will soon begin the construction of a broad-gage line from Reno to Doyle, Calif., connecting at that point with the Western Pacific Railroad.

Vein Systems of the Comstock

By Dwight T. Smith*

The outcrop of the Comstock lode is along the junction of the steepest slope of the range and the first slope at the base. The range, however, is cut into spurs by ravines that lead down from the ridge. The position of the lode is across the mouths of the ravines and along the ends of the spurs at their foot. It is contrasted in color in many places from the rest of the immediate rocks on either side by a reddish tint and occasionally also by a prominent exposure of quartz.

The upper or western portion of Virginia City is built along the outcrop. Other appearances on the west or upper side are significant. When looking from the town toward the hillsides and into the ravines, fin-like prominences of dike and quartz croppings are seen, while some are not in evidence except by close inspection. Two of the spurs have rather noteworthy, prominent extremities; one being Mt. Davidson and the other Cedar Hill. These have proved to be of more importance than any of the others in connection with the vein systems.



Sketch Map and Sections of the Comstock

Fig. 1 is a map showing to scale the outcrop of the lode, its branches, position of the "bonanzas" and adjacent veins and dikes. Fig. 2 is intended to show by means of cross-section the reason for the "bonanzas" that appear in position east of the outcrop on the map. This is a consequence of the dip which is shown. It is taken from Monograph

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*Box 531, Virginia City, Nev.

III, U. S. Geological Survey. Fig. 3 encompasses the district, and the Occidental or Brunswick lode is consequently included. This figure also shows, in an ideal manner, the structural lines belonging to the vein systems.

The arrangement of the veins and dikes seems to betray two rather central systems, both sending out rays and developing concentric curves about each center.

When the material was segregated for this brief outline from the map and notes that I have made of the district, some of the faults were overlooked and others were purposely omitted, since it was thought they would unnecessarily complicate the drawings. It was intended, however, that the foot-wall faults in Spanish Ravine and the one in Confidence Ravine be shown. The others are mainly both those in the country east of the lode and the faulting west of the mountain.

Tongues of Diorite in Overlying Andesite

Early in 1908, I discovered that the diorite of Mt. Davidson projected into the overlying andesite in the forms of tongues or apophyses; that it had assimilated the andesite around its border; and that large masses of the andesite were suspended in it. What these phenomena had to do with the vein systems was not discovered until after the veins and dikes had been mapped. There are many like instances of intrusion, but without record of a similar dike and vein system.

The whole point made in this account is that Mt. Davidson and Cedar Hill were centers of great moment. The effect from the Davidson center being many times the larger, is far reaching toward the northeast, east and southeast. The Cedar system on the other hand is more circular, being effective toward nearly all points of the compass from its center. The Cedar system is later in point of geological age, since it has sent its rays into the mass of Mt. Davidson and possesses a few concentric arcs ascribable to itself.

It is important to note that the periods of vein filling of each system are not readily separable. They appear, at least in part, to be contemporaneous. It should be said that since the Davidson formation preceded the Cedar, the latter undoubtedly utilized many of the structural lines that were favorable. In such manner the Cedar appears to have had greater effect in certain directions in the Davidson than in any other direction outside of it.

The reasons that are entertained for the formation of the space occupied by the lode and its appendages are not intended to be a part of this account, but since a cause appears in the rendering it is desired that it be not accepted as having any other effect than structural, as is shown in the arrangement of the dikes and veins. The main cause for the opening of the space came later and is reserved for subsequent discussion.

Hardy Vein Discovered in 1877

The mining of ore from the "bonanzas" occupied the attention of the miner while they were profitable, but their wane was a strong incentive to search for others. The Hardy vein was discovered in 1877. It is an east branch from the lode, but was found to merge into another vein which has also been proved to be a branch of the main lode. This branch was discovered in 1880 and has been a good source of production for the last 10 or 12 years. It is now referred to as the East vein.

This vein, at the point where it leaves the main lode, has the same dip of about 45° to the east, but, upon diverging it gradually steepens its dip to about 50°. The course of this vein is nearly northeast (magnetic); that of the Hardy about 10° north of east and of nearly vertical dip. Then opposite to the Hardy is a singular branch to the west. This vein is well exposed throughout its northwestern extremity; and at one point near the surface several thousands of dollars were extracted.

Fig. 3 is intended to show in extent the structural effect of the earlier system upon the district as well as that of the later system. The Brunswick or East lode is included, and at the south end of the main lode in Silver City, there is a conformation illustrated in the veining. But here again is imposed from another center a system similar to that of the Cedar, the effect of which has not been fully followed.

The methods of investigation have been the reverse of those usually employed, in that the geology, somewhat remote from the mines, was done first. The discovery of the systems was the result of induction rather than due to inspection *a priori*. I am alone responsible for the results of this investigation, and any errors are mine. I wish to express my gratitude to Whitman Symmes for the opportunity of visiting the Mexican mine; and to Thomas McCormack for visits to the Ophir and Consolidated Virginia; also to C. E. Julihn for a similar privilege in regard to the Union mine.

Swedish Iron Trade, 1911

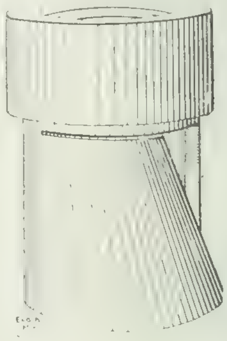
There were 6,153,778 metric tons of iron ore produced in Sweden in 1911. Of this, 5,508,871 were considered first class. No less than 4,094,581 tons carried 60 to 70% Fe, 1,270,566 tons carried 50 to 60% Fe. There were 4,460,619 tons carried 0.100 or over of phosphorus, and 3,517,147 tons carried 0.030 to 0.050 of sulphur, 1,212,559 tons carried under 0.020 of sulphur, and 99,005 tons carried from 0.020 to 0.030 of sulphur.

The Swedish iron works consumed 40,541,332 hectoliters of wood charcoal; 3,698,305 hectoliters of coal, 2,317,667 hectoliters of coke, and 42,197 metric tons of foreign scrap iron.

The production was divided as follows, the items being arranged in descending order of value: Pig iron, 634,392 metric tons; openhearth ingots, 372,705; steel bars, 85,181; iron bars, 146,772; rods and hoops, 63,978; bessemer ingots, 93,853; wire rods 52,185; castings for drawing weldless tubes from, 44,300; cast iron, 39,667; sheets, 22,848; crucible and electric-furnace steel, 4309; total, 1,660,140 metric tons. There were also 3828 metric tons of ferrosilicon and 451 metric tons of silicospiegel produced. The average Swedish blast furnace produces 19.73 metric tons of pig per day.

Lifting Drill Cores

L. C. Harden and Frank Wildeson, of Kimberly, Calif., have patented (U. S. pat. 1,008,904) a core-lifting device shown in the accompanying illustration. The part shown fits within a sleeve between the barrel and the drill, and is made by making an L-shaped slit in a cylinder of metal, and springing part of the split portion in, so that it will grip the drill core as it comes up through it into the barrel. The lifter itself does not revolve, but grips the core and remains stationary as the core slides up through it. When the drill is pulled, the core is broken off and comes up with it.



Core Lifter

Iron-Coke

A product, "iron-coke," suitable for electrodes, for decolorizing solutions, and for filters, was described by Dr. A. P. Lidoff, of Charkov, Russia, at the International Congress of Applied Chemistry. He passes iron-furnace flue dust repeatedly through magnetic separators, and mixes the magnetic product with gas-coal slack, and cokes under pressure at a high temperature.

Preparing Metallic Vanadium

According to *Journal du Four Electrique*, Oct. 15, 1912, vanadium analyzing over 99% V, has been prepared by reducing V_2O_5 with aluminum, or with vanadium carbide, VC. This is a difficult metal to obtain because of the tendency to form nitride, hydrides and carbides.

Taxation Value of Mineral Rights

By Alfred C. Lane*

The policy of the large land companies of Michigan is to reserve the mineral rights of all land sold. The taxation value of these reserved rights may be determined by the proper consideration of interest and all other charges to which they are subject. The taxation value is but a small fraction of the selling price.

It is the known custom of many of the large land companies of Michigan to sell the timber separate from the soil and in selling the land so thoroughly to reserve the mineral rights and possibilities, other than agricultural, that one might fairly say they sold only the soil. Over this policy there is much grumbling. A homesteader once said of a land agent: "He! Oh, he is the fellow who reserves even the arbutus."

This policy of reservation may go too far. It may happen that the cloud on the title from such restrictive clauses, and the consequent difficulty of borrowing money on the land, is more of a drawback than the very remote value of the rights reserved. Such clauses unquestionably restrict the investment of outside money. Yet there are good grounds so far as they go—I would not say they are sufficient in all cases—for this policy.

Large Tracts Desirable

In the first place it is more economical of all natural resources that they should be mined in units of appropriate size. These are larger than house lots and usually than agricultural units. If the legal unit, such as the western mining claim or the old diamond rights of South Africa, is too small there will be, at first, enormous waste and later consolidation.

In the second place, exploration that is extensive and has only a small chance of success (and such unfortunately are the usual conditions of exploration) will not be undertaken, if, in case of such success, most of the benefit goes to others. The well known result is that where the mining rights go with the land, before mining or drilling for exploration is undertaken, mining rights have to be gathered again into suitable units at the expense of time and money, as well as of royalties afterward. Thus, where there is a reasonable prospect of such rights being worth anything, it is well to reserve them.

Mineral Rights Should Be Taxed

On the other hand, they should not be reserved as a mere matter of form, for in many ways such restrictive clauses prove an annoyance, as I once found when I wanted to borrow money on some village property so restricted. A tax upon them will soon stop this. But how, if we wish independently to assess and tax such mineral rights, shall we value them? The different value put upon them by the owners when it is a question of taxation and when it is a question of organization of a mining company is so great that it reminds one of the story told of a certain Hebrew clothier who told the assessor, who asked him how much stock he had on his counters, that it was worth $10,000, that he paid that much for it and it was worth every cent of it, for prices had gone up since, and he hoped to sell it for $20,000.

When he received his statement he hurried around to the assessor with woe and indignation on his countenance to get his tax abated.

"Why," said the assessor, "I asked you if it was really worth as much as that."

"My God, my God, I am ruined," he cried. "I thought you was the man from Dun's."

And yet, in all fairness, there is really a very great difference between the price at which one will sell mineral rights for a few acres, and the price at which they should be assessed, just as it would be grossly unfair to assess the clothier on the basis of the retail price of each suit. This difference is well brought out in the experience of a friend who was selling a considerable village addition at $100 a lot. The assessor proposed to assess him $100 a lot on the ground that that was the price he was selling for. "Yes," said he, "but I have not got my price yet, though I am asking it, and if you will take the whole of them off my hands, I shall be glad to sell for $50 apiece."

Compound Interest and Other Charges Must be Considered

Property is not worth to a man the price at which he would sell it, or he would not sell it, and the longer he has to hold it until he gets his price, the less it is worth to him now. There is also the further probability that some of the lots will not only be held for a long time, but at the end will be sold for less than the asking price, just as the merchant must figure that a certain percentage of the goods he buys will go into the January mark-down sale.

So let us start with our lots. If my friend could sell one lot a year at $100 and if we discount the price by the interest on his money and the cost of carrying, including taxes, we shall have its worth to him now. The lots sold a year from now would be worth to him, if his money invested otherwise in some business could earn 7% and the taxes and costs of carrying, looking after the land and selling were $4, not quite $90 now. For if he had the $90 now, in a year, with the interest, it would be worth $96.30, and in the meantime he would not have had to pay $4 for taxes and other charges. In other words, he must apply well known principles of insurance, discount and amortization and take the asking price of mineral rights and find out how much of the land per annum can be sold at such asking price, then discount the future payments in proportion and find out by Figs. 1 and 2, the present worth of the whole. Dividing by the number of acres would then give the average value per acre. This seems to me as fair a basis upon which to assess mineral rights as can be devised.

Demand for Mineral Rights May Be Estimated

Of how much land the mineral rights will be annually sold we may find in two ways. We may judge by past experience or we may estimate what will be the output and, from that, determine what amount of land must be developed to keep up the output. The total value may be estimated from an estimated profit per ton, and the estimated annual income; spreading this total value over the total acreage, including producing mines, and subtracting the value of the producing mines and their acreage, we may find the value of the mineral rights of the remainder.

The first of these ways we may illustrate with the aid of facts taken from reports of the St. Mary's Mineral Land Company. In the eleven years since the present organization (1901-11 inclusive), it has sold 4274.66 acres and received in cash and stock $2,673,500.[1] This is an average sale of 389 acres a year at about $690 an acre. A cash price of $500 per acre is not unusual.

If the total receipts are the same in the next eleven years, the company will receive an equal sum, but it will not be worth that to it now. We must discount it. If the taxes and carrying charges were but nominal, we should discount it simply at the rate which money should earn in the land business, say 6 or 7%. But if we are trying to find a value on which it is actually to be taxed, we must add the tax rate and carrying charges to the interest rate as above shown, which will make a gross rate, by which future returns must be discounted, of near 10% compound interest. For taxes must be paid each year on all that is left.

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*Professor of geology and mineralogy, Tufts College, Mass., formerly state geologist of Michigan.

[1] The stock value was figured at the market price.

The present worth will then be, by Fig. 1, but $1,580,000 or 59.04%[2], little over half the selling price. At the end of the eleven years, if we assume that the depreciation in value of the lands remaining, due to picking out the most promising lands is made up by the general increase in land values, there will be another batch of 4274 acres which will then be worth $1,580,000, as the first batch of lands is now, but at present will be worth only 55.05% of that (cf Fig. 2) or say $554,000.

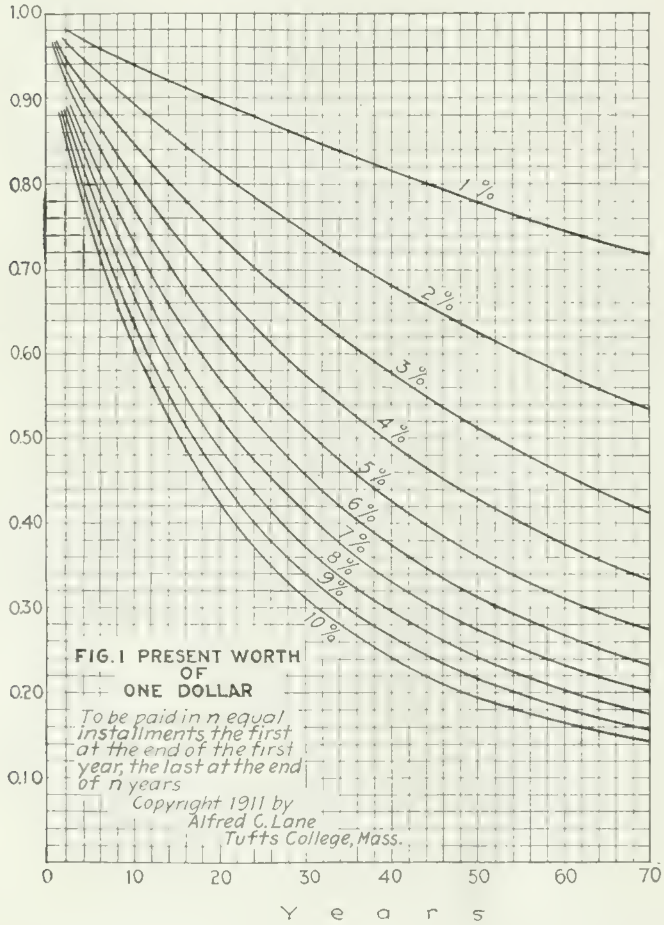

FIG. 1 PRESENT WORTH OF ONE DOLLAR

To be paid in n equal installments, the first at the end of the first year, the last at the end of n years

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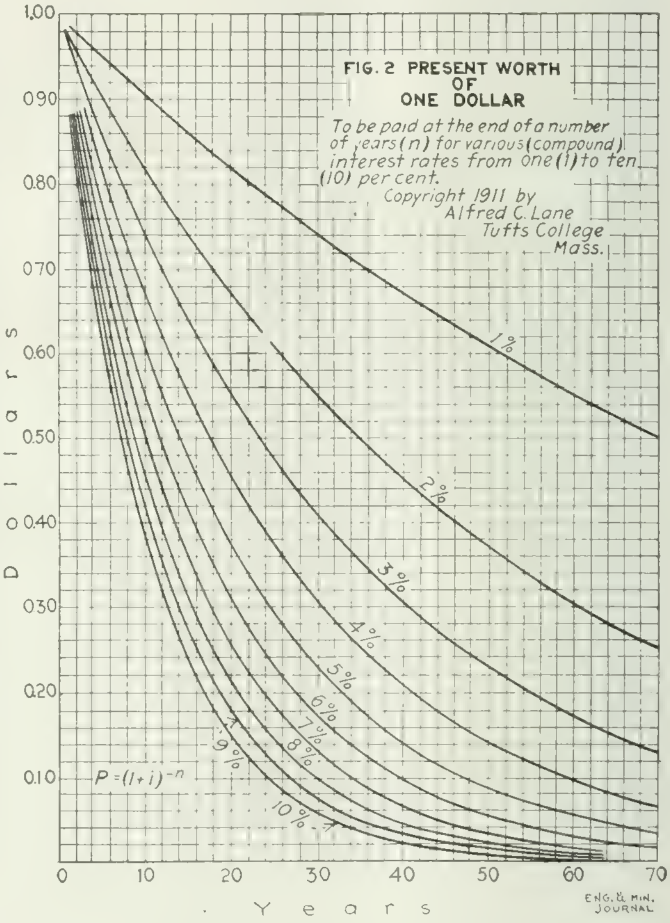

FIG. 2 PRESENT WORTH OF ONE DOLLAR

To be paid at the end of a number of years (n) for various (compound) interest rates from one (1) to ten (10) per cent.

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PROSPECTIVE VALUE OF MINERAL LANDS

Value	Acres	When Sold
$1,580,000	4,274	First 11 years
554,000	4,274	Second 11 years
194,000	4,274	Third 11 years
68,000	4,274	Fourth 11 years
23,700	4,274	Fifth 11 years
8,400	4,274	Sixth 11 years
2,800	4,274	Seventh 11 years
$2,430,900	29,918	. . .

Proceeding similarly by the same curves, we find the value of the lands of the St. Mary's Mineral Land Co., presented in the accompanying table, if grouped in batches as they will probably come into the market.

This is as far as our tables go but it is clear that the present worth of all the remaining lands that are held over eighty-eight years before they are sold is relatively insignificant even supposing, which is very unlikely, that they are intrinsically worth as much as the earlier sold lands. The result is, then, that the 93,426.92 acres of land and 14,038.82 mineral rights of the company are worth a little less than two and a half million dollars, assuming that they are taxed, at 3%. If they are taxed for less they are worth more. Whether all the lands of the company above included are on the mineral range is of little consequence so long as there are at least 29,918 acres to which the above calculation may fairly be applied.

LANDS GRADED IN VALUE ACCORDING TO SITUATION

The average present value per acre is, then, only about $25. This is practically the same result as though we supposed the average gross income from sale of lands was kept up indefinitely, that is to say, $243,000 a year. Capitalizing this, at 10%, we find again that it represents $2,430,000. The method first used has two advantages. It is applicable to bodies of land which are likely to be sold in a short time. It also shows how lands may be graded in value, according to their proximity to other mines, and the consequent chances of their being developed, and how small is the improvement in value of lands which are not likely soon to be developed.

The method of finding the rate of exhaustion of copper lands, necessary to keep up the production, furnishes an interesting check, and will also show whether the St. Mary's Mineral Land Co. is selling its land more or less rapidly than the natural progress of the copper industry calls for. From Steven's "Copper Handbook" we can find the output of the Lake mines before 1911. In 1911, it was about 210,000,000 lb., and in 1912 it may be expected to be about 240,000,000 lb. We may expect it to increase at a rate of something like 5 to 8% per annum, if it keeps pace with the growth of the world's production.

A lode 10 ft. wide with 10 lb. of copper per ton will yield from 363,000 lb. of copper per superficial acre upward, increasing with increasing dip—let us say 400,000 lb. of copper per acre. About the minimum that can now be worked without loss is 10 lb. per ton. The average of the lodes worked will probably run close to 20 lb. per ton, for just about half the copper comes from mines whose lodes run over 20 lb. per ton. If we assume that the average lode runs 20 lb. of copper per ton, it will then yield about 800,000 lb. of copper per acre, and the present annual production exhausts 300 acres each year.

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[2] Computed by slide rule.

Price of Mineral Rights Not Artificial

The total production of Lake copper through 1910, which is 5,122,000,000 lb., will then have exhausted the copper under 64,000 acres of land. The St. Mary's Mineral Land Co. has 107,000 acres of mineral rights, but of these, perhaps, 17,000 may be classed as having no appreciable chance of copper values. We have, then, about 90,000 acres left. The total area of the whole Keweenawan of Michigan, Irving gives as 1744 square miles, but the Lower Keweenawan contains all known lodes except the Nonesuch, and (from certain maps of my own) is but 900 square miles, of which 500 are east of Range 43 and the Porcupine Mountains. In this part alone there are mines and the lands of the St. Mary's Mineral Land Co. lie in this district.

Of this 500 square miles of land, the St. Mary's Mineral Land Co., therefore, controls less than one-third, and it has been selling its land more rapidly than the whole rate called for by the exhaustion due to present production. There is, therefore, no sign that the company is artificially restricting the output by abnormally high prices of land or that decreasing the price asked would increase sales except for speculation, since, in the long run, mines can be developed only as fast as exhausted, allowing, of course, for the full natural development of consumption.

If the other land of the 500 square miles above mentioned was developed for mining property as fast as the land of the St. Mary's Mineral Land Co. is sold, it would mean about 1380 acres per year, or about four times what is exhausted.

If one should draw the inference that only one mine in four is a success, and that only one acre in four of the region in question has a 10-ft. lode with 20 lb. of copper to the ton, the conclusion might not be far from right, although the inference would not be warranted. The correctness of the conclusion is illustrated by the fact that of the 47 Lake Superior copper companies listed by Stevens on p. 1893 (1910-11), only 13 have paid dividends. But as I have said, our right to draw any such inference is entirely doubtful, for the land not owned by the St. Mary's Mineral Land Co. is largely owned by already incorporated mining companies, which prospect here and there, without our being able to make any such sharp line between the idle land and the land which is being developed, as is made in the case of the St. Mary's Mineral Land Co., where practically no land is sold except for immediate development.

It is more likely that we can turn the inference the other way around and infer that the land of the St. Mary's Mineral Land Co. is developed about as fast as the other land, and not notably faster or slower. If so, this would indicate that they were asking a fair price for their land, although, as we have seen, their selling price is so much greater than the average value of their land.

Value of Mineral Rights But a Portion of the Selling Price

If we assume for the dividend or net return per pound of copper that which Stevens says is the average (3.56c.), the average yearly income from all the copper mines, after paying taxes, for a production of 240,000,000 lb., would be $8,500,000. This may gradually increase with an increasing output and will continue for so many years that we practically regard it as a fixed income, as we have found might be taken to be the case for the income of the St. Mary's Mineral Land Co. If we then discount it at 10%, the value of the whole copper range, present mines included, would be $85,000,000. But the income is after taxes are paid. Assuming that no heavier taxes are laid in the future, than in the past (a very doubtful assumption), and using 7% as the interest figure, the total value of the copper mines would then become $120,000,000, and, at 5%, $170,000,000. When we subtract the value of the going mines, we shall have but little left for the value of the mineral rights. In fact, if we take the stock-market quotations of the various listed companies, we should have nothing at all. As I have elsewhere shown, these quotations always give the value far above the value of the mine, from an income-producing point of view.

The conclusion of the whole matter is this: that mineral rights have a value which is but a small fraction of the selling price. It is possible to determine an average value for them which may be called the taxation value. The actual return to a given small holder of a small area of mineral rights will depend partly upon its accessibility but largely upon the ability of himself or his neighbors to hustle and get his tract developed sooner than the tract of someone else. This personal ability is a thing which the state cannot foresee nor tax.

The same principles which have been outlined here can be applied to the iron-mining ranges, and the data so carefully collected by Doctor Leith, provided that we assume that the output of the ranges will, as has been suggested, keep up for a reasonable length of time, at the present rate.

A 25-cycle single-phase Kjellin induction furnace has been installed by Deere & Co., of Moline, Ill., for the purpose of making special steel of steel scrap from cuttings of rods.

Copper Mining in Argentina

By C. A. Tupper*

The copper-mining industry of Argentina can hardly be said thus far to have passed beyond the earliest stages of development; nor has exploration been extensive; but enough has already been done to reveal the existence of ore deposits which will eventually be a factor of importance in the world's production.

Main Operations Near Chilecito

Present operations are chiefly centered in the districts near Chilecito, Province of Rioja, which is the lower terminus of the 22-mile Bleichert aërial tramway, built by the Argentine Government. The districts here are known as La Mejicana, El Ofir, Los Bayos, La Encrucijada, Santa Rosa, and La Parrayo.

The Mejicana district lies at an altitude of 14,800 ft. and is reached from station No. 9 of the government aërial tramway. Its geology has many interesting features. The principal formation is a highly metamorphosed Paleozoic slate, with limestone intercalated. Other rocks are tuffs, sandstone, ancient conglomerate, carbonaceous schist and recent conglomerate. The eruptive rocks are represented by granite, porphyry, pegmatite, dacite, diorite and greenstone. Similar formations characterize the other districts mentioned. The strike and dip of the veins are variable.

At the surface complex ores are encountered, with concentration and enrichment. Chalcopyrite similar to that of Shasta County, California, although not as rich, is the predominant ore in depth, mixed in places with enargite, including an antimonial variety known locally as "famatinite" from the Famatina Mountains in which the mines are situated. Pyrite, galena, blende, etc., are also found in large quantities. The matrix is mainly quartz, with some calcite and barite. The copper content ranges from about 4% in the upper mines, at Upulungos, to 14% at San Pedro, with sulphur content from 26 to 34%, silica 16 to 38% and iron 18 to 20%. Gold, silver, zinc and alumina are also present in quantities, the gold averaging 1.3 oz. and silver 71 oz. per ton. Of the remaining content from 5 to 6.5% is accounted for by lead, nickel, zinc arsenic, antimony, magnesia, bismuth and lime, and by barite in about the same proportion as the total of these elements. Of moisture there is only a trace. The heaviest deposits are near the surface.

The principal mines here have been acquired by the Famatina Development Corporation, Ltd., of London, England and its subsidiary, the Forastera Mines, Ltd., the two together being known locally as "The Syndicate."

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*Consulting engineer, 389 Thirty-first Avenue, Milwaukee, Wis.

The supply of labor has, in general, been found sufficient, difficulties anticipated in respect to this not having materialized. The most efficient miners are Chileans, and they will probably be the best permanent source of future supply. At the beginning of systematic development work they demanded and obtained housing and other accommodations superior to those of the native element. The grade of Argentine labor has, however, been raised.

The lodes are not wide, ranging from about one to six feet, or an average of about four feet, and one of the greatest difficulties encountered by the management has been to teach the miners to narrow their stopes, so as to avoid breaking out an undue proportion of wall rock. Sorting will, however, have to be more carefully done as operations increase, for the reason that transportation of waste, mixed with good ore, is too costly.

Operations in the Mejicana district will be greatly facilitated by the introduction of electric power at the mines, and several sites for hydro-electric plants have been located, one or more of which will be developed in the near future. Present hand work, owing to the low efficiency of hand labor at such high altitudes, is slow and costly; so that with electric power an appreciable economy can be effected.

El Ofir Mines Undeveloped

Within 1½ miles of the tramway terminal at Upulungos, and about 540 ft. lower, are El Ofir mines, which are still comparatively undeveloped. The lodes dip 50 to 60° and are composed of quartz, with pyrite and chalcopyrite and some gold and silver. The copper content, as thus far revealed, does not run above 8% but further exploration may show better grade. This is a contact zone of slate with a granite and porphyritic mass, the latter being separated from the granite of the higher ranges by bands of red sandstone and conglomerates.

About 1600 ft. farther down the mountain range and in the vicinity of station No. 8 of the government tramway, is the district of Los Bayos, the principal operator in which has thus far been the Compañia Minera Los Bayos. The surface rock is dacite, broken by eruptions of porphyry, which resulted in the formation of numerous fissure veins. The fissures are filled partly with decomposed rock, or *tofo* and partly with ore. The ore is composed of tetrahedrite and enargite, with pyrite and chalcopyrite in the lower levels. Quartz and barite form the matrix. The ore occurs as inclusions in the gangue or as small concretionary masses. It yields, on an average, about 3% copper and a high percentage of silver.

Seven miles from the mines of the Famatina Development Corporation, at an altitude of 10,000 ft., is the Encrucijada district, where the ores are chalcopyrite, bornite, chalcocite and covellite, each of which carries silver. The gangue is argillaceous. The primary formation is Paleozoic slate. Parallel with the copper-bearing lodes are bands of green magnesite, with inclusions of pyrite. Some mining has been done here by natives and a small smeltery for reducing the ore to a first matte is intermittently operated.

In approximately the same altitude but farther to the northeast, or 18 to 23 miles from Chilecito, are the Santa Rosa and Pararrayo districts, the principal mines of which belong to the Rio Amarillo Copper Mining Co., with a smelting works at Totoral. Chalcopyrite and chalcocite are the chief ores, with surface occurrence of malachite and iron oxides. The figures and other data used in this article have been taken in part from a comprehensive report prepared for the Argentine government by Pablo Viteau, national inspector of mines.

Famatina Corporation Active

The most important and promising operations in this section are undoubtedly those of the Famatina Development Corporation, above mentioned, which was originally organized as the Famatina Copper and Gold Syndicate, Ltd., and reorganized in 1903 under its present style with $3,500,000 authorized capital. Besides the two principal groups of mines at Upulungos and San Pedro, there are the Esperanza, Placilla, Andueza and Verdeona. The company's concessions cover more than 800 acres, extending over two miles. Development is by adits or tunnels, several of large extent having been opened up. From these winzes and raises are driven.

A 200-ton smeltery has been built at Santa Florentina, near Chilecito, reached by a branch line from station No. 2 of the tramway, or Durazno. The first furnace was started in the summer of 1908 and a second erected during the following year, together with a stand of converters. For calcining there is a Brown mechanical roasting furnace. It is proposed to do some heap roasting when enough ore is regularly produced to keep the smeltery running to capacity, as under that condition the Brown furnace will not be sufficient. Two 18-ft. 6-hearth roasting furnaces of the McDougal type, similar to those used by the Cerro de Pasco company in Peru, have been ordered.

There is also a Yeadon briquetting plant in which the fine flue dust from the smelting works is mixed with roasted ore, slaked lime being added as a binder. Flux is obtained from a near-by limestone quarry, with some brought in from Cordoba, and the company has a sufficient supply of quartz on its own properties. Assays of regulus from the smeltery showed 61.24% copper, 255.3 oz. silver and 4.7 oz. gold per ton. Since April, 1911, however, all of the product has been in the form of blister copper. To avoid losses of copper and precious metals in the escape of dust and fumes, further improvements in the plant will be made, including new flues and settling chambers. Recent smelting has averaged about 3000 tons monthly.

Fuel Scarce

The greatest obstacle to be overcome in smelting ore anywhere in Argentina is the lack of suitable fuel. No anthracite or good coking coal has thus far been discovered and the beds of lignite found in certain localities are unsuitable for furnaces. Thus far coke has had to be brought from Europe, via Buenos Aires. The principal hope of the future seems to lie in some method of electric smelting, with current transmitted from water power back in the Andes.

Power for the mechanical operations at the smelting plant is obtained from a small hydro-electric development, with steam auxiliary. This cannot be greatly enlarged but other power sites, as above cited, have been located between the works and the mines.

Outside of the Chilecito or "Famatina" section, copper deposits have been found in the provinces of Catamarca, Mendoza, Neuquen, Salta and near Candelaria and Santa Anna.

Some of these deposits are being worked on a minor scale; but the aggregate production will probably continue small until the problems of transportation, fuel and skilled labor have been more effectively solved. The most encouraging reports should come, in the immediate future, from the Famatina Development Corporation. As explained in the articles describing the aërial tramway the operations of the company were seriously interfered with by failure of the government to provide the necessary facilities for keeping the line in continuous service; but this condition appears to have been remedied, and the current year should show a much larger production than any preceding.

Mineral Production of India

The mineral output of British India for 1911 is officially reported as follows: Coal, 12,048,726 tons; mica, 31,686 cwt.; manganese ore, 441,426 tons; gems, 288,216 carats; gold, 8277 oz.; samarskite, 24 cwt. It is also mentioned that there were increases in production in limestone, copper, iron, salt, slate, wolframite, fuller's earth, galena, graphite, chromite and tin, but no figures are given. There were 146,336 persons employed, of whom 93,656 work underground, and 52,680 on the surface. The adult males numbered 92,048; adult females, 48,971; and 5317 were children under 12 years.

Requirements of Glass Sand

Sand is the main constituent of glass, constituting from 62 to 65% of the original mixture, or from 60 to 75% of the finished product after melting has driven off carbon dioxide and other volatile materials. On the quality of the sand depend the transparency, brilliancy, and hardness of the glass, says the U. S. Geological Survey. For the finest flint ware, such as that used for optical and cut glass, "water whiteness," absolute transparency, great brilliance, and uniform density are required, and only the purest sand can be employed, since slight impurities, especially small quantities of iron, tend to destroy these effects.

For plate and window glass, which are commonly pale green, absolute purity is not so essential, but generally the sand should not carry more than 0.2% of iron oxide. Green and amber glass for bottles, jars, etc., can be made from sand relatively high in impurities. An excess of the chief impurity, iron, is usually avoided in the quarries by a careful selection of the whitest sand, although the whitest sand is not invariably the purest. Repeated washing tends to remove the iron. Magnetic separators also have been resorted to, especially when the iron is present in the form of magnetite.

Clay materials are objectionable because they cloud the glass. Washing helps to remove them, since they occur usually in a very finely divided state. Magnesia, which is more apt to be introduced into glass materials through limestone than through sand, is troublesome because it renders the batch less fusible.

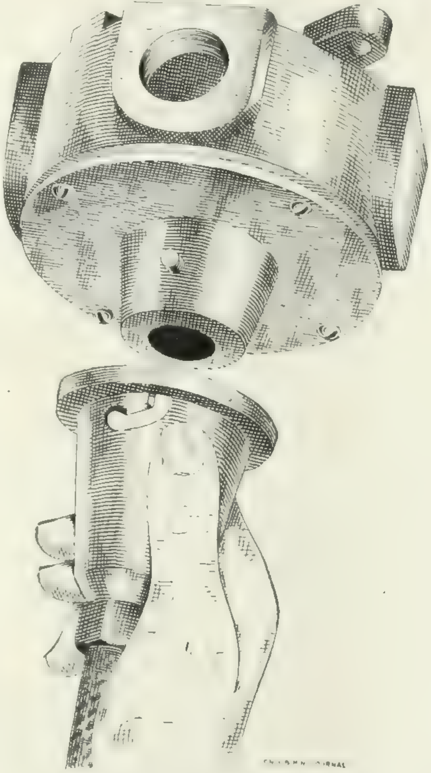
In examining sand in order to ascertain its value for glass making, inspection with a magnifying glass is the best preliminary test. The following points should be observed: The sand should be nearly white and of medium fineness (passing a 20- to 50-mesh horizontal sieve); the grains should be uniform in size, even, and angular; less preferably they may be rounded. A simple chemical test consists in heating the sand in a dilute acid. Effervescence indicates the presence of lime; loss of color shows the presence of clay impurities. Iron in minute quantity may be detected by dissolving sand in hydrofluoric acid and adding potassium ferrocyanide, which produces a blue precipitate if iron is present. Complete quantitative analyses as well as a furnace test should be made as a final determination of the character of a prospective glass sand before its use is attempted.

Pennsylvania produces 30% of the sand used in glassmaking in the United States—about 400,000 tons. The average value of glass sand in Pennsylvania is $1.40 per ton.

Conlan Watertight Electrical Connection

The electrical plug and receptacle shown in the accompanying illustration is being introduced by the Conlan Electric Co., 43 Murray street, New York, to meet the need for an automatic watertight receptacle which does not require the operator to do more than make the electrical connections.

Among the points claimed by the manufacturer are these: Electrical connection cannot be made without making the device watertight, and the receptacle cannot be left nonwatertight. The plug is locked into position by a push and a single turn, therefore no switch is needed, as a quick make and break can be made. The receptacle is mounted on the cover, independent of the outlet box. No cover is used, and no threads are employed. All metal parts are of heavy brass and bronze. The receptacle is of porcelain; the plug and valve of heat-resisting insulating material.



CONLAN WATERPROOF ELECTRICAL CONNECTION

Wash for Removing Black Drawing Ink

A wash for removing black drawing ink from tracing cloth has been recently put on the market by William G. Bond, Wilmington, Del. The wash does not injure the cloth and gives good results where the surface has not been injured by rubber erasures, pen cuts, etc. After the surface of the cloth, where the ink is to be removed, has been dampened for two or three minutes with the preparation, called "Inkwash," the ink can be readily wiped off with a moist cloth and the surface of the tracing cloth polished with a soft dry cloth.

Mining in Chosen

The gold mines of Chosen have long been one of the chief sources of national wealth and during the last two years, according to a British diplomatic and consular report by Consul-General Bonar, a slight increase in the output has taken place. Exports of gold bullion have risen from, roughly, $4,509,000 in 1910 to $4,625,000 in 1911.

Although a large portion of the stock is owned by British subjects, the principal companies are American corporations, and include: Oriental Consolidated Mining Co., Wunsan, capital $5,000,000. This company has been working for 13 years and in 1911 paid a dividend of 15%. Chikusan Gold Mining Co., Chikusan, capital $1,000,000. The new flotation of this company provides for a Japanese holding of 24% in the stock. Seoul Mining Company, Suwan, capital $500,000. This company commenced work in 1909. A dividend of 45% was paid in 1911. Chosen Mining Co., Kosurg, capital $510,000. This is a new company which was floated in 1911.

Chosen is regarded as a promising field with resources barely touched, and there are now signs that owners of large mining enterprises in Japan are prepared to work gold and other mines in this country.

Iron-mining operations have hitherto been confined to the neighborhood of Chinnampo, but deposits of iron ore are reported in varying quantities all over the peninsula. Facilities for communication and transport are desirable to insure developments. At present the only mines of importance being worked are at Inritsu, Sainei and Angaku. The first two are controlled by the Japanese government iron foundry at Wakamatsu, and the third is a private concern selling all its ore to the Wakamatsu foundry.

The consul-general reports, however, that recently the Mitsui Bishi Co. purchased iron mines, 1470 acres in extent, and applied for permission to work another mine 792 acres in area. The Mitsui company intends to work iron mines with an aggregate area of 3054 acres, and Okura & Co. have applied for permission to work an iron mine 41 acres in area.

The consul adds that the reserves of capital possessed by these companies augur well for the future prosperity of the industry, and with the extension of railway communication iron mining should assume a high place among the sources of wealth in Chosen.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments

Frederick P. Burrall has returned to New York, after spending two months in Alaska.

Samuel A. Benner, assistant to the president of the Pittsburgh Steel Co. for the last two years, has resigned.

H. Kenyon Burch, after spending a few days in Los Angeles, Calif., left there Oct. 28, on his way to Globe, Arizona.

R. H. Flaherty, of Port Arthur, Ont., has returned from an exploration of Ungava district, in the interest of Mackenzie & Mann.

Charles A. Gibbons, Jr., has been appointed superintendent of mines for the Central Chile Copper Cor., to succeed J. W. Maxwell, who will leave the employ of the company Jan. 1 next.

Dr. J. A. Holmes, chief of the Bureau of Mines, sailed from New York, Nov. 2, for Panama, where he will make some investigations of fuel questions affecting the supply of the canal works.

L. A. Phillips, assistant general manager of the Refining & Producing Oil Co., of San Francisco, has been elected general manager and vice-president of the corporation, succeeding the late Henry J. Crocker.

Joseph Thorpe has been appointed assistant general superintendent of the Pennsylvania Coal & Coke Co., with headquarters at Cresson, Penn. He was superintendent of the Nanty-Glo mines of the company.

R. E. Hesler has been appointed chief engineer of the Indiana division of the Rochester & Pittsburgh Coal & Iron Co., with headquarters at Indiana, Penn. He was formerly with the Morrisdale Coal Co. as chief engineer.

J. B. Tyrrell, mining engineer, of Toronto, has returned to that city after having spent five months on the shores of Hudson Bay and in the country between Hudson Bay and the new railroad line of the Grand Trunk Pacific.

By a reconstruction of the Canadian administration, Hon. Louis Coderre, M. P. for Hochelaga, Que., becomes Secretary of State and head of the Department of Mines, which has been transferred from the Minister of the Interior to the Secretary of State.

M. J. Butler has resigned his position as general manager of the Dominion Steel Corporation. No successor will be appointed, the duties being divided between other officials. D. H. McDougall, assistant general manager of the Dominion Coal Co., becomes general manager of that company.

Van H. Manning, of the U. S. Bureau of Mines, made a recent visit to San Francisco and continued on to Denver by way of Los Angeles. The bureau is establishing a laboratory at Denver, and Mr. Manning stopped at San Francisco to confer with Dr. Cottrell's office regarding necessary equipment to be placed at Denver.

Thomas X. Fitzgerald, formerly superintendent of the Tudor works of the Republic Iron & Steel Co., at East St. Louis, Ill., and since July 1 superintendent of the Mahoning Valley works, Youngstown, Ohio, of the same company, has been appointed general labor foreman by the general superintendent, Oscar Black. He succeeds M. J. Regan, who has been made superintendent of the Hannah furnace, Youngstown.

T. Inouye and T. Nakamura, mining engineers of Japan, have recently been visiting important mining properties in California, including the Mammoth copper mine in Shasta County, La Grange hydraulic mine in Trinity County, and the Noble Electric Steel Co.'s iron smelter at Heroult, Shasta County. Mr. Inouye is professor of mining in the Imperial University, and Mr. Nakamura is manager of coal mines in the southern part of Manchuria. The purpose of their visit has been to study the methods of mining, milling and smelting in California. They also visited some of the dredging fields. They came to America by way of Siberia and Europe and, returning, left San Francisco, going direct to Japan.

OBITUARY

Sidney H. Newbury died at Pittsburgh, Oct. 29, aged 48 years. He was born in Wales but went to Pittsburgh when a boy and entered a steel mill there. He had been for some years with the Crucible Steel Co., as superintendent of its open-hearth furnaces.

James S. Burgess died at Wilson, N. Y., Oct. 13, aged 68 years. He was born in New York, and went to Colorado when a young man. He was prominent as a miner and operator at Leadville in the earlier days of that camp, but retired on account of injuries received in an accident.

S. C. Beebe died at Butte, Mont., Oct. 18, aged 77 years. He was born in New York, but went to Montana when 19 years old, with the pioneers of that state. After an early experience in mining, he engaged in the construction of mills and smelting works and was employed in Montana, Idaho, Nevada and Washington. He directed the construction of mills at the Cable, Blue Bird, Bimetallic and other well known mines. It was claimed for him that he set the first timbers in the shaft of the Anaconda mine, and built the first smelting works at Anaconda. He leaves three sons, all engaged in the same business as their father.

Prof. Thomas Price died at San Francisco, Oct. 13, aged 77 years. He was widely known throughout the West as a mining engineer and metallurgist. He went to San Francisco from Swansea, Wales, in 1862. His was a very active career, and his professional duties called him, at one time or another, into all the Pacific Coast states and territories; to Colorado, Montana and Mexico, and even as far East as North Carolina. Professor Price came to the United States, originally, to purchase copper ores for shipment to Swansea, and for a number of years conducted that business on a very large scale. He erected, at Antioch, Calif., in 1864, the first copper-smelting plant in the West. The first plant of the Selby Smelting & Lead Co. was built from his plans and under his direction, his Swansea experience giving him a knowledge of the metallurgy of lead, which, at that time, was unique on the Pacific Coast. He was well known to a large number of friends, who will learn with great regret of his death. He was of a lovable, genial character, and while his scientific attainments were large, he was the most modest of men. The hydrated borate of lime, known as "priceite," was first shown by him to be a new mineral, and was so named by Professor Sullivan, of Yale, who confirmed Professor Price's original work.

Societies and Technical Schools

American Institute of Mining Engineers—The annual meeting of the New York Section will be held at the Engineering Societies Building, Nov. 22. A paper on "The Structure of the Northern Anthracite Basin Relative to Forms of Folds," by Nelson H. Darton, of the Bureau of Mines will be read.

Old Freibergers in America—A meeting of old students of the Freiberg Bergakademie will be held on Friday, Dec. 20, at 7 p.m., in the Hofbräu Haus, Broadway and 30th St., New York. Old Freibergers are requested to send their names and addresses, with those of any others they may know, to C. L. Bryden, 1015 Myrtle St., Scranton, Penn., secretary.

American Society of Mechanical Engineers—The annual meeting will be held in New York, Dec. 3-6 next. The meeting this year will comprise sessions upon a greater variety of topics than have ever been arranged for a meeting. No less than 10 sessions are contemplated, with papers grouped to form symposiums upon various subjects. This broadening of the society's work is the result of the subcommittees lately appointed under the direction of the committee on meetings. The publication of the papers for the annual meeting began in the September number of the *Journal*. The last will appear in the December number or be printed in pamphlet form for distribution at the meeting.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 30—The recent ruling of the General Land Office regarding mineral land, which holds that mineral found in surface rock alone will not amount to a discovery unless it contain ore in paying quantities, has created much uneasiness among prospectors and locators in California. The Prospectors Alliance of America, organized at Bishop, Inyo County, about one year ago, has taken the matter seriously and will hold a meeting at San Francisco in December for opposing the ruling and offering some suggestions as to the revision of the mining laws. The organization has grown and gradually extended its influence to other counties in California and Nevada, and it is expected that the meeting will be largely attended. The ruling of the land office is particularly unfortunate in its effect upon the mining industry in California at present. The last summer has been an active season in prospecting and locating new mining claims, and a poor season for wildcatters and unreliable promoters. If the purpose of the ruling is solely to discourage the promoters it will fail in this state, for the promoter, if allowed to operate at all, is as competent to swindle the stock purchaser with the promotion of a developed mine as with a new claim; in fact the opportunities are greater in the promotion of partially developed mines or the reopening of old producing mines than in the exploiting of new claims. If the purpose is to discourage the prospector and conserve the timber at the sacrifice of the mining industry the purpose will be fairly well accomplished unless the miners act concertedly and promptly. The ruling of the land office further holds that discovery of mineral cannot be claimed simply because surface indications, combined with geological inference, indicate that other and unconnected veins or lodes lie at greater depth; and that there must be a vein or lode of quartz or other rock in place carrying gold or some other valuable mineral deposit. To the miner, the ruling appears dangerous to the prosperity of the mining industry in California, and the effects may not be easily overcome.

It is reported that there is scarcity of labor in the mining districts of northern California, particularly in Sierra County. The Alaska, the Sierra Buttes, and others of the larger mines are in need of more men. The mines at Alleghany, Forest and Plumbago have about the usual complement of men for winter work, but there are no idle men.

Denver

Nov. 2—The fate of a great engineering project hangs on the results of the election of Nov. 5, when the people of Colorado will vote on the Moffat tunnel bonds. This is an act to promote and increase the general prosperity of the state by driving a tunnel through the base of James Peak. This act provides that the state shall loan its credit to the amount of $4,000,000, 50-year, 4% bonds to assist in building the tunnel. The Denver, Northwestern & Pacific R.R. is operated over the top of the main continental divide at an altitude of 11,600 ft., and it has been found that it cannot be operated profitably over 23 miles of 4% grade above timberline, which has prevented the road being financed so as to build westward from its present terminus at Steamboat Springs on the eastern edge of the Yampa coal field, to Salt Lake City as originally intended. Newman Erb has agreed to build this extension if the people of the state will pass the tunnel bill, and guarantees the payment of the principal and interest on the bonds, the railway giving security based on its entire holdings to this end. The tunnel will be of such immense benefit to the state and to Denver and Mr. Erb's offer is such an eminently fair one, that the bill should be carried unanimously, but it is feared that it has no chance, owing to the ignorance of the mass of voters, and in the fact that it has been made a more or less political, personal, sectional and railway opposition issue. The educational campaign which was started about two weeks ago should have been begun three months ago.

According to reports given out by the various plants treating the gold ores from the Cripple Creek district, the October output was 75,486 tons of a gross value of $1,182,953. Part of the report here given is interesting as showing the extraordinarily low-grade ores that are now being treated.

Mills	Tons	Assay	Total value
Portland	16,240	$2 23	$52,445
Stratton's Independence	10,591	2 92	30,725
Kavanaugh	1,700	2 20	3,740
Gaylord..	1,400	3 50	4,900
Isabella	750	1 50	1,125
	30,681	$3 29	92,935

Butte

Oct. 30—At the Pennsylvania mine of the Anaconda Copper Mining Co., the main shaft has reached a depth of more than 2000 ft., and will be continued to the 2400-ft. level. A station is being cut on the 2000-ft. level, where exploration work will be started. The work of changing the hoist from steam to compressed air was completed near the end of September, and on Oct. 1 operations were resumed at full capacity. There are 460 men on the payroll and about 500 tons of ore is being hoisted daily, this amount being smaller than usual, due to the large amount of development being done. The work of driving the south crosscut on the 1800-ft. level was temporarily suspended recently, after a distance of approximately 2100 ft. from the shaft had been attained, and the miners working there began to drift west on a small stringer of ore, which was passed through about 200 ft. back from the present face. Retimbering of the air shaft three-compartments wide from the 1400-ft. level to the surface, which has been progressing for several months, has reached a place midway between the 500- and 400-ft. levels. This leaves about 450 ft. of shaft still to be timbered, and which should be completed in four months or less. At this time, a first-motion hoist, operating two double-deck cages, will be installed, and ore from the western portion of the mine hoisted, thus considerably increasing the mine's output, while at the same time the increased width of the shaft will augment the amount of fresh air now passing through the workings of the mine.

No. 1 shaft of the Leonard mine, which is now used principally for lowering timbers and supplies, has been sunk to the 2000-ft. level, where a station has been cut and crosscutting commenced. The No. 2 shaft, which is the main hoisting shaft, is being sunk, three-compartments wide,, to the 2200-ft. level, and is about 2100 ft. deep. On the 1400-ft. level, a crosscut has been driven under the East Colusa shaft, and the work of raising 500 ft. to connect with that shaft at the 900-ft. level, has been commenced.

At the West Colusa mine, the hoisting engine is being altered to admit of hoisting with compressed air in the future instead of steam. This work has been going on for more than a month, and during this time a force of men has been engaged in retimbering the shaft. Until recently, a limited amount of mining was being done, and the ore hoisted in equal amounts by the Mountain View and Leonard mines, but all mining has now ceased and will not be resumed until the shaft has been fully repaired and the compressed-air hoisting system installed.

At the Mountain View mine, the air shaft is being newly timbered from the 600-ft. level to the surface. The work has reached a point a short distance above the 300-ft. level. Due to the fact that the upper levels of the mine are constantly settling and moving slightly to the east and south, it has been decided to place a jacket about the shaft from the 300-ft. level to the surface, and as this work is necessarily very slow, it will probably be about four months before the shaft is in commission again, as the distance from the 300-ft. level to the surface at this point is about 500 feet.

Salt Lake City

Oct. 31—The situation at Bingham remains unchanged. The Utah Copper Co., it is reported, is working about 1500 men, exclusive of deputies. Blasting was resumed Oct. 27, and more than 12,000 tons of ore was mined and shipped. Fifteen steam shovels are in operation, and work is being done on practically all levels. A night shift was put on, Oct. 24, for the first time since the strike. Some Mexican laborers have been brought in, and it is said to be the policy of the management to eliminate Greek labor. The statement that any negotiations have been entered into by the company with the Western Federation of Miners is authoritatively denied. Some old employees, boiler men, machinists, etc., have returned to work for the company. Conditions are approaching normal, and an average of about 10,000 tons of ore daily is being mined. Nine sections of the Arthur mill and eight sections of the Magna plant are being operated. The September copper production was 6,965,144 lb. At the Utah Consolidated 130 men were at work Oct. 24, and 500 tons of ore was mined. The working forces have since been increased to 150 men. The aërial tramway to Tooele is being operated intermittently. Other mines are gradually resuming operations and increasing forces; the Yampa, Bingham-Montana, Silver Shield, and one or two smaller properties are the only mines that have not yet resumed. Miners and deputies going to work in Upper Bingham cañon, Oct. 25, were fired on from ambush by strikers, and a deputy sheriff and three men were injured. The men who did the shooting are believed to have escaped over the range toward Pine cañon on the Tooele side, and are being looked for by an armed posse of 20 men. A reward of $2000 has been offered. This shooting, it is thought, may have been caused by personal differences among some of the foreigners, Greeks, Italians, etc., and does not reflect the actual conditions. At the Ohio Copper 24 men are at work underground, and a night shift will soon be added. Ten trains of 18 cars each, or about 900 tons of ore, were sent out to the concentrator at Lark, Oct. 24. Three shifts are being worked here, operating two units; 78 men, or about 60% of the normal working force, is employed. At the mines of the Utah Apex Mining Co. 40 men are working, and up to 70 tons of lead ore daily has been shipped to the smeltery at Murray.

Deadwood, S. D.

Oct. 25—In a case tried before Judge W. G. Rice, of the circuit court of Lawrence County, the assessed valuation of the Golden Reward properties, at Terry, was reduced to the original valuation returned by the assessor. The county commissioners had previously raised the assessment 175%. This is not the end of the case, however, as the court has under advisement the matter of making a new assessment, and raising the valuation materially. The judgment of the court was based upon the fact that the commissioners had ordered the raise of assessment at a time after their session should have expired. Under the law of South Dakota, the sessions of boards of county commissioners are limited to 15 days in each month; the judge held that this means 15 calendar days, while the board had sat for 15 working days, which at this particular session included a holiday and two Sundays, and their action on the assessment had taken place after the 15th. of the month. There is a likelihood that this case may result in all property being assessed at full valuation, instead of one-third, as has been the practice in the past.

Toronto

Nov. 1—The five-months period during which the duty on imported cement was reduced by half on account of a short supply in western Canada, expired today and no further action will be taken by the government until the meeting of parliament. The effect of the reduction was a great increase in cement importations. During the four months from June to September inclusive, the imports for the whole of Canada were 793,656 bbl. as against 327,439 bbl. for the corresponding months of 1911, and the imports into the provinces of Manitoba, Saskatchewan and Alberta amounted to 302,450 bbl., as against 3191 bbl. As the building season in the west is nearly over with large supplies of cement on hand, the urgency which prompted the action of the government is now at an end. F. P. Jones, general manager of the Canada Cement Co., states that the reimposition of the original duty of 52c. per bbl. will not cause any change in prices.

Chihuahua

Oct. 27—Depredations by marauding bands of rebels have greatly harassed operations throughout the states of Chihuahua and Durango for practically the entire month of October. Lately, however, the government troops have shown more energy in pursuit of these bands and more vindictiveness in the punishment of the captured leaders. Verified reports from the western part of the state have reached this city stating that several of the more dangerous bandits have been hung from convenient trees and left hanging there as a warning to others.

On the night of Oct. 22, a band of rebels visited the camp of Terrazas, 25 miles north of Chihuahua, robbed the Rio Tinto Copper Co's. safe of about 4000 pesos, looted the store and cut off the water supply so that the smelting plant was forced to shut down. Several of the Mexican and foreign employees were also robbed. The bandits escaped before the arrival of federal troops. This property is owned and operated by the Corrigan-McKinney company of Cleveland, Ohio. The same interests suffered loss about three weeks previous when their Concheño mine in the western part of the state was similarly looted by rebels. The Mapimi camp in the state of Durango was also visited by bandit rebels recently, but the Peñoles Mining Co., the chief operator, was a small loser on account of the timely arrival of government troops.

Owing to these and other molestations a number of companies have postponed resumption of work, while many have been obliged to reduce their output on account of the dangers attendant upon the marketing of bullion over bandit-infested trails. Another serious drawback has been the disturbed railroad traffic. For the latter half of the month the Mexico Northwestern Ry. discontinued service on its line between Casas Grandes and El Paso, while the National Ry. suffered from the destruction of part of its lately repaired line from El Paso south. The Orient line was inoperative on both its eastern and western branches out of Chihuahua for most of the month. The National line south of Chihuahua has been open most of the time so that supplies were brought in, as was sufficient fuel to insure several weeks' operation of the Chihuahua smeltery.

Several of the outlying properties in the near by Santa Eulalia camp were looted, but the losses were small. No reports have come in mentioning personal injury to any foreigner at the mines, although two American cattlemen were seized and caused to pay ransom for their liberty. It is not likely that any of the companies now operating will be forced to suspend as long as the railroad line south is kept open.

The Mining News

The Current History of Mining

Alaska

The Yukon Gold Co. sent $552,000 in gold bullion from the mines to the Seattle Assay Office Oct. 29, via steamer "Humboldt."

J. T. McGriff, of Fairbanks, contemplates building a dredge on his Deadwood Creek property in the spring.

Alaska-Mexican—During September the mill was in operation 30 days, crushing 19,593 tons of ore for a recovery of $54,360 in gold and concentrates. The estimated net profit is $23,296; the yield $2.80 per ton of ore milled.

Alaska-United—During September, 17,990 tons of ore was crushed in the Ready Bullion mill, and 19,656 tons in the 700-Ft. Claim mill. The recovery in gold and concentrates was $59,123, and $52,274 for the two mills; the estimated net profits are $30,465 and $21,869. The yield from Ready Bullion ore was $2.89; that from 700-Ft. Claim was $3 82 per ton of ore milled.

Alaska-Treadwell Gold Mining Co.—During September, the mill was in operation 30 days, crushing 79,436 tons of ore, from which $176,121 in gold was recovered in bullion and concentrates. The estimated net profit was $78,510; the yield $2.24 per ton of ore milled.

Arizona

MOHAVE COUNTY

Loper and Carney—It is reported that Ralph H. Cameron has taken a bond on these properties, which are about eight miles east of Hackberry, in the Cottonwood district. The owners have been asking $50,000 for the claims.

Midnight—Kean St. Charles is shipping machinery for a concentrating plant to this mine, at Chloride. Mr. St. Charles has been developing the property for several years and has much copper, lead and zinc ore blocked out.

Arizona-Southwestern Copper Co.—The new mill, at Copperville, is nearly completed, and the work in the mine preparatory to stoping ore is being rushed so that the mill will probably be in operation within the next few weeks.

Nevada-Arizona—J. F. Wallace has completed his contract for driving the Roosevelt tunnel at these gold mines in the Music Mountains. This tunnel was driven 730 ft. along the vein to connect with the Mohawk shaft, and it is stated that about 700 ft. of this distance is in good milling ore. Near the shaft and on the Mohawk vein ore was encountered, which assayed over $100 per ton. A contract is to be let to sink the main shaft on the Lucknow claim at least 200 ft. deeper. The bottom of this shaft will then be below the old stopes, and it is also expected that the available water supply will be greatly increased. The machinery for the new mill has been on the ground for some time, but construction has been delayed by waiting for lumber, which is now *en route* from the coast. A loading platform is to be built on the Sante Fé railroad, at Antares, where a large oil-storage tank will also be built. Col. H. L. Stewart, president of the company, accompanied by P. McCardell, were at the mines a few days ago. Mr. McCardell made a survey for the proposed tram from the mine to the mill. His survey demonstrated the expediency of putting in a 1200-ft. aërial tramway from the mouth of the tunnel just completed to the mill site.

Tom Reed—Four bars of bullion, weighing more than 500 lb., and worth about $100,000, were recently shipped to Kingman. This was the result of a three-weeks' mill run. The company has recently been acquiring some of the surrounding claims, both for their mineral and water supplies.

I. X. L.—It is reported that work has been resumed; C. G. Atlee, in charge.

Telluride Mining, Milling & Development Co.—This company is installing a hoist and expects to have a force of men at work soon. The property is in the Tom Reed district. Mr. Rose is superintendent.

California

AMADOR COUNTY

Oneida—The development of the 1800 level of the South Eureka, adjoining the Oneida on the north, is showing some good ore and indicating the extension of the South Eureka vein into the Oneida ground. The owners have spent much money in the development of the Oneida preparatory to reopening the property. The mine was formerly a large producer, and is equipped with a 60-stamp mill, which will be again placed in commission when the development warrants. W. H. Schmal, of Sutter Creek, is superintendent of both properties.

Mountain King—This prospect, in the Pine Grove district, on the East belt, is still producing rich surface ore. The ore is extracted and treated by hand, and the shaft is only 20 ft. deep. Ben Pitts is owner. The property is worked by Pitts and his wife.

Kennedy—The deepening of the 3450-ft. vertical shaft, which was begun in August, was extended to 3680-ft. level, where a station was cut and a compressed-air hoist installed. The shaft is now being deepened to the 4000-ft. level. It is understood that drifting and stoping will then begin at the 3680- and 4000-ft. levels. Recent reports state that the pay ore on the levels above the 3680-ft. is improving in grade, and that some high-grade ore is being extracted. Webb Smith, of Jackson, is superintendent.

Hardenberg—Gravel and cement for the concrete foundations and lumber for the housing of the new 20-stamp mill are being delivered. S. N. Kelsey, of Jackson, is superintendent.

South Jackson—The new vertical shaft has been sunk to the 450-ft. level, and will be deepened to about 550 ft. before crosscutting the formation to the inclined vein is started. Machine drills are used.

Bunker Hill—Dividend No. 76, of 5c. per share was paid Oct. 15. The dividends paid have averaged about 5c. per share, or $10,000 per month, making a total of approximately $750,000 in about six years. E. Hampton, of Amador City, is superintendent.

Keystone The shaft has reached a depth of 2000 ft., which is 660 ft. below the old workings. A soft slate formation has been cut in the shaft, which is considered a good indication of ore in the vicinity. C. R. Downs, of Sutter Creek, is manager.

BUTTE COUNTY

Berry Creek—The tunnel is in about 100 ft. and pay ore is being milled. The ore is reported to be high grade. Charles Willetts is owner.

Kid—Pay gravel is being washed by underground sluicing. A pipe line is being installed preparatory to increasing the number of men. The property is 18 miles east of Chico. George F. Slimmer, of Durham, is superintendent.

P. B. Steifer Mining Co.—This mine, in the Magalia district, has been unwatered for the first time since 1908, when the power plant was destroyed by flood from the west fork of Feather River. Two new units have been installed and a new power house erected. Power is furnished from a reservoir held by a dam 75 ft. high and 125 ft. long. Active mining will be resumed immediately.

Crystal Hill Gold Mining Co.—This company has been organized by eastern men, who have purchased the Princess mine, near Magalia. R. S. Andrus is superintendent.

Blue Hog—This mine, near Magalia, has resumed operations, after having been closed down since May on account of shortage of water. John Lopozich, of Los Angeles, is president and manager.

CALAVERAS COUNTY

Ferraris—It is reported that a 12-ft. vein of talc and quartz has been disclosed at a depth of 55 ft. in the shaft. The shaft will be deepened to 400 ft. The ore is said to be above the average grade. John Ferraris, of Albany Flat, is manager.

Angels—The 40 stamps are dropping on good ore taken from the 850-ft. level. Allan Randall, of Angels Camp, is superintendent.

Gold Cliff—The 60-stamp mill is again in operation. The ore from the lower levels now being crushed is reported to be the best that has been taken from the mine. F. J. Martin, of Angels Camp, is manager.

Waterman—The 5-in. prospecting drill has drilled to a depth of 125 ft. Surface buildings have been erected, and preparations are being made for the installation of operating machinery. H. W. Kuns, of Angels Camp, is manager.

Melones—The 100-stamp mill is crushing good ore, taken from the north side of Morgan Hill, through the glory hole to the tunnel at the 1100-ft. level. W. G. Devereaux is manager.

Dolling—Recent development has disclosed a large shoot of pay ore in the new winze sunk from the 400-ft. level. A room is being cut out at this point for the installation of a compressed-air hoist. The southwest drift on the 400-ft. level is making a good showing. D. G. Overall, of Angels Camp, is superintendent.

ELDORADO COUNTY

Murdock—This gravel mine, near Smith's Flat, is being equipped for handling a large quantity of gravel in the coming winter. Burger Bros., of Placerville, are owners.

Landecker—The mine has been recently sold by Burges Bros., of Placerville, to Los Angeles and San Diego men, and is again in operation.

TUOLUMNE COUNTY

Jumper—Twenty stamps are dropping on good ore from the upper levels. Thirty men are employed. This is an old mine, near Jamestown, that was a big producer in the early mining days. Development and exploration of the old workings have been in progress for the last year. Neil Cochrane is superintenden

Colorado

GILPIN COUNTY

Mountain Lion—The Mountain Lion and Gilpin County mines, at Central City, have been leased by Denver men, with R. L. Martin, manager of the U. P. R. mill, in charge. The two mines have a good record for producing milling and smelting ore in the early days, but were closed down when the influx of water in the joint shaft, which is 545 ft. deep, rendered production unprofitable. Since the Newhouse tunnel began to drain this region work can be more economically carried on. It is said that ore worth $227,000 is already available.

LAKE COUNTY-LEADVILLE

Penrose Shaft—Efforts are being made to obtain a lease on the Penrose & Coronado shafts and if the owners agree as to terms, the lessees will unwater these down-town shafts, and prospect for zinc-carbonate ore.

Creole Mining Co.—This lately organized company has obtained control of the Oro La Plata, Gueson, and part of the Montgomery lodes, which are being worked through the La Plata shaft.

London—The long talked of crosscut to intersect this vein at the head of South Mosquito Gulch has at last been commenced. It will take several months to cut the vein, but when it is accomplished the upper workings will be drained and the ore handled at a much reduced cost.

Columbine—A good vein of lead-zinc ore, containing some gold, has been cut by Peter Horrigan, at the 175-ft. level in this mine at Bonanza.

Long & Derry—At this mine in Iowa Gulch a good tonnage of high-grade lead ore is being shipped steadily.

Ella Beeler—Lessees in the Ella Beeler tunnel are making regular shipments of high-grade silver-lead ore from the lower tunnel. The tunnel is nearing the Houston vein.

Fairplay—A good tonnage of lead ore carrying gold and silver is being shipped monthly by Manager Covey from this mine in Adelaide Park. The 100-ft. level is being driven toward the fault and some streaks of rich gold and silver ore have been found. A 37-hp. electric hoist is being installed and engine house, ore bins, and other buildings being erected.

La Plata—In the La Plata shaft, Rock Hill, lessees have opened zinc-carbonate ore at the 360 level.

Gilt Edge—A new headframe, engine house, and 37-hp. electric hoist have been erected on the shaft of this mine in California Gulch, and the collar of the shaft is being retimbered.

New Monarch Mining Co.—Work is to be started at the shaft in South Evans gulch as soon as Manager Watson can get a supply of coal, when he will unwater the shaft and prospect from the bottom level. At present the company is working on different levels on the Cleveland down to the seventh level and shipping a fair tonnage of ore monthly.

TELLER COUNTY-CRIPPLE CREEK

Elkton—A 2c. dividend has been declared. During October 6000 tons of $18 ore was produced. It is said that the Tornado shaft is to be leased and that the Gregory shaft will be worked on company account. The main shaft is now 60 ft. below the 11th level and as soon as the water recedes 40 ft. more a new level will be driven.

Mary McKinney—Accompanying the 2c. dividend checks just issued, is a report covering the nine months ended Sept. 30, 1912. The company shipped 8035 tons of ore, of a gross value of $221,281, and lessees shipped 2544 tons, of a gross value of $42,585. Minor revenue brought the total receipts to $265,197, of which $161,482 was spent for treatment and other charges. The total net income for the nine months was $103,825. The cash on hand Sept. 30 was $94,150.

Progressive Mining & Leasing Co.—This company, Charles Waldron, manager, is installing a 75-hp. hoist and 100-hp. compressor at the Chicken Hawk mine on Guyot Hill. These will be ready for operation in about one month. This is a Denver company.

Gold Dollar—A dividend of $12,500 will be paid Dec. 1, 1912. The development work, which consisted of sinking the shaft and driving a drift from the water level, has been profitable, and the main orebody is said to be proving up so well that it is believed the company will now be able to pay dividends regularly.

Work Mining & Milling Co.—From the different shafts of this company on Raven Hill a good production is being made by lessees, chief of whom is Russell & Co., working through the Davenport shaft of the Doctor Jack Pot.

SAN JUAN REGION

Preparations for work during the winter are being made. At the Tomboy, in Savage Basin, above Telluride, the tramway from the Ophir tunnel to the Pandora railway loading station is nearly completed, the timbers for the 10 towers are all framed and foundations in, and it is expected that the two terminals will be built and the tramway running by the end of this month. The Ophir Gold Mining & Milling Co. has nearly completed the building of its 150-ton cyanide plant, for which a part of the machinery of the old Suffolk mill was used. At Rico the Rico-Wellington company is remodeling the Pro Patria concentrator, and the Rio Grande Southern R.R. has laid a spur to the mill. At Ouray the Humboldt mine, in the Sneffels district, will have 30 men at work all winter.

Idaho

Idaho County

Mascot—A concentrating table will be installed. The ore continues to plate well and the mill is operated steadily.

North Star—The mill, which has been treating ore from the Dillinger mine, is preparing to do some custom work on ores from near-by mines.

Penn-Dixie—The management is making arrangements to put in a compressor. The No. 2 tunnel will be driven under the shaft and a raise will be started to connect with this shaft.

Knob Hill—The force has been increased by putting on a night shift in the tunnel.

Mineral Zone—A 30-ft. sump has been completed below the second level and drifting has been begun from the No. 2 station both east and west.

Majestic—Work has been begun in what is known as the Campbell drift from the No. 3 tunnel. Thomas Pritchard, until recently mine foreman, has been made superintendent and will have charge of the property this winter.

Michigan

Copper

Superior—The construction of the extension of the Isle Royale railroad to the Superior shafts is progressing satisfactorily and should be completed within a few weeks. This connection will afford facilities for shipping to the Lake Milling, Smelting & Refining Co.'s mill, where the ore is to be treated. At present it is being treated at the Atlantic mill.

Adventure—This company has rigged up a drilling outfit at the bottom of its No. 5 shaft and will test the formation at depth, it being somewhat shattered at the place that the formations are being opened, although an encouraging run of ground is being exposed in driving on the lode.

New Arcadian—The shaft at this property is about 225 ft. deep. The surface equipment has been completed and is working satisfactorily. A station is to be cut at a depth of 250 ft., but no lateral opening will be made until a depth of about 500 ft. is reached.

Isle Royale—Encouraging ground is being opened on the Grand Portage lode. This formation lies about 200 ft. west of the Isle Royale lode and is being opened by a crosscut from No. 2 shaft. The underground working force has been gradually increased and openings put in shape to increase production. Connections with the Mineral Range R.R. are about completed so that the increased tonnage can be shipped to the Lake Milling, Smelting & Refining Co. plant.

Iron

The company has placed an order for 400 new steel ore-cars of 50 tons capacity with the American Car & Foundry Co. The type of car will be the same as used on the Lake Superior & Ishpeming Ry., being somewhat different from the other cars of the "South Shore." With this addition, the company's usable cars will number 1100. The new steel cars will cost about $1000 each. The South Shore serves 15 active mines on the Marquette Range; its ore docks are at Marquette.

Caspian—At this mine of the Verona Mining Co., at Palatka, the shaft-house was destroyed by fire Oct. 18. The ore crusher suffered some damage, but there was no break in the steam line, so pumping was not interfered with. The fire occurred at 7 p.m.; two hours later work was resumed underground. A temporary headframe, 45 ft. high, has been erected.

Oliver Iron Mining Co.—This company recently arranged a lecture on first aid to the injured, for its officials and rescue crews on the Menominee Range. The lecture was delivered by Dr. Shields, of the Red Cross society.

Rogers—Drifting has been started at this new Rogers-Brown mine. The pump stations at the shaft were cut some time ago.

Corrigan, McKinney & Co.—The machinery from the old Fairbanks or Paint River mine at Crystal Falls has been transferred to the Tobin mine, where it is installed in No. 2 engine house, recently erected.

Imperial—The steam shovel having loaded nearly all the stockpile, has been sent back to Ishpeming.

Cascade Mining Co.—Shaft sinking has been stopped temporarily to allow concreting through the overburden. The air compressor will be set up so that when sinking is resumed, compressed air will be available for actuating the rock drills. Up to this time steam has been used.

Chase—At this mine of the Cleveland-Cliffs Iron Co., at Dexter, where operations were resumed a short time ago, the water has been pumped out. The shaft, which is down 300 ft., will be sunk deeper; drifting is in progress on three levels. About 30 men are employed.

Breitung - Hematite — Diamond drills have been operating at this mine for more than a year, seeking a site for a new shaft. Most of the drilling was done east of the present shaft in the swamp at the foot of the hill. It has now been demonstrated that there is too much ore at this place, and it is planned to put the new shaft back up the hill, south of the present shaft. A diamond drill is operating there. The shaft will probably be started during the winter, and will be the same size as the Lucky Star shaft of the same company. It will be raised from the underground workings about 700 ft. deep; eventually the shaft will be 2000 ft. deep.

Florence Iron Co.—This company has contracted with the Peninsula Power Co., of Iron Mountain, for electrical power for its Ernst mine, at Commonwealth, Wis., and its Florence mine, at Florence, Wis.

American—On the ninth level, a drift has been driven across the western boundary into the Mass lands, controlled by this company; a raise will be put up to hit ore shown by drilling. On the 12th level, a drift is being driven in the same direction.

Oliver Iron Mining Co.—In the drilling in progress west of Republic, on the lands of the Michigan Iron & Land Co., difficulty has been experienced from extremely deep overburden containing boulders. In some cases there is over 200 ft. of overburden.

Minnesota

Cuyuna Range

Shipments of iron ore from the Mesabi range to the Duluth docks continue, but there has been a gradual decrease in shipments. Many of the independent mines are making plans to maintain operations during the winter.

At the stockpiles at the Pioneer A shaft and at the Zenith mine, both of which are operated by the Oliver Iron Mining Co., steam shovels have been in operation and the stockpiles are nearly cleaned up. Extensive preparations are being made for stockpiling this winter; new trestles will be erected at several of the shafts.

Wadena—Advance royalties have been paid to the owners by the E. J. Longyear Exploration Co., which is operating the property. The property consists of about 80 acres of land that has been fairly well prospected by drilling both by the owners and the leasing company. The lessees are to pay $6000 per year as advance royalty for the first three years and $9000 per year thereafter. When actual mining commences the owners are to receive 30c. per ton of ore mined.

Pearson — This property has been closed for the winter.

Hawkins—The concentrator is to be shut down in the near future.

Crosby—This property will be operated through the winter.

Ruddy—This mine is about ready to resume operations, after having been closed for nearly three months while the work of removing the débris which was washed into the mine by a cloudburst was under way. It is stated that the workings were not damaged beyond being partially filled with mud and débris.

Morton—This state mine, near Hibbing, will be operated during the winter and a larger force of men will be put to work as soon as enough underground miners can be found. This property recently went on the shipping list and will continue shipments direct from the shaft as long as lake navigation remains open. Low-grade ore is going to the stockpile.

Montana

BUTTE DISTRICT

Ophir—The Butte Central Copper Co. has completed the erection of the 150-ton concentrator building and cyanide plant at the Ophir mine. Machinery is being installed and operations will commence about the first of the year. The construction work and installation of machinery is being done under the supervision of John E. Rothwell. From tests made of the ore, the mill is expected to save 80% of the silver and 90% of the gold, as well as a large proportion of the copper and lead. Development work in the mine during the last few months has been confined principally to the 500-ft. level, where much ore, carrying silver, gold, lead and a little copper has been opened. The silver averages from 15 to 40 oz. per ton; gold $1 to $1.50; lead from 8% to 16%; some copper ore runs as high as 1½%. As soon as the concentrator is started it is planned to unwater the shaft to the 1000-ft. level and begin development work at that depth. Recently the company acquired the Shonbar property, adjoining the Ophir mine on the south, and which was opened to the depth of 300 ft. in the early days, and produced considerable gold and silver. A crosscut will be driven on the 500-ft. level of the Ophir to intersect the Shonbar vein.

Butte & Zenith City Mining Co.—Butte and Duluth men have recently incorporated this company, capitalized with 300,000 shares, par value $10, to develop 241 acres of patented ground and two unpatented claims, six miles west of Butte, near Silver Bow junction. The officers and directors of the company are: John Killorin, William White, I. Feimuth and John A. Percival, of Duluth; Solomon Gensberger, of Butte, Goodwin T. Paul and James Murray, of Dillon. Six or seven veins outcrop on the property, and the company is preparing to sink a 500-ft. shaft at about the center of the property, and crosscut to the veins. Work will be started upon the buildings, and installation of a hoist with capacity for sinking to a depth of 1000 feet.

BROADWATER COUNTY

Development work is being done at a number of properties in the Radersburg district, and ore is being blocked out at the Keating, Ohio-Keating and several other mines in anticipation of the early completion of the branch line of the Milwaukee railroad from Three Forks. At present construction has been suspended, but the roadbed is nearly completed, ready for laying rails, and it is probable that the work will be started again soon and be finished by the first of the year.

Keating—The shaft has been sunk to the 800-ft. level; a station has been cut, and development work is under way. A pump is now being installed on the 800-ft. level, and upon the completion of this work, a crosscut will be driven north of the Blacker shaft to the orebodies. On the levels above, ore is being blocked out, and when the railroad is completed the company will be in a position to ship 200 tons of ore daily.

Ohio-Keating—At this property, adjoining the Keating on the west, the shaft is being sunk to the 500-ft. level, where a station will be cut and development work be started. Mining is being carried on steadily, and the ore is shipped in wagons. The vein is parallel to that in the Keating, the ore being of a similar nature, containing gold, and a little copper.

CASCADE COUNTY

Florence Mining & Milling Co.—This company, which took over the Florence mine, at Neihart, seven months ago, has greatly improved the surface plant, and has developed the property to the producing stage. A steam hoist, with capacity for hoisting from a depth of 1200 ft., and a six-drill air compressor, have been installed. A blacksmith shop, assay office, bunk houses and ore bins have been erected; and the Great Northern R.R. has built a spur to the mine. The shaft has been sunk 1100 ft., and a station cut on the 500-ft. level. The vein was opened in cutting this station, and drifting is in progress in both directions on the vein, both faces being in commercial ore. There are two carloads of ore in the bins, and it is believed that regular shipments will commence in two or three weeks. The officers and directors are: W. F. Smith, John A. Percival, Charles T. Fitzsimmons and Frank S. Sleeper, of Duluth: and Max Stevens, of Ironwood, Michigan.

Nevada

COMSTOCK LODE

Consolidated Virginia—A development of importance has just been made on the 2300-ft. level in the northeast drift, started 25 ft. from the mouth of the east crosscut from the shaft station. The vein has been encountered at a point about 140 ft. in, and 4 ft. of quartz in place has been opened up on the hanging wall. Car samples of the material saved, show the ore to be low grade at the place where found in the vein. The prospects ahead on this level are considered favorable, for the same vein has already been tapped a considerable distance to the north, but exploration was prevented on account of a large flow of hot water. The new pump equipment on the 2300 station is now equal to handling any amount of water that may be found and driving will be continued to develop the vein.

Union Consolidated—The west crosscut from the north drift, at a place 40 ft. south of the north boundary line has recently cut strong quartz stringers, and these will be followed both north and south.

Sierra Nevada—The north drift on the vein has entered a fault, which is now being crossed to pick up the vein on the other side. The fault strikes west of north, and is the third fault to be crossed since the exploration left the Union line.

Crown Point—The assays of the ore extracted recently show a gradual increase, the last report giving 421 mine cars sampling above $15 per ton. Ore is being shipped steadily to the Yellow Jacket mill.

CLARK COUNTY

Monte Cristo—Duncan & Fredrickson, who have this property under lease and bond, have opened zinc-carbonate ore near the surface. Shipments have been going forward for the last month at the rate of two cars per week, and the lessees are considering the purchase of a motor truck for the seven-mile haul to Jean.

CHURCHILL COUNTY

Nevada Hills Mining Co.—During September 3915 tons of $23 ore was milled for a recovery of $82,647 at a net profit of $49,790.

ESMERALDA COUNTY

Goldfield Consolidated Mines Co.—J. F. Thorn, general superintendent, reports that during the quarter ended Sept. 30, 94,145 tons of ore yielded $1,245,861. Operating costs totaled $581,923; construction costs, $2079; net operating realizations, $661,859.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Oct. 26, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,450	144,419
Tonopah Belmont	3,185	104,865
Montana-Tonopah	1,085	44,463
Tonopah Extension	1,050	43,123
West End	800	32,672
Midway	50	720
MacNamara	470	16,109
North Star...		266
Mizpah Extension		46
Jim Butler	300	3,100
Totals	10,390	389,677
Estimated value	$259,750	

North Star—A hoist has been installed on the 1250-ft. level and sinking on 4 ft. of good ore has been resumed.

Halifax—This company is installing a 300-hp. electric hoist and will sink the shaft from the present depth of 1400 ft. to the 3000-ft. level. A drift on the 1000-ft. level is being run on mill ore.

Jim Butler—A hoist has been installed on the 600-ft. level and sinking has been started on 3 ft. of good ore. A raise from this level on a parallel vein shows 6 ft. of good ore.

West End—The profits for September exceeded $40,000. An 18-drill Nordberg compressor has been purchased and the hoist is being increased to 150 horsepower.

New Mexico

SOCCORO COUNTY

Ernestine Mining Co.—The main tunnel, west, has opened new ore, 10 ft. wide, of excellent milling grade. This is the fifth oreshoot proved on the property. The main tunnel, east, is also entering pay ground. Both of these are in virgin territory. The first 20 days in October yielded 22,550 oz. of gold and silver bullion and 15,500 lb. of high-grade concentrates; 720 tons of ore was milled during the week ended Oct. 26.

Socorro—Drifts have been advanced 50 ft., both east and west, on the eighth level, and the three-compartment shaft is being sunk to ninth level. The 500, 700 and 800 levels are all yielding a good tonnage of milling ore.

Deadwood—Five bars of gold and silver bullion were shipped for second 10-day cleanup, in October. During the week ended Oct. 26, 350 tons of ore was milled and 35 ft. of development work done in mine. Fine milling ore is coming from the lowest level.

Oaks Co.—Eight out of the nine development headings now being advanced by this company are yielding a good grade of ore, which is being sent to the custom mills. Shipments for the week ended Oct. 26 amounted to 102 tons.

Deep Down—During the week ended Oct. 26, 90 tons of ore was shipped to the custom mill.

Utah

BEAVER COUNTY

Indian Queen—Lessees are still operating on this property, near the old Horn Silver and South Utah. Some lead ore is being mined.

Majestic—October shipments promise to exceed the record of the month preceding. Up to Oct. 24, 33 cars of copper-iron fluxing ore were shipped. There has been a shortage in railroad cars, which has retarded shipments. During the last week, two cars only could be secured, while 10 cars of ore were on hand awaiting transportation.

Revenue Consolidated—A small force of men is working at this property, 18 miles southwest of Newhouse. A tunnel has been driven 136 ft. on the contact of quartzite and white limestone. The objective point is an old shaft, in which ore carrying lead, silver and some gold, has been opened. Between 75 and 100 ft. remain to be driven.

Sheep Rock Mining & Milling Co.—A bond and lease have been taken on this property, in the Newton district, by Beaver County and St. Louis men. The ground consists of 10 patented claims, covering about 175 acres. During the Robinson brothers' lease, a good tonnage of high-grade gold ore was mined from two oreshoots, about 600 ft. apart, and within 40 ft. of the surface.

IRON COUNTY

Further prospecting and some development is being done on the Bull Valley gold discoveries, below Modena. Several small tunnels have been driven and open cuts made. One tunnel is in about 100 feet.

JUAB COUNTY

Tintic Standard—The new winze being sunk from the 1000-ft. level is down 40 feet.

Lower Mammoth — Shipments have been somewhat delayed by the shortage of railroad cars. Two carloads are in the bins awaiting shipment. More than half the force is working on development, but notwithstanding this, expenses or better will be made during October.

Chief Consolidated—An explosion of powder recently wrecked a part of the ore bins. The money loss is stated to be less than $500.

Dragon Consolidated—E. R. Higginson, who has been at the Black Jack has been transferred to this property, and is superintending the shipment of iron ore.

Gold Chain—Much prospecting is being done and ore is being mined. A drift from the Lower Mammoth has been driven into the western part of the property at a depth of about 700 ft. below the 1000-ft. level. Developments here are being watched with considerable interest.

SALT LAKE COUNTY

Cardiff—Preparations for continuing work during the winter are being made, and supplies are being hauled to the mine. Ore is being sent down, and shipments will be continued until the closing up of the road. Work has been resumed in the lower tunnel. A total of 15 men is employed at the property.

SUMMIT COUNTY

Park City shipments for the week ended Oct. 19, amounted to 3,167,400 lb.; for the week ended Oct. 26, to 3,153,420 lb. The principal shippers were the Silver King Coalition, Daly-Judge and Daly West.

Mines Operating Co.—This company, which has a 10-year lease on the Ontario to work old stope fillings, etc., has started operations by its new milling process, and reports that, aside from demonstrating the roasting capacity to be slightly insufficient, the new process is a success. The treatment consists of dry crushing, chloridizing roasting and cyaniding, an extraction of up to 90% silver is reported. A small tonnage of ore is being treated at present, and the mill will be brought up to full capacity in the near future.

Diamond-Nimrod—Suit was filed against this company, Oct. 24, by Harry Joseph, for the collection of $48,915, alleged to be due for money advanced and on various contracts during the last five years.

New York Bonanza—During September, shipments were made, the returns from which were sufficient to continue development work. This is being carried on in a new section of the property. The grade of the ore has been somewhat better, being reported to net the company around $15, exclusive of mining costs.

TOOELE COUNTY

Bullion Coalition—A steady production of between 250 and 300 tons of ore weekly is being made by this property, at Stockton, both by lessees and company.

Lion Hill Consolidated—A new strike is reported from the Chloride Point incline of this property, at Ophir. A narrow streak of ore, carrying silver chloride with some gold, has been cut, this being surrounded by lower-grade material. Silver ore has recently been opened in an 80-ft. raise from the East Side tunnel. About 20 men are employed.

Utah Mine—Thirty tons of good-grade silver-lead ore has been shipped from this property, at Fish Springs, 75 miles from Oasis, the nearest railroad station.

Washington

FERRY COUNTY

Harper Consolidated—This company is considering the erection of a large stamp mill for the property in the Republic district.

North Star—A 265-ft. shaft is being sunk on this property, and other improvements are to be made in the near future. Harry Wilson, Orient, is superintendent.

Mogul—A road is being built to this mine in the Orient district and preparations are being made for starting a long tunnel.

Surprise — The North Washington Power & Reduction Co. recently produced from this property a bar of gold bullion valued at $7800.

OKANOGAN COUNTY

El Dorado—This company has been organized by Henry Barrs and others of Oroville, for claims in that vicinity.

STEVENS COUNTY

Gray Copper—Some fine copper ore has been found in the tunnel on this property near Chewelah, and additional improvements are to be made. Oscar DeCamp is superintendent.

Wyoming

NATRONA COUNTY

The area of the Salt Creek oil field has been enlarged by the bringing in of a new well with a flow of 100 to 500 bbl. per day, owned by the Northwestern Oil Co., a Denver company. This field is 45 miles north of Casper. The Midwest company has enlarged its Casper refinery to 7000 bbl. per day and is said to be producing oil in excess of its refinery capacity, all tanks being full. The Salt Creek field was discovered last June and the oil-producing area is being rapidly increased.

Canada

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for September, 1912, were:

Beaver	55 12
Buffalo	124 91
Chambers-Ferland	73 29
Cobalt Townsite	241 78
Cobalt Lake	128 74
Coniagas	163 95
Dominion Reduction Co	56 65
Drummond	52 75
Hudson Bay	35 61
Kerr Lake	30 30
La Rose	315 23
McKinley-Darragh	151 79
Nipissing	179 24
O'Brien	107 70
Right of Way	32 60
Timiskaming	50 58
Trethewey	27.65
	1827 89

On the Elk Lake Branch of the Timiskaming & Northern Ontario Ry., steel has been laid across the Jean Baptiste River, 12 miles west of Earlton. About 140 men are at work at the following properties: Beacon Consolidated, Donaldson, Fleur de Lys, Cobalt Frontenac, Patricia, Regal, Sterling, Paragon, Cobalt, and the McKenzie.

Red Rock—Surface work has been started on this property, which has been leased by the Lost & Found Company.

Millerett—The concentrating plant at this Gowganda property has been closed, owing to the exhaustion of the supply of low-grade ore on the dumps. Negotiations are in progress for the leasing of the mill to the Miller Lake-O'Brien adjoining, while explorations for new ore are being made.

Cochrane—This mine has been taken over by the General Assets Co., of Montreal, and a contract let for the erection of camp buildings and the sinking of a shaft.

Cobalt Townsite The strike situation is looking more serious. The Cobalt branch of the Western Federation of Miners has taken up the cause of the strikers and the Timiskaming Mine Managers' Association is assisting the company in its endeavors to work the mine. The plant is closely picketed. Underground men are being offered $4 per day to go to work and 15 men have been secured. Some of the stamps at the Northern Customs mill, where the ore was being treated, have been hung up on account of shortage of ore.

Timiskaming & Hudson Bay—During the last year the company paid out $209,547 in dividends, being at the rate of 2700% on the capital. The mill treated 21,439 tons of ore making an average of 69.83 tons per day. The extraction was 86.44%. The average assay of the high-grade ore was 3431 oz. silver and the concentrates 853.73 oz. Three new veins were discovered and several thousand tons of milling ore developed. The work on the company's Gowganda property has proved costly and brought small results.

La Rose—Sinking is being continued at the 500-ft. level on the fault vein, which was picked up on the 380-ft. level.

Cobalt Lake—In the No. 6 workings, a shoot of high-grade ore has been developed.

Gould—The shaft will be sunk to the 200-ft. level and a crosscut run to pick up the vein which has been located on the Seneca property.

Green-Meehan—It is reported that the old company is about to resume control of this property; there has been some trouble with the leases.

Aladdin—This is the old Silver Queen mine; it has been taken over by an English syndicate. About 20 men are at work and development is being done on a vein in the Keewatin formation.

Nipissing—The hydraulic plant, which was used for surface prospecting last summer, has resulted in the discovery of 12 new veins. One of these shows high-grade ore on the surface and last month, from an open cut, $10,000 worth of silver was taken out of this vein.

Beaver—In the face of the main vein at the 600-ft. level, there is five inches of 2000-oz. ore. A new vein has also been found on this level running off in a westerly direction from the main vein. The mine has developed a large tonnage of milling ore and the mill capacity will in the near future be increased from 60 to 120 tons per day.

Provincial—On the 360-ft. level, a crosscut is being driven to explore the ground at this depth. The formation is conglomerate and is the deepest known in the camp.

Seneca-Superior—This company, successor to the Kerry Mining Co., on the Cort Lake and Peterson Lake leases, has cut two veins of high-grade ore in the 200-ft. crosscut from the shaft on Cort Lake. R. H. Lyman is manager and W. E. Segsworth and Kirby Thomas consulting engineers. Extraction from the new veins which will be called the "Worth" veins, after the president of the company, S. Harry Worth, of Philadelphia, will be commenced at once.

ONTARIO-PORCUPINE

Four claims in Gauthier and McVittie Townships, owned by A. Charlebois, F. Beauregard and Boissonault, of Haileybury have been sold to a Montreal syndicate for $250,000.

C. L. Sherrill has taken an option on the Shillington claim adjoining the Rea Mine. It is intended to prospect the property by shot and diamond drills.

Vipond - The principal stockholders have arranged to underwrite a bond issue of $125,000, the money to be used to erect a cyanide plant and to further develop the mine. The cyanide plant will be finished in about two months.

Northern Canada Power Co.—The Wawaietan Falls plant will be finished about the first of the year. This company also owns the plant at Sandy Falls which supplies power to the Hollinger, McIntyre, Pearl Lake, McEnaney, Vipond, Plenaurum and Jupiter.

Scottish Ontario—In the course of surface exploration on one of the group of claims held by this company in Whitney Township, a vein heavily impregnated with sulphides carrying gold and about 10 ft. wide has been encountered in slate and schist.

Apex—The new shaft is down 108 ft., at which depth sulphides appear in the vein which carries increased gold.

Krist—The shaft is being put down to the 130-ft. level in an endeavor to pick up some of the veins found on the adjoining McEnaney property.

Dome Extension—It is reported that this company has opened some pay ore on the 200-ft. level in the crosscut near the Dome boundary line.

Hughes—A two-stamp mill has been ordered for immediate installation for the purpose of testing ores, while plans are being completed for the larger mill. A temporary electric-lighting plant of 100-light capacity is being put in for use until the company can get power and light from the falls.

South America

DUTCH GUIANA

The official report gives the gold production of Dutch Guiana for the nine months ended Sept. 30, at 518,957 grams, or 16,684 oz.; a decrease of 170,629 grams from last year.

Two companies, writes David E. Headley, of Surinam, are now investigating the vein and placer deposits of cinnabar near the Marowyne River. The ore appears to be high grade; the gangue is quartz.

Asia

CHOSEN

Oriental Consolidated Mining Co.—The clean-up for October was $127,500. During September, 27,771 tons of ore was milled for a total recovery of $121,964.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Nov. 6—The coal trade in the West continues to be affected largely by transportation conditions. Car shortage is becoming serious, and the scarcity of supplies is the cause of complaint at many points. Much the same conditions exist in the Seaboard bituminous trade, but not quite to the same extent.

The anthracite trade is still behindhand, and the cold snap this week has brought out a call for supplies which dealers find much difficulty in meeting.

French Foreign Trade—Imports and exports of fuel in France, half year ended June 30, metric tons:

	Imports	Exports	Excess
Coal	7,217,100	1,068,779	Imp. 6,148,321
Coke	1,314,100	83,592	Imp. 1,230,508
Briquettes	528,100	98,663	Imp. 429,437
Total	9,059,300	1,251,034	Imp. 7,808,266
Total, 1911	9,892,100	772,379	Imp. 9,119,721

Exports this year include 140,701 tons coal furnished to steamships in foreign trade.

French Coal Production—Coal mined in France for half-year ended June 30, in metric tons:

	1911	1912	Changes
Coal	19,153,543	19,825,768	I. 672,225
Lignite	339,256	368,620	I. 29,364
Total	19,492,799	20,194,388	I. 701,58

Of the coal mined this year, 13,487,484 tons were from the departments of the Nord and Pas-du-Calais.

German Coal Trade—Exports and imports of fuel in the German Empire, eight months ended Aug. 31, metric tons:

	Exports	Imports	Excess
Coal	20,564,655	6,394,713	Exp. 14,169,92
Brown coal	35,107	4,779,051	Imp. 4,743,94
Coke	3,696,057	389,345	Exp. 3,306,71
Briquettes	1,776,947	111,532	Exp. 1,665,84
Total	26,072,766	11,674,641	Exp. 14,398,12
Total, 1911	21,942,438	12,068,750	Exp. 9,873,64

Exports this year included 24,618 tons of coke to the United States.

IRON TRADE REVIEW

New York, Nov. 6—As November opens there is some falling off in new business, which was not unexpected, and which is not unwelcome to many of the mills.

The near approach of election, usually considered a cause for slowing down of business, seems to have had very little effect this year. The rush of new orders and of specifications had been so great in October that a lull seemed inevitable. The mills will have some chance to work up to their deliveries more closely than they have been doing. No important changes in prices are noted, but there have been advances in one or two minor lines, such as chains and hoops.

Opinions differ a good deal as to what proportion of speculative business is included in the October rush of orders. Most of the larger producers have sought to avoid that class of business, but it is not always possible to discriminate.

Railroad orders for rails, and especially for cars have been prominent features of the October business, and more orders seem to be coming out.

The total production of rolled iron and steel in 1911, as officially reported, was 19,039,171 gross tons, against 21,621,279 gross tons in 1910, the record year. This is a more important item than the production of steel ingots and castings, reported last July. The present year's production of rolled iron and steel promises to approach 25,000,000 tons very closely, if it does not exceed that mark.

Pig iron continues active, notwithstanding the heavy tonnage taken last month. Prices are firm and the advancing tendency is strong. The coke situation does not improve, and production is limited by this cause. The scarcity of labor is also causing some delays, and helps to check the possible increase of production.

Coke has grown still scarcer, and Connellsville furnace coke of standard grade cannot be purchased at less than $4, for prompt shipment, while off grades are bringing close to that figure. Several merchant furnaces would have been blown in before this had it been possible to secure coke at a price commensurate with prevailing prices for pig iron.

Tinplate Trade—Recent changes in the foreign tinplate trade of the United States are shown by the following statement of imports and exports for the nine months ended Sept. 30; figures are in long tons:

	1910	1911	1912
Imports	53,808	12,769	1,502
Exports	8,395	42,557	66,722

Imports have practically ceased, while tinplates have become an export item of export. Of the exports in 1912, Canada took 36,702 tons; China, including Hongkong, 8700; Argentina, 3795; British India, 3630; Japan, 2902; Mexico and Brazil, each about 2000 tons; Cuba about 1100 tons. The remainder went to various other countries.

Baltimore

Nov. 4—Exports for the week included 13,600 lb. steel rails, 100,740 lb. track fastenings and 3,703,800 lb. steel billets to Liverpool; 1,578,435 lb. steel plates to Rotterdam; 1,149,107 lb. miscellaneous iron and steel to Havana; 1,598,786 lb. structural steel and 3,591,895 lb. miscellaneous iron and steel to Panama; 400 lb. selenium to Hamburg. Imports included 6050 tons manganese ore from Poti, Russia; 4593 lb. pyrites from Huelva, Spain; 4950 lb. iron ore from Cuba.

Cleveland

Nov. 4—Lake shipments, it now seems sure, exceeded 7,000,000 tons in October, and will reach a total somewhere over 45,000,000 tons for the season. Shipments from docks are still delayed by short car supply.

Pig Iron—Sales are good and there are some heavy inquiries in for basic pig. Prices are higher and firm. Quotations, Cleveland delivery, are $17.90 for bessemer, $17.10@17.25 for basic; $17@17.25 for No. 2 foundry and $16.25@16.50 for forge.

Finished Material—Pressure for delivery is not quite so strong, but business is good and prices are firm and still tend upward. Jobbers report business active in all lines.

Chicago

Nov. 5—Notwithstanding political distractions, the last week has recorded no check in the buying of iron and steel. Between 20,000 and 25,000 tons of pig iron have been sold, a fair aggregate for this market, and an improvement over the previous week's record. Prices are firm, holding to the high figures of the last two or three weeks. Northern No. 2 foundry iron brings $17.50@18, at furnace, which means about $18@18.50, delivered; Southern No. 2 foundry sells for $14@14.50, Birmingham, or $18.35@18.85, Chicago, with the higher price obtaining on most sales.

The buying is for first half or first quarter, many melters desiring to cover the bulk of their needs for the second quarter as well as the first, and there are some inquiries for third-quarter deliveries. Buying is frequent also for the supply of small lots needed to fill out requirements of melters who have bought conservatively in the past. The tone of the market is one of confidence in the continuation of present prices and conditions of buying. Election results do not seem likely to make any difference.

In the market for finished products there is a somewhat quieter tone, but nothing to indicate a decided change. Railroad buying continues heavy; structural material is somewhat less in demand, though there is a large number of small requirements that make a fair aggregate. Bars are much sought, but the capacity to supply them is wanting, and prices remain high with the prospect of the demand exceeding the supply for several months to come. Sheet and plate mills are filled with orders into the second quarter and the demand continues for their further products.

Philadelphia

Nov. 6—Active buying has continued during the past week in all lines of pig iron and and prices have hardened in a way that it is simply impossible to give definite figures. That is, different furnaces making the same kind of iron are asking different prices. Some furnace people are accepting first-quarter business where they can get it on their own terms and even second-quarter business. Furnaces are on the defensive. The recent heavy dealings in basic leave very little business to be done at present. Southern furnaces are making no effort to get business with the exception of giving attractive quotations on basic which will probably lead to business in a short time. Forge iron continues to sell freely and in some cases for later delivery than usual. The coke situation is a most disturbing factor. Fuel is advancing and the outcome of prices depends upon factors not yet in sight. No. 2 X foundry is $18.50; forge, $17.50; basic, $18.50; low phosphorus, $24 per ton.

Billets—Basic openhearth billets are nominally quoted at $30, but as high as $34 has been paid.

Bars—Iron bars are quite active in a wholesale and retail way at 1.65@1.70c., and steel bars are quoted as low as 1.60c., with a large volume of business seeking acceptance for forward delivery.

Sheets—Sheet mills are unable to accept all of the business which has been offered recently upon the terms of delivery insisted on by buyers.

Pipe and Tubes—The market appears to be unusually quiet, but this is merely due to the fact that nearly all consumers are well protected by contracts or stocks in hand. The consumption is remarkably heavy.

Plates—Steel plate is in very active demand and material for cars, ship work and, in fact, every kind of work calling for plate, is wanted for delivery extending in some cases into the spring months.

Structural Material—It is a fight between buyers and makers as to the placing of much business that is being presented. For the rest of the year there is very little capacity to be filled up and the railroad requirements are making themselves safe even as late as the second quarter.

Scrap—The scramble for scrap still continues, with a growing scarcity of supplies which amounts to a serious inconvenience in some cases.

Pittsburgh

Nov. 5—The local iron and steel market shows no material change in the week, unless for an accentuation of the quietness as to contracting and specifying against contracts which began to be noticed in some quarters three weeks ago. This is generally attributed partly to the shadow of the national election, and partly to the fact that engagements between producers and consumers are already enormous. It is not felt that it betokens any tendency toward weakness in the market, because a heavier pressure for prompt-delivery material is being experienced, resulting in the payment of premiums higher than ever. These are particularly marked for merchant-steel bars, which readily bring 1.80c. for carloads for prompt shipment, while ton lots out of store bring above two cents.

A large part of the contract tinplate business for next year has been closed in the past two or three weeks, including a majority of the important contracts for tinplate for packers' cans. Business with jobbers has been closed only for the first quarter. It is predicted in some quarters that an advance from $3.60 to $3.70 will be made within a few weeks when all the heavy business has been closed. An estimate is made of this year's production at 950,000 gross tons, which compares with 783,960 tons officially reported in the past week as last year's production.

Pig Iron—The pig-iron averages for October, compiled by a leading trade interest from actual sales of 1000 tons and over, are announced at $17, Valley, for bessemer, and $16.184, Valley, for basic, representing advances over September of $1.038 for bessemer and $1.05 for basic. The bessemer average was made up of about 50,000 tons, all sold at $17, this not including a fairly large tonnage sold by a furnace outside the Valleys. The basic average was made up of a slightly larger tonnage than the bessemer, largely of sales at $16@16.25, but there was a limited tonnage included at higher than $16.25. The market has been quiet the past week as regards actual sales, but there is greater pressure for deliveries, several of the furnaces being decidedly behind, partly by reason of consumers calling for heavier shipments and partly by reason of poor working of furnaces on account of irregularities in the quantity and quality of coke received. Premiums are obtainable on foundry iron for early shipment, and the market is not closely quotable on account of the absence of governing sales. We quote: Bessemer, $17; basic, $16.25; No. 2 foundry, $16.50@17; forge, $16@16.50; malleable, $16.25@16.75, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Shipments are behind on nearly all ferromanganese contracts, and buyers are seriously incommoded. It is difficult to place fresh contracts at the regular price, on account of uncertainties whether production can be maintained, on account of scarcity of ore. Prompt material is scarcely quotable, there being hardly any offered. We quote prompt nominal at $70@75, and contract at $61, f.o.b., Baltimore.

Steel—There are very few transactions in unfinished steel on account of limited offerings, but occasional sales indicate that the market is 50c. or $1 per ton higher. There are no offerings on contract for next year, the large mills stating it will require them to stay out of the market a quarter in order to get caught up. We quote, largely nominal: Bessemer billets, $26.50; sheet bars, $27; openhearth billets, $27.50; sheet bars, $28, f.o.b. maker's mill, Pittsburgh or Youngstown. Rod quotations of $29 have been withdrawn, and a few sales have been effected for delivery before the close of the year at $30, Pittsburgh, while the same price would rule on contracts for next year. Even at the advance, rods are low compared with billets.

Sheets—Specifications on contracts continue very heavy, and mills have fallen farther behind. They now have, on an average, more than enough business actually specified to carry them into January, with specifications still coming in at a fairly heavy rate against contracts expiring Dec. 31 and which are at considerably lower rates than those ruling for next year's contracts. The mills which have been ready to sell for next year now have the great bulk of their first-half production under contract, and those which have been reserved about selling, on account of uncertainties as to steel supply, are still practically out of the market. Premiums continue the rule for any early delivery. We quote: Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.50c.; blue annealed, 10 gage, 1.65c.; painted corrugated, 2.45c.; galvanized, 3.45c., Pittsburgh.

St. Louis

Nov. 4—The pig-iron market continues active. Sales are not quite so heavy. Agents are not pushing for business, most of them preferring to wait for better prices. On No. 2 Southern iron, $14 Birmingham, or $17.75 St. Louis, is the minimum price. A premium of 50c. per ton over this price is being generally asked for second-quarter delivery. Northern iron is being quoted around $18.50 St. Louis.

The demand for finished products continues to be exceedingly strong. All of the steel foundries and car shops have more than they can do.

Coke is very scarce; $6.50 St. Louis is asked for first-class Connellsville, with very little to be had. Byproduct coke is in excellent demand.

Iron Ore Trade

A charter is reported of a steamer to carry iron from a Spanish port to Philadelphia at 12s. 9d.—$3.06 per ton. This is said to be the highest rate for many years. Very little foreign ore can come here at such rates.

Lake Superior iron-ore shipments in October totaled 7,010,219 tons, making 43,348,601 tons moved down the lakes to Nov. 1. Estimating the wind-up of the season in relation to the October shipments, with an estimate of the all-rail movement for the year, a total season movement of 50,000,000 tons is indicated, passing the record total of 1910 by 6,560,000 tons, and the movement in 1907 and 1909, the next best years, by 7,500,000 tons. The season is ending with heavy pressure for the movement of ore, and an advance in prices of 50@75c. is probable for next year, with heavy shipments at the opening.

British Imports—Imports of iron and manganese ores in Great Britain nine months ended Sept. 30, long tons:

	1911	1912	Changes
Iron ore...........	4,972,955	4,845,023	D. 127,932
Manganese........	288,280	272,116	D. 16,164

The largest imports of iron ores are from Spain. There are practically no exports.

Sault Ste. Marie Canal Traffic

The total freight passing through the Sault Ste. Marie Canal in September was 10,467,782 short tons. This has never been exceeded except in August. The total freight reported for the season to Oct. 1 was, in short tons:

	1911	1912	Changes
East-bound......	26,630,196	39,613,431	I. 12,983,234
West-bound.....	12,807,971	12,339,277	D. 468,695
Total..........	39,438,167	51,952,708	I. 12,514,541

The total number of vessel passages this year was 16,543, showing an average cargo of 3140 tons. The mineral freights included in the totals were as follows, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal..............	11,564,977	10,865,581	D. 699,396
Iron ore	23,665,119	35,096,829	I. 11,431,710
Pig and mfd. iron.	301,545	459,756	I. 158,211
Copper	83,212	73,784	D. 9,498
Building stone.....	4,367	2,282	D. 2,085
Salt, bbl...........	480,277	486,719	I. 6,442

Iron ore was 67.2%, and coal 20.9% of the total freight this year.

METAL MARKETS

New York, Nov. 6—The metal markets show little change from the last report, and fluctuations have been small.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Sept. 1912	$ 568,302	$ 4,200,682	Imp $3,632,380
" 1911..	2,352,861	4,704,096	Imp 2,351,235
Year 1912..	43,728,274	38,789,793	Exp. 4,938,481
1911..	18,263,310	45,177,106	Imp. 26,913,796
Silver			
Sept. 1912..	6,011,221	3,648,883	Exp. 2,362,338
" 1911..	4,940,391	4,161,706	Exp. 778,685
Year 1912..	52,347,946	36,301,752	Exp. 16,046,194
1911..	49,527,961	33,696,430	Exp. 15,831,531

Exports from the port of New York, week ended Nov. 2: Gold, $14,056; silver, $1,286,280, to London and Paris. Imports: Gold, $131,678; silver, $111,836, from Mexico and South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was some competition for the supplies arriving, but not sufficient to draw out any premium prices.

Platinum—The market is steady and unchanged. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes under date of Oct. 24 that the market and prices are without change. Considerable quantities of platinum have been sold this fortnight. A new company, with a capital of $7,500,000 is founded for working platinum mines in the northern Urals. It is proposed to install five or six dredges on its mines. Till now these placers have been worked by the starateli.

The quotations are, in St. Petersburg, 37,500 rubles per pood; at Ekaterinburg, 9.80 rubles per solotnik, for crude metal, 83% platinum—equivalent to $36.75 and $36.85 per oz., respectively.

Iridium—Prices are firm and unchanged at $68@70 per oz., New York.

Palladium—There is some demand for this metal, and $72 per oz. is quoted.

Silver—The market has been quiet and dull with a lower tendency on account of higher rates for money, induced by the Balkan War. The market closes steady at 28 13/16d. in London.

SILVER AND STERLING EXCHANGE

Oct.-Nov.	31	1	2	4	5	6
New York....	62⅞	62½	62 [illegible]	62⅞		62⅝
London .	29	28⅞	29	29	28 13/16	28 13/16
Sterling Ex.	4.8570	4.8540	4.8560	4.8565		4.8555

New York quotations, cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Oct. 24, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India..	£7,275,600	£8,791,500	I. £1,515,900
China	989,700	1,066,000	I. 76,300
Total	£8,265,300	£9,857,500	I. £1,592,200

Imports of silver into France, eight months ended Aug. 31, were 184,399,000 fr.; exports were 178,098.000 fr.; excess of imports, 6,301,000 fr., against 35,155,000 fr. last year.

Copper, Tin, Lead and Zinc

NEW YORK

Oct.-Nov.	Copper		Tin	Lead		Zinc	
	Lake, Cts. per lb.	Electrolytic Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
31	17½ @17⅝	17.10 @17.15	50¼	4.95 @5.00	4.80 @4.82½	7.30 @7.40	7.15 @7.25
1	17.40 @17.60	17.05 @17.15	50⅜	4.87½ @4.90	4.72½ @4.75	7.30 @7.40	7.15 @7.25
2	17.40 @17.60	17.05 @17.15	50⅜	4.82½ @4.87½	4.67½ @4.72½	7.30 @7.40	7.15 @7.25
4	17.40 @17.60	17.05 @17.15	50⅛	4.70 @4.75	4.55 @4.60	7.30 @7.40	7.15 @7.25
5	......	......	...	......	......	......	.....
6	17.40 @17.60	17.10 @17.15	50	4.70 @4.75	4.55 @4.60	7.30 @7.40	7.15 @7.25

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Oct.-Nov.	Copper			Tin		Lead	Zinc
	Spot	3 Mos	Best Sel'td	Spot	3 Mos	Spanish	Ordinaries
31	75¾	[illegible]	[illegible]	[illegible]	[illegible]	19¼	[illegible]
1	75⅞	[illegible]	81	230	229¾	19	[illegible]
2							
4	75½	[illegible]	[illegible]	[illegible]	[illegible]	18 9/16	[illegible]
5	76	[illegible]	81	227½	[illegible]	18	[illegible]
6	76	[illegible]	81	228	228	18 1/16	[illegible]

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Copper—Although the week Oct. 31-Nov. 6 was a broken one, a larger volume of business than in the previous week was reported. Electrolytic copper was offered all along at 17¼c., delivered, usual terms, and that price was shaded materially on domestic business in order to make sales. Under this pressure by certain producers several million pounds were placed at receding prices. At the end of the week, however, it looks as if this selling had been finished and an improvement in the market is expected. The European statistics for the second half of October showed a decrease in the stocks of about 2300 tons, and reports from abroad are to the effect that consumers are poorly supplied and must soon come into the market. During the week no business in Lake copper has been reported, and quotations are but nominal. The market closes with Lake copper nominally at 17.40@17.60c.; electrolytic in cakes, wirebars or ingots at 17.10@17.15c.; casting copper is quoted nominally at 16.95@17.05c. as an average for the week.

The standard market has been without special feature and fluctuated within narrow limits, spot ruling around £75 10s. and three months £76 2s. 6d. At the close, the market was firmer, due to bear covering and some bull speculation, and the final figures are £76 for spot and £76 2s. 6d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 3697 long tons. Our special correspondent gives the exports from Baltimore at 3994 tons for the week.

Tin—The market ruled quiet but firm throughout the week. The figures published the beginning of the month once more established the very excellent statistical position of the metal. Speculatively this fact is also expressed in the confidence with which future material is being bought, so that spot and future prices in the London market are now on an equal basis. Business here is not very active, and while stocks in the hands of consumers must be very much diminished, they are aware that there is at present no scarcity of material and therefore are not anxious to replenish the same. The market closes steady at £228 for spot and three months in London, and about 50c. for November tin in New York.

Lead—The market has been weak. There has been considerable pressure to sell, in the face of a small demand. Consumption continues good, but buyers being well covered for the time being are holding off, apparently looking for lower prices. The close is quoted 4.70@4.75c., New York, and 4.55@4.60c., St. Louis.

The European market for lead has also declined, owing to the fact that there has been more lead offering and that the consumption has fallen off slightly, due to the decreased demand for white lead. At the close, Spanish lead is quoted £18 1s. 3d., English lead 2s. 6d. higher.

By a clerical or typographical error, we gave the London quotation for Spanish lead on Aug. 13, 1912, as £19⅞ instead of £19⅜, the latter figure being the correct one. The correct average price of Spanish lead in London for the month of August was £19.655, instead of £19.679, as then given.

Spelter—The market is unchanged. There is a fair demand, which is being freely met, and the metal is quoted 7.15@7.25c., St. Louis, and 7.30@7.40c., New York., according to delivery, metal for early shipment remaining somewhat scarce.

The London market is unchanged, good ordinaries being quoted £27 7s. 6d., specials £27 12s. 6d. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—The market continues strong and sales are good. Current quotations here are 27c. per lb. for No. 1 ingots, New York, for early delivery. Higher prices, up to 28@29c. per lb., are asked for futures.

The latest London quotation for ingots is £81@85 per long ton, according to size of order and delivery. This is equivalent to 17.60@18.47c. per lb., November and December delivery.

Antimony—Sales are good and the market is firm. Cookson's is quoted at 10⅜@10½c. per lb.; Hallett's at 9¾@10c.; while 9⅜@9⅝c. is named for Hungarian, Chinese and other outside brands.

Quicksilver—Business is good and the market here is steady, but with no material change in prices. New York quotations are $42@42.25 per flask of 75 lb., with 60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price has been reduced to £7 12s. 6d. per flask, with the same quotation given from second hands.

Nickel—Shot, blocks and plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Selenium—Producers of this metal quote large lots at $2.75@3.50 per lb., according to size of order; while as high as $4.50@5.50 is paid for retail lots.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 2—The highest premium price this week for zinc ore was $57; the base price of 60% zinc was $55@56. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED NOV. 2

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	749,970	....	884,700
Platteville	675,100	.....	82,000
Galena	641,800	....	....
Highland	294,000	....	....
Mineral Point	286,100	......	....
Shullsburg	260,000	147,700	....
Cuba City	250,950	....	121,660
Hazel Green	220,000	......	......
Montfort	70,000	....	....
Linden	66,260	....	....
Harker	62,950	....	....
Total	3,577,130	147,700	1,088,360
Year to date	168,985,850	7,218,960	31,129,950

Shipped during week to separating plants, 2,762,060 lb. zinc ore.

Joplin, Mo., Nov. 2—The high price for zinc sulphide ore was $61, the base per ton of 60% zinc, $52@58. Zinc silicate sold at $31@34 per ton of 40% zinc. The average price, for all grades of zinc, is $55.04 per ton. Lead, selling on a base of $61@62 per ton of 80% metal, brought no higher price than the top base price, no ore assaying over grade. The average of all grades of lead ore is $60.18 per ton.

SHIPMENTS WEEK ENDED NOV. 2

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,433,640	.....	634,340	$143,488
Joplin	3,037,140	.....	231,970	93,749
Alba-Neck	896,370	......	17,200	26,509
Galena	707,820	.....	156,810	24,680
Duenweg	553,270	......	51,510	17,061
Oronogo	375,300	.....	205,570	14,525
Carl Junction	405,700	......	......	12,374
Miami	377,790	.....	60,490	11,259
Granby	258,900	187,240	17,730	9,750
Cave Springs	248,370	......	11,310	7,170
Jackson	203,180	......	9,640	5,886
Spurgeon	57,480	218,990	18,840	5,811
Wentworth	88,020	......	.....	2,200
Lawton	65,590	......	......	1;870
Carthage	65 000	......	......	1,755
Sarcoxie	63,000	......	......	1,701
Quapaw	63,110	......	......	1,577
Totals	11,899,680	406,230	1,415,410	$381,365
44 weeks	473,857,100	29,768,510	79,149,240	$15,403,480

Blende val., the week, $332,046; 44 weeks, $12,676,621
Calamine the week, 6,723; 44 weeks, 469,726
Lead value, the week, 42,596; 44 weeks, 2,257,133

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41 85	$44.90	$40 55	$43.54	$55 68	$58.92
February	40 21	45.75	39 16	43 31	54 46	52 39
March	39.85	51.56	38 45	49.25	54.57	54.64
April	38.88	52.00	37 47	50 36	56 37	54 18
May	38.25	55 30	36 79	53.27	55 21	52.45
June	40 50	55 88	38.18	54 38	56 49	55 01
July	40 75	58 85	38 36	56 59	58 81	58 83
August	42 50	55 13	41 28	53.27	60 74	57 04
September	42 63	59 75	41 29	57 07	59 33	61.26
October	42.38	57 00	40.89	55.97	54.72	63 22
November	45 40	..	43 25	......	57 19	.
December	44.13	....	40.76	......	62 03	....
Year	$41.45	......	$39.90	......	$56.76	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore: the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Nov. 6—The general market continues active.

Arsenic—Receipts from Mexico have increased lately, relieving the situation greatly. The market is easier, $5@5.25 being paid for spot and $4.75 per 100 lb. for futures.

Copper Sulphate—Trade is good and the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is quiet and the market is a little easier, 2.57½c. per lb. being asked for all positions.

CURRENT WHOLESALE PRICES

Ammonium sulphate	cwt.	3.25@3.28
Arsenic, white	lb.	0.04¾@0.05¼
Barytes, ground	sh. ton	12.50@14.00
" floated	sh. ton	16.00@17.00
Calcium acetate, gray	cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls	sh. ton	70.00
Carbons, good drill quality	carat	85.00
Cement Port. Am.	400-lb. bbl	1.33
Chrome brick, f.o.b. Pittsburg	M	175.00
ore, 50%, ex-ship, N. Y.,	lg. ton	14.00@16.00
Copperas, bulk	cwt.	0.55
bbl	cwt.	0.65@0.85
Copper sulphate	cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg	ton	8.00@9.00
Magnesite, crude, 95%	lg. ton	10.00@11.00
calcined, powdered		30.00@35.00
brick, dom., f.o.b. Pittsburg	M.	160@180
Paints, litharge, Am. powd	lb.	0.07@0.07½
red lead, American	lb.	0.07@0.07½
white lead, Am., dry	lb.	0.05¾@0.06¼
zinc white, Am., dry	lb.	0.05⅛@0.06¼
Phosphates, acid:		
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75
Potassium cyanide, 95@96%	lb.	0.24
Pyrite:		
Domestic, non-arsenical, furnace size, f.o.b. R.R. per unit		0.12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit		0.13½
Imported, arsenical, furnace size, size, ex-ship, per unit		0.13@0.13½
Imported, fines, arsenical, ex-ship.		0.11½@0.12
Imported, fines, non-arsenical, ex-ship, per unit		0.12½

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton from furnace-size price is made when ore is delivered in large lumps.

Sodium cyanide, 120 to 130% KCN (per 100%)	lb.	0.21
nitrate 95% spot	cwt.	2.57½
95%, future	cwt.	2.57½
Sulphur, Louisiana prime, N. Y,	lg. ton	22.00@22.50
roll	cwt.	1.85@2.15
flour	cwt.	2.00@2.40
flowers, sublimed	cwt.	2.20@2.60
pow. com., bags	cwt.	1.50
Sicilian, crude brimstone	lg. ton	22.50
Zinc chloride, granular	lb.	0.04¼@0.04½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S.C.

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

The monthly report of the *Oil City Derrick* shows new wells completed in October as follows: Pennsylvania, New York and West Virginia, 534; Lima-Indiana, 56; Kentucky, 10; Illinois, 146; Kansas-Oklahoma, 739; Texas-Louisiana, 145. In all the divisions 1633 wells were completed, having a new production of 57,857 bbl. This was an increase of 108 in the number of wells and a decrease of 3371 bbl. in new production. Of the new wells, 276 were failures, and 167 were gas producers, being an increase of 14 dry holes and 12 gas wells. The number of oil-producing wells was 1190. In September, the productive wells numbered 1108, 1272 in August and 1092 in July. At the close of October there were 519 rigs up and 1644 wells drilling, a total of 2163. These figures show a decrease of 60 in rigs, an increase of 180 in wells drilling, and a net increase of 120. The most of the new work is found in the Mid-Continent field.

MINING STOCKS

New York, Nov. 6—On Oct. 31 the Exchange rallied a little, but declined and closed weak. On the Curb there was a good demand for copper stocks at slight advances. Other mining stocks also sold well and were fairly strong.

Nov. 1 trading on the Exchange was slow and changes small. The Curb also was slow and trading in mining stocks light. Nov. 2 the Exchanges were closed on account of the funeral of Vice-President Sherman.

Nov. 4 the Exchange was still weak and irregular, being affected to a considerable extent by the disturbances on the European markets. The Curb was inclined to be active, with some demand for mining stocks at generally firm prices. Nov. 5, Election Day, was a holiday.

The Listing Committee of the New York Curb Market Association has admitted to quotation the 900,000 common shares of the Oil Fields of Mexico Co., par value $5, of which 700,000 shares are outstanding; 200,000 shares of 7% preferred stock, par value $5, all outstanding; $1,000,000 6% bonds, due July 1, 1922, denomination $1000. Also 500,000 shares Lone Star Consolidated Mining Co., par $1 each.

At auction in New York, Oct. 31, a lot of 200 shares Colorado Fuel & Iron Co. common, $100 par, brought $35.12½ per share.

Boston, Nov. 5—It has been a dull and uninteresting week in the local stock market. Copper shares have been heavy for the most part without any particular offerings, although the final, up to election day, saw some stimulation in certain issues, which gave the market a good tone. There is very little incentive for trading, although sentiment continues optimistic as regards the metal shares.

Some strong spots have been witnessed in the cases of Granby, Mohawk, Old Dominion, Utah Consolidated, Wolverine, Superior Copper, North Butte and Calumet & Arizona; all of which showed advances.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	August	Sept.	October
Alaska shipments	1,242,836	1,726,715	
Anaconda	25,250,000	24,500,000	25,250,000
Arizona, Ltd.	3,260,000	3,340,000	.
Copper Queen	8,040,421	9,103,861	8,184,575
Calumet & Ariz.	4,514,000	4,462,000	4,404,000
Chino	3,437,309	3,372,369	.
Detroit	1,882,289	1,881,668	1,934,828
East Butte	1,410,500	1,250,000	
Mammoth	1,802,590	1,834,937	
Mason Valley	1,384,000	1,200,000	
Nevada Con.		5,607,578	. .
Ohio	.		
Old Dominion	2,597,896	2,204,000	
Ray	2,888,095	2,978,405	
Shannon	1,400,000	1,142,000	1,250,000
South Utah	224,855	225,568	
United Verde*	2,500,000	2,750,000	
Utah Copper Co.	11,248,992	6,616,887	
Lake Superior*	21,000,000	19,250,000	
Non-rep. mines*	8,970,000	4,100,000	.
Total production		....	....
Imports, bars, etc.	23,561,161	....	....
Total blister		..	
Imp. in ore & matte	8,544,624	. ..	....
Total American			..
Miami	3,048,750	2,949,150	.
Brit. Col. Cos.:			
British Col. Copper	941,364		..
Granby	1,970,388	2,083,118	..
Mexican Cos.:			
Boleo†		. .	...
Cananea	4,044,000	3,500,000	...
Moctezuma	3,229,839	771,844	3,045,667
Other Foreign			
Cape Cop., S. Africa	...	....	. ..
Kyshtim, Russia	. ..	.	.
Spassky, Russia	902,720	981,120	....
Famatina, Argen.	....		. .
Tilt Cove, Newf'd.		....	... ...
Exports from			
Chile	8,512,000	6,048,000	. .....
Australia	8,064,000	7,616,000	. . ..
Arrivals in Europe‡	20,200,320	8,518,720	....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
X, 1911	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	64,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796
X	......		......

VISIBLE STOCKS

	United States	Europe	Total
XI, 1911	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	63,065,587	107,408,000	170,473,587
XI	....	103,801,600	. ...

Curb trading has been low and price changes unimportant for the most part. Butte Central has recovered some of its recent loss. This stock will go to the New York Curb during the week. Some of the penny stocks have been fairly active.

Assessments

Company	Delinq	Sale	Amt.
Alpha Con., Nev	Nov. 13	Dec. 4	$0.03
Best & Belcher	Nov. 6	Nov. 25	0 05
Big Elk, Ida	Oct. 9	Nov. 10	0.001
Black Horse, Ida.	Oct. 18	Nov. 8	0.01½
Buffalo, Ida	Oct. 28	Nov. 28	0 002½
Consolidated Virginia, Nev.	.....	....	0 15
Crown Point, Nev	Nov 11	Dec. 4	0.10
Crown Point, Utah	Nov. 15	Dec. 10	0.01
Eastern Star, Ida	Oct. 12	Nov. 12	0.003
Exchequer, Nev	Oct. 30	Nov. 20	0.03
Franklin, Mich.	Oct. 18	....	2 00
Laclede, Ida	Nov 18	Dec. 9	0.003
Holy Terror, Ida	Oct. 18	Nov. 18	0.00¼
Hugo, Ida.	Nov. 9	Dec. 9	0.001
Indiana, Mich.	Oct. 16	....	1 00
Lucky Calumet, Ida.	....	Nov. 8	0.005
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Melcher, Utah	Nov. 23	Dec. 12	0 02
National Copper, Ida.	Nov. 15	Dec. 10	0 01
Oneco, Mich	Oct. 10	....	1 00
Ophir, Nev	Nov. 11	Dec. 9	0.15
Rhode Island, Ida	Oct. 31	Nov. 30	0 00½
Sunshine, Ida	Oct. 30	Nov. 30	0 001
Tar Baby, Utah	Nov. 2	Dec. 2	0.002½
Utah Ideal, Utah	Oct. 9	Nov. 10	0.0⅛
Yellow Jacket, Nev	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52 375	53.795	56 260	24.154	24 865	25 887
February	51.534	52.222	59 043	23.794	24 081	27.190
March	51 454	52 745	58.375	23 690	24.324	26.875
April	53 221	53.325	59.207	24.483	24.595	27.284
May	53 870	53.308	60 880	24.797	24 583	28 038
June	53.462	53 043	61 290	24 651	24 486	28 215
July	54.150	52 630	60 654	25 034	24 286	27.919
August	52 912	52.171	61 606	24 428	24 082	28 375
September	53 295	52 440	63 078	24 567	24 209	29 088
October	55 490	53.340	63 471	25 596	24 594	29 299
November	55 635	55 719		25 680	25 649	
December	54 428	54 905	..	25.160	25.349	
Year	53 486	53 304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55 600	62.760
February	12.256	14.084	12.611	14.329	54.974	62 893
March	12 139	14.698	12.447	14.868	54.704	65.884
April	12 019	15 741	12.275	15.930	54.034	70.294
May	11.989	16.031	12 214	16 245	54 313	72 352
June	12.385	17 234	12.611	17 443	56.365	78 259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12 405	17.498	12 634	17 644	56 266	78 670
September	12.201	17 508	12.508	17.698	55.253	78.762
October	12 189	17.314	12.370	17.661	55.170	76.389
November	12.616	.	12.769	.	57.253	
December	13.552		13.768		62 068	
Year	12.376		12 634		55 973	

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	44 519
February	41 614	42 962	August	43 319	45 857
March	40 157	42 577	September	39 755	49.135
April	42 185	43 923	October	41 186	50 077
May	43.115	46.053	November	43.125	
June	44 606	45 815	December	44 655	.
			Av. Year	42 281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4.435	4 334	4.327	13 009	15 597
February	4 440	4.026	4 266	3 946	13 043	15 738
March	4.394	4.073	4 238	4.046	13 122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4 373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13 260	17 588
July	4 499	4 720	4 397	4 603	13 530	18 544
August	4 500	4 569	4 406	4 452	14 260	19 655
September	4 485	5 048	4 356	4 924	14 744	22.292
October	4 265	5.071	4 139	4.894	15 332	20 630
November	4 298	.....	4.181	.	15 821	
December	4.450	.....	4.332	......	15.648	.
Year	4.420	..	4 286	...	13 970	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23 887	26.642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5.563	6.626	5 413	6.476	23 016	26.048
April	5 399	6.633	5 249	6 483	23 743	25 644
May	5 348	6.679	5.198	6.529	24 375	25 790
June	5 520	6.877	5 370	6 727	24 612	25.763
July	5 695	7.116	5 545	6 966	25 006	26 174
August	5 953	7.028	5 803	6 878	26 801	26 443
September	5 869	7.454	5 719	7 313	27 750	27 048
October	6 102	7.426	5.951	7.276	27 256	27.543
November	6.380	.....	6.223	.	26.795	......
December	6.301	......	6.151		26 849	.
Year	5.758	......	5.608	..	25 281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15 90	$15.12	$14 40	$13.32	$14 75	$14.00
February	15 90	15.03	14 50	13 28	14 81	14.01
March	15.90	14.95	14 65	13 66	14 96	14.10
April	15 90	15.13	14 65	13 90	15 00	14 15
May	15 90	15.14	14 30	13 90	14 72	14.12
June	15 90	15.15	14 06	14 11	14 56	14.22
July	15 90	15.15	14 03	14 38	14 53	14 38
August	15 90	15.43	14 00	14 90	14 47	14 85
September	15 90	16.86	13 57	16 03	14 40	15.63
October	15 43	17 90	13 44	17 18	14 34	17 22
November	14 92	..	13 30	....	14 25	.
December	15.15		13 10	....	13.90	.
Year	$15 72	..	$13 94		$14.49	.... .

STOCK QUOTATIONS

COLO. SPRINGS Nov. 4

Name of Comp.	Bid.
Acacia	.04¼
Cripple Cr'k Con.	01½
C. K & N	17½
Doctor Jack Pot	05⅞
Elkton Con	65⅛
El Paso	5.38
Findlay	04½
Gold Dollar	18¾
Gold Sovereign	.02⅜
Isabella	.21⅛
Jack Pot	‡ 04½
Jennie Sample	.06½
Lexington	007
Moon Anchor	01
Old Gold	‡ 03½
Mary McKinney.	.73
Pharmacist	.01½
Portland	1 00
Vindicator	89
Work	‡ 01

SALT LAKE Nov. 4

Name of Comp.	Bid.
Beck Tunnel	08
Black Jack	10
Cedar Talisman.	01
Colorado Mining.	.15
Columbus Con.	10
Crown Point	02
Daly-Judge	‡5.90
Grand Central	66
Iron Blossom	1 10
Little Bell	‡ 20
Lower Mammoth	06
Mason Valley	12.00
May Day	15
Nevada Hills	1 40
New York	‡ 01
Prince Con	1 77½
Silver King Coal'n	2.95
Sioux Con	.02½
Uncle Sam.	.13
Yankee	.15

TORONTO Nov. 5

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 50	Foley O'Brien	.22
Hudson Bay	‡63.00	Hollinger	15 00
Temiskaming	39	Imperial	.02¼
Wettlaufer-Lor.	25	Pearl Lake	22
Am. Goldfield	‡ 40	Porcu. Gold	.18¼
Apex	‡ 01⅞	Preston E. D.	.03
Crown Chartered.	03½	Rea	33
Dobie	25	Standard	‡ 01
Dome	20 00	Swastika	08¼
Dome Exten.	.11½	West Dome	‡ 13

SAN FRANCISCO Nov. 4

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	‡.05	Belmont	9.12½
Belcher	.25	Jim Butler	.72
Best & Belcher	‡ 04	MacNamara	.21
Caledonia	‡.90	Midway	.45
Challenge Con.	‡.05	Mont.-Tonopah	2.05
Chollar	‡.03	North Star	.39
Confidence	‡ 45	West End Con.	1.62½
Con. Virginia	.31	Atlanta	.18
Crown Point	.36	Booth	‡.06
Gould & Curry	‡ 02	C.O.D. Con	.07
Hale & Norcross	‡.14	Comb. Frac	.12
Mexican	‡2 60	Jumbo Extension	.33
Occidental.	‡ 70	Pitts.-Silver Peak	.87
Ophir	‡.41	Silver Pick	.07
Overman	‡.45	St. Ives	‡.30
Potosi	‡.03	Tramp Con	.02
Savage	‡ 10	Argonaut	‡2.00
Sierra Nevada	‡ 39	Bunker Hill	‡4.50
Union Con	.62	Central Eureka	‡.20
Yellow Jacket	.40	So. Eureka	‡2.00

N. Y. EXCH. Nov. 4

Name of Comp.	Clg.
Amalgamated	83½
Am. Agri. Chem.	58
Am.Sm.&Ref.,com	82½
Am. Sm. & Ref., pf.	107½
Am. Sm. Sec., pf. B	85½
Anaconda	43
Batopilas Min	1⅜
BethlehemSteelpf	74
Chino	45⅝
Federal M. & S., pf.	45½
Goldfield Con	2⅝
GreatNor.,ore.,ctf.	47
Guggen. Exp	‡54¼
Homestake	‡98½
Inspiration Con.	19⅜
Miami Copper	27¼
Nat'nalLead,com.	63
National Lead, pf.	109½
Nev. Consol	21
Phelps Dodge	‡215½
Pittsburg Coal, pf.	92
Ray Con	21¾
Republic I&S,com.	31¾
Republic I & S, pf.	92⅛
SlossSheffi'd,com.	54
Sloss Sheffield, pf.	95
Tennessee Copper	40¾
Utah Copper	62⅛
U. S. Steel, com	76
U. S. Steel, pf.	‡114
Va. Car. Chem	47¼

N. Y. CURB Nov. 4

Name of Comp.	Clg.
Barnes King	‡ 60
Beaver Con	.42
Braden Copper	7
B. C. Copper	4½
Buffalo Mines	2¼
Caledonia	40
Con. Ariz. Sm.	½
Davis-Daly	2⅛
Diam'field-Daisy.	6
Ely Con	20
Florence	77
Giroux	4⅝
Gold Hill Con	5/16
Greene Cananea.	9⅞
Greenwater	05
Internat. S. & R.	‡124
Kerr Lake	2¾
Keystone	2
La Rose	2½
McKinley-Dar-Sa.	1⅞
Min. Co. of A. new	2⅞
Motherlode Gold.	‡15/16
Nev. Utah M. & S.	‡ 01
Nipissing Mines.	8⅛
Ohio Copper	1 9/16
Pacific Sm. & M.	¼
Puebla S. & R.	‡1 11/16
South Live Oak	2
South Utah M. & S.	⅝
Standard Oil (Old)	1110
Stand'd Oil of N.J.	394
Stewart	1 5/16
Tonopah	6⅝
Tonopah Ex	2 7/16
Tonopah Merger	.96
Tri-Bullion	¾
Tularosa	1 1/16
Union Mines	‡ 10
United Cop., pfd.	10
Yukon Gold	3 5/16

LONDON Nov. 6

Name of Com.	Clg.
Camp Bird	£1 5s 3d
Dolores	1 10 0
El Oro	1 1 3
Esperanza	1 19 3
Mexico Mines	6 15 0
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 7 0

BOSTON EXCH. Nov. 4

Name of Comp.	Clg.
Adventure	6
Ahmeek	330
Algomah	‡3
Allouez	39½
Am. Zinc	30¾
Ariz. Com., ctfs.	‡3⅜
Bonanza	.30
Boston & Corbin	6
Butte & Balak	3⅞
Calumet & Ariz	76⅝
Calumet & Hecla	550
Centennial	19
Cliff	‡3
Copper Range	54½
Daly West	3¾
East Butte	15
Franklin	10
Granby	65
Hancock	22½
Hedley Gold	25
Helvetia	75
Indiana	14¼
Island Cr'k, com.	55
Island Cr'k, pfd.	‡86½
Isle Royale	31⅝
Keweenaw	‡2
Lake	27¾
La Salle	4¾
Mass	6⅜
Michigan	1½
Mohawk	62
New Arcadian	‡2½
New Idria Quick.	7
North Butte	34⅛
North Lake	3½
Ojibway	‡3
Old Dominion	59⅜
Osceola	107⅜
Quincy	81⅛
Shannon	14
Shattuck-Ariz	28
Superior	41
Superior & Bost.	‡1¾
Tamarack	41
Trinity	4¼
Tuolumne	2¾
U. S. Smelting	45⅛
U. S. Smelt'g, pf.	50½
Utah Apex	2
Utah Con	11¼
Victoria	2½
Winona	4
Wolverine	76½
Wyandot	1¼

BOSTON CURB Nov. 4

Name of Comp.	Last
Alaska Gold M.	8½
Bingham Mines	4¾
Boston Ely	1
Boswyocolo	01½
Butte Central	6½
Cactus	07
Calaveras	2 11/16
Chief Cons	1¼
Corbin	[illegible]
Cortez	[illegible]
Crown Reserve	3 7/16
First Nat. Cop.	2 1/16
Majestic	41
Mazatan	‡¼
Moneta Porc	‡ 04½
Nevada-Douglas.	3⅜
New Baltic	1¾
Oneco	2
Raven Copper	.30
Rhode Island Coal	‡ 22
San Antonio	‡3
Smokey Dev	2½
S. W. Miami	5¼
South Lake	6¼
Trethewey	‡.30
United Verde Ext.	.53

‡Last quotation.

The Engineering and Mining Journal

Vol. 94 NOVEMBER 16, 1912 No. 20

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres Robt McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 31—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Slime-Filtering Decision

One of the metallurgical patent disputes of the first magnitude was concluded last week by the decision of the U. S. Circuit Court of Appeals for the Third Circuit in the case of the Moore Filter Co. vs. the Tonopah-Belmont Development Co., which in effect was the Moore filter vs. the Butters. This case had been pending for many years and had been the subject of many wars of words, both within and outside of the courts, being a case of the same magnitude as those respecting the cyanide process, the mechanical roasting furnaces, and the still pending flotation process. Butters won in the Circuit Court, Moore appealed and has now won in the higher court. The main part of the decision handed down by Judge Buffington, which upholds the validity of U. S. patent 764,486, granted on July 5, 1904, to George Moore, is given elsewhere in this issue of the Journal.

The decision is extraordinarily sweeping. This is no matter of a particular apparatus, but rather the upholding of the broadly claimed process of slime filtration outlined by Mr. Moore in his patent specifications. "After a careful study of Mr. Moore's patent," says Judge Buffington, "We have reached the conclusion that his process is a radical departure from the whole prior art and was an original and pioneer step in metal recovery by filtration. Like all important inventions its merit is its simplicity, and its novelty consists in his utilizing the simple elemental processes of nature. These processes he has, of course, neither discovered nor invented, but he has utilized them in combination in a manner never before used and has thereby secured a new result."

Being of the opinion that Moore's process was novel, useful and inventive in character, and that his patent is valid, the court turned to the question of infringement, taking up the fourth and fifth claims as furnishing sufficient basis for deciding that question insofar as the device of the defendant in this case is concerned. These claims are as follows:

> (4) A filtering process comprising submerging a filtering medium in a material to be filtered, drawing the liquid being filtered from said material through said medium until a deposit of solids is formed upon the medium, removing the medium from the material being filtered, further impoverishing the solids by a cleansing operation, and removing the solids from the medium by passing a cleansing current through said medium.
>
> (5) A filtering process comprising submerging a filtering medium in the material to be filtered, drawing the liquid being filtered from said material through said medium, removing the medium while continuing the drawing action, passing a cleansing fluid through the medium, and then passing a cleansing current through said medium.

The court held that the Butters filter infringed both of these claims. Manifestly the decision of the court is so broad that many of the other slime filters are put in jeopardy.

The decision of a circuit court of appeals in a patent case is commonly final in present practice, patent cases being no longer open to appeal to the Supreme Court in the former way. Decisions of a circuit court of appeals may be brought to review by the Supreme Court by certiorari, but the Supreme Court is unlikely to take up the case unless there has been some abuse of power or flagrant mistake by the lower court. However, the decision of a circuit court of appeals is binding as legal precedent only within the jurisdiction of that particular court. By the introduction of new and material evidence a new trial may be inaugurated within another circuit, and if carried to its court of appeals and there awarded a decision contrary to that rendered in the other court of appeals, the case may be taken to the Supreme Court, which under these circumstances would undoubtedly accord to it a hearing. Such a sequence of events is, however, unusual, and probably the slime-filter case may now be taken as settled.

With this decision the Moore Filter Co. will have a great power over the mining and metallurgical industry. Much will depend upon the moderation and good judgment with which this power is exercised. Infringers of the Moore patent will probably have to make up their minds to pay the owner of that patent for the use of it. If the aforesaid owner is temperate, and better yet, lenient, it will probably reap the best of the reward to which the Court of Appeals has declared it to be entitled. If, on the other hand, it adopts a harsh policy and attempts to exact an exorbitant toll, it will probably realize least in the long run. Probably there is no patent that cannot, and will not, be broken or circumvented if the public be pushed to the extremity.

Iron Contents of Lake Superior Ores

An interesting series of tables has been published by the *Iron Trade Review*, giving shipments and analyses of iron ores from the Lake Superior region over a series of years, and showing a steady decline in the average iron contents of those ores. It is true that these contents show an average decrease of 3 to 5% only; but a loss of even 1% on the Lake shipments, which will probably reach 50,000,000 tons this season, is a matter of considerable importance.

Those familiar with the iron-ore situation at the Lake Superior mines, have long realized this condition. The decline, however, has now reached a point where practical recognition of the facts must be made, and it is expected that this will lead to a further lowering of the guaranteed metallic iron content of the ores, which forms the basis of sales. Prior to 1907 the base for Old Range bessemer ores was a hypothetical ore, containing 63% metallic iron, 0.045% phosphorus and 10% moisture, giving a natural iron content of 56.70%. In the same period the base for nonbessemer ores was a hypothetical ore containing 60% metallic iron and 12% moisture, giving a natural iron content of 52.80%. An exception to these was Mesabi nonbessemer for 1905 and 1906, when the natural iron content was 53%. Before the 1907 sales were made, the bases were changed. The hypothetical ore for Old Range and Mesabi bessemer became one having 55% metallic iron and 51.50 for Old Range and Mesabi nonbessemer.

The average percentage of iron in the total shipments of bessemer and nonbessemer ores from the old ranges, has decreased from 56.3991 in 1902 to 53.5859 in 1911; and from the Mesabi Range from 56.0663 in 1902 to 51.1842 in 1911. The decrease is occurring much more rapidly in the Mesabi ores than in the Old Range ores, and this is accompanied by a proportionate increase in the phosphorus content. In 1902 about 80% of the Mesabi ores shipped were bessemer, while in 1911, the percentage was only 50 per cent.

The rapid decline in the grade of the Mesabi ores means much for the other ranges. The Michigan ranges will again assume more importance and will offer more attractive fields for exploration than they otherwise might. In doing this, they will fulfill the predictions that have been made by several iron-ore experts in recent years. In Minnesota, both the Cuyuna and Vermilion ranges will benefit, as it will tend to put them on a more nearly competing basis. The next few years will undoubtedly witness a marked revival of activity on the Vermilion, and a great expansion of exploration on the Cuyuna. Not the least effect, however, will be to stimulate interest in the search for successful methods of treating low-grade ores on all the Lake Superior ranges, both in the United States and Canada. Sufficient advances have been made along this line of late years, to indicate that the problems are going to be solved satisfactorily, and probably before long.

The Copper Statistics

The report of the Copper Producer's Association for October shows that the refinery production, which is now about in step with the smelters', will probably continue to run over 140 million pounds per month; and that this is in excess of the present demand, wherefore the accumulation is likely to continue to increase. The smallness of the exports in October was because Europe had been supplying itself out of its own accumulation, which it was able to do on more favorable terms than America offered. The extraordinarily large American deliveries were due in part to the forwarding of supplies of Lake copper in anticipation of the closing of navigation, and perhaps to anticipatory shipments from other quarters. Really the statistics of the mouth are less favorable even than they look, but in a consideration of the figures month by month, no very sound deductions may be drawn.

The Mexican Situation

The recent silence of the daily newspapers respecting revolutionary affairs in Mexico lends additional color to the suspicion that the dispatches from that country have been issued for a purpose to a more or less extent. Manifestly the daily press has been too much occupied lately to attend to Mexico. Consider that during the last two months there have been such weighty affairs as

The Baseball Championship.
The Trial of Lieut. Becker.
The Shooting of Mr. Roosevelt.
The Turco-Bulgarian War.
The Presidential Election.

and what room has there been for Mexico? The last time it was in our mind we were on tenterhooks respecting Felix Diaz. Would he be shot, or wouldn't he? We are still in ignorance, the daily press not having taken the trouble to inform us. We wonder if it is true that Mexico is gradually and quietly straightening out its troubled affairs? Anyway, it is reported from Sonora that the dispersing of the rebels and bandits in that state has created an outlook for the mining industry that is more favorable than for many months heretofore.

The prospect of the new congress being called in special sesion for the specific purpose of revising the tariff makes the terms of the Underwood bill introduced in the second session of the 62d congress of especial interest as an indication of what may be expected from the Democratic control. Mr. Underwood proposed to tax steel ingots, blooms and slabs, at 10% *ad valorem;* aluminum at 25%; antimony and antimony ore at 10%; lead bearing ore at 25% upon the lead contained therein; lead in pigs, bars and base bullion at 25%; nickel and nickel oxide at 10%; quicksilver at 10%; zinc (in blocks or pigs), zinc dust and sheet zinc, 15%. The free list was to comprise iron ore, manganiferous iron ore, pyrites cinder, tungsten ore and zinc ore.

By the Way

A Johannesburg dispatch announces the finding, in the Premier mine, of a 1649-carat diamond, the second largest ever discovered. The new stone, according to the dispatch, is more than half the size of the Cullinan diamond, which came from the same mine, and has black streaks, but experts consider them to be only surface flaws.

A truth which is not generally recognized is that a large part of the European production of radio-active mineral originates in the San Juan district of Colorado, and is shipped from Placerville, San Miguel County. An engineer who is familiar with the details of the subject states that in his opinion this district will ultimately become more famous for its production of radium, uranium and vanadium than for its output of gold and silver.

Seven coal-mining companies in the Kanawha coal field in West Virginia have filed suits, asking damages aggregating $750,000 in the Federal Court for the Southern district of West Virginia against nonresident officers of the United Mine Workers of America, and in the Circuit Court of Kanawha County against local officers of the miners' union. The plaintiffs charge unlawful interference with the operation of their mines during the recent strike, intimidation of miners and destruction of property.

Sir William Ramsay has said in interview with the Boston *American*: "Every factory which has anything to do with manufacture of copper or treatment of copper is producing selenium and tellurium as a byproduct. Nobody knows what can be done with them. Here is a chance for some bright young American students to go to work with patience and determine to solve the problems of the identity and properties of these two substances. There may be a fortune for somebody in this one field of research." And then again, it may be the company that will get the fortune.

In commenting on the market for Comstocks, the San Francisco *Chronicle*, of Nov. 1, says: "After whipping Sierra Nevada up and down for several days on the strength of a reported orebody, the Bush-street manipulators laid violent hands on poor old Con. Virginia yesterday and forced the decrepit to produce a "strike," which struck very deeply into the imaginations of the paranoiacs who revel in that sort of thing. The stocks advanced to 42c. bid at the close, which is nearly the sum of the last two assessments."

The Eastern Texas Brown Ore Co. has advanced so far in the development of its mines, that the ore is to be offered to furnaces for delivery early next year. The ore is a brown hematite, which runs about 52 per cent. in iron natural and around 0.09 per cent. in phosphorus with a trace of sulphur. The new railroad line which will give this ore an outlet to the Gulf of Mexico at Port Bolivar is completed and the mining equipment and plant are being installed. Steamship arrangements for transporting the ore to the eastern Pennsylvania seaboard have been practically made.

High finance in public-service corporations in New York has lost its glamour. Here is the Public Service Commission refusing permission to the New York Railways Co. to issue bonds for 175 new cars to displace the same number of old ones. The commission held that the old cars having been already charged to capital account, only the difference between the first cost of the new and of the old cars should be funded. What is the opportunity for a Napoleon of finance under such restraint? The New York Railways Co. has nothing to do with the mining industry, but there are many mining and metallurgical companies that do just what it used to do and delude their stockholders in the same way.

The holidays in Mexico and South American countries are recognized by all long-suffering mine managers as an unmitigated nuisance. The same feeling is more and more coming to be held in the anthracite coal field of Pennsylvania. In one week recently more than half the time was lost. These holidays are filled with hilarity and boisterousness stimulated by the drinks, which are never absent. On this account a single holiday may mean two days away from work. The situation regarding miners' holidays was described to the *Wall St. Journal* by a man on the ground, as follows: "The past week the miners celebrated Mitchell Day on Tuesday, All Saints' Day on Friday, All Souls' Day on Saturday, but endured All Hell's Day on Sunday."

An engineer requested advice respecting procedure in a case where he had reason to believe that his client would fail to pay him the balance due upon a mining report when that report should be delivered, and asked if it be customary among engineers, and in conformity with professional ethics, to send such a report through a bank with draft attached. There is nothing unprofessional in the suggested procedure, so far as we can see, but it is not common. The business of a mining engineer, like all other business, rests in the main upon credit and confidence. The transmittal of a report through a bank with draft attached implies, of course, that the engineer has no confidence in the integrity of his client, and resenting this the client might refuse to accept the report unless it were a necessity to him. However, every engineer probably will recollect regretfully some occasion in his experience when he ought to have done just this thing.

"When it is time to go to work the sound of a great bell gives the workmen warning, and when this is heard they run hither and thither through the streets toward the mines. Similarly, the same sound of the bell warns the foreman that a shift has just been finished; therefore as soon as he hears it, he stamps on the woodwork of the shaft and signals the workmen to come out. Thereupon, the nearest, as soon as they hear the signal, strike the rocks with their hammers, and the sound reaches those who are furthest away. Moreover, the lamps show that the shift has come to an end when the oil becomes almost consumed and fails them. The laborers do not work on Saturdays, but buy those things which are necessary to life, nor do they usually work on Sundays or annual festivals, but on these occasions devote the shift to holy things. However, the workmen do not rest if necessity demands their labor; for sometimes a rush of water compels them to work, sometimes an impending fall, and at such times it is not considered irreligious to work on holidays." *Agricola* (Hoover trans.) This raises the question whether the old Germans, and even the Mexicans and Peruvians of today, were not wiser than we are. There are other things than dividends.

The best arranged schemes of mining men aft gang aglee, and sometimes very unexpectedly. A mine superintendent on the Rand tells the following story against himself. He was managing a deep mine working under a special permit from the government, with only one shaft instead of two, and in consequence of certain complaints as to ventilation and the frequency of "air blasts," there was to be a special inspection by the government mining engineer and the president of the mining corporation was to accompany him also. They do not believe in surprise visits in Johannesburg, and due notice of the visit was given. In truth, things were a little bit uncomfortable below and the miners were spending most of their time in a somewhat hot and smoky atmosphere, dodging flying pieces from exploding pillars or slabs that "walked out" to meet them from the faces. The manager thought it advisable to dress the show a little and stopped doing any blasting for 48 hr. before the visit, while the small ventilating fan did double time at 100% overload, so that the mine should be cool and the air clear and the faces quiet. He forgot the laws of expansion and contraction, however, and the result of cooing down things too much was that the party was met by a fusillade of small rock from drifts and faces, and the visitors had a nerve-trying experience. It is not related how our friend made his excuses and explanations; but he was apparently successful as the mine is working today under better conditions.

New Lake Ore Dock

A new ore dock is about to be constructed at Superior, Wis., and bids for the work will soon be opened at St. Paul, Minn., by the chief engineer of the Northern Pacific Ry. The dock will be situated on land owned by the railway between the Reiss docks and the Nemadji River. The slip is now being dredged by the Great Lakes Dredge & Dock Co. While the size of the dock will not be as great as some others recently built, the dock itself will be fully modern in every way. Concrete-and-steel construction will be employed, and the dock will be 1300 ft. long, 70 ft. wide and 80 ft. high, with a pocket capacity of 60,000 tons of ore. The American Bridge Co. has the contract for the steel construction and the dock will be electrically operated.

The building of this dock is an interesting outcome of recent Cuyuna Range developments, marking in a practical manner, recognition of the present worth and future possibilities of this newest of the Lake Superior iron ranges. The Northern Pacific Ry. once owned a great amount of the land that in the last few years has been shown to contain valuable iron deposits. The Minneapolis, St. Paul & Sault Ste. Marie Ry., however, and not the Northern Pacific, aided materially in the development of the range by constructing, at much expense, a new line of considerable length into the new range. It has only been within the last three years that the Northern Pacific Ry., the pioneer in the region, has interested itself in the tonnage possibilities of the range to any extent, and the culmination of its activity is the building of the dock at Superior. The main line of the Northern Pacific Ry., built many years ago, runs through the heart of the range.

Metric Carat Adopted in the United States

The metric carat of 200 mg. was adopted on Oct. 28, 1912, by representatives of the largest jewelry firms in New York. This is about 2½% lighter than the carat heretofore used in the United States, which has been 205.285 mg. The weight of the carat abroad has varied from that of 188.5 mg. at Bologna, to 213.3 at Turin. The English standard is 205.304, while former Dutch standards were 205.128 and 205.712. However, the metric carat is now the chief standard in France and the Low Countries. The new measure will go into use on July 1, 1913, and the U. S. Treasury will be asked to use it in assessing valuations. Of 400 votes, only nine were cast against the new weight, which will greatly simplify bookkeeping, weighing for inventory, etc.

Zachary Hochschild

Zachary Hochschild, managing director of the Metallgesellschaft, of Frankfurt-am-Main, Germany, died suddenly at Munich, Nov. 6, at the age of 58 years. This news has come as a great shock to all those interested in the metal business throughout the world, and particularly to the American Metal Co., Ltd., of New York, which is closely affiliated with the Metallgesellschaft, and whose president, B. Hochschild, laments the loss of a brother.

Mr. Hochschild entered the employ of the Metallgesellschaft 40 years ago as a boy, and worked his way up to the leading position in a comparatively short term of years. For many years he has been the moving spirit in the Metallgesellschaft, and that concern in a large measure owes its prominence in the metal trade and industry the world over to his untiring energy, exceptional ability and sterling character.

Mr. Hochschild was well known throughout Europe, and his influence extended far beyond his activities within his own concern. His public spirit, compelling personality and high standard of honor were early recognized by the municipality of Frankfurt, which elected him one of the justices of its Commerce Court, in which position he was frequently called upon to act as arbitrator in the most important cases. In recognition of his public-spirited work, the Royal Prussian Government a few years ago honored him with the title of Kommerzienrat. The business world in Germany has lost in him one of its most able representatives. In spite of the many commercial duties which he had assumed, he always found time to devote himself actively to the furthering of charitable institutions, and particularly to the poor of Frankfurt, who have lost in him one of their best friends.

Zachary Hochschild

Mr. Hochschild frequently visited the United States, Mexico and Canada, and was intimately acquainted with the mining and smelting industry of the North American continent. His premature death is keenly felt, and his memory will be cherished by the many friends whom he had made on this side of the water.

Ontario Mineral Productian

Returns to the Bureau of Mines of Ontario, giving the mineral and metal production for the first nine months of 1912 show: Silver, 22,231,451 oz.; pig iron, 452,021 tons; nickel, 15,907 tons; copper, 8019 tons; gold, 53,488 ob.; cobalt and nickel oxides, 711,180 lb., and cobalt in crude material, 209,899 lb.; iron ore, 37,265 tons; white arsenic, 2,944,104 lb. The articles are arranged in order of their descending value.

The Porcupine mines began to produce during the summer, and the yield of gold in Ontario for the first nine months of 1912 exceeds any other recorded full year. The bulk came from the Hollinger and the Dome mines. Other contributors were the McIntyre and Vipond at Porcupine, the St. Anthony at Sturgeon Lake, the Olympia at Lake of the Woods.

The shipments from the Cobalt district were: 15,408 tons of ore, 7859 tons of concentrates, and $2,239,124 in bullion. South Lorrain produced 616,692 oz., and Gowganda, 449,281 oz.

The Sudbury mines yielded 15,907 tons of nickel and 8019 tons of copper, during the nine months, both being about 25% increases. Another source of nickel is now the Alexo mine on the T. & N. O. Ry., from which ore was shipped to the Mond Nickel Co.'s smeltery at the Victoria mines.

American Institute of Mining Engineers

The second adjourned session of the annual meeting of 1912 was held in the offices of the institute, on Tuesday, Nov. 12, about 30 members being in attendance. Prof. J. W. Richards, in behalf of the committee on the constitution of the institute, introduced a series of amendments to the constitution and by-laws, the purpose of these being to improve the administration of the institute, especially by abolishing the present dual system of government. The committee proposes to abolish the council and enlarge the board of directors. Another important feature of the proposed amendments is the introduction of the letter-ballot system.

The series of amendments previously introduced by Messrs. C. R. Corning and George C. Stone are still before the institute, but it is possible that they will be withdrawn.

After some discussion of matters involved in the remodeling of the constitution and by-laws of the institute, the meeting was adjourned *sine die*, the annual meeting of 1912 being thus closed.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Food Supply of Miners

With some experience in earlier years in providing for small mining camps and in later years in the subsistence of our army, I have been interested in the JOURNAL articles on the food problem, especially so as your correspondent in the issue of Sept. 28, 1912, has quoted the present army ration.

The changes made in the army ration during the last 10 years have been more and more to relieve the deadly monotony of the food articles and the even deadlier effect of inferior cooking. That the army ration has always been more than sufficient in quantities has not been questioned. Ten years ago, most of the articles for issue to the troops were compulsory, and savings (money value) were allowed to the men only on a few articles and a certain percentage of the component or principal ones. Later, savings were allowed on a portion of all of the articles of the ration. At present no issues are made of the ration, but the value of certain articles, as per accompanying table, is computed each month and the money value credited to the organization. Purchases may be made against this credit of whatever articles of the ration and a long list of what are called "sales articles" that the men desire. Any balance due on this credit is paid in cash at the end of the month, and is expended for food articles that are not carried by the commissary. This plan is feasible only when markets are available and camps are more or less of a fixture. In isolated movements or when transportation is uncertain, the commanding officer directs what articles should be taken by the troops, which would be the principal components of the ration. But the regular ration leaves a surplus.

CALCULATION OF RATION EQUIVALENTS

Garrison *Rat or*

Month.................................191..

No. rations	Articles	In bulk	Price	Amount
70	Beef, fresh	Meat component		
30	Bacon, issue			
100	Flour, issue			
100	Baking powder			
50	Beans	Cean Component		
50	Rice			
70	Potatoes, fresh	Fresh veg'e component.		
20	Onions, fresh			
10	Tomatoes, cn'd			
30	Prunes			
50	Jam	Fruit component		
10	Apples, Evap.			
10	Peaches, Evap.			
100	Coffee, R & G			
100	Sugar			
100	Milk, Evap.			
50	Vinegar	Vinegar component		
50	Pickles, cuc.			
100	Salt			
100	Pepper, bl'k.			
100	Cinnamon			
100	Lard			
100	Butter			
100	Sirup			
100	Flav. ext. Lem			

Cost of one ration averages at present about 24c.

The Subsistence Department has schools for bakers and cooks at several points, and men are being constantly detailed to take a course of instruction. Extra-duty pay and increases of pay are added as an inducement to study and perfect the culinary art. Company commanders are more and more interesting themselves in the way the food is served to the men, and the result is—better cooking—less waste—and more contentment.

Other points to be considered in considering food supply for miners are that soldiers have more idle time on their hands, do not perform such laborious work as miners, consequently do not require so much staple food, but have a greater desire for luxuries. Hard work and cold weather mean that more food is required and abundant food should be on the miners' table to meet this demand.

The army ration in staple lines is not sufficient for mining camps, while the means at the command of the government allow of a greater diversity of food articles and, as regards storage and transportation, ways and means are not considered as they must be by a private firm.

Summing up: The chief requisite is a good cook. He will save more than the extra cost. Give him his price. In Australia, on the large sheep ranches, the men who are working at piecework in shearing time, pay the cook so much per head per week. The price is a liberal one and the cook one of the best paid men—but he must have the goods.

H. GRAY.

Oakland, Calif., Oct. 17, 1912.

Lead Salts in Cyanide Treatment

I have been much interested in the article on the above subject, by J. E. Clennell, in the JOURNAL of Sept. 28, 1912. There are several points, however, upon which additional data would be of assistance in throwing light upon the subject. The statement is made that the experiments were carried out with mill solution, except when otherwise stated, and a sample of "Mexican silver ore containing silver mainly as sulphide, and ground so that over 99% passes a 200-mesh screen." It seems to me that this is not sufficient information upon which to base conclusions. The character of the ore experimented upon should have been clearly stated, and its contents, aside from silver and gold, explained, so that it would be possible to arrive at conclusions as to the possible effect of the lead salts upon similar or dissimilar ores. The content in silver and gold, also, would be of assistance to anyone wishing to study the matter, as it might have a certain bearing on the subject.

Mr. Clennell believes that soluble sulphides can seldom, if ever, be detected in solution, even without the addition of lead salts, and that they are likely to be immediately converted into thiocyanates or precipitated by the zinc in solution. My own observation corroborates this belief, but there are some cases where, in the absence of lead salts, a large amount of free sulphur exists mechanically suspended in the solution. This sulphur will resist efforts to settle or filter it and has an appreciable effect upon extractions.

The subject is of interest and it is to be hoped that Mr. Clennell will supplement his article with another explaining fully the nature and grade of the ore and solution upon which he experienced.

VIAJERO.

Denver, Colo., Nov. 1, 1912.

College Men in Underground Operations

As economic underground operations continue to involve more and more the principles of scientific management, the question of what class of men is best fitted to direct these operations seems to become more and more important. At most of the larger mines the men eligible for the more important positions, are, in general, of two classes: "Old timers" or practical men and the college men with a good education and more or less practical experience, the former naturally far outnumbering the latter. Between these two classes a choice must inevitably be made, by the larger mining companies at least, as to which shall fill these before-mentioned more authoritative positions.

It is frequently said by college men after having underground experience that they "learned more about mining in their first year out of college than they did in all their four years in college." This may be perfectly true and it is believed that most college men will admit it, but it is probably the training they received during their college years that fitted them to learn faster and better when later they actually "got their nose in the muck." Any reasonable man will also admit that a college course, if taken seriously, trains any man to be systematic, and in uptodate mining this is, of course, a fundamental principle, no matter what position a man may occupy. An "old timer" may be systematic (most of them are very much so) but it takes him longer to learn than it does a college man, and if conditions change and it is necessary to learn a new system or adopt new methods, there is hardly any comparison to be made between these two classes as the difference is so great. In other words, an "old timer" adopts a system merely because it is easier for him to work by rule of thumb; but a college man sees the reason for it and is, therefore, quicker to see how improvements can be made by a change of system.

At the larger mines in the United States where accurate costs of all underground operations are kept, it is difficult for the average "old timer" or practical man to understand or realize the importance of such terms as: "Cost per ton powder," "development cost per foot labor," "tons per man per day," etc. An understanding and realization of the importance of such terms and methods of cost keeping of course enable the operating men to know what the different classes of work and supplies are costing in their different working places, and such knowledge makes it possible for them to make comparisons and to reason out the source of leaks, making their work more efficient accordingly. A lack of knowledge concerning how these figures are arrived at and what they amount to means that such a man might very easily overlook an important leak or a wasteful expense for a long time before he knew what was really the matter. Of course, many companies do not make a practice of allowing their operating men to know the cost details of their work, but it is, however, common practice at the better managed mines to let the operating men know approximately what they are doing in this respect and to govern their work accordingly.

The attitude which "old timers" take toward such methods is well illustrated by a remark heard recently from an old practical man who has spent many years underground. "Figuring may be all right but you can't put ore in the skip with a pencil." As has been said, it is, as a rule, hard for the "old timer" to understand the truth and importance of figures, whereas the technical or college man has been trained in that direction and it should come natural to him.

A college man can learn much from a practical man and the knowledge he acquires from such sources and from experience will gradually develop him into what might be termed a "practical technical man" which is indeed the happy combination of the two. On the other hand it is difficult for an "old timer" to learn anything from a college man and it is, therefore, almost impossible for him ever to understand more than the most elementary technicalities. It goes without saying that there are many exceptions to this statement, some of which are noteworthy in many respects; but as a general rule this condition of affairs is believed to be true.

The ability to handle men is largely a temperamental gift and is as likely to be found in the college man as in the practical man. However, one of the secrets of this ability is to know what a fair day's work is, and probably most mining men will agree that this knowledge is to be gained in no other way than from practical experience. A college man who has never been on the business end of a "muck stick" himself or who has never done his trick at the crank of a machine is certainly in no position to dictate how many cars a mucker should muck or how many holes or feet is a good shift's work for a drill runner. There is nothing more ridiculous on the face of the earth or more properly, under it, than a green college man giving orders and laying out work which he has never done himself.

In such cases a college man will probably demand an unreasonable amount of work from one man and lay out something so absurdly easy and simple for another that the first will generally be justly disgusted and not do so well as he otherwise would and the second will, in nine cases out of 10, "throw a bluff" and "taper" most of the shift. In neither case is the man working efficiently. Therefore it is believed that the best thing a recent technical graduate can do, who intends to follow the operating end of mining, is to subject himself to a year or two years good stiff grind as mucker, machine man, timberman and under-boss of some sort provided he has luck enough to get such jobs and sand enough to hold them. Furthermore, a college man who has not done such work cannot be of much use in the underground operating department of any good mining company.

Another point in favor of long practical experience is the sound judgment it gives, which is required in cases of bad ground, the weight of heavy or moving ground on timbers, the drilling and breaking qualities of different formations and many similar details. The "old timer" can be relied upon to be almost correct in his opinions of such things and although some of the questions which come up in such circumstances are really no more than guesses, the "old timer's" guess is far more apt to be right than any college man's.

A practical man with no college education will work as a rule for less wages for a longer time than a man who has been technically educated. The college man calculates that his years of training in a scientific school entitle him to better pay than that received by the "old timer" and he will generally consider himself worth more to the company whether he is or not. As a rule, the "old timer" is more faithful to his employers than the average college man is apt to be and is generally more satisfied with his work, for the reason that a college man looks for rapid advancement, while the "old timer," as long as he receives fair wages, is satisfied. Most mining men realize and appreciate the fine loyalty and pride which nearly all "old timers" show and feel for the company which employs them and doubtless most of us can call to mind not a few examples of the fine old men who have spent the best years of their lives in the interest and service of their employers and whose faithful efforts have contributed not a little to the success of mining companies, large and small, throughout the mining countries of the world.

The main points in the foregoing paragraphs may be summarized as follows: (1) The ability of college men to learn fast, to be systematic, to reason clearly and to adapt themselves and their work to changing conditions. (2) The ability of college men to calculate and realize the importance of figures. (3) The possibility of a college man's developing himself into a "practical technical man." (4) The lack of ability in a college man to direct work for others which he has never done himself. (5) The better judgment of the "old timer" in details which can be gained only from long experience. (6) The superior faithfulness of the "old timer" to his employers.

In conclusion it may be said that whether a man is a college graduate or not, the fact remains that the ideal operating man for the efficient mining of today is the one who has good sound common sense, good practical experience, and education and brains enough to handle the technical problems which come before him. Such a man may either be a college man who has gained his technical knowledge in some good scientific school and, to learn the other side of it, has had sense enough to humble himself to a period of good stiff underground labor, or, he may be a practical man who has educated himself sufficiently and who, through hard work and study, has developed into the ideal combination. Statistics would probably show that cases of the former kind are more numerous than the latter and, in view of the economic conditions required in underground operations today, it is therefore believed that the college man is destined to be given the preference.

THEODORE V. K. SWIFT,
Mine Captain.

Mineville, N. Y., October 31, 1912.

Decision in Slime Filter Case

The decision in the appealed case to decide whether the Butters filter infringed the Moore patent was awarded the Moore company. The opinion of the court declares that evidence showed that Moore was the first to solve the slime problem; that his claims for a process of slime filtration were valid; that the Butters filter used the Moore process.

As announced in a previous issue, the Moore Filter Co. was awarded the decision in its case (No. 1612) against the Tonopah-Belmont Development Co., in which it was claimed that the Butters filter used by the defendants infringed the Moore patent (U. S. pat. No. 764,486, July 5, 1904). This decision was given at the October term of the U. S. Circuit Court of Appeals for the Third Circuit, at Philadelphia, Penn., Judges Gray, Buffington and McPherson sitting. It reverses the decision of the U. S. District Court given at Trenton, N. J., in February of this year.

Two Questions to Answer

In his opinion, Judge Buffington states: "As applied in the present case, the patent concerns the process of filtering metal-bearing slimes and is known as the Moore process. The respondent's filter is for the filtration of like slimes and embodies the Butters process. Both processes utilize the cyanide-ore treatment and the question before us is twofold: (1) Does Moore's process involve invention? and (2) does the respondent's Butters filter make use of the Moore process?"

Judge Buffington then outlines the early history of the cyanide process pointing out, by excerpts from articles published in technical journals in 1892 and thereafter, the great hindrance offered by slime to the successful application of the process when leaching and decantation methods alone were practiced.

The following excerpts from the opinion indicate the course of reasoning followed in reaching the decision: "The first suggestion for the solution of this world-wide problem is found in the Engineering and Mining Journal, Dec. 5, 1903, being a communication from George Moore, wherein he described the process for which the patent in suit was issued to him the year following."

"After a careful study of Moore's patent, we have reached the conclusion that his process is a radical departure from the whole prior art and was an original and pioneer step in metal recovery by filtration. . . . its novelty consists in his utilizing the simple elemental processes of nature. These processes he has, of course, neither discovered nor invented, but he has utilized them in combination in a manner never before used and has thereby secured a new result."

"The creation of this uniform and even resistance in the cake is the gist of Moore's process and such uniformity . . . . is secured by the slime being submerged when subjected to suction."

"It is contended, however, that the Moore patent is invalid by reason of the disclosures of the prior art. But in our view this contention is based on a failure to recognize the true significance of what Moore really did. Practically his problem was to make commercially possible the recovery of a minute amount of valuable metal from a large quantity of mud. Of the fact of the metal being there, there was no doubt, for that fact, and indeed that it was possible to extract it, the tedious and costly method of laboratory filtration showed. It suffices to say that no one of the numerous patents cited did such work, used such process, or effected such results, and if none of them led their inventors or users to the use of any process whereby such work could be done, or even led to a suggestion in their descriptive matter of the possibility of the use of any such process as Moore's, it follows they taught Moore no more than others.

Moore's Process and Not His Apparatus Involved

"So far as the patent here in question is involved, Moore's disclosure was the process he originated and not the machine with which he illustrated the use of his process in accordance with the statutory requirement that he file a written description 'of the manner and process of using it.' To find, therefore, here and there in prior patents, and disassociated from each other, all the mechanical appliances of the combination apparatus which Moore thus illustratively used is not to prove that Moore's process is not original.

"Viewed from a patent standpoint, the significance of a machine lies not in its form but in the principle on which it works, as will be seen in the requirements of 4888, 'in the case of a machine, he shall explain the principle thereof.' It suffices therefore to say that very few of these patents are even for a process, and as none of them operated on the principle or process of Moore, they cannot be held to forestall or minimize the originality of Moore's subsequent disclosure.

"And in giving these patents their due relation to Moore's disclosure the fact must not be overlooked that the slime problem which Moore solved only came into existence from the use of the cyanide process, which began, as we have seen, about 1887. It will therefore be manifest that no patents preceding that date and none subsequent thereto which did not apply to the cyanide process, were calculated to solve the cyanide percolating difficulties that arose in the use of that process.

Prior Laboratory Practice Does Not Affect Validity

"So, also, to say that following prior laboratory practice, it was possible to leach and extract the unrecovered ore left in a pasty mass by the cyanide process is not to destroy Moore's patent; for this is to lose sight of the practical working value of Moore's process as a workable, economic treatment, as compared with theoretical possibility of laboratory practice. By repeated dilution the laboratory could and we will assume did recover with practical completeness all such unrecovered metal, but this has been done with an expenditure of time, labor and expense out of all proportion to the value of the metal.

"When, therefore, Moore disclosed a process by which such recovery was made enormously profitable and by which he turned a dump heap which under all known processes, machines and laboratory methods was worthless into profitable ore, we are constrained to give little weight to the suggestion that his process was either anticipated, a mere advance incident to the art, or involved no invention.

"So, also, it is said that the step described in his claim, viz: 'further impoverishing the solids by a cleansing operation,' was merely the washing or dilution of the prior art. Considered in its literalism and in isolation, such contention may seem plausible but considered as a step in Moore's process it takes on new significance and value. Bearing in mind that in the prior steps of the process covered by this claim, the completely submerged filtering medium has formed a cake of uniform resistance at all points and by reason of such uniformity the solvent has percolated and is permeating the cake, it follows that the step which follows is a nondiluting and bodily displacement of the solvent and not a diluting intermingling.

"This displacement in contrast with dilution, not only saves the time and expense of repeated dilution and refilling, but also obviates excessive dilution of the solvent solution and the necessity of rehandling large volumes of diluted solutions in the recovery of the metal. It seems, therefore, that the 'further impoverishing the solids by a cleansing operation' of Moore's process, owing to the prior step whereby a cake of even and uniform resistance is secured by submergence, is not a mere washing or diluting step, but is one wherein there is exerted a uniform pressure or pushing action through the entire cake surface, thereby in effect advancing a wall of water pressure to force ahead of it from the cake the value-bearing solvent liquid and leave in the cake an equal volume of nonvalue-bearing water. This final result is secured by first having built up a cake of uniform resistance to solvent fluid flow, and secondly by again submerging the filtering medium and its built-up cake in the nonvalue-bearing displacing fluid. By this displacement by pressure difference only Moore pushes ahead instead of washes through the cake-contained, metal-carrying fluid.

"As showing the practically complete metal extraction by the Moore process, we restrict ourselves to the uncontradicted testimony of results at a South Dakota mine, where the original slime contained gold at the rate of $7.90 per ton of dry slime. After filtration alone the cake still contained $2.75 per ton of dry slime. After being then subjected to the displacement step there was left in the cake but four cents of gold per ton of dry slime.

MOORE PATENT CONSIDERED VALID

"Being of opinion, therefore, that Moore's process was novel, useful and inventive in character, his patent is valid and we next turn to the question of infringement.

"As claims four and five furnish sufficient basis for deciding that question, so far as the respondent's device is concerned, and as some questions, not necessary to be here decided, exist as to claim 10, we restrict ourselves to a consideration of claims four and five. In considering the question of the infringement of a process patent, it must be borne in mind that the monopoly secured by the claims is, generally speaking, a monopoly of the process and the test of infringement, is whether such process is utilized by the infringer.

"As the apparatus shown in a process patent is only to show that the process may be practically applied, it follows that such illustrative apparatus does not limit the process patentee to that type of machine alone. If that were the case a process patent would be of little value. So distinctively and separate in the patent law are process and apparatus for utilizing such process that where, after a patent for a process by one inventor a second inventor might patent a novel apparatus for utilizing the process, the situation would arise that the inventor of the process could not employ his process in such machine without license from the machine patentee and the latter could not use the process in his machine without license from the process patentee.

DETAILS OF APPARATUS IMMATERIAL IF FILTERING PRINCIPLE IS IDENTICAL

"It will therefore be evident that the test of process infringement is not the similarity of apparatus, but rather whether the apparatus, no matter what its form, utilizes the process. Tested by this standard it is clear to us the respondent's device infringes. In form the particular apparatus shown in Moore's patent and the apparatus of respondent vary in the number of tanks, in the differences between changing the fluid which envelops the filtering medium, as in respondent's device by allowing the filtering medium to remain stationary in one tank while the submerging fluid is first drawn off and the second submerging bath is then drawn into the same tank, while in Moore's the filtering medium is raised from the submerging bath in the first tank and then lowered into the second submerging bath in a second tank.

"But this difference in numbers of tanks and of respective withdrawal and replacing of different baths in no way affects the identity of the process, for it is manifest that Moore could in his patent specification have shown the use of his process, just as well by using respondent's apparatus, had he known of it, as his own. Both alike use the principle of submergence and intra-leaf suction to create the uniform and even resistance of the cake and both alike use the principle of intra-leaf pressure, Moore using air and the respondent water, to shed the uniformly resisting cake from the filter.

"For the mere fact of the output being carried off as a dry product in Moore's case to a dump heap and in respondent's in fluid form to a slime pit, does not go to the substance of the process. In the essentials that involve the invention the two are alike. Had an apparatus such as respondent's, operated as it is, been in use prior to Moore's there would have been no invention either in the process or in the apparatus shown in Moore's patent. And what, if preceding a patent, would have anticipated it, equally infringes if subsequent. We therefore hold the fourth claim is infringed.

"As we are of opinion and so find from the proofs that there is in respondent's device a 'removing the medium while continuing the drawing action,' the fifth claim is also infringed.

"The decree of the court below is therefore reversed and the cause remitted with instructions to enter a decree adjudging claims four and five valid and infringed and for such action by that court in the way of injunction and accounting as it shall deem fitting."

Defendant's View of Filter Decision

In response to our request for a statement concerning the decision of the U. S. Circuit Court of Appeals in the suit, Moore Filter Co. vs. Tonopah-Belmont Development Co., the Butters company has sent us, with permission to publish, a copy of a letter received from its attorney, Harold Binney. This communication is given below in full:

New York, Nov. 11, 1912.

To the Butters Patent Vacuum Filter
Co., Inc.,
50 Church St., New York.

Gentlemen:

Please find inclosed a copy of the opinion written by Judge Buffington as the opinion of the United States Circuit Court of Appeals for the Third Circuit in the suit Moore Filter Co. against Tonopah-Belmont Development Co., overruling Judge Rellstab's decision in the lower court, and holding the Moore process patent valid and infringed. The decision that Moore's apparatus patent is not infringed remains in force.

My colleague, Mr. Kenyon, agrees with me that the serious errors of fact on which the opinion rests will be so obvious to all mining and metallurgical engineers that a modification of the opinion by rehearing is (so far as it might form a persuasive precedent in other courts) quite unnecessary. As, moreover, the decision is binding as a legal precedent only upon the courts of New Jersey, Pennsylvania and Delaware, which form the Third Circuit, and as it is still subject to review by the Supreme Court of the United States by certiorari it should not give any alarm to licensed users of the Butters patent filters or processes anywhere else.

I strongly urge you to consider the advisability of publishing the two opinions together, thus letting public opinion throughout the world be formed upon full information of the reasoning of the two courts. The carefully studied opinion of Judge Rellstab, based on arguments that were not cut short by time limits, will speak for itself to those skilled in the art.

The other pending suit upon the Butters patents against the Moore Filter Co. is not affected by the present decision, but as the Moore Filter Co. has refused to admit its own responsibility for the use of the Butters acid wash and of reduced vacuum while the filter is exposed to the air, I strongly advise you to immediately sue the infringing users themselves.

(Signed) HAROLD BINNEY.

Ocher is defined as a hydrated ferric oxide permeating a clay base. Its most extensive use, according to the Geological Survey, is as a filler in the manufacture of linoleum.

Oxygen Efficiency of the Pyritic Furnace

By George A. Guess*

I have claimed that the gases from a pyritic furnace always contain considerable free oxygen; that the oxygen efficiency of a pyritic furnace will vary from 50 to 80%. In the days when the furnaces of the Tennessee Copper Co. were individually connected to the blowing engines in the power house, I made many of these calculations, starting from the piston-blowing engines, the efficiency of which we knew, making the calculations on a month's run. When the acid plant was put into commission, a slight back pressure was put on the furnace tops, so that no false air was admitted, and the furnace gases always showed considerable free oxygen. The average of the analyses for a month, checked with calculations based on air delivered. I have many times marvelled at Sticht's published analyses of his furnace gases taken from near the furnace focus, which have been widely accepted. These analyses show practically no oxygen.

Some years ago, while chief chemist for the Greene Cananea Copper Co., I drew gas samples from a reverberatory-furnace flue, and found no oxygen. It had all been absorbed in the metallic tube through which the sample was drawn. This question of gas analysis has just been opened again for me by a study of Vol. III of Richards' "Metallurgical Calculations." In this volume, Richards takes data that various metallurgists have published and makes most interesting problems from them. On p. 471, problem 106 deals with the average of five analyses, by Sticht. Calculating from these, and taking the formula of the sulphide as FeS, Richards can account for barely two-thirds of the oxygen, which must have accompanied the nitrogen, which is 87.66% of the gas by volume. He says the sulphide must therefore be Fe_2S (?) and not FeS, "for otherwise the gas analyses would show impossible conditions." His calculation, based on the assumption of Fe_2S, however, still shows a shortage of oxygen, accounting for only 20.24 volumes out of a necessary 23 volumes. Calculation on the basis of FeS gives the oxygen efficiency as 67%, instead of 94%, as shown by Sticht's figures.

I am well aware that many men realize that about 70% is common practice for the oxygen efficiency in pyritic smelting, but the published analyses of the gases from Mount Lyell and the frequent statements based on these analyses that pyritic furnace gases contain no free oxygen have been the cause of a great many misconceptions. With this in mind, no doubt Professor Richards, in problem 105, based on Freeland's published article on pyritic smelting in the Engineering and Mining Journal, assumes that there is no free oxygen in the furnace gases. He works out on this basis the efficiency of Freeland's blower as 32.8% of the rated capacity, as stated in the article. An old rotary blower often has a low efficiency, but no one would conceive of Freeland's running a blower whose efficiency was only 32.8%. The trouble is in the assumption of 100% oxygen efficiency in the pyritic furnace.

Richards, in calculating further in problem 106, from Sticht's gas analysis, finds that 960 cu.m. of air are used for each metric ton of slag made or practically 1¼ tons of air to one ton of slag, which ratio appears absurd.

I say that Sticht's analyses of pyritic-furnace gases are incorrect; that calculations based on them lead to absurdities; it is impossible to obtain a gas containing 87% nitrogen either by calculation or experiment where FeO is produced from iron sulphide; and that the continued reference in textbooks used in our metallurgical schools to such a condition as essential to pyritic smelting is an error that should be more widely recognized.

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*Professor of mining and metallurgy, University of Toronto, Toronto.

California Oil in September

The September production of petroleum in California fields exceeded all other months. The largest increases were in Midway and Fullerton fields. Kern River and Coalinga fields decreased. The net production in September was 7,222,185 bbl., an increase over August of 51,196. Daily average production in September (30 days), was 240,739 bbl., an increase over August (31 days) of 9417.

PRODUCTION BY FIELDS

District	Bbl.
Fresno County—	
Coalinga . .	1,540,646
Kern County—	
Midway	2,189,748
Kern River	864,864
McKittrick-Beldridge	521,844
Maricopa.	510,033
Lost Hills	115,981
Total Kern County	4,202,470
Santa Barbara County—	
Santa Maria, Lompoc, Cat Cañon	437,422
Summerland	4,250
Total Santa Barbara County	441,672
Southern Fields	
Fullerton (Olinda, Brea, Puente)	513,384
Salt Lake-Sherman	221,911
Coyote-La Habra...	146,200
Ventura	57,976
Whittier	56,704
Los Angeles	32,000
Newhall	9,222
Total Southern Fields	1,037,397
Total all Fields	7,222,185

September shipments amounted to 6,400,580 bbl., a decline from August of 284,526. Field consumption in September, 420,299 bbl., a decline from August of 1017. Stocks on hand, Sept. 30, 46,674 172 bbl., an increase over August of 749,222. Field operation and development in September showed 41 new rigs, 58 completed wells, 5789 producing wells active, 735 wells capable of producing, but idle, 366 wells actively drilling, 313 wells on which drilling was suspended, 38 wells being deepened, five wells abandoned.

Nevada Consolidated Copper Co.

The report of the Nevada Consolidated Copper Co. for the quarter ended Sept. 30, 1912, shows a production of 18,405,467 lb. of copper. This is made up as follows: July, 6,246,859 lb.; August, 6,551,030; September, 5,607,578 lb. The falling off in the September production was due partly to treating considerable ore from the Liberty Pit, which, through its hardness, reduced the tonnage per mill section, and partly to unsettled labor conditions in September previous to a strike at the mines.

During the quarter, 797,794 tons of Nevada Consolidated ore, averaging 1.74% Cu, were milled, of which 737,065 tons were from the pits, and 60,729 tons from the Veteran mine. Deep drilling to determine the possible existence of additional ore at the Eureka Pit was begun in September, but the strike forced a suspension of this work. It will be resumed as soon as possible.

The net credit for the quarter to undivided profits amounted to $798,135, after payment of dividends, depreciation on mines and Steptoe Valley smeltery. Owing to good earnings, a reduction in copper in transit, and taking over cash from the subsidiaries, the Steptoe Valley Smelting & Mining Co., and the Nevada Northern Railway Co., the cash on hand now stands at $1,303,191, and it is stated that if financial conditions are as good at the next dividend date as they are now, an extra dividend will be declared.

The report, dated Oct. 30, 1912, states that the strike above referred to was purely for recognition of the Western Federation of Miners. Operations ceased at the mines on Oct. 2, were resumed on Oct. 24, and at the date of the report, the mines were running at 50% capacity.

Utah Copper Co.

The report of the Utah Copper Co. for the third quarter of 1912 shows a total production of 29,966,920 lb.; July, 11,160,614 lb.; August, 11,841,162 lb.; and September, 6 965,144 lb. During the quarter there were 1,581,521 tons of ore milled, as compared with 1,503,884 tons in the preceding quarter, when the production was 28,372,038 lb. of copper. The average assay of the ore milled was 1.41% of copper, as compared with 1.42% in the previous quarter.

The average cost per pound of net copper produced, after allowing for smeltery deductions and without crediting miscellaneous income, is given at 7.707c., as compared with 8.127c. during the second quarter. If the net miscellaneous earnings in Utah, including those from the Bingham & Garfield Ry., were credited to the cost of operations, the net cost per pound for the quarter would be reduced to 7.017c. Financial results were: Milling profit for quarter, $2,539,584; other income, rents, etc., in Utah, $11,699; income from Nevada Consolidated dividends, $375,187; total net profit, $2,926,470; less dividends paid, $1,182,413; net surplus for quarter, $1,744,057.

During the quarter, a total of 1,408,133 cu.yd. of capping was removed, a decrease of 181,515 cu.yd. from the previous quarter, due to a strike at the mines. This deficiency is also shown in the copper output, as given above. The cause and progress of the strike have been chronicled from time to time in the JOURNAL, so reproduction of the particulars given in the report is unnecessary.

During the quarter, the Magna plant was in full operation until closed by cessation of shipments from the mines, handling 62% of the total tonnage. The thirteenth and last section of the Arthur plant was started early in September, and nothing in the way of construction remains to be done at either mill, excepting the completion of the improvements in the coarse-crushing departments now in progress at both of them, which work is now nearly finished.

The contemplated extension of the Magna steam plant is unnecessary, due to proposed hydro-electric extension in the vicinity of Salt Lake City and on the Bear River, in Utah and Idaho. The Utah Copper Co. will obtain all its power requirements from this source. Operations of the Bingham & Garfield Railway continued satisfactory until the day of the strike, Sept. 18. Up to that time, 13,140 tons of ore per day had been transported, together with 928 tons of other freight.

Chino Copper Co.

The report of the Chino Copper Co., covering the third quarter of 1912, shows a total production in concentrates of 10,340,963 lb. of copper, of which 3,228,703 lb. was produced in July; 3,668,714 in August; and 3,443,546 in September. Production in the first quarter was 3,271,980 lb., and in the second quarter was 4,289,644 lb. There were 340,300 dry tons of ore milled during the quarter, of an average tenor of 2.33%, of which 62% came from the Romero orebody, 29% from the Chino, and 9% from the Hearst.

Milling profits for the quarter are given at $994,274; for the nine months at $1,556,678; miscellaneous income for the quarter, $57,413; for the nine months, $113,225; total profit, quarter, $1,051,687; nine months, $1,669,904.

The cost per pound of net copper, allowing for smelting deductions, and not including miscellaneous income, is stated to be 6.57c. per lb. There is included in this a charge of 30c. per ton, to extinguish mine development and stripping charges. In miscellaneous income is credited $23,382 from the direct shipment of 1125 tons of Hearst ore to a smeltery. The cost per pound of copper was 7c. on this material; the contents 267,515 lb.; which, added to the concentrator production, makes a total of 10,608,478 pounds.

The recovery was 65.15%, compared with 62.96% in the second quarter. The low extraction is still laid to having to treat oxidized ore, and it is stated that in July, on less oxidized ore, a recovery of 74.84% was made. The production of concentrates was 20,665 tons, averaging 25.02% Cu. Concentration was 16.47: 1.

The fourth section of the mill, at Hurley, N. M., was ready for operation in August, but the water-reclaiming system had not been completed, and four sections could not be run continuously until near the close of September. The fifth section should be complete in November, at which time the great construction expenditures will be over.

Plans of California Independent Oil Producers

The increase in the output of petroleum for the month of September in this state and the likelihood that October's production will be greater on account of the recent coming in of several gushers in the Midway field, together with the refusal of the Standard Oil Co. to accept any more crude oil at less than 18%, has thrown operators whose product is of that quality into consternation, says the San Francisco *Chronicle*. It is understood that the greater part of the contracts with the Standard for this low-grade oil will expire next January, after which date there will be no market for it unless some one of the other great marketers—the Associated or the Union—steps in to their relief. So many applications have been made since for membership in the Independent Oil Producers' Agency that the board of directors of that corporation held a meeting at Bakersfield to pass upon the advisability of admitting the outcasts.

The directors of the Independent Oil Producers' Agency, at their meeting, affirmed a resolution adopted last spring against receiving from the individual members more oil each month than is necessary to meet the current sales; placed in the hands of the president, L. P. St. Clair, the authority to prorate the deliveries from the several companies; went on record as opposing the building up of storage as a bad policy for the agency to pursue, even though storage be furnished free; voted to admit to membership the United Development Co., the Oil Exploration Co. and the Miocene Oil Co.; denied a request of E. L. Doheny, of the American Oilfields Co., to withdraw from the agency 240 acres of land in the big gusher district of North Midway and substitute a section of unpatented land in another part of the field, and appointed a committee of five to confer with a like committee from the producers of low-gravity oil, whose contracts the Standard has declined to renew, with a view to devising a plan whereby the latter companies may be taken care of with advantage to both parties. Conferences were to be held by President St. Clair with a committee from the Oil Producers' Protective Association, with a view of making arrangements for the handling of its product by the Independent Agency.

Hollinger Finances

The financial statement of the Hollinger Gold Mines, Ltd., is of especial interest just now, as that company is the first of the Porcupine mines to enter the dividend-paying class. An initial declaration of 3%, payable Nov. 2, has been made, and it is understood that dividends of the same amount will be paid every four weeks, making 39% per year. The figures given in the accompanying statement are provisional, and subject to correction when the smelters' returns are received. The surplus as of Nov. 2 is estimated at approximately $800,000.

HOLLINGER PROVISIONAL BALANCE SHEET AS OF OCT. 26, 1912

Current Assets			
Cash			$33,496
Bullion on hand			27,570
Bullion shipped (not paid for)			89,499
Precipitates on hand			97,500
Gold in mill solutions			24,000
Slags on hand			17,000
Materials and supplies on hand			30,660
Accounts Receivable			7,407
Guarantee Deposits			500
Imperial Bank, Toronto, Reserve for Dividend No. 1			90,000
Insurance paid in advance			2,833
			$420,465
Capital Assets			
Mining properties		$2,500,000	
Development		302,556	
Plant		593,728	3,396,284
			$3,816,749
Current Liabilities			
Wages unpaid			18,254
Salaries unpaid			2,750
Accounts payable			36,973
			$57,977
Capital Liabilities			
Capital stock			3,000,000
Surplus			
Premium on shares sold—invested in plant and development		$250,000	
Profit from operations.			
Reinvested in plant	$82,432.92		
Reserve—div No 1.	90,000.00		
Balance in reserve	336,338.89	508,771.81	758,772
			$3,816,749

Lithium is the lightest known solid element and has a specific gravity of 0.585. It is soft, not tenacious and is not known to have any valuable properties.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Foundations for Prospecting Machinery

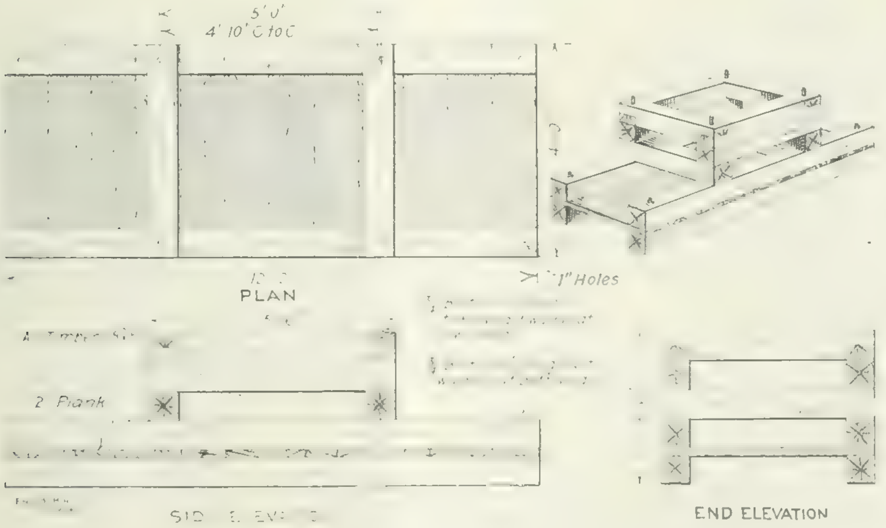
By Horace F. Lunt*

The conditions of operation of the small hoists used for prospecting seldom render it necessary or desirable to construct masonry or concrete foundations. The work is of a temporary character, and in a comparatively short time the hoist will be replaced by a larger one or the work abandoned. What is needed is something that is easy to construct, inexpensive and yet sufficiently strong and solid. Timber foundations are generally used in such cases, but often they are poorly constructed and so unsteady as to permit trouble due to vibration.

Timber foundations are perfectly satisfactory if properly designed, and if they are not intended for use for a longer time than the life of the timbers; this period will, of course, vary with the kind of timber and the conditions under which it is used. The illustrations show a timber foundation designed for a 6x8-in. steam hoist. Its essential feature is the platform between the sills, on which sufficient rock and earth is piled to hold the hoist steady. I have used a foundation of similar design but of heavier (12x12-in.) timbers for a 30-hp. electric hoist with perfectly satisfactory results. I have also employed this design, using round timbers and round poles in place of the plank platform, the upper set of timbers being hewed flat to receive the bedplate of the hoist. Round timbers make it a little more difficult to level the foundation, but are otherwise just as good, and often much cheaper, than the sawed lumber.

In building such a foundation the following notes will be found useful: The holes for the anchor belts should be bored ¾ in. larger than the bolts, in order to allow for the variations of the bedplate castings. The holes should be bored after the timbers are framed and placed in position, otherwise there is likely to be difficulty in getting the bolts through them. The lower ends of the anchor bolts should rest on something solid, a good-sized flat rock or a substantial piece of timber, so that they cannot be driven down out of reach by any accidental blow before the hoist is in position. The upper ends of these bolts should project far enough through the holes in the bedplate to permit of their being grasped with a pipe wrench in case they turn when the nuts are being tightened. If possible, the excavation for the foundation should be large enough for a man to get down into it and tamp under the mud sills after it is all put together. Even if the sills are leveled carefully at the start, the top may be found out of level, due to inequalities in the timbers. If round timbers are used it is practically impossible to level the foundation until it is completely assembled.

Setting the foundation with its greatest dimension parallel to the line from the hoist to the shaft gives the maximum stability. I have, however, placed the sills at right angles to this line where circumstances prevented their being laid the other way, making them somewhat longer in proportion to the rest of the foundation, so as to increase the area of the platform and, therefore, the weight holding the foundation in place. This design can easily be adapted to small compressors or other machines. Where a belted compressor is used, a satisfactory construction is to use the same sills as a base for both compressor and motor foundations.



Timber Foundation for Hoisting Engine

Changing Dipper Teeth on Steam Shovels

By Clarence M. Haight.*

When digging iron ore with a steam shovel, it becomes necessary, at intervals of two or three weeks, to replace the dull dipper teeth with sharp ones. As there are four teeth used on a dipper, the time thus spent in the course of a season was an important item. Formerly, and at many mines at present, a tooth was fastened to the dipper with six 1-in. bolts. With this method much trouble was experienced at times; for, unless there was absolutely no play between the dipper and the tooth, the whole strain of the digging came on the bolts. In such a case the bolts bent so much that it was difficult to remove them.

On this account the changing of a tooth was generally done on Sunday in order not to delay operations. As it

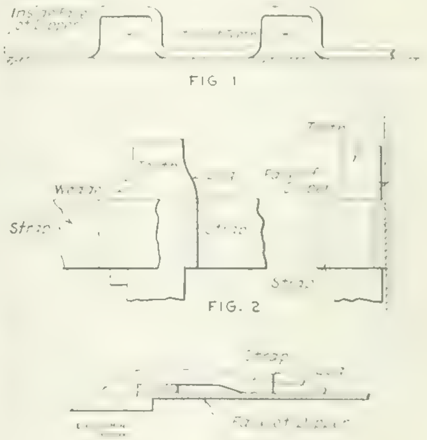


FIG. 1

FIG. 2

FIG. 3

Method of Attaching Steam Shovel Dipper Teeth is not necessary to change all the teeth at the same time, a part of almost every Sunday had to be devoted to this work.

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*Mining engineer, Colorado Springs, Colo.

*Mining engineer, Hibbing, Minn.

At many mines now a new method of attachment is in use which makes the removal and the replacement of a tooth a comparatively simple matter. A scrap of ¾x5-in. iron, bent as shown in Fig. 1 of the accompanying drawing, is riveted inside the dipper on the face which digs the ore. The dipper tooth has a lug projecting from one side near the back end, as shown in Fig. 2. The loops in the strap are wide enough to admit the tooth and this lug easily. When the lug is behind the strap the inset part of the tooth fits against the edge of the dipper. The end of the tooth is pushed to one side until it touches the side of the strap. A wooden wedge is then driven in between the tooth and the other side of the strap to hold the lug in place. This completes the operation; the lug prevents the tooth from falling out and the edge of the dipper takes all the strain, as it should. To remove the tooth the operation is reversed; the wedge is driven out, any dirt in the way is removed, the tooth is shoved to one side until the lug will clear the strap, and the tooth is then pulled off.

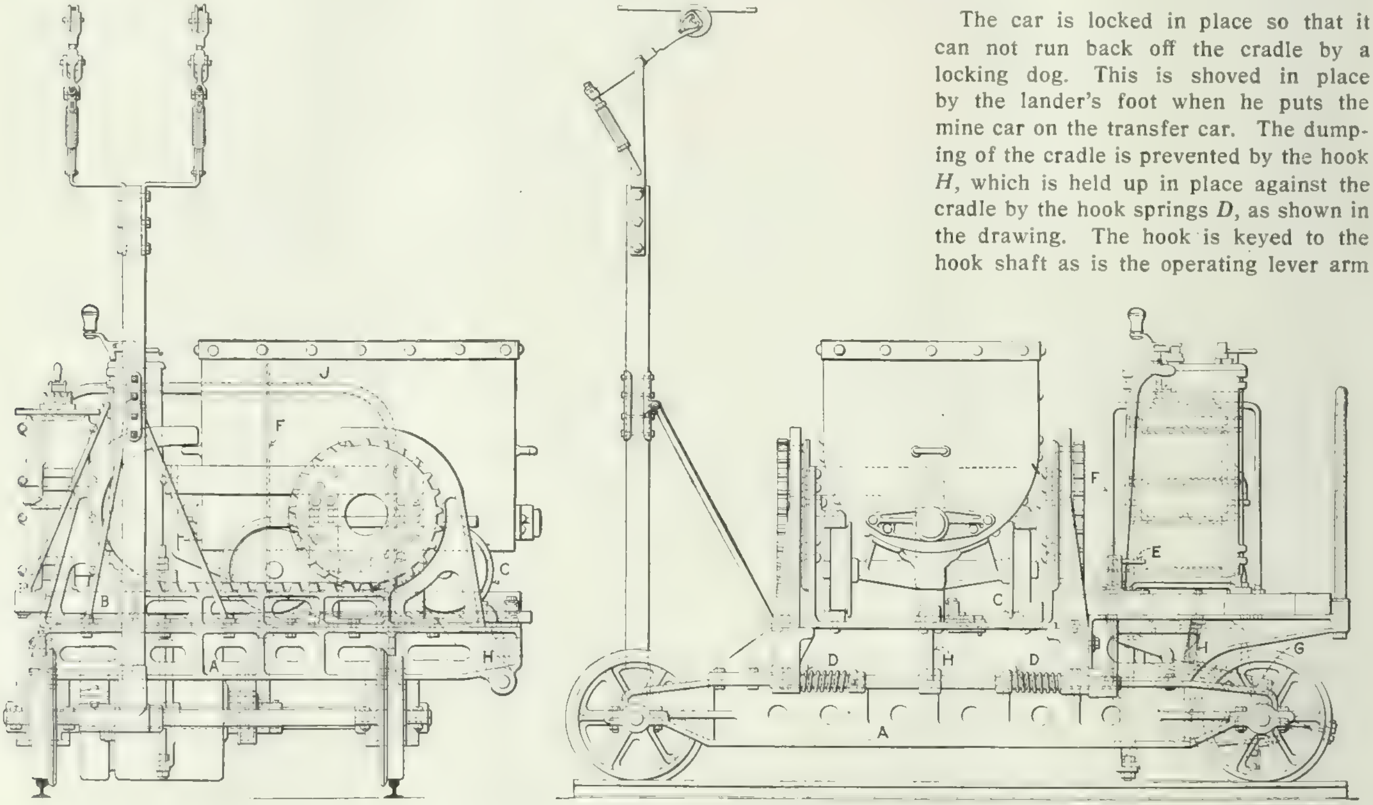
The Mitsui Busan Kaisha is erecting a zinc smeltery at Omuta, in the Nagasaki district, Japan, near its new coking plant; another company, according to Consul Carl S. Deichman, has recently been organized in Osaka to erect a zinc smeltery.

Combined Transfer and Dump Car

In the accompanying drawing is shown the construction of the transfer cars used at the shafts of the St. Louis Smelting & Refining Co. in the lead district of southeastern Missouri. The ore is hoisted to surface in ton cars on one-deck cages, and at surface, instead of tramming the ore to the bins by hand, it is put on the transfer cars which are equipped with motor drive. The method has its advantages and its disadvantages, but the construction of the transfer car is interesting as the idea is applicable to transfer cars used for other purposes.

The speed with which the men approach the shaft after the trip to the ore bins and the accuracy with which they bring the cars to a stop so that the rails of the dump on the transfer car justify with the tracks at the collar of the shaft, for there is not much leeway left them, is amazing and an indication of the accuracy that men attain with prolonged practice at their work. It comes with the skill with which the engineers at those Butte shafts where cages are still used in hoisting bring the cages to a stop with the deck of the cage even or only an inch or so lower than the level of a station, say 1600 ft. deep, so that the car can be pushed right on without any loss of time resulting from the use of landing chairs; or the way that some of the skilled carmen of the West in square-set mines come up at full speed to a turn-sheet about 6½ ft. square and slough their cars for a 90° turn without any noticeable hesitancy at the turn-sheet.

The frame *A* of the car is of cast steel. Longitudinal members extend out beyond the deck of the car far enough to take the bearings for the wheels. The motor which has a capacity of 14 hp. is mounted so as to mesh with the back axle, and the braking is done on wheels of that axle. The controller is carried on a raised platform resting on a cast-iron frame bolted to the main frame of the car. To the main frame and running crossways with it is bolted the dump frame *B*. This dump is of the traveling-cradle type which is especially good in this class of work. All castings are of steel.



Transfer Car Used at a Flat River Mine

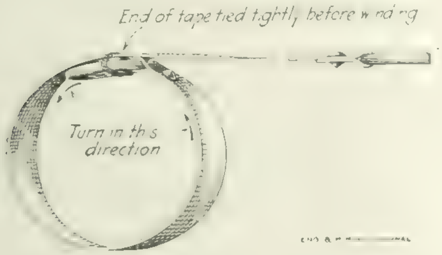
The car is locked in place so that it can not run back off the cradle by a locking dog. This is shoved in place by the lander's foot when he puts the mine car on the transfer car. The dumping of the cradle is prevented by the hook *H*, which is held up in place against the cradle by the hook springs *D*, as shown in the drawing. The hook is keyed to the hook shaft as is the operating lever arm *E* of the hook by which the hook is pulled back off the cross bar of the dump cradle at the proper time. This lever controlling the dump is operated by the motorman's foot. The lever *F* extending up to the height of the controller is the brake lever which is operated by hand, as that allows the brake to be put on under closer control than if a foot brake were used. It is by this brake that the car is stopped even with the landing tracks, and so the brake is made extra strong. The brake link-lever *G*, is fitted with a spring *I*, which holds the brake beam off the wheels.

To prevent the motorman from falling off the car a railing of pipe *J*, is carried around the controller platform. A return wire is used on the trolley circuit so that a double-runner trolley pole is used.

Of course it would be somewhat better if the bins were arranged so that the ore could be dumped into them without any long tramming, but where that is necessary and electric haulage is used about the plant as is the case at the plant of this company, a transfer car of this type carrying the dump on it is to be considered. It probably is cheaper in some respects than a conveyor for handling run-of-mine ore while it is more flexible. Moreover, by having an extra car it is possible to keep running when trouble arises in the motor without interfering with the hoisting from the mine. A conveyor system on the other hand, when it breaks down ties up the shaft. This is an important feature where the hoisting is done in cars and the ore is shoveled directly into the car, as at these mines, for there is little bin capacgity underground and a stopping of the hoists soon means a tie-up of the shoveling and the tramming. Of course, with mines having large underground bin capacity such a tie-up would not be so important and the flexibility of the system of the surface handling of the ore would not be so vital.

Coiling Steel Tape

Steel tapes, 100 ft. or over in length, are apt to be difficult to coil when no reel or spool is at hand. Unless great care is taken, twisting and kinking are almost sure to result. The following simple method of coiling, recommended by Wallace G. Imhoff, superintendent, Duluth Diamond Drilling Co., Iron River, Mich., avoids any twisting or loose wrapping of stray strands: Give the tape one round, and tie the end tightly to the main body of the tape; the whole thing may now be easily and neatly coiled by standing at right angles to the coil, facing the tape, and turning the first round hand over hand in the direction of the operator.



METHOD OF COILING STEEL TAPE

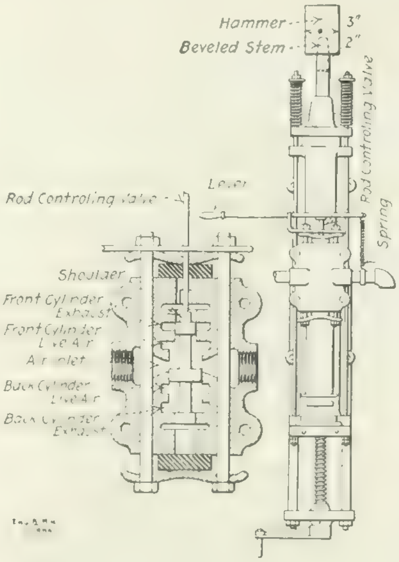
At the Forbes mine at Iron River, Mich., a new steel headframe has been erected. It is a new type in the Iron River district, being of the two-post style. Instead of being built directly over the shaft, it is all on one side and the skips are hoisted up along the outside of the headframe. It is similar to the Prince-of-Wales headframe at Negaunee; the latter, however, is of wood.

Variable Stroke Air Hammer

By J. R. McFarland

At Giroux Consolidated Mines Co., at Kimberly, Nev., an air hammer has been constructed for the blacksmith forge out of an old 3¼-in. rock drill. The delicate control of which the hammer is capable warrants its description. The arrangement is patterned after the design commonly used on drill-steel sharpeners and works much more satisfactorily than the customary throttle valve to govern the operation of the hammer. With a throttle valve the length of strokes cannot be varied; when the throttle is closed the hammer and piston drop to bottom and are in the way.

With the improved arrangement, both the power and length of the stroke are governed by a small rod extending through the front end of the valve chest hindering or releasing the valve.



VALVE ARRANGEMENT OF VARIABLE-STROKE AIR HAMMER

The rod has a small shoulder on the inside to prevent its coming out of the chest. The rod on the outside end fits against a lever with a spring attached to one end, holding back the valve when at rest and allowing air to enter in front of cylinder and hold the piston up out of the way.

As the handle of the lever is pulled back slowly, the air is first allowed to enter the back end of the cylinder in small quantities so that the strokes are light and short, the piston being reversed immediately after reverse port is passed.

As the lever is pulled farther back the drill gets its full supply of air and the momentum of the piston gives it a longer stroke. As the rebound from an iron anvil is greater than from rock a rubber buffer is placed in the back head. The neck of the piston was originally 1½ in. but as a 3-in. square hammer is used the neck was increased to two inches. The end of the piston neck or stem has a beveled fit in the hammer. The control is so delicate as to allow a piece of paper to be picked off the anvil by the hammer without the hammer touching the anvil.

Hydraulic Elevators in Placer Mining

By A. H. Martin*

Economic disposition of tailings frequently perplexes the placer miner. The character of the work precludes the extensive employment of stacking equipment, and in many districts stringent laws prohibit the deposition of débris in streams affecting navigable water courses. In California, the hydraulic giant has been driven from most of the oldtime fields, largely because of the débris question. In other states the same exigency has militated against operations. To overcome this serious objection new methods are being incepted in California, Alaska and other placer fields which promise to eliminate the tailings question where conditions favor application of the practice.

In Siskiyou County, Calif., the tailings are handled and gravel treated extensively by the elevator method. The elevator is an inclined trough, usually eight feet wide and 80 to 100 feet long. The sides range from 12 feet wide at bottom to six feet at top. The bottom of the trough is composed of two sets of 1¼-in. boards, with one layer of boards forming the upper section. A double bank of boards forms the sides. From the elevator to the gravel extends a bridge, or approach, constructed of boards well supported. The bridge and first 20 ft. of the incline are solid and lined with ⅜-in. steel plate. The bridge usually has a length of 10 ft. Grizzly bars of 2½x6-in. timbers, protected with steel bands, are placed at the upper portion of elevator. The steel protectors are three inches wide and ⅜ in. thick. The sluice boxes contain transverse riffles, with longitudinal riffles placed at intervals to increase the gold-saving efficiency. Riffles are formed of 2x4 in. timber, covered with ¼-in. steel.

In operation two or more giants are employed. The first cuts down the deposit as in usual practice, while the second is stationed about 80 ft. ahead of the elevator bridge. As the first giant drives the gravel behind and alongside of the second monitor, the latter carries it on the bridge and the main portion of the elevator. It simply forces the material over an incline by the driving power of the water. The gravel passes over the grizzly bars and the fine material drops through and into the sluice boxes, while the coarse material is shot over the top of the machine and drops to the tailings dump. It has been found feasible to handle 1200 cu.yd. of gravel per day, with two No. 3 giants using about 1200 in. of water under a 450-ft. pressure. Not only is ordinary gravel easily driven over the inclined machine, but boulders up to five feet in diameter.

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*Redding, Calif.

As the tailings dump grows too close to the machine, stringers provided with a covering of double boards are laid on the pile and discharge of material carried beyond the first dump. By this means a vast quantity of tailings is readily stacked at a minimum of expense and time, with no danger of interference with operations. On a large property two or three such machines may be easily worked provided a requisite quantity of water is available. In some of the Siskiyou placers the elevator method is successfully used in mining gravel ranging in depth from 20 to 25 ft. with deposits containing numerous boulders. It has been found desirable to employ a third giant to drive the tailings to a barren dumping place, but when conditions are not sufficiently favorable for such practice, or when the operator is content with the method described, two giants perform work in an excellent manner. The elevator method is also employed in Alaska, South America, Oregon and other fields, and is particularly favored in districts where the deposits are of comparatively limited extent and the disposition of débris forms a prominent factor.

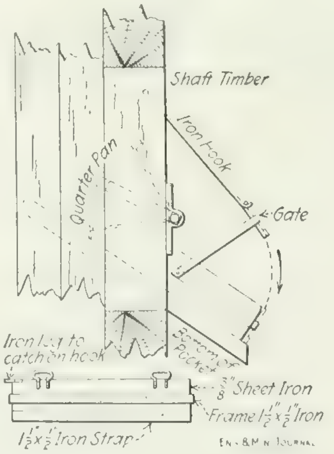
With an abundance of water and a large property, the method adopted by some Alaska placer operators invites consideration. By this system two or three monitors are stationed at the lower portion of the sluiceway, with their streams so directed that the tailings are met at right angles as they emanate from the boxes. The powerful streams of water drive the heavy gravel to the side and the pile is gradually built below and to the side of the sluice line. Thus the ground in front of sluices is constantly kept clear and the débris stacked at a convenient point. As the dump gains in height the monitors are gradually raised until a wall of gravel is constructed, somewhat resembling the tailings pile built up in dredging. The giants are raised and lowered as work demands and piles are built to a height of 15 to 20 ft. In this method an abundance of water is required and it can be employed only when conditions favor its use. Considerable of the fine material is carried into the streams by the water, but as this is permissible in Alaska no attempt is made to prevent its escape. In sections where regulations prevent this practice, the difficulty might be avoided by directing the water into restraining ponds, such as are used in many California placer enterprises operating in restricted territory.

In selecting methods for his own particular purpose, the operator is necessarily influenced by the natural conditions regnant in his own district. The popular Alaskan method, although satisfactory, would be of small use in a district where the water was expected to have a high duty. The elevator method has been comprehensively tested in several fields, and has demonstrated its merits beyond question. The machine is somewhat unhandy to move, four men with a mule, capstan and block-and-tackle requiring eight to nine days to change and set up a machine, including moving giants and pipe lines. Costs of operation are stated to average from six to seven cents per cubic yard, with the material usually heavy and somewhat difficult to handle. Where it is imperative that the tailings be handled effectively and economically, the method has proven especially worthy of close consideration.

An Emergency Ore Gate

By L. D. Davenport*

In one of the mines of the Chisholm district, considerable difficulty was experienced in cutting off the flow of ore from the underground pocket as soon as the skip was full. Frequently a hard chunk of ore or a piece of blocking caught under the curved gate or quarter-pan, and the fine ore continued to run, flooded the skip and necessitated cleaning out the skip pit.


Shaft Timber
Iron Hook
Quarter Pan
Gate
Iron lug to catch on hook
Bottom of Pocket
$\frac{3}{8}$" Sheet Iron
Frame $1\frac{1}{2}$"x$\frac{1}{2}$" Iron
$1\frac{1}{2}$"x$\frac{1}{2}$" Iron Strap
En. & M. N. Journal

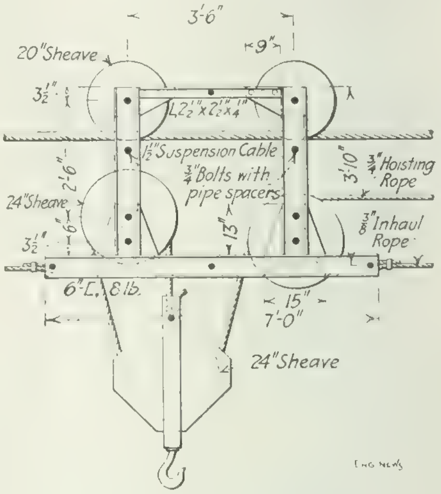
Details of Emergency Gate

The emergency gate was designed to overcome this trouble and is now in general use in the mines in this district. As shown in the accompanying sketch, the gate consists of a simple $\frac{3}{8}$-in. iron plate 8 in. wide and long enough to cover the end of the chute. It is supported in such a manner that it can be instantly dropped over the end of the chute and thus stop the ore in case an obstruction prevents the quarter pan from closing down tightly.

A Stiff Cableway Carriage

A cableway carriage used at asbestos mines, Thetford Mines, Que., is shown by the drawing herewith. Ten such carriages have been in service for more than two years, with satisfactory results. E. Torrey, Sherbrook, Que., who designed the carriage, describes it as follows (*Eng. News*, Oct. 31, 1912):

The carriage is built of structural shapes instead of the usual flat bars, giving it the advantage in strength, lightness, cheapness and ease of assembling. The sheaves are the same as commonly used, with hubs 4 in. long and 2½ in. bore. A steel sleeve 2 in. in diameter and $4\frac{1}{16}$ in. long, bored for a 1-in. bolt, forms the sheave pin, and acts as a separator for the halves of the frame. A brass bushing 4 in. long is bored and turned to run free on the pin and in the hub, and is drilled with $\frac{3}{8}$-in. radial holes to carry the lubricant. Beside the sheave pins, pieces of pipe over $\frac{3}{4}$-in. bolts are used as separators.


3'-6"
9"
20" Sheave
$3\frac{1}{2}$"
L $2\frac{1}{2}$"x$2\frac{1}{2}$"x$\frac{1}{4}$"
$1\frac{1}{2}$" Suspension Cable
$\frac{3}{4}$" Bolts with pipe spacers
3'-10"
$\frac{3}{4}$" Hoisting Rope
2'-6"
24" Sheave
6"
13"
$\frac{3}{8}$" Inhaul Rope
$3\frac{1}{2}$"
6" [, 8 lb.
15"
7'-0"
24" Sheave
Eng. News

Cableway Carriage Built Up of Stiff Shapes

There is nothing unusual about the fall block, unless it be the side straps, which are bent to guide the block when it strikes the bottom chord of the carriage. Here the 6-in. channels give a stiff resistance, and so far have shown no sign of bending, whereas the usual flat bars last but a few months.

A feed wire for mine use should be of somewhat larger capacity than the trolley wire and should be run to the end of the haulage, says *Coal Age*. The current should be fed in every 500 ft., which allows all the motors to get about the same amount of current and avoids the stalling of one motor while another is on a heavy grade.

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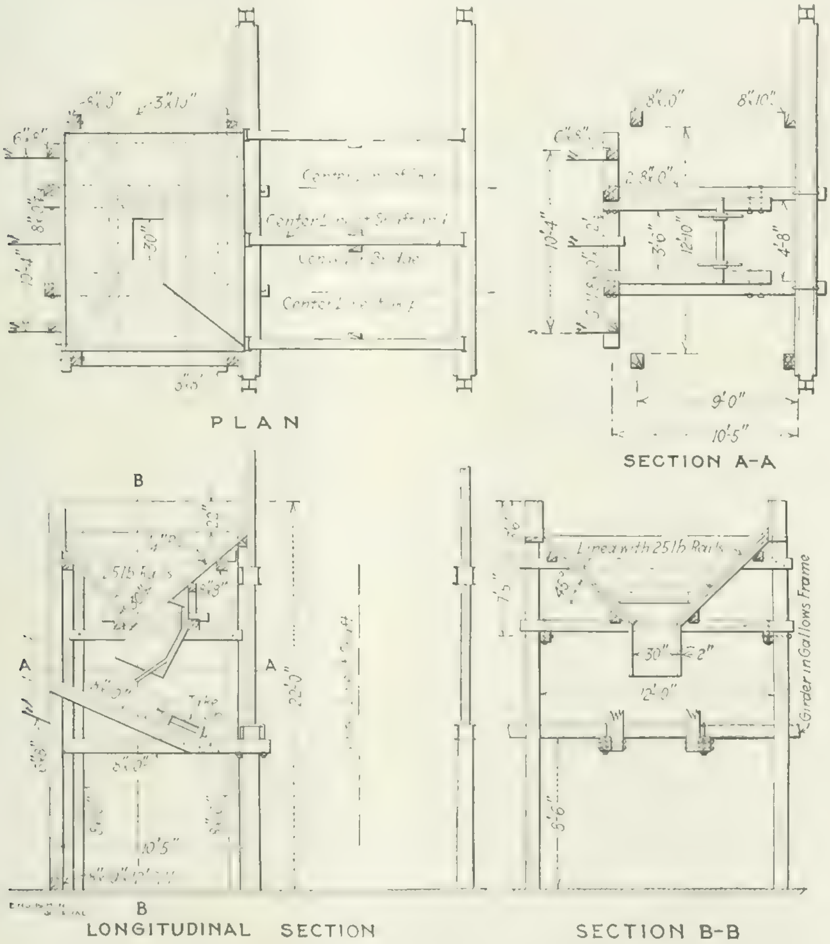
*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Transferring Mine-Run Ore from Skip Pocket to Bin

Surface buildings and a high headframe make it inconvenient to dump the ore directly into the ore bin from the skips, at the No. 1 shaft of the Federal Lead Co., in southeastern Missouri. The skips dump into a receiving pocket; the ore is then elevated by a conveyor to the bin, which is about 90 ft. distant from the shaft. The conveyor is of the flat, lapping-pan type, and is set at an angle of about 23° and housed in a bridge of the ordinary style. At the top of the ore bin is placed the 25-hp. motor, which drives the conveyor at a speed of about 70 ft. per minute.



RECEIVING POCKET AT ONE OF THE FEDERAL LEAD COMPANY'S MINES

The details of the receiving pocket, which has a capacity of about 10 tons, or approximately two skips, are shown in the accompanying drawing. The top is wide enough to receive the ore from both skips, while the bottom is contracted to feed directly upon the 30-in. conveyor pans. The pocket is lined with plates, and where the wear is heaviest rails are used instead of plates.

If a boulder becomes wedged at the bottom of the feed hopper, the attendant, who is always on duty, throws a switch, stopping the conveyor-drive motor. At the same time he closes another circuit, which causes a bell to ring in the engine room; while this bell is ringing the hoisting engineer does not dump the skips. The attendant can thus go into the feed pocket and sledge the boulder until it is small enough to go under the lip of the feed hopper. The upkeep of the conveyor is small and it seldom gets out of repair. About 1800 tons per eight-hour shift are handled without difficulty. In many ways it would be better to dump directly into the ore bin, but where conditions make this impossible, the receiving pocket and conveyor is feasible.

Melting and Refining Precipitate at Tigre Mill

At the Tigre mill, El Tigre, Sonora, Mex., the Merrill process of zinc-dust precipitation is used. The following description of the methods employed in melting and refining the precipitate is taken from an article by D. L. H. Forbes in the August *Bulletin* of the American Institute of Mining Engineers.

The precipitate taken from the presses is dried in an electrically heated car, which has a series of superimposed shallow pans, under which the resistance coils are placed. On account of the large amount of moisture given off from the precipitate while drying, the resistance wires have to be protected by an asbestos paint covering in order to prevent corrosion. The car has a capacity for drying 1000 lb. of precipitate in 10 hr. and takes 4.5 kw. of power.

Melting is done in two No. 125 crucible Steele-Harvey oil-burning furnaces of the tilting type. The object of the melting is to fuse the precious metals and to remove as much of the copper and zinc as possible in a slag which will also carry off the baser impurities, such as alumina, silica, lime, and iron. To effect this purpose, fluxes are added to the precipitate in such proportions that the oxides of copper and zinc find sufficient finely powdered silica present to unite with it and form subsilicates; the oxides of iron, aluminum, and calcium find sufficient borax and silica to dissolve or unite with them; while a little sodium bicarbonate and fluospar are added to make the slag fluid.

The precipitate analyzes as follows: Au, 0.3%; Ag, 63.13%; Cu, 1.5%; CuO, 3.14%; Zn, 2.0%; ZnO, 3.23%; SiO_2, 11.6; Al_2O_3, 5.7; Fe_2O_3, 1.3%. For the melt 100 parts of precipitate are fluxed with 5.7 parts of silica, 5 parts of borax, 0.6 part of fluorspar and 9.1 parts of soda bicarbonate. When fluxed in this manner the precipitate melts down nicely. As the charge sinks in the crucible, fresh precipitate, mixed with flux, is added about every 20 min. until the crucible is nearly full of metal and slag in a state of quiet fusion. The slag is then poured into a conical pot, in which a crust is allowed to form to a thickness of 1 in.; the molten slag inside the crust is run out on cast-iron floor plates.

The crusts from this operation usually contain a small button of gold and silver at the point of the pot, and this button is broken off, and either put back in the crucible, or, if matte be present, is saved for a separate treatment with other similar buttons. The crusts themselves carry sufficient gold and silver to warrant a remelting, while the molten slag that is run on the floor is low in value, and, once a month, is weighed, sampled, and returned to the head of the mill.

After two to three pourings of slag, the molten metals in the crucible are subjected to a refining process, which depends upon the rapid formation of the oxides of zinc and copper when these metals are exposed to the air at high temperature in the molten state. With the furnace tilted forward, the operator throws a handful of bone ash over the surface of the molten metal. This thickens whatever slag still remains, and enables it to be easily removed by means of spirals of 0.5-in. round iron. The air striking the exposed surface of the metals rapidly oxidizes the zinc and copper. After a couple of minutes, borax is thrown on and dissolves the oxides, forming a slag, which is thickened with bone ash and removed as before. After about two repetitions of this refining, the precious metals are ready for pouring.

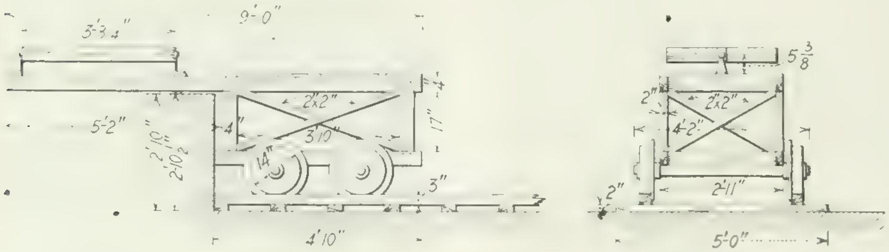
The furnace is tilted back and the heat applied for about 5 min. with the cover over the crucible. A step-bottomed truck, with bullion-molds that have been heated and greased with a mixture of oil and flake graphite, is then run in front of the furnace, the mold on the highest step being set in front of the spout. The bars of bullion are poured by tilting the furnace forward over each of the molds in turn. After removal from the molds and cooling, the bars, which weigh from 1200 to 1300 oz., are chipped, sampled by drilling top and bottom, and stamped, ready for shipment. By this process, in spite of the high content in copper carried by the precipitate, bars from 850 to 900 fine are obtained.

From 20 to 30 lb. of flue dust are collected and removed each month from a large chamber outside the melting-room through which the furnace gases are led. A typical analysis of the flue dust is: Au, 0.01; Ag, 21.39; Cu, 10.40; Zn, 7.50; SiO_2, 11.08; Al_2O_3, 2.90; Fe_2O_3, 2.30; undetermined, 44.42 (chiefly particles of borax, fluorspar, etc.); total, 100 per cent.

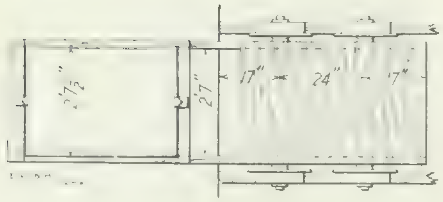
For the remelting of slag crusts, scraps of iron box bands are added to the slag in the proportion of about 0.5% of the weight of the slag, and the slag put through the furnace until a button of sufficient size to collect in the mold is obtained. Slag assaying Au, 1.98; Ag, 650 oz. per ton; Cu, 7.5; Zn, 13.5; SiO_2, 28.1; Al_2O_3, 11.34; Fe_2O_3, 4.76 per cent. was reduced in this manner to Au, 0.06 and Ag. 32.34 oz. per ton; yielding metal that assayed Au, 0.147; Ag, 40.183; and Cu, 42.4 per cent.

Truck for Blueprint Frame

A simple truck for carrying a blueprint frame, which allows the frame to be pushed through an open window, is shown in the accompanying drawing. The truck is made of 2x4-in. lumber and weight to counterbalance the overhanging frame is obtained by fitting the truck with mine-car wheels. The wheels run on 3x3-in. stringers nailed to the floor. The 2x4-in. top stringers, which support the frame, are spaced 2 ft. 7 in. apart and extend 5 ft. from the front of the truck; this allows the printing frame to be moved to any angle on center supports.



TRUCK FOR BLUEPRINT FRAME



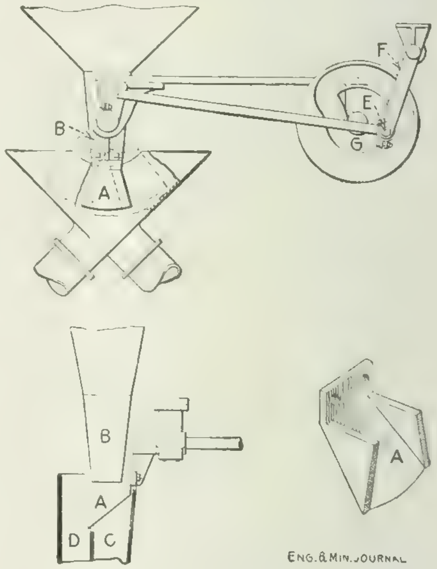
Float for Solution Sump Indicator

Generally speaking, solution-sump indicators are troublesome for the reason that the cork or wooden floats usually get waterlogged and so become unreliable. A simple float that avoids this difficulty is described by Percy L. Morrisby (*Journ. Chem. Met. and Min. Soc. of So. Africa*, August, 1912).

The float is made of a fair-sized drum, a 10-gal. paint drum serving the purpose admirably. The ends of the drum are made tight; two holes are drilled in the middle of the sides to receive a length of ¾-in. iron pipe, which is soldered in position at right angles to the long axis of the drum. The object of the short piece of pipe is to hold the float in position; it should project about one inch on either side of the drum. A rod of ⅝-in. round iron, long enough to reach from the bottom to the top of the vat, serves as a guide for the float; this is screwed into a piece of flat-iron plate, say 12x12x½ in., which rests on the bottom of the vat about nine inches from the side, the upper end of the rod being supported in a suitable manner. The float is placed in position on the rod and connected to the indicator board by pliable steel wire. To keep these drums in good order,a coat of tar applied twice a year is recommended.

Sheridan Oscillating Ore Sampler

Leslie M. Sheridan, of Anaconda, describes a new oscillating ore sampler in U. S. Pat. No. 1,031,385. The main features are the lightness of the moving part, which is exposed to wear, and the ease of replacing it in event of injury. The device consists essentially of a cutter *A*, oscillating in a sampling hopper, which is divided into two longitudinal sections, each of which has a separate delivery spout. When the cutter *A* is at either end of its oscillation, the ore flows through spout *B* down into section *C* of the sample hopper, and on to the ore bins. When the cutter *A* swings under spout *B* the ore is deflected to the sampling apparatus proper.



SHERIDAN SAMPLER

The patent also covers a peculiar cam motion, which regulates the relative periods during which the cutter is under the spout and when it is not. This motion is the resultant of the motion given the rocker arm *F*, because of the pin *E* having to follow the cam groove *G* as the wheel rotates.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Aluminum Peroxide

The preparation of an aluminum peroxide by A. Terni is noted in the *Journal* of the Society of Chemical Industry, Sept. 16, 1912 (Abstr. from Atti R. Accad. dei Lincei, Rome, Vol. 21, p. 104).

A concentrated solution of potassium aluminate prepared by dissolving freshly precipitated aluminum hydroxide in the smallest possible quantity of 50% potassium-hydroxide solution, was treated with excess of a 30% solution of hydrogen peroxide, and the precipitate produced was filtered off with the aid of the pump, washed well with water, then with alcohol and ether, and dried in the air. The light, amorphous, white powder thus obtained had the composition, $Al_2O_3.Al_2O_4.10H_2O$, and exhibited the properties of a true peroxide. It dissolves readily in alkalis, without evolution of oxygen, probably owing to the formation of peraluminates. If the precipitate produced on adding hydrogen peroxide to potassium-aluminate solution, be rapidly filtered off and pressed between absorbent paper without washing, a product is obtained in which the ratio of active oxygen to alumina is approximately 1:1. This substance, Al_2O_4, is decomposed by water and slowly, even on keeping, with formation of the compound, $Al_2O_3.Al_2O_4$.

Avoiding Loss in Brass Founding

In *Metallurgie*, p. 523, 1912, F. Bensel gives the results of some attempts to diminish the losses in brass founding. Direct addition of zinc to melted copper in a crucible heated electrically produced hardly any alloy, the zinc volatilizing and oxidizing. Several attempts to substitute for the zinc an equivalent quantity of blende, the copper being in sufficient excess to form cuprous sulphide with the sulphur of the blende, and sodium sulphide being used as a flux, were also unsuccessful; the brass produced never contained more than about 12% of zinc, and great quantities both of copper and zinc were lost in the slags. Sodium and calcium carbonates used to flux the blende were also unavailing. Finally, the metals were melted together in a closed egg-shaped furnace, through the center of which passed carbon electrodes joined by a rod of resistance carbon. The furnace could be rotated so as to agitate and mix the metals, and had a covered opening through which the alloy could be poured. There was practically no loss of zinc, and the resulting brass was almost exactly of the composition (70:30) calculated for. The cost of melting a ton of brass was about $1.50 for power (in a furnace taking 50 kg. at a time), and about 55c. for resistance carbon. The saving in zinc, as compared with the ordinary process of manufacture, may be taken at 60c. per ton of brass.

Electrolytic Zinc Production

"Zinc Electrolysis in Aqueous Solutions" was the subject of a paper read by Doctor Engelhardt, at the recent annual meeting of the Association of German Metallurgists, says the *Mining Journal*, Oct. 26, 1912. The lecturer demonstrated how, after strenuous exertions, extending over fully 30 years, to solve the problem of producing metallic zinc by an economically and technically unobjectionable electrolytic method, the only group of processes now held to be deserving of consideration is that in which chloride or sulphate solutions are dissociated by insoluble anodes and without utilization of the functions of the anodes.

The chloride electrolysis (more particularly the Höpfner process) has, for various reasons, so far proved a failure, but with sulphate solutions success, though only a qualified one, may be obtained, if proper attention be paid to the material of the anodes. Exhaustive experiments in zinc-sulphate electrolysis carried out at the Siemens-Halske works with anodes of massive peroxide of lead or manganese have proved that, technically speaking, the problem has been satisfactorily solved. From the economic standpoint, however, it is pointed out that under ordinary circumstances an electrolytic zinc works can, owing to high working costs, operate satisfactorily only if it turns out the high-priced, entirely pure metal with more than 99.9% zinc. But, though metal of that quality is saleable in comparatively small quantities at considerably higher prices than the usual refined brands, its consumption is of far too limited a character to admit of an electrolytic production on a large scale. In order to install works for that purpose with economically satisfactory results, it would be indispensable to reduce the working costs to such an extent that they leave a sufficient margin of profit at ordinary zinc prices. That, however, would only be possible in localities where either very cheap power is available, or where the ores, for some reason or other—for instance, their refractoriness or difficult transport conditions—are obtainable at materially lower prices than the usual market rates.

Alumina in Iron Furnace Slags

In a paper presented before the International Congress of Applied Chemistry, J. E. Johnson, Jr. gives the results of observations on the *rôle* of alumina in iron blast-furnace slags. It is his opinion that alumina acts neither as a base nor an acid in slags, but only as a diluent, affecting its viscosity, but not its chemical nature.

Comparing a slag which ran for 24 hr. with 36% of Al_2O_3 with slags produced in standard Virginia and Lake-ore practice, gives the accompanying table.

SLAG COMPOSITIONS

	Al_2O_3 %	SiO_2 %	CaO By diff.*	$\frac{CaO}{Al_2O_3 + SiO_2}$	$\frac{CaO + Al_2O_3}{SiO_2}$	$\frac{CaO}{SiO_2}$
Virginia	6.5	36.0	54.0	1.27	1.68	1.50
Lake Ore	13.5	33.0	50.0	1.08	1.92	1.51
Experimental	36.0	24.7	36.8	0.59	2.90	1.44

*After allowing residue not Al_2O_3, SiO_2, or CaO, of 3.5%

There seems to be no reasonable basis for calculating acidity or basicity on the basis of this table except to regard the alumina as a diluting element only. Again, in foundry-iron practice, it will be found that the lime-silica ratio will always be between 1.2 to 1.4.

There seems to be a well defined opinion among furnace men that alumina has the effect of making the slag viscous and stringy over a certain range, beginning about 16, reaching a maximum about 20, and disappearing between 25 and 30%. Mr. Johnson suggests that a portion of this stringiness is wrongly attributed to the alumina, and that it is really due to attempting to figure the alumina either as acid or base, and consequently getting an incorrect lime-silica ratio.

In figuring lime-silica ratios it is the author's opinion that magnesia should only be figured as equivalent to lime, weight for weight. This he explains by the supposition that the chemical activity of magnesia is less than that of lime in just about the proportion that its molecular weight is less, instancing as proof of its inertness that quicklime can be added to a soda solution to deprive it of carbon dioxide, whereas magnesia, under like conditions, is inert.

Some of his general observations on slags are also of interest. For instance, for "several years technical literature contained many learned discussions on the oxygen ratio of the acids and bases, all on the assumption that they must be present in a ratio depending on molecular weight and valency."

"A wider knowledge of the blast furnace now enables us to say that for practical purposes this work has been of almost no value. It is now generally admitted that on the physical side the important point of a given slag is neither its total heat of fusion nor its softening point, but its free-running temperature, since this is the critical temperature of the furnace.

Shipping Cement in Bulk

The recent experiments of the Universal Portland Cement Co. on shipping cement in bulk have already been commented on. The company has now issued another circular dealing with the matter, concerning which *Engineering News* makes the following comment:

When one computes the cost of all the items involved in packing and handling cement in bags, it is probable that a total saving of not less than 25c. per bbl. on the cost of cement could be made by handling it in bulk instead of in bags. There is no difficulty in shipping cement in tight box cars; and if rain finds entrance to the car through the roof or sides, the damage to the cement is less than if it were shipped in bags instead of in bulk.

Besides the economy to the cement manufacturer and user, it is worth while pointing out that from the standpoint of the quality of the product, engineers should favor the use of cement in bulk. The even aëration which bulk cement receives in handling from the car to the mixer will have the same effect in securing the certain hydration of any free lime particles that is sought by the specifications which require cement to be stored a certain time before using.

There is doubtless a certain prejudice in favor of the use of cement in bags because it is easy to get the right proportion of cement by counting the number of bags put into a batch of concrete. There is, however, always the chance that the man on the mixer may make a miscount and put in perhaps one bag too few so that there will be a lean batch of concrete turned out, or one bag too many, wasting cement. With cement in bulk the proper amount of cement for one batch is measured just as the stone and sand are measured, and there is no chance for making an error. We are informed that bulk cement is now being shipped and used with great satisfaction and economy on some large contract work as well as in factories using cement in the manufacture of sewer pipe and other cement products.

Copper Smelting in the Electric Furnace

Mr. Stephen, the manager of the Ugine smelting works, Savoy, has recently published the results of exhaustive experiments on smelting in the electric furnace, says the *Mining Journal*, Oct. 26, 1912.

For copper-ore smelting, he used as reducing agents charcoal, coke and anthracite, all of which proved suitable; limestone served as flux. The electrodes consisted of carbon, and partly soft-steel poles and water-cooled copper poles were employed. The ores contained from 10 to 20% CuO, 30% SiO_2, 10% Al_2O_3, 3 to 5% CoO, and from 7 to 32% moisture. The product obtained was never anything better than black copper, spoiled by considerable quantities of cobalt, iron and silicon. From 1000 to 1200 kw. current and 8 kg. of electrodes were consumed per ton of ore, and the consumption of the reducing agents averaged 25% of the copper contents of the charge. As a result of his experiments, Mr. Stephen comes to the conclusion that for producing copper the electric furnace is not promising. The smelters now in use, he says, are working so economically that the electric furnace cannot be expected to compete with them, except, perhaps, in localities which, while rich in water power, are poor in solid fuels, and where transport of ores would be difficult. Mr. Stephen said that zinc and nickel ores gave similar results.

Danger from Dust Inhalation

In Sir Thomas Oliver's paper before the International Congress of Hygiene were some interesting statements concerning what becomes of inhaled dust, particularly as throwing light on plumbism. In experiments by Dr. Yoichiro Saito, dogs and rabbits inhaled air charged with white-lead dust from one to 33 hr. The greater part of the dust was subsequently recovered, not from the lungs, but from the alimentary canal. In experiments with men and white-lead dust, 95% of the dust inhaled remained behind in the body, and from 60% to 80% eventually found its way into the alimentary canal, apparently by mixing with the nasal mucous and being subsequently unintentionally swallowed. These experiments show the necessity for respirators, and the good of frequent nasal douches, and that simply to avoid contamination of food, etc., with lead dust is not enough.

Properties of Tungsten

Some of the interesting properties of tungsten were given before the International Congress of Applied Chemistry, by C. G. Fink, of the General Electric Co. Its density is 19.3 to 20.2; tensile strength, 322 to 427 kg. per sq.mm.; coefficient of expansion, 4.3x10^{-6}; specific heat, 0.0358; hardness, Moh's scale, 4.5 to 8.0; melting point, 3100° C.+. The ductile metal is practically insoluble in all common acids, and it can be drawn to a thinner wire than can any other metal. Tungsten gauze has been used as a filter in the laboratory, and is recommended for use commercially, e.g., for filtering electrolytic slime in refineries. [It would appear that capital expenditure might cut some figure here.—EDITOR.]

It is well suited for standard weights because of its high specific gravity, its incorrodibility in air, and because it is so hard it will scratch glass; acid-proof dishes and tubes have been made for laboratory use; because of its great ductility it is well adapted for galvanometer suspensions, and for cross hairs in scientific apparatus; and because of the same property it is recommended for use in surgery. Tungsten resistors are of two types, tungsten wire helix on an aluminum tube, sealed in a hydrogen atmosphere; and a tungsten tube, replacing the carbon tube in an Arsem vacuum furnace. The tungsten-molybdenum couple is used in thermo-electric work; its electromotive force increases to about 12½ millivolts at 540° C., then decreases to 0 at 1300° C. Owing to its elasticity and paramagnetic properties, it could be used in electric measuring devices, watch springs, etc.

In the discussion, Doctor Fink said the cost of pure tungsten was $10 to $12 per pound. Other uses of this interesting metal are noted on p. 642, ENGINEERING AND MINING JOURNAL, Oct. 5, 1912.

Boiling Points of Metals

The boiling points of various metals were determined by means of an optical pyrometer by H. C. Greenwood (*Chem. News*, 1912, pp. 31, 42) at the time vaporization became sufficiently vigorous to project drops of metal from the surface. These boiling points at atmospheric pressure were: Ag, 1955° C.; Al, 1800°; Bi, 1440°; Cr, 2200°; Cu, 2310°; Fe, 2450°; Mg, 1110°; Mn, 1900°; Pb, 1525°; Sb, 1420°; Sn, 2275° Centigrade.

Dredging on Butte Creek, California

By Lewis H. Eddy

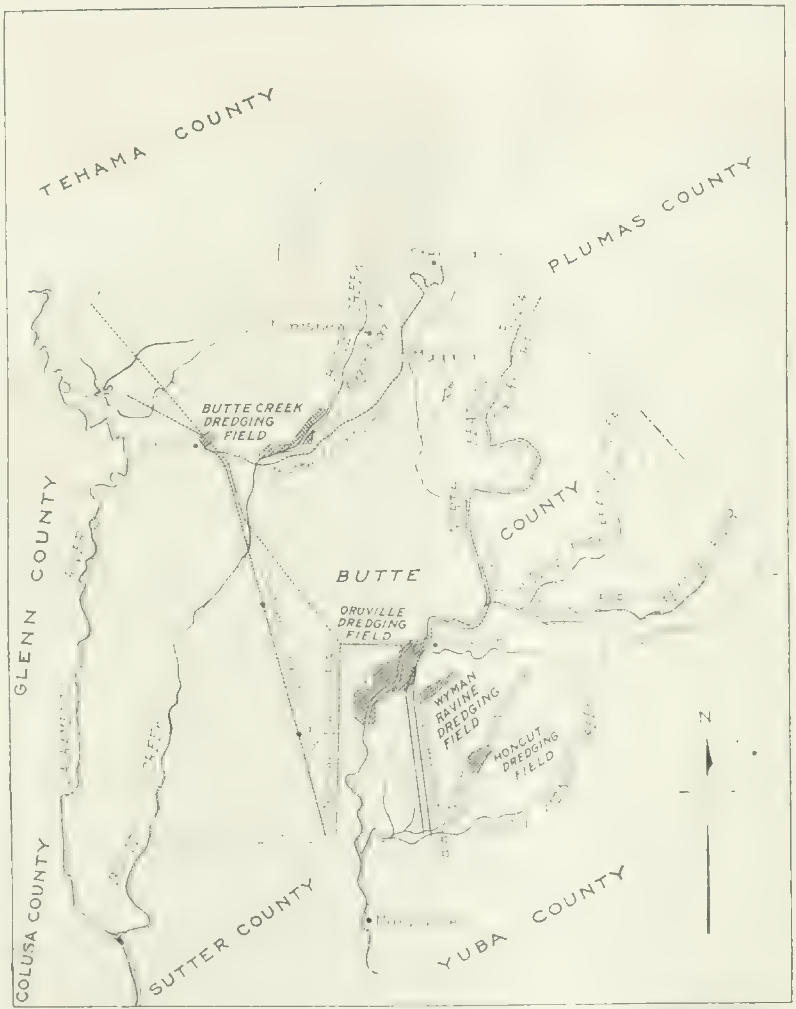
Two bucket-elevator gold dredges, showing many differences in constructional details, are operating in Butte County. The older, originally of 11-cu. ft. open-link type, was recently remodeled for 5-cu. ft. close-connected buckets. The other dredge is equipped with 4-cu. ft. close-connected buckets of special design.

There are two bucket-elevator gold dredges on Butte Creek, about 10 miles north of east from Chico, Butte County, Calif. The older dredge was originally equipped with 11-cu.ft. open-link buckets of special design which, in October, 1912, were being displaced by 5-cu.ft. close-connected buckets of Bucyrus standard type. The newer dredge is equipped with 4-cu.ft. close-connected buckets of special design. The Butte Creek field is distinct and separate from the Oroville field, although in the same county and only about 18 sectional miles in a west of north direction from the Feather River district. Geographically the two fields are so closely related that Butte Creek, like Honcut and Wyman Ravine fields, is generally considered tributary to the Feather River district. The headwaters of the two streams flow nearly parallel and are only three to six miles apart, but Butte Creek is tributary to Sacramento River.

TWO DREDGES OPERATING

The older dredge on Butte Creek was installed in April, 1909, by the Butte Creek Consolidated Dredging Co.; the newer one in June, 1911, by John Ross Wade. The dredges are unlike in most of the constructional features and were initially wholly unlike in bucket design, though in general construction and design the buckets were both classed as California type. The essential difference between the 11-cu.ft. and the 4-cu.ft. buckets was particularly noticeable for the reason that both were operating in similar, if not precisely the same, character of gravel and only about two miles apart on the same stream bed.

The older dredge is equipped with deck and tail sluices and tail scow constructed for saving the gold and disposing of the tailings. The original buckets were designed with square-cornered wide mouth, deep and narrowed at hood and bottom. The buckets of the newer dredge conform more to the California type, but are of circular-shape mouth design, shallow and rounded at bottom and hood; the gold-saving tables are a modification of the standard type, and the tailings are handled with a belt conveyor. In other parts the machinery is of standard type, though differing in some features of arrangement from usual practice, due to physical conditions not usually considered and to specific results which the operator desires to attain as economically as possible. The operation of the newer dredge is improving the channel of the creek, and the older dredge is replacing the land in condition for agriculture, which, in a measure, account for some of the differences in mechanical arrangement.



DREDGING FIELDS IN BUTTE AND YUBA COUNTIES, CALIFORNIA

The Butte Creek Consolidated dredge was originally equipped with thirty-nine 11-cu.ft. open-link buckets, designed by E. L. Smith, of New York, and with Taylor Iron & Steel Co. machinery. The digging ladder, 83½ ft. long, is constructed of steel, weighing 80,000 lb. It was designed to dig 35 ft. below the water line, with from eight to 12 buckets dumping per min. The spuds are 28x48 in. in section and 50 ft. long; one is steel, the other wood. The steel spud weighs 20 tons; manganese steel is used at points of greatest wear. The hull is 109 ft. long, 40 ft. wide, 9 ft. deep, 4½-ft. draft.

The gravel was washed in a revolving screen 12 ft. long, 8-ft. diameter, perforated with 6-in. and 10-in. holes, and made of manganese steel. The boulders of more than 10-in. size passed the perforations and were carried off at either side of the boat through steel chutes. The smaller gravel and sand, passing through the screen holes, dropped to the main sluice, built on deck beneath the screen, and were carried on and through the tail sluice supported by the tail scow.

The main sluice is 36 ft. long and the tail sluice is 120 ft. long. They are equipped with manganese-steel riffles made in sets 4-ft. square and 4⅞ in. deep. The scow is equipped with undercurrent and tables for fine gold. A 15-in. pump furnishes water for the sluices. The dredge is electrically driven; the motors are direct connected and have a total rated power of 375 hp., distributed as follows: Digging ladder, 150 hp.; winch, 85 hp.; screen, 15 hp.; sluice pump, 100 hp.; primary pump, 25 horsepower.

The rated yardage capacity of the dredge was 100,000 cu.yd. per month. At the time of my first visit, during the operation of the old bucket line, the buckets were carrying about 75% of the capacity of 11 cu.ft. Much of the gravel or boulders ranged in size from 12 to 20 in., though these large rocks were more noticeable passing through the chutes than an equal quantity of the same size would be in passing over a belt conveyor; the separation of the rocks above 10 in. from the remainder of the material, taking place in the screen, also attracted closer notice to the size of the large pieces than would be attracted to the same sizes passing through a revolving screen 35 ft. long, carrying all the gravel to a belt conveyor and delivering only the fines to the riffle tables. Some of the boulders carried off through the chutes were from 24 to 48 in. in size; but these extraordinary rocks are not confined to this part of the creek, nor are they confined to the Butte Creek field; they are found in nearly all dredging districts of the state, though there are fields where the gravel runs more uniformly to smaller sizes.

BUCKETS OF UNUSUAL DESIGN

The peculiar lip design and hopper-like shape of the hood and bottom of the old buckets attracted the attention of the most casual observer. The hood and bottom were in one piece, having an acute pitch that gives a small bottom surface, compared with the width of the mouth. The lip was double riveted and made especially strong, the corners being raised about two inches higher than the front edge of the lip and the sides of the hood This extra strength is designed to withstand heavy digging and the extra wear to which the corners of all buckets of square-shaped mouths are subjected. The theory of the designer was that the projecting corners would save the bucket and distribute the wear evenly.

So far as the body of the bucket is concerned, the desired result may have been attained, but the wear on the lips was decidedly uneven. Theoretically, the corners of the lips would be the first to give way to the grinding effect of uniform-sized gravel and the heavier contact with the large rocks; the practical result has been that the lower or front edges of the lips on many of the buckets were as badly worn as were the corners on other buckets. The failure of the buckets to dig the full capacity was not necessarily attributable to the shape of the bucket, nor the uneven wear of the lip, nor to any other single feature or combination. There are physical conditions of the ground in many instances to be considered, and the inclination of the operator to drive the dredge at less than full capacity may have governed.

The only point of dissent with the theory of design of this bucket is that the raised and strengthened corners of the lip tend to an even distribution of the wear, for the contrary effect has been plainly demonstrated not only by this dredge, but by dredges equipped with the older Bucyrus buckets. It is admitted by operators of dredges equipped with hood-shaped buckets of less pitch and rounded bottoms that the hopper-shaped bucket will dump more efficiently; but this admission contemplates the employment of the hexagonal upper tumbler, and does not consider the square or four-sided tumbler to be practicable. But the standard bucket with less pitch, built on the hopper-shape plan, in accord with the dumping theory, is designed with a rounded instead of a flat bottom, upon the theory that the gravel, especially the irregular-shaped larger rocks, is more readily released. However, the speed at which the buckets are dumped and the difference in action of the open-link and the close-connected buckets have a bearing on the practice in considering the merits of the buckets of various designs; and the four-sided tumbler also may possess merits that are worth considering.

DREDGE EQUIPMENT BEING CHANGED

The operation of this dredge stopped in June, 1912, and the bucket line was dismantled preparatory to the installation of the new bucket line of 5-cu.ft. close-connected manganese-steel buckets of the standard Bucyrus type. The old bucket line was operated for the three years with the addition of only one new bucket, there having been 40 buckets of the original design and construction while the line carried 39. The old buckets were manufactured by the Brake Shoe Co., of Chicago, which has been succeeded by the American Manganese-Steel Co. The latter company built the new bucket line. These buckets are being delivered at the dredge complete for installation; no machining or other work will be necessary.

It is the intention of the operators to change the revolving screen; the new screen, or the remodeled old one, to be 32 ft. long instead of 12 ft. as at present, the perforations graduated from ⅜ in. to ½ in. It is expected, also, to take out the present sluiceways and install the usual type of gold-saving tables. In the operation of the dredge it was found that the gravel was so large that the quantity of water required for washing and carrying away the heavy gravel through the sluices was expensive, and that with this large volume of water much of the fine gold was carried away and lost. It was expected that the remodeled dredge would be ready for operation sometime in November of the present year; although it may be decided to install the other changes before placing the dredge again in commission.

Three years is an extraordinary record for the life of a bucket line without addition of new buckets; but the dismantled buckets examined on my last visit were found to be badly broken and worn, and wholly unfit for further economic service. Whether the buckets performed sufficient profitable service in the three years to warrant the maintenance of the line intact is known only to the operators of the dredge. The common practice in dredge operation is to displace the broken or badly worn buckets with new ones, and thus maintain a competent bucket line continously, or until a new design of bucket may be decided upon. The substitution of the 5-cu.ft. for the 11-cu.ft. buckets would seem to warrant the assumption that the original buckets were found to be too large and cumbersome to be operated to their full capacity by this boat. It is not probable that the 11-cu.ft. buckets carried at any time, continuously, their full capacity. Buckets carrying an average load are less liable to excessive wear and breakage than buckets carrying 50 or 75% of capacity. The results of general practice in dredge construction and operation indicate that 5- or 7-cu.ft. buckets are more economical for this size dredge and the character of gravel which it has been digging.

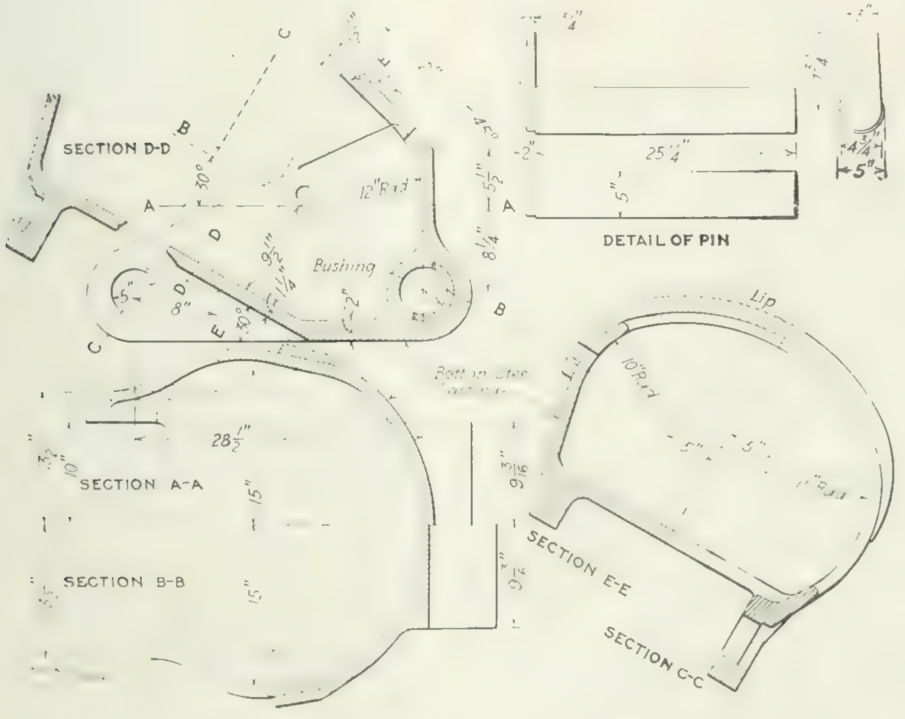
The Butte Creek Consolidated Dredging Co., operating the dredge above described, has total land holdings of 1450 acres, situated in T. 22 N., R. 2 and 3 E. Of this area, 500 acres were dredgeable, and about 100 acres have been worked. The gravel averages about 20 ft. in depth, and contains some clayey material; the bedrock is lava. H. P. Galligan, of Chico, is superintendent.

WADE DREDGE OPERATING ALONG LIVE STREAM

The land on which John Ross Wade is operating a dredge of his own design and construction is situated in T. 22 N., R. 2 E., about two miles southwest from the Butte Creek Consolidated lands. The gravel averages 27 ft. in depth, and contains a large proportion of coarse material and many boulders from 20 to 40 in., and some larger. The stream channel at this point courses between bluffs or mesas about 300 to 600 ft. high. The country rock and the bedrock of the creek are of the same lava formation that extends for several miles northerly to the Nimshew and easterly to the Magalia drift- and lode-mining districts.

In September, 1912, after about 15 months' operation, the dredge was overturned in about 26 ft. of water, the port side resting on the bed of the stream, the deck standing at an angle of 90° from horizontal. It required about one month of time and the services of a diver to right the boat. It was again in operation in October. The overturning of the dredge resulted indirectly from a break in the digging-ladder hoist. The jarring caused by this break made a break in the tailings-stacker support, which swung the stacker to port. The starboard-side line broke, and the stacker swung around almost at right angles, causing the boat to take a heavy list to port. The door of the hatch was open and an obstruction prevented its immediate closing. When the boat listed to port the water poured in, and the hull was quickly filled, causing the boat to settle port side on the bed of the stream. A diver was employed to close the hatch. Then the water was pumped out and the boat righted.

The dredge is working longitudinally with the live open-water channel. The cut is 200 ft. wide, and at the side a cut 50 ft. in breadth is kept open. It is the intention, when the upper end of the ground is reached, to make the return cut alongside the present cut, leaving a second open-water course of 50 ft. adjoining the first, or a total of 100 ft.; and in the future to work the ground always up and down the living open-water channels, to the end that there may be ample channels for the flood waters, thus avoiding any complication with the débris commission, and preventing inconvenience to the ranches above and below.



Details of 4-cu.ft. Bucket on Wade Dredge, Butte Creek, Calif.

In order that the channel improvement may be more conveniently accomplished, headlines are employed instead of spuds, and the general construction of the dredge is so arranged as to make it possible to stack the tailings on one side and leave the ground open at the other side. In order to provide for working the dredge close along the banks of the cut, the sluices are kept wholly on the boat, no provision being made for overhanging extensions. The assumed necessary area of 1500 sq.ft. occupied by the gold-saving tables is provided by placing the pumps below decks and the winch on the upper deck at the stern.

Hull Reinforced by Steel Girders

The hull is 85 ft. long, 37 ft. wide, 7 ft. deep, 5-ft. draft; the height of the boat over all from the main deck to the top of the stern gantry is 37 ft. The hull is reinforced at bow and stern with steel-plate girders extending the full depth; the bow, with ⅜-in. plates and 4x6-in. channels, and the stern with ⅜-in. plates and 15-in. channels. The body of the hull structure is further strengthened with 2½-in. truss rods extending fore and aft and horizontal, provided with turnbuckles for contraction and expansion of the structure.

The 7-ft. depth of the hull is sufficient for the installation of pumps, and their position in this part of the boat eliminates the priming of the pumps. There are two 8-in. Ragen 20-ft. lift pumps for supplying water to the gold-saving tables, and one 8-in. Krogh 55-ft. lift pump for supplying water to the revolving screen operated by 30-hp. motors under 2200 volts. The suction screen for the low-pressure pump is at the end of the well and so arranged that gravel which misses the regular save-all will pass over the pump screen. Examination of the gravel found in the distributing pipes has shown the presence of gold, thus indicating an appreciable saving through this arrangement.

The digging ladder is 62 ft. long, equipped with fifty-nine 4-cu.ft. close-connected buckets, digging 27 ft. and carrying an excess of rated capacity, and dumping 25 per min. The ladder is girder-trussed with angles; the upper parts of four 15-in. channels with two 1x15-in. plates between channels. The return sluice plate ½ in. thick is supported by heavy transverse angles. The top of the channels is further stayed from transverse flection by plates and angles with open spaces between them to admit of the ladder rollers turning. The ladder rollers are cast steel, the roller body and journal in one piece. The bushings are cast iron with ball-and-socket supports of cast steel. There are 11 rollers placed at intervals of five feet.

The ladder support or hanger is an inverted U- or horseshoe-shaped steel casting six feet long from the outer side of the curve to the ends of the stems. The opening between the stems is just sufficient for the buckets to pass. This construction renders it impossible for the buckets to go clear off the lower tumbler, as they will engage the hanger and be brought to a gradual stop, as the hanger will be deflected somewhat before it comes to a position in which it can effect the stopping of the bucket line. This construction affords also a ready method for putting the buckets back in place, as by reversing the line the buckets are directed toward the center of the tumbler. The ladder fork is of solid steel casting, with the lower-tumbler bearings swiveled at the extremities. The bearings are provided with packing glands to exclude grit. The journals are 12 in. in diameter and 16 in. long. The lower tumbler is six-sided, cast in one piece of high-carbon steel, the treads and corner plates are of manganese steel 2½ in. thick, riveted to the main casting.

Upper Tumbler and Shaft in One Piece

The upper tumbler is four-sided, cast in one piece of high-carbon steel, provided with projections or sprockets lined with manganese-steel plates, 2½ in. thick, for supporting the bucket under the front and back eyes. The journals are 16 in. in diameter and 20 in. long. The tumbler is driven by a single gear. The housings for the top tumbler bearings, hanger shaft and intermediate shaft are steel castings extending the full length. The ladder is supported by a steel shaft 10 in. square. The tumbler stands 22 ft. above the water level. Casting the tumbler and shaft in one piece reduces the weight and makes a saving in the first cost, and avoids the possibility of the shaft working loose. In case of a broken shaft a new tumbler can be supplied at no greater cost than the taking out of the old and putting in a new shaft.

The upper tumbler supports the buckets only under the front and back eyes; the lower tumbler, being six-sided and without sprockets, supports the buckets only through the middle; this gives mo uniform travel to the bucket line, an distributes the wearing action of the two tumblers, tending to wear the bucket bottom uniformly. This method of distributing the wear, causing regular and uniform movement of the buckets over the ladder rollers, tends also to distribute the wear uniformly on the sides of the buckets.

There is no rolling or sliding of the buckets on the tumblers to cause excessive wear of the bucket bottoms and the tumbler treads. General gold-dredge practice has demonstrated that this wear is due primarily and almost exclusively to the sliding motion between the bucket and the tread, and not to impact. The four-sided tumbler gives the most abrupt dumping action to the bucket; when provided with sprockets it also eliminates the sliding motion. In dumping, the bucket being concave or rounded in form, the gravel clears from the bottom and sides with a single motion of the bucket instead of sliding away as with the six-sided tumbler and the hood- or hopper-shaped bucket.

Two new tumblers, one upper and one lower, have replaced those originally built with the dredge. The present lower tumbler has been in use about six months, and the bearings show little wear. New tread plates were placed on the upper tumbler in October. A good record has been made in the operation of the ladder rollers. The bearings have been in use for 15 months. Two or three months ago these bearings were taken off and the mark of the lathe tool was still discernible. The average wear on the lower tumbler shafts has been about ⅛ in., from a diameter of 14 inches.

BUCKETS OF 4-CU.FT. CAPACITY

The buckets were designed to carry four cubic feet of gravel, and in actual practice uniformly carry an excess of rated capacity. They are close-connected, two-lug type. The body, including hood and bottom, is cast in one piece of 60-point carbon steel, weighing approximately 1100 lb.; the lip is cast of manganese steel, weighing 130 lb.; the bushings of manganese steel weighing 30 lb.; total approximate weight 1385 lb., or a maximum of 1400 lb. The dimensions are: Width, 32 in. at center, 26 in. at bottom; height 24 in.; depth 30 in.; pitch 28 in. The bucket has greater width of mouth, hood and bottom and less depth than the standard California-type bucket, and is concave or rounded.

The lip approximates the arc of a circle and is tilted backward at greater pitch than is common to the standard type. As a whole it conforms more to the design of the bucket of El Oro dredge No. 1 operating in the Oroville field than to any other. Briefly it may be described as a short and round bucket. Measurements were made after the dredge had been in operation for seven months, showing that the outer edge of the lip had worn less than one inch, and the inner edge less than ½ in.; and that the variance of wear measured at three points, the center and sides, did not exceed 1/16 in. In the casting the outer edge of the lip projects at a sharp angle. The wear has cut this down to a bevel. The bottom and sides of the buckets also show uniformity of wear, and no evidence of gouging in spots from impact with the tumblers. After the dredge had been in operation for 15 months, I made further measurement of the same buckets and found that the wear on the lips had increased about ¾ in., making a total wear in 15 months' actual work of about 1¼ in. on the outer edge. The variance of wear was about equal to that shown by former measurement. The bottom and sides of the buckets likewise showed uniformity of wear and no gouged spots.

HIGH SPEED OF BUCKET LINE

The estimated weight of the loaded buckets is approximately one ton each, and the ladder 50 tons; a total weight of ladder and 59 loaded buckets of 109 tons. The results of the motor show, notwithstanding the high speed of the bucket line, that the increased strain is light and more than offset by certain advantages, including the uniform travel of the bucket line. There is no thumping or jarring of the boat caused by the buckets on the tumblers, but a rise and fall in sound, a trace of noise in the gears as the bucket gets to a flat position. The entire action of the dredge is smooth and uniform, which in part may be accounted for by the reinforcement and strengthening of the hull and the thorough trussing of the superstructure, rendering the boat less liable to the effect of any jarring motion of the machinery. There is no appreciable evidence of jarring, nor is there extreme pitching resulting from digging at different depths. The dimensions of the structure and the arrangement of machinery combine to eliminate ordinary disturbance common to boats improperly constructed.

The dredge was operated continuously for five months without a break in the bucket line. Then within a few days two buckets were broken by an incompetent winchman getting the bucket line off the lower tumbler, and not understanding either the necessity for reversing the travel, or the cause of the trouble, resulting in one bucket being jammed and broken between the hanger and the bottom of the tumbler. Thus the inverted U devised for the purpose of preventing the bucket line from going clear off the ladder proved the theory of its construction and application, and would not have caused the breaking of the buckets had proper caution been used. Another bucket was afterward taken off the line because of a crack in the body, occasioned in the same way, the lip being placed on a new bucket. Three more buckets have since been broken, making a total of five broken buckets in 15 months' actual running time. No lips have been broken nor worn out. The five lips taken from the broken buckets have been placed on new buckets.

The revolving screen is five feet inside diameter, 32 ft. long, placed at a grade of two inches to one foot; the perforation surface of the screen is 24 ft. long; the perforations are ⅝ in. The gravel is washed with nozzles 1½ in. diameter, five at the lower and three at the upper end. The gold-saving tables are the cross system, a liberal modification of the standard longitudinal type, having an area of 1500 square feet.

CONVEYOR-BELT STACKER

The stacking ladder is 76 ft. long equipped with a 30-in. belt, guarded by a canvas trough; this trough prevents the heavier rocks from bounding off the belt. A simple device is employed for protecting the belt and the trough from the heaviest rocks that pass through the screen. This is a small wooden frame constructed of three pieces of 2x4-in. board placed parallel and fastened near the ends with cross pieces, to be put on the belt by a deckhand at signal from the winchman in time to catch the extra-heavy rock and carry it free of the belt to the end of the ladder. The deckhand follows along on the gangplank, and recovers the frame by holding on to the rope attached to it. Thus the rock is disposed of without coming into direct contact with the belt or the trough. Rocks of 36 in. or larger are taken off the bucket at the bow of the boat, necessitating the stopping of bucket line, as is the case in general practice in handling extraordinary rocks.

Electric power is furnished by the Sacramento Valley Power Co. over a pole line, a distance of about 100 miles. All motors are operated under 2200 volts, are direct- or belt-connected, having a total of 225 hp. distributed as follows: Digging ladder 75 hp., conveyor 30 hp., winch 30 hp., screen 30 hp., variable speed: pumps, (two) 30 hp. each. The motors are Westinghouse type.

The rated yardage capacity of the dredge under favorable conditions is 3000 to 3500 cu.yd. of gravel per 24 hr., approximately 100,000 cu.yd. per month. The actual average result in the 15 months has been about 70,000 cu.yd. per month. Under favorable conditions the average has run as high as 82,000 cubic yards.

The superstructure consists of four longitudinal 15-in. channels, each having two girders; each panel is secured from fore-and-aft strains by four 2½-in. rod trusses fore and aft extending from the bow gantry to the stern gantry and with transverse truss rods of the same dimensions; the posts are wood. The winch drums and gearing are supported by structural-steel bedplate extending the full width of the dredge, and resting on a steel stern girder.

. The construction of the dredge was practically all done, with the exception, of course, of the pumps, motors, etc., in a temporary shop built at one end of the dredge pit. Here the tumblers, rollers, ladder forks, hoisting shaft, buckets, etc., were machined from the rough material and castings. The structural portions were built here from the rough structural steel. The ladders, girders and such parts as required assembling were assembled and riveted on low trucks run on tracks extending through the end of the shop and into the pit; when completed they were carried on the same trucks to the places where they were built into the hull of the boat, and where necessary, as in the placing of the ladders, the tracks were run up on the hull; the trucks carrying the ladders were drawn into position from which the ladders were lifted to their places in the dredge.

The same shop is still conducted as a general machine and repair shop. At the time of my visit a new upper tumbler and a new lower tumbler were being constructed, buckets were being machined and the lips riveted to the bodies of new buckets, to meet emergencies and thus avoid delays in case of the breaking of a tumbler shaft or the cracking of a bucket. The further purpose of this preparation of new tumblers and buckets is in anticipation that the life of the various parts of the bucket line will be approximately equal, and that the lip of the bucket will equal the body in service. It is probably too early in the life of the dredge to form an opinion, but the indications apparent from the even wear of the various parts are that, barring breakage, the entire bucket line will require rebuilding at one time.

Stratton's Independence

The report of Stratton's Independence, Ltd., for the year ended June 30, 1912, shows that 31,515 tons of ore were mined, having a gross value of $573,205, and a net value of $398,465. The lessees' output was much less than the previous year, while the production on company account exceeded any previous year since the leasing system was established. The net profit for the year's operations was £27,465, out of which two 10% dividends, or £25,000, were paid.

The production from the Washington claim showed a substantial increase over the two previous years, due to a rich strike on the 900-ft. level. On Sept. 16, the water had receded so as to expose the workings down to the 1150-ft. level, after a submergence of eight years. It is proposed to crosscut for the Washington vein immediately in the hope of opening payable ground at that depth. About 80% of the total production was from the Independence claim. A large increase in the production is anticipated by stoping out such mineralized ground as will exceed $2.50 per ton; previous experience warrants the expectation of encountering occasional bunches of high-grade ore.

The mill treated 112,392 tons of ore, averaging $3.10 per ton, at a cost of $1.27 per ton. Of this amount, 13,019 tons were from the mine and the rest from the dump. An extraction of 73.63% was obtained; 42.19% by concentration and 31.44% by cyanidation. The mill was forced to suspend operations from Dec. 22 to Jan. 17, because of freezing of the water supply.

Trail Location and Construction*

The first and most important consideration in trail construction is always the location, and grade is the determining factor in location. Where it is steep, switchbacks should be resorted to. The methods used in location are: (1) Compass and Abney hand level (accurate); (2) hand level only (fairly accurate), and (3) ocular leveling (inaccurate).

A route should first be reconnoitered and definitely decided upon before it is staked out. The main points can be sketched in on a map by means of a compass and hand level. On short distances the hand level will be sufficient. Laying out by eye is a poor method and inaccurate at its best. The route should be staked every 50 to 100 ft. and blazed, but as a usual thing routes are laid out by blazing only. The blazes should be made close together along the trail so that there will never be any trouble in following them. Location should always be from the top of a hill to the bottom, otherwise the maximum grade is apt to be exceeded, because in locating from the bottom there is danger of making the grade steeper than necessary. Location work can be done with a crew of three men and costs from $2 to $10 per mile.

There are several choices for trail routes: (1), Valley or cañon; (2), ridge route; (3), trails crossing mountains, and (4), foothill. The use of one of the first two routes depends somewhat on the nature of the country. Where the cañons are extremely steep, narrow, and full of boxes or interrupted by cliffs, the ridges and sidehills can be followed without much trouble. For the latter, the south sidehills should be used, because they are passable three weeks earlier in spring and later in autumn than north hillsides. Where the country has been worn down the valleys have a gentle grade and are fairly wide, so that they make good trail routes. Routes crossing the mountains are usually expensive and contain steep grades. Foothill routes are undesirable, because there is so much winding in and out of the heads of cañons, to keep an even grade, that the trail becomes extremely long.

Factors which influence the building and cost of trails are: (1), Grade; (2), width of the cleared space and the tread; (3), nature of soil; (4), cost of labor; (5), distance for packing supplies; (6), distance men have to walk to the work; (7), cost of supplies; (8), supervision. Grade is the determining factor.

The cleared space varies from 6 to 14 ft., and the tread from 1 to 4 ft. Ordinarily a tread of 18 in. is wide enough, for a horse will almost invariably travel on the lower side of a trail and always in the same place; if the trail is wider, the inside will fill up with sliding material and the extra cost in excavation will be thrown away. On turns, trails are widened and on switchbacks the width is doubled. The trail bed should be flat. Excavation should be made into the bank instead of building up the outer side of the trail, because on steep slopes earth thrown out of the trail makes a poor footing. The supervision of the crew is a most important factor, for if the work is not arranged as it should be, the trail will be expensive under the most favorable conditions.

The size of the crews varies from 2 to 15 men. In crews of 8 to 15 men it is necessary to have a cook, a packer, and a foreman. The brushing out can be done by 2 to 4 men, while 5 to 8 can do the grading. Small crews vary from 2 to 5 men.

On side-hill locations where water will run down a trail, it is always best to put in water bars; that is, small ditches 2 to 4 in. deep, running diagonally across the trail and banked on the lower side with earth or a small log sunk a few inches in the ground. These will turn the water and prevent any great amount of washing, which might ruin a trail. The number of water bars will vary with the grade of the trail and the degree of slope of the side hill. It is much cheaper to put them in when building the trail than afterward. Under ordinary conditions they can be located from 150 to 225 ft. apart. In building a trail, the country should first be reconnoitered and the route fully decided upon. It should then be located by stakes or blazes, and cleared and brushed, after which it will be graded and the tread formed to the specified width.

The production of sand and gravel in the United States in 1911, as reported by E. F. Burchard, of the U. S. Geological Survey, amounted to 66,846,959 tons, valued at $21,158,583.

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*Abstract of a paper by Ernest Wohlenberg in the Forest Club Annual of the University of Nebraska, reprinted in "American Forestry," August, 1912.

Who Is a Mining Engineer?

By Mark R. Lamb*

In this article is given a complete graphic solution for "Lamb's Formula" by which a mining engineer may determine his "Relative Location." Of the factors affecting the result, "Tact" is shown to have the greatest influence.

This question has been discussed exhaustively, but heretofore only as an ethical problem. I have discovered that it may be solved practically to two-decimal accuracy by the use of an easily understood diagram. Right now, before going further, it is insisted that to be entitled to consideration, any criticism of this solution or of factors or their values must be accompanied by a sworn statement that the critic has not yet determined his own Relative Location.

The Factors Needed for Solution

The purpose of the chart is to furnish a rapid solution, sufficiently accurate to be well within the limits of the observed data. The chart consists essentially of three parallel scales, one for Publicity, U; one for degree of Specialization or diffusion of efforts, S; one for Money value, D; a diagonal line graduated in Professional Associates Rating, T; and a set of curves for the various values of N, or the coefficient of friction, sometimes improperly called "luck" curves. This Tact factor N, while of course the most important, unfortunately must be assumed. It has been found best to obtain disinterested opinions from various sources and either average or integrate them.

Corresponding values for Money and for Publicity lie in a straight line through a point on the Rating diagonal where this is cut by a vertical through the interesection of the Specialization and Tact lines determined by the given conditions.

A good client of mine will serve as the subject for an example. The diagram has been so arranged that, given the necessary data, the relative location of a mining engineer can be determined in ten seconds. To make the method clear, however, it will be described in some detail. My good buyer came to Chile to examine a copper mine, bought it, promoted it, equipped it and is now manager. Plainly therefore, his value on the Specialization scale is 6. As the word "native" is frequently on his lips, his Tact factor can never by any chance be greater than 5.

Project horizontally from 6 of the Specialization scale to Tact curve 5 and thence vertically to the rating diagonal. A straight-edge connecting this point with 7 on the Publicity scale (he contributes to the Journal and is writing a book on "The Aborigines as Miners") gives him a rating of 2.5 on the money scale. This is only fair and handicaps him in the final test.

His geographical position during the last five years, by semesters, was as follows: Beginning with the first semester of 1908 his record on the "G" table appears as a broken line through the points 2, 2, 4, 8, 9, 2, 2 and 2, making an average of 4.5 from which project to the small Money scale. The point of intersection on the Relative Position scale gives his standing as a mining engineer. It will be seen that his relative position is secure at 4 but how much better it would be with at least some experience in London—or with a higher Tact value.

He is an example of man whose actual earnings would entitle him to a higher position on the Money scale, except that such earnings are not as a Mining Engineer but rather as a commercial reward.

Baby's Colic as Affecting Relative Location.

Each engineer, in determining his own location, will find that some years of study and self-examination are necessary before a value for Tact can be assumed with any degree of confidence in its accuracy. Indeed, this is a very variable variable and can vary with the climate, the dinner or the baby's health.

Space forbids enlarging upon this important factor. Each would-be mining engineer can look back over his life and locate definite periods when his value for Tact was very low and changeable. Usually—though not always—he can notice a gradual increase in value.

The word-values opposite the numbers on each scale are intended only as an aid to the unimaginative. Conceivably they may be changed or interchanged, though this should be done with extreme caution. Even before this has gone to press, a noted engineer has insisted that "full-dress" and "check book" on the Money scale should be interchanged. He gives no reason, but it is perfectly plain that such a change would raise his relative position. Another engineer insists that he would travel "first class to Europe" under any circumstances. He declines to give us his factors for working out his position, but it seems certain that his experience points would be all close to the "Boston" line. Word-values may be interlined between those given on the various scales, depending upon the ideas of the engineer.

It will be noted that while the value of Money influences and in fact will usually predominate in determining the relative location of the engineer, experience and consequently knowledge has some influence. This is right. Knowledge should have some effect even though it is truly said that an engineer's progress is stopped quicker and oftener by a low value of the coefficient of Tact than by technical shortcomings.

Publicity by Technical Contributions

Values for Specialization and Publicity can be determined easily. The first is not easily changed and depends more upon outside influences than any of the others. Publicity can be changed only by the expenditure of effort continuously, though it can be gained out of office hours, on the train, during holidays and Sunday mornings by a judicious and continuous recording of experiences for the technical press.

The chart furnishes a means of determining any one of the four factors, the other three being known. This will be very useful when it is desired to find the Tact coefficient of a man, for example, who is to be employed by a stupid board of directors or in a country where the feeling against his nation is strong. The determination of this factor from testimonials or even from preliminary interviews is misleading. This is because, however variable its value, Tact is always under the absolute control of the engineer *whenever he sees fit to exercise control.* His prospective employer wishes to know its *average* value.

The range of values on the several scales covers all but the most extraordinary conditions. The graduations on the Money scale range from "private car" to "visiting wife's folks". This will include 99.9% of the readers of the Journal.

The Specialization scale provides for any possible condition, as is proven by the terms describing the two extremes. It is perhaps well to forestall possible impulsive and unthoughtout criticism of this scale by explaining that while a diversified or dispersed experience increases a man's value as a manager or editor, it does not *per se* increase his value as a mining engineer.

The Publicity scale ranges from utter obscurity as described by the words "secretive of data" to "featured in the Saturday Evening Post." These are certainly the limits of terrestrial publicity. Two years have been spent by the writer in the study of the values for the Publicity scale. Therefore, though this factor may seem to have been given undue importance, it should be accepted with entire confidence.

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*Manager in South America for Allis-Chalmers Co., Santiago, Chile.

It is understood of course that only desirable publicity is available as a factor. In one of the early attempts to arrange the diagram, the publicity scale included minus quantities. The minus portion of this scale is useless, however, since no degree of Specialization could raise an engineer's value above zero, if his Publicity rating were below zero. It is hardly necessary to say that a high value for Tact is incompatible with a low Publicity.

There is no royal road to desirable publicity. Neither can it be purchased. An engineer I know has a standing offer with the editors to buy all the desirable publicity they can furnish. He also has a reward standing for a practical, effective scheme for professional advertising.

There is another point to be taken into consideration in choosing a value for the Publicity factor. An engineer may today enjoy a high degree of desirable publicity and tomorrow, through having detached more than his dentist has equipped him for, suffer with an equally large factor of publicity of opposite sign. The desired value in such case is obtained simply by adding the plus and minus quantities.

Tact the Important Factor.

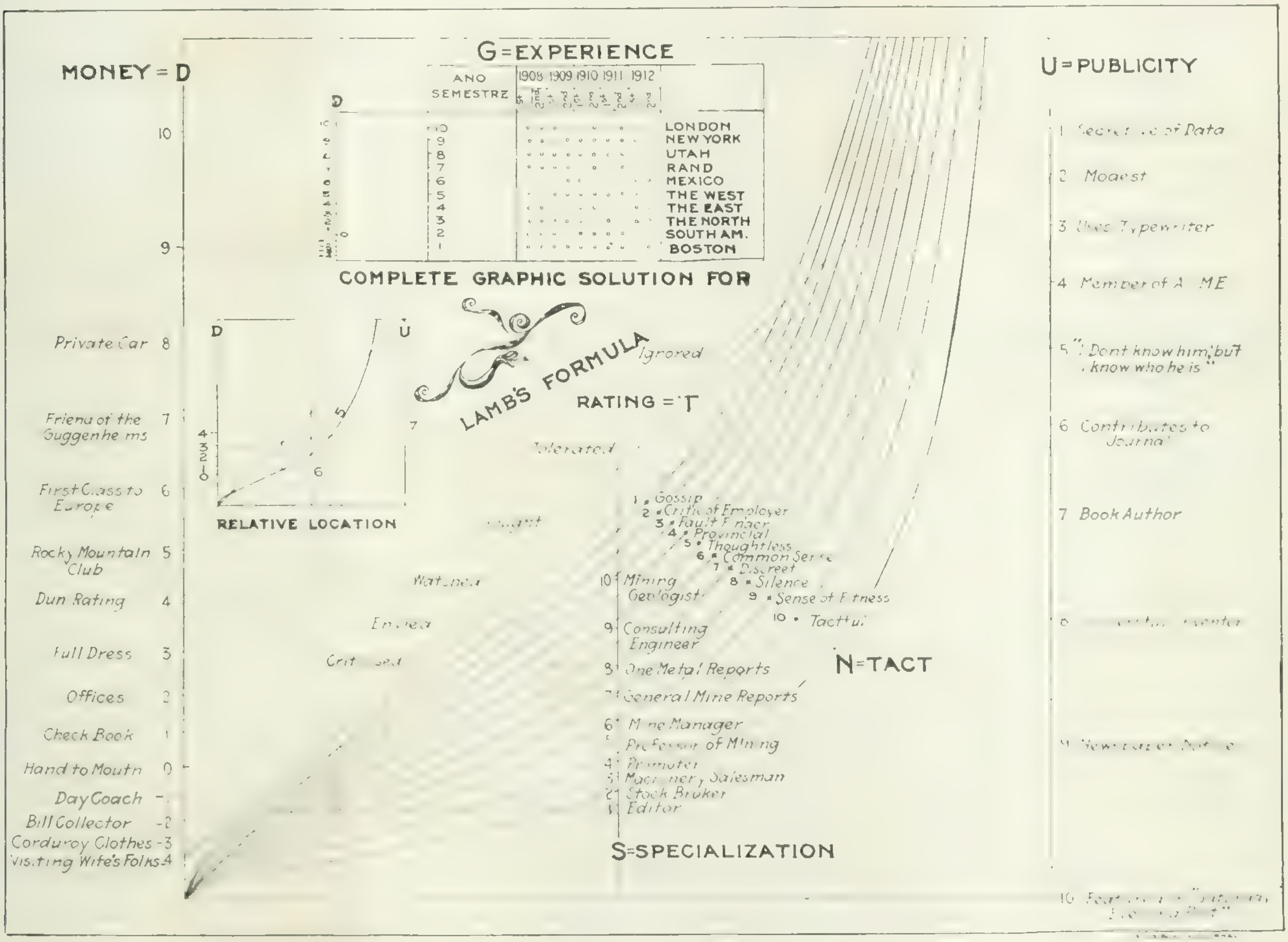
The Tact curves cover all the values obtainable from such noted authorities as Socrates, Marcus Aurelius, Æsop, Solomon, Lord Chesterfield, Uncle Remus and Uncle Charley. The coefficient for Tact is of course the most influential. Except for the effect of the title of this article upon the value of my own Publicity factor, it would have been called the solution of the Tact formula.

The Money scale, or the man's monetary value as a mining engineer (upon which the results are usually sought) with reasonable care in reading will give results to within two or three units in the second significant figure, an accuracy well within that of the original data. With Specialization and Publicity factors unvarying, an engineer will find his Money value shift frequently from "full dress" to "check book." "Office" is the critical point with many engineers. It is a point reached several times before it is passed permanently. This fluctuation is caused by variations in the value for Tact.

The study upon which this solution is based has been laborious, extending over many years and involving the painstaking accumulation and correlation of data. It is based upon strictly scientific and accepted theorems and I trust that my own life line will not be thought to have influenced the final diagram.

What Not to Say and When

Many lessons can be gathered from a few searching and candid analyses of the qualifications of one's friends. For example, if my client above mentioned had a publicity rating of only 4 or 3 his Money value would be very low. Even with a protracted London experience, he could not attain a good relative location as a mining engineer. To be sure, he could raise his Tact factor, but he will not—he is too old. A man entitled to Tact curve 7 or 8 will rarely find use for the words "Englishman," "American" or "native" in ordinary conversation. If he must know your nationality he will say, "What is your native city?" rather than "Do you speak English?"



Graphic Solution for Lamb's Formula

Much (Allis-Chalmers Co's.) time has been spent in preparing this. If it has been the means of calling your attention to the low average value of your Tact coefficient, your employer's sighs of relief will amply reward me. In order to obtain the best results from the use of the diagram it should be used frequently and should be kept handy. This advice is particularly for the younger men. They can learn and change, whereas the old men are bunkered.

The graph accompanying this contribution (like that accompanying "Curves of Comfort" in the *Mining and Scientific Press*, Aug. 27, 1910) has been drawn life size with instrumental accuracy. It is certain to lose in clearness when reduced for publication. A limited number of signed proofs, full scale, may be obtained from the author. These are mounted on art parchment and are in every way suitable for use in private practice.

Crown Mines, Limited

JOHANNESBURG CORRESPONDENCE

The Crown Mines, Ltd., has successfully issued one million pounds of 5% debentures to pay off the balance of a total of £1,546,103 spent on capital account since the formation of this company by the amalgamation of a large number of mines on the Central Rand. This large sum, considering the tonnage of 36,000,000 tons in the upper known portions of the mine which will be affected by the work, has been wisely spent. It represents less than 6d. per ton on this total.

The design has been to concentrate the work of hoisting 220,000 tons per month on the two main seven-compartment shafts, or, if necessary, on one, instead of using 11 shafts as before. The whole mine is nearly three miles long, and underground the ore is concentrated on these shafts by main-haulage levels, one of which, on the 13th level, is now two miles long. It is 15x9 ft., equipped by electric haulage.

The two main shafts are so arranged that practically all the ore in the deeper portions of the mine will be raised to them by subsidiary inclines. They are equipped with 10-ton skips, and their hoisting capacity is 5000 tons in eight hours. They have been provided with immense sorting and crushing stations of reinforced concrete and connected to the three main milling plants by a railway system. Should one shaft be hung up, all the ore underground can be sent to one shaft and distributed on the surface to all the mills.

The ore reserves since the amalgamation in July, 1909, have been increased from 4,000,000 tons to 10,000,000 tons. Workshops have been centralized, the whole plant electrified and reduction capacity increased from 150,000 tons per month to 220,000 tons per month. A further capital expenditure of £150,000 will be required to complete the work in hand for mining the area containing 36,000,000 tons now being attacked. In July last, 166,000 tons were milled for a working profit of £118,825. Some short fall in grade and tonnage is expected for the first few months of working the new scheme, but with sufficient labor there are enough faces available to treat 220,000 tons per month.

Sulphatizing Roasting of Copper Ores

A paper, by Utley Wedge, before the International Congress of Applied Chemistry, described the sulphatizing roasting of copper ore and concentrates in the Wedge furnace. Mr. Wedge described some of the conditions under which smelting became unprofitable, where fluxing material, or fuel, is scarce, and thought that sulphatizing roasting with subsequent wet recovery of the copper might offer a way out.

Theoretically one part of copper requires one-half part of sulphur for sulphatization, but practically an excess must be present. This may be added as sulphur, SO_2, SO_3, H_2SO_4, or in the form of some sulphide or sulphate. Iron sulphide is a desirable addition agent for sulphatizing; zinc, lead, lime and magnesia, if in forms which may take up sulphur, are undesirable.

The chief reactions entering into sulphatization are:

Above 350° C., $2CuS = Cu_2S + S$, followed by $S + 2O = SO_2$.

Above 350° C., below 500° C., $2Cu_2S + 5O_2 = 2CuO + 2CuSO_4$.

Above 500° C., $Cu_2S + 2O_2 = 2CuO + SO_2$.

Different copper sulphides behave differently at the various temperatures, but the common tendency is to form some copper oxide at all furnace temperatures, and in the attempt to secure the highest percentage of water-soluble copper, the constant formation of copper oxide is the chief obstacle to be overcome.

The presence of iron sulphide assists in sulphatizing the copper oxide thus formed. At furnace temperatures below 600° C, there is some basic sulphate of iron formed, which, at temperatures above 530° C. roasts to form Fe_2O_3 and SO_3, and the SO_3 may combine with the CuO to form $CuSO_4$, which is stable below 650° C., or CuO may react directly with $Fe_2(SO_4)_3$.

$3\,CuO + Fe_2(SO_4)_3 = 3\,CuSO_4 + Fe_2O$

Even the Fe_2O_3 is of some assistance in sulphatizing the CuO, for between 500 C. and 750° C. the iron oxide is a vigorous catalyzer for the production of SO from SO_2. The following tests were made in a Wedge multiple-hearth furnace on a chalcopyrite, pyrite and pyrrhotite ore, no extraneous material being added. The ore carried: Cu, 1.07%; Fe, 49.25%; S, 32.6; SiO_2, 6.8; MgO, 2.18; Al_2O_3, 1.59%. The results showed: Water-soluble copper, 0.35% = 27.8% extraction; acid-soluble, 0.80% = 63.4% extraction; insoluble, 0.11%; total, 1.26% and 91.2% extraction. The calcined material carried 4.7% S and was reroasted in a Wedge multiple-hearth mechanical muffle furnace. The results then showed: Water-soluble copper, 0.76% = 60.3% extraction; acid-soluble, 0.48% = 38.1% extraction; insoluble, 0.02%; total, 1.26% and 98.4% extraction. The acid-soluble is the portion which can be leached by dilute sulphuric acid.

Another ore was treated in a 9-ft. 9-in., Wedge, five-hearth muffle furnace. It was a chalcopyrite, with a diabase gangue. It carried: Cu, 4.38%; Fe, 9.61; S, 16.37; CaO, 1.01; MgO, 0.72; insol., 61.21. Actual leaching of the copper in the ore gave: Water soluble, 73.7%; acid soluble, 15.7%; total extraction, 89.4%. If the copper is recovered by electrolysis, there is ample acid regenerated to leach out the acid-soluble copper.

Another ore was ground to 20-mesh and given a single treatment in a small test furnace, showing: Water-soluble copper, 80.80%; asid-soluble, 11.8%; which results were afterward duplicated in a Wedge 20-ft. furnace.

Another furnace test on a copper-nickel ore showed: Water-soluble, 69.2% Cu, 13.6% Ni; acid-soluble, 12.8% Cu, 4.4% Ni. Another ore contained copper chiefly as silicate. The ore ran: Cu, 1.86%; Fe, 2.79; S, 0.80; Al_2O_3, 2.58; insol., 88.3; comb. H_2O, 3.4%. The sulphur in the ore seemed to be partly in cinders from the locomotive, which had accumulated *en route* from the West. Six per cent. of pyrites was added, and the mixture treated in a five-hearth muffle-fired furnace. After leaving the first hearth, 79.3% of the copper was soluble; after leaving the second hearth, 81.4; third hearth, 93.4; fourth hearth, 95.2; fifth hearth, 95.2%. A bornite ore after roasting gave 92.6% water- and acid-soluble copper. This ore carried 63% SiO_2.

It is Mr. Wedge's opinion that work with his furnaces indicates the possibility of displacing smelting in special cases.

According to the U. S. Geological Survey there were 27,703,644 tons of coke produced in beehive ovens in 1911, as compared with 34,570,076 tons in 1910, while there were 7,847,845 tons of coke produced in retort ovens in 1911, as compared by 6,866,432 tons in 1910. At the close of 1911 there were 2254 new ovens in course of construction of which 698 were byproduct ovens.

Mining Methods at Kimberley—II

By John T. Fuller*

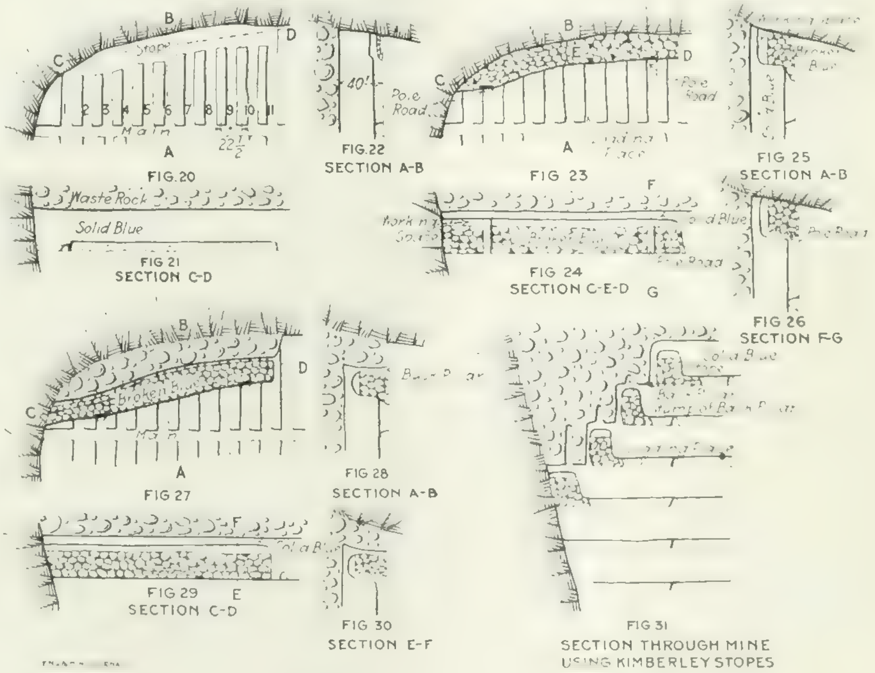
The features of the Kimberley system of stoping are vertical stope walls, pole roads and back pillars. The Dutoitspan system contains features of both the De Beers and Kimberley methods. Water tunnels have practically eliminated the occurrence of mud rushes.

The features of the Kimberley stoping system are vertical stope walls, the use of pole roads, and after the first stope against the rock has been put up, the use of a "back pillar" to keep back the reef in each succeeding stope, as shown in Figs. 20 to 31. A stope is started exactly as in the DeBeers system by connecting the ends of the 22½-ft. center tunnels and forming a long gallery, Fig. 20. As soon as the gallery is completed the proposed length of the stope, the roof is attacked and the stope carried vertically upward to the broken material 40 ft. above, sufficient broken blue always being left in the stope to enable the miners standing thereon to drill the roof.

Two offsets or tunnels, preferably the ones second from the ends of the stope Fig. 23, are cut out for pole roads. This is done by cutting back these two offsets about three feet beyond the stope line roughly in the shape of a semicircle. Across this opening poles eight to 14 ft. long and averaging about six inches in diameter are placed and wedged into position by cutting hitches in the sides of the stope and piling the broken blue behind them. The poles are spaced from one to four feet apart, depending on their position, whether near the bottom or near the top of the stope. The space between the poles is filled in with short pieces of old rails and lagging boards. The poles are sometimes staggered especially near the bottom, see details Figs. 45 and 46. As the stope gains in height the pole roads are kept even with the surface of the broken ground in the stope and become the sole means of entrance and ventilation. If the stope is long it is advisable to have a third pole road near the middle of the stope as an additional means of escape should it become necessary to abandon the stope in a hurry.

Stopes Maintained at Uniform Height

It is highly important both in the DeBeers and Kimberley systems to maintain the stopes at an equal height throughout their length, otherwise there is a possibility of temporarily loosing portions of the stope and of choking, with attendant delay. The same conditions prevail and must be considered with regard to the final bringing in of the stope as in the DeBeers system. When a stope is completed the bottom poles of the pole roads are blasted and the stope loaded out. Some of the poles and most of the lagging and rails are recovered for future use during the loading.



Kimberley Stoping System

In putting up the second stopes from the rock and each succeeding stope, the Kimberley system differs most radically from the original DeBeers system. Instead of starting immediately in front of the old stope, a 6- to 12 ft. pillar known as the back pillar is left and the stope carried up as before (Figs. 27, 28, 29 and 30). As the top of the stope is approached the back pillar is thinned down and if the stope is to be brought in the final round of holes is so placed as to shatter both the roof and the top of the back pillar.

Purpose of Back Pillars Twofold.

The reason for leaving this back pillar is twofold, first to hold back and prevent an inrush of waste rock from the old filled stope behind and second to support the overhanging lip or back of blue above until such time as it is safe and advisable to relieve it of such support. The ideal section for a back pillar if it could be formed is probably as shown at *a*, Fig. 41. This shape is of course a practical impossibility. The pillar as actually formed approaches a pyramid in section *b*, Fig. 41 with a heavy base and gradually thinning down to a point as the top is reached.

The average condition of the back pillar after the final blast has been put in is shown in Fig. 42. As the broken blue is loaded out thus relieving the pillar of its side support the force of the waste behind will tend to crush and thrust forward the remainder. In any case there is bound to be a stump of the pillar left behind. The height of this stump will depend on the thickness of the pillar and the force exerted by the waste. The stump may be recovered in two ways, either by "timbering in" or from the level below.

It sometimes happens, especially in DeBeers and Kimberley mines after a stope is brought in and before it can be completely loaded out, a rush of reef will cut off the broken blue remaining in the stope from the loading place (See Fig. 43). When this occurs one of three methods may be employed for the recovery of the covered blue. The reef may be loaded out and dumped in a special pass provided for that purpose from whence it is taken and hoisted to the surface and disposed of; or if the amount of reef proves excessive the stope may be abandoned and the blue recovered from below, or timbering in may be resorted to.

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*Consulting engineer, Honesdale, Penn., formerly manager of the Dutoitspan diamond mine.

Buried Blue Ground Recovered by Timbering in

Timbering in consists of placing sets, composed of a cap and two posts, skin to skin by means of a fore-poleing process through the reef until the blue is again reached (See Fig. 44). The timbering is started well back in the tunnel and thoroughly braced and may be continued through to the back pillar which is then blasted and loaded out. After the blue has been recovered the timbers are gradually withdrawn by blasting the caps, sometimes both caps and posts must be blasted, but as a rule a fair proportion of the posts are recovered for use. The other details of stoping such as drilling, blasting, loading etc., are identical with those described under the DeBeers system. A section through a mine using the Kimberley stopes is shown in Fig. 31. It will be noted that the stopes from the levels below are so located as to come up under the back pillar stumps of the abandoned stopes above. As in the DeBeers system the stope interval must be carefully maintained.

The opening up of the Dutoitspan mine for undergound work introduced many conditions that had not been met before in underground diamond mining. To begin with, compared with the DeBeers and Kimberley mines, this mine is enormous. Some idea of this may be gained by stating that in 1907 it was estimated that there were in sight between the 350- and 750-ft. levels of Dutoitspan, a vertical distance of only 400 ft., not less than 29.446,000 loads of blue ground while in Kimberley mine at the same date between the 2160- and 2520-ft. levels, a vertical distance of 360 ft., there were but 876,000 loads.[1] Dutoitspan is practically two miles connected by a neck of barren ground and is in the shape of a flat V.

Original Kimberley Stoping System not Satisfactory at Dutoitspan

The first stoping system used at this mine was the Kimberley including all of its features. When I was appointed manager of this mine it had been for some time evident that among other things there was something wrong with this system of stoping for so large an area. Briefly summed the disadvantages were:

(1) The great length of the stopes anywhere from 250 to 400 ft. made caving and crushing in of the long backs a dangerous and difficult feature to handle as the stope gained height.

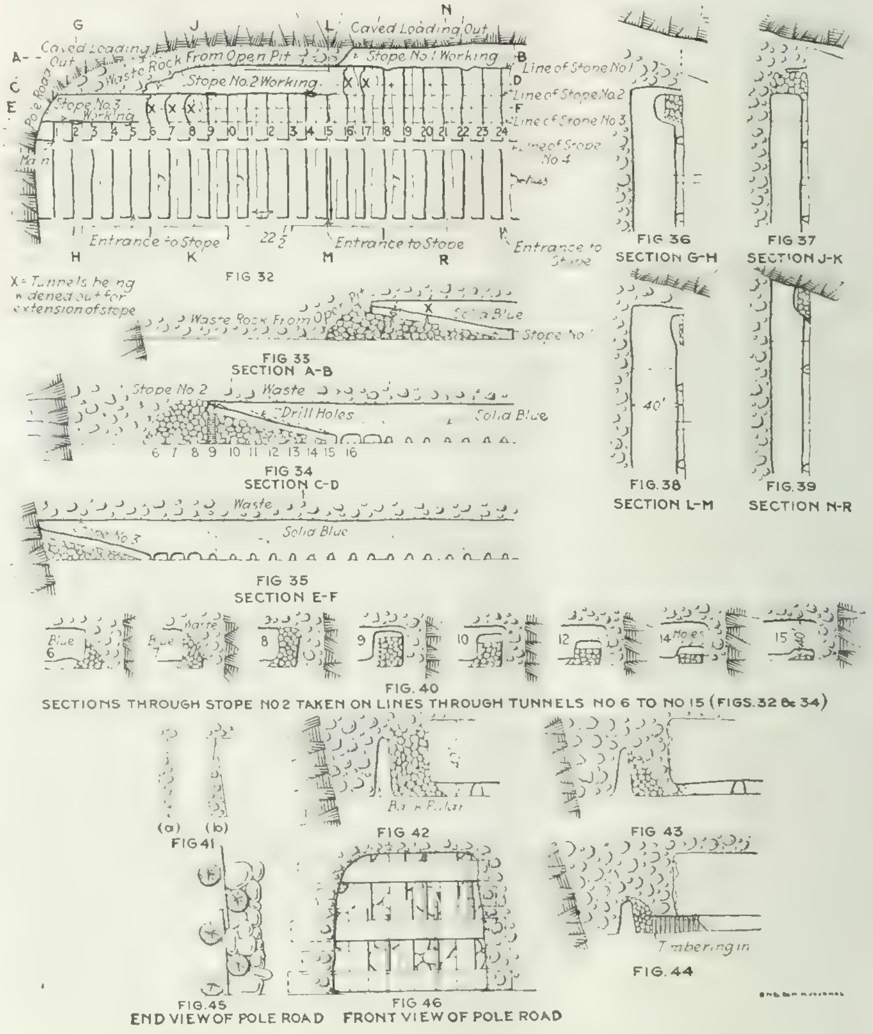

FIG 32

FIG 33 SECTION A-B

FIG 34 SECTION C-D

FIG 35 SECTION E-F

FIG 36 SECTION G-H

FIG 37 SECTION J-K

FIG. 38 SECTION L-M

FIG. 39 SECTION N-R

FIG. 40 SECTIONS THROUGH STOPE NO 2 TAKEN ON LINES THROUGH TUNNELS NO 6 TO NO 15 (FIGS. 32 & 34)

FIG 41

FIG 42

FIG 43

FIG. 44

FIG. 45 END VIEW OF POLE ROAD

FIG 46 FRONT VIEW OF POLE ROAD

Dutoitspan Stoping System

(2) That in this system it is imperative that the stope be maintained at a practically even height throughout its length. This proved an exceedingly difficult thing, the miners being unable to gage the roof properly over such long distances, while premature caving, especially at the middle, frequently cut the stopes in two interrupting the ventilation and causing long and costly delays.

(3) The pole roads did not provide sufficient ventilation for these long stopes.

(4) As a stope under the Kimberley system must be brought in and completely loaded out, throughout its entire length, before a second stope can be started in front, considerable fluctuation is caused from time to time in the tonnage obtainable from a given level. Thus while a stope is going up, the only tonnage obtainable is the surplus not required as a platform in the stopes, this is always a variable quantity from shift to shift. After a stope is brought in there will be a rush of tonnage until it is loaded out when it drops back practically to zero while another stope is started.

(5) The government mine inspector was getting so nervous that he would not risk much more of his person than his nose in a stope and would often order the manager to take the men out.

Dutoitspan System a Modification of Other Methods.

After a thorough study of the situation and a number of experiments L. P. DeCastle, the assistant manager, and I finally evolved the system shown in Figs. 32 to 40. In working out the details of the system material assistance was given by the men and sub-bosses by their hearty cooperation and valuable suggestions. A careful inspection of the drawings will show that we simply borrowed the features of the long-established DeBeers and Kimberley systems and shifted them about in a new combination to fit our particular needs. Thus the long inclined back of the DeBeers system is shifted around until the inclination is parallel to the long axis of the stope instead of the short axis; this gives the strength required to resist premature caving. The back pillar and pole road are borrowed from the Kimberley system. A stope is started precisely as in the two systems described except that one end is carried up more rapidly than the other until an inclined back having an inclination, Fig. 33, of from 10° to 15° has been formed. As the stope gains in height it is extended in length, thus maintaining the inclination constant. A pole road is started at the second or third tunnel from the high end and as the stope extends in length other pole roads are put up at four or five tunnel intervals.

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[1] De Beers annual report.

Kimberley Open Pit Water Tunnel at X

It will be seen that as a stope progressed it exhibited all three conditions of "working," "loading out," and "abandoned," long before it reached the end of the line at the opposite side of the mine. It was thus possible to start a second, a third, and even at times a fourth line of stopes before the first was completed, thus maintaining a constant tonnage from a level. It was further found that the ventilation of these stopes was excellent, and that the angle of inclination was easily maintained, the miner simply having to stand at the bottom and look up at the line of lights held near the roof to obtain a clear idea of the shape of the back. This was greatly aided by the system of drilling adopted later. When a stope reaches the extreme boundary it is quickly brought in so as not to exceed over five tunnels, about 100 ft., in length, and then pushed to completion by the regular Kimberley system without delay or danger from premature caving.

While every effort is made in all stoping systems described to maintain the roof or backs at a uniform height above the broken ground in the stopes, yet they often present an irregular appearance. This is due in great part to the system of using the machine drills. A machine is set up and as many holes as possible drilled before moving; while this may be an economical procedure if properly carried out, yet it leads itself to the abuse of drilling as many holes as possible from one set up regardless of the number of holes actually necessary. If the drill runners are paid by the foot with a bonus for extra footage, this abuse is apt to occur in spite of the best supervision that can be given. The miner is apt to charge and fire all the holes drilled to cover up the bad work of the driller, with the consequent bad effect on the roof.

The miners in DeBeers and Kimberley mines are mostly experienced men who have worked in these mines since the old open-pit days and with the DeBeers company since its formation, consequently they are apt to be given great leeway in the matter of placing shots. As a result holes are put in, in all directions and at all angles, depending on the individual judgment of each miner. This practice also results in many cases of bad roof, lost ends, etc. It is true that shift bosses frequently order the direction or location of holes changed, but often they will be changed back again as soon as the boss passes on.

Uniform System of Drilling Adopted

When Dutoitspan was opened however, the supply of experienced miners in this class of mining available was decidedly limited, and it was necessary to employ almost any man who offered, whether he had ever seen a mine before or not. These men had to be taught. It soon became apparent that some uniform system of drilling would have to be adopted and the following was used. The drill boys were placed three or four abreast, depending on the stope width, across the stope and drilled their holes looking up the incline. One hole being placed at each rib and one or two, as the case might be, in the space between. A second row of drillers was placed a distance in front of the first so that the openings of the second line of holes came about opposite the point where experience had shown the first line would break. In this manner the drill boys were distributed over the stope until enough had been provided to drill all the holes required to bring down an even section of roof. The holes were drilled from two feet six inches to six feet deep depending on the nature of the ground, and all were drilled in the same direction and at as near the same angle as possible. All holes were drilled with long jumpers and were self cleaning, except a few each shift in the ribs to straighten out any projections left by previous shift, these were generally down holes using hand hammers. The pole roads were carried up by vertical holes drilled by a boy standing in the pole road and using a long jumper.

In blasting the fuses were so cut and lighted as to insure as far as possible the lines of holes going off beginning with those at the high end of the stope and working down. In special cases, such as final rounds, electric blasting was used. It soon became apparent that this system practically eliminated the uneven roofs and was a great saver of explosives. The position and direction of holes is shown in the section of Stope No. 2, Fig. 34 and in sections 10, 12, 14, and 15 of Fig. 40. When Dutoitspan was reopened in 1911 after a shutdown of over two years caused by the great slump in the diamond market in 1908, compressed air drills were introduced and whether or not the drilling system as here described is still in use is unknown to me.

Mechanical Haulage on Main Levels

The method of handling the mined blue ground is practically the same in all five mines. The blue, broken in the stopes and tunnels, is hand loaded into 16 cu.ft. capacity steel trucks and hand trammed to the nearest pass, where they are tallied and dumped. The trucks used are of two types, end tippers and side tippers; but both types are not used in the same mine as the arrangement of the pass dumps must be different for each type.

The track in the loading places and tunnels where only light traffic is handled is constructed of 16-lb. rail; that in the mains and tunnels leading to the passes of 20-lb. rail. All track throughout the mine and surface equipment is 18-in. gage spiked to wooden ties, generally of redwood. Each truck is manned by a span of two natives who both load and tram. A span of natives will load from 10 to 45 or more trucks in an eight-hour shift depending on conditions of loading place, distance from pass, nature of loading place (stope or tunnel), and the energy of the natives. This work is paid for on a bonus system, a minimum wage being paid for a certain number of loads and a bonus for each additional five loads above this number.

The blue ground dumped in the passes falls to the main hoisting level, where it is caught in special loading boxes built of timber or steel. A box of the steel type was shown in the Engineering and Mining Journal of July 15, 1911. This type of box was first designed, built and erected by L. P. De Castle and me at Dutoitspan mine. From the loading boxes the blue is loaded into 20-cu.ft. side-tipping steel trucks and transported to the main hoisting shaft by either endless-rope or electric-locomotive haulage. At the shaft the trucks are dumped into two special loading bins, each bin containing one skip load, which varies at the different mines from five to eight 20-cu.ft. trucks. The skips and shaft arrangement are of the well-known Kimberley type. On reaching the surface the skips dump into large bins in the head frame from which the blue is loaded into 20-cu.ft. trucks similar to those used below, and transported by endless rope to the depositing floors or direct to a reduction plant.

Ventilation Easily Accomplished

It has been stated by critics in enumerating the disadvantages of the Kimberley mining systems that the ventilation is complicated and difficult, while as a matter of fact it is so simple and easy of regulation that one is tempted to use the old saying, "A child can use it.' I firmly believe that the difficulty in properly ventilating most mines, other than coal mines, is generally due to financial rather than physical obstacles. With the exception of the Kimberley mine, all the mines of the group are ventilated by natural ventilation. As long as one of the mine openings is through the open pit, the general direction of ventilation is down the main hoisting shaft to the main level, from thence up through various air passes and ladderways to the working levels, from the working levels to the prospect shaft, from thence to the next prospect shaft, etc., until it finally reaches the open pit. On cold days this direction may be reversed.

When in the course of time the open pit escape must be abandoned and a second vertical shaft sunk from the surface it becomes practically necessary to install an exhaust fan at this shaft to maintain an adequate ventilating current. The Kimberley mine is ventilated by a large "Waddle" exhaust fan and the DeBeers mine has probably been provided with a fan by this time. The air current on the working levels is directed where required by means of temporary brattices and curtains, while such places as raises and high stopes where the current is either entirely absent or sluggish, are ventilated by means of small portable electric blower fans, the air being led to the face through a light galvanized pipe.

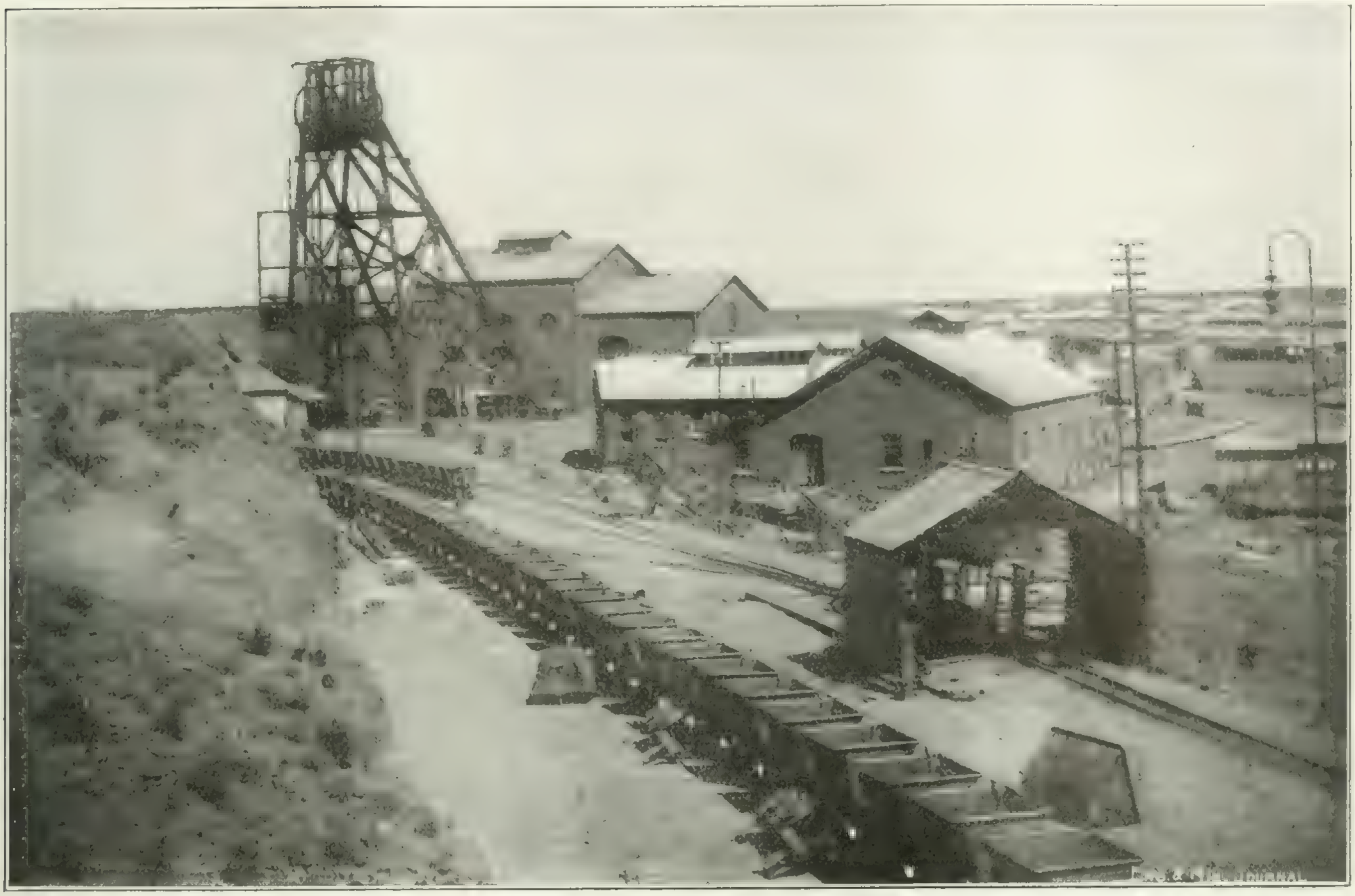
Water Tunnels Prevent Mud Rushes

The water tunnels previously referred to should really be started before the mine reaches the underground stage so that they may be ready and in operation by the time that stage is reached. The tunnels as stated are driven entirely around the crater 50 to 100 ft. back from the sides and as near as possible to the junction of the shale and melaphyre, and hence will be for some distance in the Dyka Conglomerate. It is at this horizon that the greater part of the water is encountered in these mines.

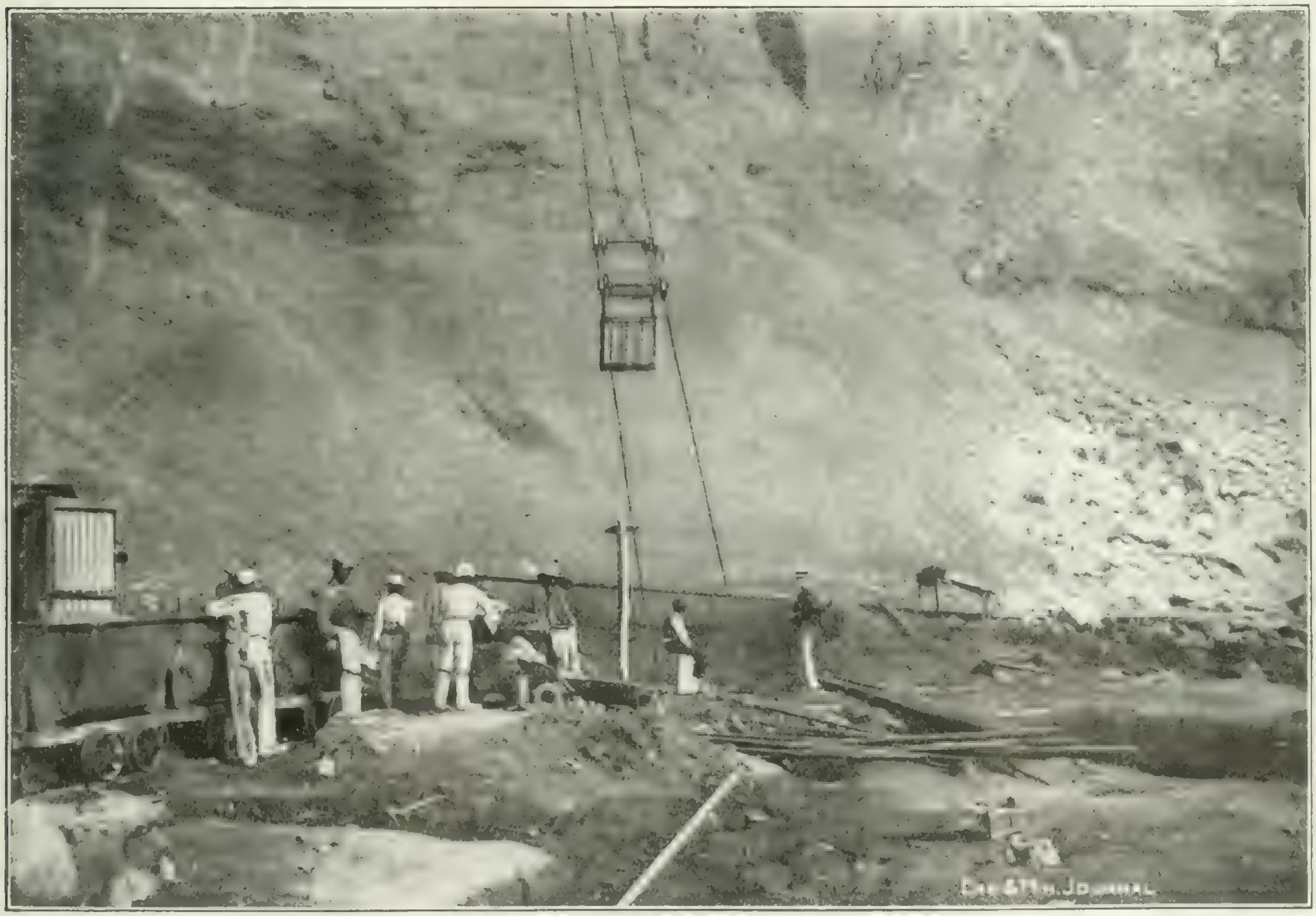
At frequent intervals side tunnels and inclines are driven to daylight about the edge of the open pit which serve the double purpose of ventilation and drainage. These side tunnels serve to lead the surface water that may flow into the open pit to the main water tunnel. A system of ditches is maintained, as far as the changing conditions will permit, along the sides of the open pit directng such water to the tunnels. Wherever a considerable stream or feeder of water is met a side tunnel, raise or incline is driven following the course of the stream until assured that the whole stream is draining into the water-tunnel system. Grouting is resorted to wherever there is danger of leaks from the main tunnels. The main tunnel surrounding the mine is graded to one point from which a direct tunnel leads to one of the main shafts where a large sump and pumping station is installed and the water pumped to the company's reservoirs for use on the floors and washing plants. The reason for all this elaborate and expensive precaution to cut off a comparatively small amount of water is to prevent the highly dangerous and disastrous "mud rushes" to which these mines are subject. These mines are not wet mines, as wet mines go. Wesselton, which is probably the wettest mine of the group, only averages about 26,000 gal. per hour. About 18,000 gal. of this is pumped from the water tunnels. As a cure for the mud rush evil the water tunnels are most successful.

Mud Rushes Now Practically Eliminated

It must be borne in mind that as the diamond-bearing rock is extracted, the open pits become gradually deeper and the only thing to prevent the open pit being as deep as the highest working level in the mine is the caving of the unsupported rock sides. The waste rock, locally called "reef" which thus falls to the bottom of the open pit, consists chiefly of the dolerite and shale, and while the open pit at Kimberley mine is at present 1000 ft. deep, there is about 1500 ft. of waste rock lying between this point and the highest working level. This mass of material exerts a tremendous pressure on the workings below. As both of the rocks forming the bulk of this waste disintegrate rapidly on exposure to the air, a high percentage of the mass will be comparatively fine material. In the case of the shale, which is generally of a bituminous nature and contains a high percentage of iron pyrites, spontaneous combustion increases



Dutoitspan Main Headframe, Endless-rope Haulage to Depositing Floors and Surface Buildings



Loading Station for Aërial Gear—Wesselton Open Pit the disintegrative action. If water is permitted to reach this mass of material overlying the workings, it will work its way down until it encounters a comparatively impervious stratum, either on top of the blue itself or down where the material has become tightly compacted. The water will there dam back and gradually form a heavy and sticky black mud.

Conditions are now ripe for a mud rush. The first stope from the workings which breaks through under or near this mass will be suddenly and without warning flooded with mud which will pass from the stope to the rest of the workings with incredible rapidity, filling up completely hundreds of feet of tunnels and spreading death and destruction in its path. Nothing can stop this onrush until its force is spent, by which time if the reservoir was extensive, it will probably have choked up two or three levels. When the mud has finally come to rest, which is determined by the appearance of the water, there is a long, hard, and disagreeable job ahead to dig it out, rescue those who may be caught and still live, behind some barrier or stope within the mud-filled area, and recover the bodies of those who were not so fortunate. Many stories could be told of self-sacrificing heroism shown on these occasions. The Kimberley, and especially the De Beers mine, have had a number of bad mud rushes in their history, but the construction of the water tunnels have, of late years, practically eliminated this menace.

Total Recovery from 75% to 95%

It is difficult to estimate with any great degree of exactness the total recovery percentage, as may be gathered from the descriptions of the mining methods. This percentage will vary from level to level and stope to stope, thus blue which may be a total loss on one level may be entirely recovered on the next, etc. I have made many estimates extending over long periods of time and have obtained results which ranged from 100% recovery to as low as 40%. It is my opinion, however, that the average recovery from DeBeers and Kimberley mines lies between 75% and 85%, while for Wesselton, Dutoitspan and Bultfontein mines the percentage of recovery lies between 85% and 95 per cent.

Critics of the mining systems employed at these mines have been inclined to believe that the large amount of development work necessary would adversely affect the cost of mining. A few figures quoted from the DeBeers annual reports may prove interesting on this subject. For the year ended June 30, 1907, at Dutoitspan mine a total of 68,916 ft. of development work was done and 2,481,987 loads of blue mined, at a total cost per load, including mining, transporting and depositing on the floors of approximately 96½c.; of this total, approximately 55c. is chargeable to mining alone. A load weighing 1600 lb. the cost per ton for mining works out at 61 2/3 cents.

For the year ended June 30, 1911,[2] the average cost of mining and depositing for all mines was about 76c. per load, and for washing about 74c. per load, making a total cost per load of mining and milling of $1.23. When it is remembered that two of these mines are close to 3000 ft. in depth and the other three average about 1000 ft. in depth, it will be admitted that few mining companies can show such low cost records.

Reduction of Tax Valuation of Michigan Mines

Negaunee Correspondence

Considerable interest is manifested in the action of the State Tax Commission, which is reviewing the valuation of mines and general property. Local assessors this year lowered the valuations put upon the mines a year ago by the Finlay report, giving as reasons that the ore reserves have been diminished by one year's mining, and that the price of ore is now much lower than Mr. Finlay calculated in his estimates. The Tax Commission has allowed this reduction, but has found enough new mines and developments to keep the total from lowering. The following is an official statement by the Secretary of the Tax Commission regarding the valuations in the Iron River and Crystal Falls districts:

"The net result of the tax commission's reviews of the Iron County mine values for the year 1912, has been to add 3½% to the mine valuations. Last year's values were $15,101,300; this year's values are $15,622,664, or an increase of $521,364.

"During the spring the local township and village boards had reduced the total mine valuation by $463,636. The tax commission's figures restore the reduction and add $521,364 more.

"The mine valuations were reduced by the value of the ore mined for the year, except where development had kept up with shipments. It is clear, therefore, that this increase in mine values is due to new development and exploration. When it is remembered that this has been a year of low prices and that development has in many cases been held back to an unusual extent by the recent increase in taxes, it is probable that other years will see a still greater increase, and show that there is little basis for the contention that the recent increase in mine values will put a stop to general development. Certain mines may curtail development temporarily, but business conditions soon require them to develop for a reasonable margin of safety in their ore reserve.

"Although there is a net increase, a number of properties have been reduced, indicating that the net result is due to an independent consideration of each property on its merits. It is significant also that the changes are nowhere large, one way or the other, except for new discoveries, whereas, last year changes as high as 100% were discussed at the hearing. This year the changes discussed were, for the most part, below 10 or 15%. One fact alone makes it certain that no net deductions in the total mine valuations will be made for some years to come and that is the large amount of ore existing in the county, which has thus far been estimated only on drilling, and given a low valuation to allow for the usual contingencies for opening the property. As these properties are developed and the ore is shown up by underground workings, the value per ton is automatically increased under the system used by the tax commission, and the increase will continue for each property until the property has established a standard value for its ore.

"The tax commission is arranging to have the work of appraisal established on a systematic basis to run continuously through the year, so that records and information can be kept and the details more closely followed. The much smaller difference of opinion as to mine values which appeared at this year's hearing, as compared with last year's, warrants the belief that a continuation of the present method of mine appraisal will soon yield results on which there can be no essential difference of opinion."

At Crystal Falls, a representative of the Crystal Falls Taxpayer's Association appeared before the commission to contend that general property was assessed too high, as compared with the mines. Figures were presented to show that before the Finlay appraisal, the mines at Crystal Falls were assessed for $750,000, and general property for $500,000. After the appraisal, the mines were assessed at $1,500,000 and general property remained the same. But last spring the city Board of Review decreased the mine assessments by $286,000, and raised the general property to $900,000. Also, it was maintained, two business blocks in Crystal Falls pay, respectively, 35c. and 47c. in taxes for every dollar in profit taken in, while the Bristol mine pays only 3c. in taxes on each dollar of profit.

The Brazilian Chamber of Deputies, says the *Daily Consular and Trade Reports*, has approved a motion recommending that a commission should be appointed to take up the matter of a new mining law.

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[2] Eng. and Mining Journal, Feb 24, 1912

New Publications

ELEMENTS OF DRAWING. By George F. Blessing and Lewis A. Darling. 6x9, pp. 193, illus. John Wiley & Sons, New York.

SOUTHERN VANCOUVER ISLAND. By Charles H. Clapp. 220 pp., illus. Memoir No. 13, Canada Department of Mines, Geological Survey Branch, Ottawa.

REPORT ON THE BUILDING AND ORNAMENTAL STONES OF CANADA. VOL. 1. By William A. Parks. Pp 382, illus. Canada Dept. of Mines, Mines Branch, Ottawa.

PORTLAND-CEMENT RESOURCES OF ILLINOIS. By A. V. Bleininger, E. F. Lines and F. E Layman. Pp. 121, illus. Bulletin No. 17, Illinois State Geological Survey, Urbana.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE, VOL. LXXXV, No. I, 1912. Edited by George C. Lloyd. 5½x8½, pp. 688, illus. E. and F. N. Spon, Ltd., London, Eng.

REPORT ON THE UTILIZATION OF PEAT FUEL FOR THE PRODUCTION OF POWER. By B. F. Haanel. Pp. 145, illus. Canada Department of Mines, Mines Branch, Ottawa.

THE TASMANITE SHALE FIELDS OF THE MERSEY DISTRICT. By W. H. Twelvetrees. Pp 125, illus. Geological Survey Bulletin No. 11, Tasmania Department of Mines, Launceston.

GAZETTEER OF SURFACE WATERS OF CALIFORNIA. PART II, SAN JOAQUIN RIVER BASIN. By B. D. Wood. Water-Supply Paper 296, U. S. Geological Survey, Washington.

MINERAL RESOURCES OF ALASKA. Report on Progress of Investigations in 1911. By Alfred H. Brooks and Others. Pp. 360, illus. Bull. 520, U. S. Geological Survey, Washington.

THE KEWEENAW SERIES OF MICHIGAN. By Alfred C. Lane. In two volumes. Pp. 983, illus. Publication 6, Geological Series 4, Michigan Geological and Biological Surveying, Lansing.

THE FREEZING-POINT, BOILING-POINT AND CONDUCTIVITY METHODS. Second Edition, revised. By Harry C. Jones. 5¼x8¾, pp. 75, illus. Chemical Publishing Co., Easton, Penn.

JOURNAL OF THE CANADIAN MINING INSTITUTE, VOL. XIV. Proceedings of the Thirteenth Annual Meeting, Quebec, 1911. 5¾x8¾, pp. 730. H. Mortimer Lamb, Secretary, Windsor Hotel, Montreal.

THE PRINCIPLES OF PARALLEL PROJECTING-LINE DRAWING. By Alphonse A. Adler. Part 1 of The Theory of Engineering Drawing. 6x9, pp. 66, illus., $1. D. Van Nostrand Co., New York, N. Y.

THE DESIGN OF STEEL MILL BUILDINGS AND THE CALCULATION OF STRESSES IN FRAMED STRUCTURES. By Milo S. Ketcham. Third edition, revised. 6x9, pp. 78, illus.; $4. McGraw-Hill Book Co., New York

SUMMARY REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE CANADA DEPARTMENT OF MINES FOR THE CALENDAR YEAR 1911. Pp. 422, illus. R. W. Brock, Director, Geological Survey, Ottawa, Canada.

WATER RESOURCES OF CALIFORNIA. Part I, Stream Measurements in Sacramento River Basin. By H. D. McGlashan and F. F. Henshaw. Pp. 411, illus. Water-Supply Paper 198, U. S. Geological Survey, Washington.

SURFACE WATER SUPPLY OF THE UNITED STATES, 1910. Part IX, Colorado River Basin. By W. B. Freeman, E. C. La Rue and H. D. Padgett. Pp. 233, illus. Water-Supply Paper 289, U. S. Geological Survey, Washington.

SUMMARY REPORT OF THE MINES BRANCH OF THE DEPARTMENT OF MINES OF CANADA FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1911. Pp 208, illus. Canadian Dept. of Mines, Mines Branch, Ottawa.

SURFACE WATER SUPPLY OF THE UNITED STATES. 1910. Part XI. Pacific Coast in California. By W. B. Clapp, F. F. Henshaw and H. D. McGlashan. Pp. 218, illus. Water-Supply Paper 291, U. S. Geological Survey, Washington, D. C.

MINERAL RESOURCES OF MICHIGAN, WITH STATISTICAL TABLES OF PRODUCTION AND VALUE OF MINERAL PRODUCTS FOR 1910 AND PRIOR YEARS. Prepared under the direction of R. C. Allen. Pp. 465, illus. Publication 8, Geological Series 6, Michigan Geological and Biological Survey, Lansing.

TUNNELING: A PRACTICAL TREATISE. Sixth edition, revised. By Charles Prelini. 6x9¼, pp. 349, illus.; $3. D. Van Nostrand Co., New York.

This book was evidently written for civil and railway engineers. It will prove disappointing to mining engineers.

TIN DEPOSITS OF THE WORLD, WITH A CHAPTER ON TIN SMELTING. Third Edition, Revised. By Sydney Fawns. 5¾x8½ pp., 301 illus. Mining Journal, London, Eng.

This volume aims to treat completely the geology, prospecting, lode and alluvial mining, and smelting of tin, all in one volume. Owing to the ground covered, and the fact that much of the book consists of excerpts from recent papers by various authors, the book is lacking in continuity, and logical presentation. However, we do not know how more could be gotten in the space allotted, nor do we see how the engineer who is interested in tin mining can well do without this last edition of what may be considered a classic.

DIAMOND DRILLING AT POINT MAMAINSE, ONT. By Alfred C. Lane; introduction by Alfred W. G. Wilson. Pp. 59, paper, illus. Mines Branch, Canadian Department of Mines, Ottawa.

This report is published in connection with an investigation now being carried on by Dr. Alfred W. G. Wilson into the copper resources of Canada, including abandoned mines and prospects, which, under improved mining methods, may be made productive. In view of changing conditions, it is regarded as desirable to preserve the records of past exploration work, as a guide to future explorers. The occurrence of amygdaloids, carrying native copper, on the northeast shores of Lake Superior, has been known for many years. A number of mining companies have explored portions of these deposits, but no property has been successfully developed. The present bulletin contains detailed descriptions, by Dr. Alfred C. Lane, of the results of diamond drilling carried on by the Calumet & Hecla Mining Co. in 1908, at the old Pancake Bay location, near Point Mamainse, at a cost of $25,000. The result was not conclusive as to whether copper occurs in commercial quantities, though it indicated that the region was less promising than others, and that exploration would be relatively difficult and expensive. Doctor Wilson notes that although no large deposits of ore that could be economically worked have been discovered, only a small portion of the district has been explored and that only imperfectly. In the future the exhaustion of other sources of supply may make this district of more importance, in which case these records will be valuable for comparison and guidance.

OIL FINDING. By E. H. Cunningham Craig. Cloth, 5x8 in., pp. 195, illus.; $2.40. Edward Arnold, London. Longmans, Green & Co., New York.

This book is a clear, accurate and readable exposition of the fundamental principles governing the occurrence of petroleum. It is written by a geologist experienced in the oilfields of Trinidad, Persia and Burma, primarily for the edification of other geologists, but the language is so simple and the processes of reasoning so clear that they can be easily grasped by any reader. The author expresses the hope that the book may be the means of correcting misapprehensions in the minds of actual or potential shareholders in oil companies. While the introductory chapters on the origin of petroleum are mainly controversial, the remainder of the book is characterized by a plain statement of observed facts, as opposed to scientific theories.

As to the origin of petroleum, the author states truly that it is not an academic question, but that a correct conception is essential as a means of distinguishing favorable from unfavorable conditions for its occurrence. He then takes his stand squarely in support of the theory of vegetable origin, and it must be conceded that he makes out a strong case in its favor, at the same time showing the weakness of the opposing theories.

His view is that petroleum was extracted from plant accumulations, deposited among beds of clay or sand mainly in the deltas of old rivers, by the exertion of great pressure, at comparatively low temperatures, and in the presence of a limited quantity of water. Against the animal origin theory he points out that the entombment of the fatty parts of animal tissue, in adequate amounts to yield our supply of petroleum, is contrary to our experience and is beyond comprehension; also that the corresponding deposits of phosphatic material are not observed in conjunction with petroleum beds.

On the subjects of the migration of petroleum, of its subterranean storage, of its lateral variation, and of the relation of its occurrence to geological structure, many of the author's conclusions are equally bold, but the relevancy of the observations he brings to their support must be admitted.

The chapter on indications of petroleum is a clear summary of the conditions which would lead one to suspect the presence of petroleum in any locality, and the chapter on the location of wells makes practical application of theory to the matter in hand, and is the most practically valuable section of the book.

The last two chapters contain hints as to equipment for an oil survey in new territory, general advice as to methods of field work, and suggestions on the preparation of maps and reports.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

J. T. Fee is drilling an iron property north of Fort William, Ontario.

Harold Titcomb has been examining mines in the Transbaikal province of Siberia.

E. D. McDermott has been appointed manager of the Tanalyk copper mine, in Eastern Russia.

A. B. Willmott and J. W. Astley have completed an important examination in eastern Ontario.

Dr. James Douglas returned to New York on Nov. 11, after four weeks' absence in the West.

Joseph F. B. Erdletts has been in Russia and Siberia on professional business for the past six months.

Ross B. Hoffman has been engaged during the summer in professional work near Nikolaievsk, Siberia.

Frederick Laist, superintendent of blast furnaces at Anaconda, Mont., is in the East on a tour of inspection.

Edward H. Benjamin, president of the Joshua Hendy Iron Works, San Francisco, visited New York this week.

E. K. Soper is absent on leave from the Geology Department of the University of Minnesota and has gone to Sierra Mojada, Mexico.

Kirby Thomas has returned to New York from a professional trip to eastern Ontario and to Port Henry, N. Y., and the iron district on Lake Champlain.

August O. Hoffmann has resigned as manager of the Polevskoi Mining & Smelting Co., in Russia, and has been in London on professional business.

W. S. Keith has severed his connection with the F. B. Keener mining companies and will establish an office at Dutch Flat, Calif., as a consulting mining engineer.

Edwin Higgins has been appointed assistant engineer in the U. S. Bureau of Mines, and is at present stationed at Pittsburgh, but expects to go to Michigan soon.

Sanford E. Thompson announces the establishment of Boston offices, at 141 Milk St. The main offices and laboratory will still be maintained at Newton Highlands.

J. P. Hutchins has returned to St. Petersburg, after examination work on mines for the Cabinet of the Czar of Russia, in consultation with the engineers of the cabinet.

A. C. Paulsmeier, vice-president and chief engineer of the Byron Jackson Iron Works, of San Francisco, has been visiting Seattle, Wash., and Vancouver, B. C., on business.

C. A. H. de Saulles, general manager of the Prime Western Spelter Co., Iola, Kan., for many years, has taken the position of manager of the U. S. Zinc Co., at Pueblo, Colorado.

Charles A. Banks, formerly of Auckland, New Zealand, is now manager of the Jewel gold-quartz mine and stamp mill, at Long Lake, Boundary district, B. C., in succession to R. Roberts.

Dr. Frank D. Adams was recently the guest of honor at a dinner given at Albany, N. Y., by Dr. John M. Clarke, the state geologist, to celebrate the dedication of the new State Survey and Museum Building. Doctor Adams also represented McGill University at the dedicatory exercises.

Dr. George W. Maynard, one of the first members of the American Institute of Mining Engineers, is recovering from a severe illness at the Engineers' Club, New York. After professional work in Arizona and Colorado, he was taken ill while in Denver, and was brought from that place under the care of a physician.

Sir Stuart Montagu Samuel, of the silver brokerage firm of S. Montagu & Co., [illegible] seat in the British Parliament called in question before a special committee of the House of Commons. The charge is that his seat should be vacated because his firm has recently undertaken the purchase of silver for the Indian government in London.

George D. James, consulting engineer for the Colorado River [illegible] Co., of Salt Lake City, Utah, has been engaged in professional examinations of the mineral deposits in Utah and Arizona, with a view to ascertain the nature of the rare minerals which exist in those regions; especially those of uranium and vanadium; in addition, the copper and gold deposits which have been found in the various localities. He has found that the belt extends from the northeast portions of Utah to the southwest of Arizona, and that with development, much will result commercially.

OBITUARY

Peter Patterson died at Pittsburgh, Oct. 13, aged 70 years. He has been with the National Tube Co. for 42 years, the last 10 years as consulting engineer.

Edward Eggleston Seelye shot and killed himself, Nov. 9. He was 36 years old, was a graduate of Cornell University and the Columbia School of Mines, and was employed at the works of the Orford Copper Co., at Bayonne, N. J. He had been in poor health for some time.

Timothy W. McNamara died recently at Pierre, N. M. He was formerly superintendent of the Auburn mine, on the Mesabi Range, later taking a position with the Colorado Fuel & Iron Co., at Pueblo. He was later transferred to New Mexico, where he had been for the past few years.

Col. Isaac Trumbo died at San Francisco, Nov. 7. At one time he was a large owner of mining property in Utah. He was employed by the Mormon Church as chief counsel for several years. Inside information on the mines of Utah made him rich. For years he entertained lavishly at his home in San Francisco, but since the fire all his weath had slipped away. Recently his pictures and furniture were sold to pay debts.

Societies and Technical Schools

Society of Chemical Industry—At the regular monthly meeting of the New York Section, on Nov. 22, the principal feature will be a lecture on "The Smoke Problem," by Dr. Raymond C. Benner, of the Bureau of Industrial Research of the University of Pittsburgh.

Colorado Scientific Society—At its meeting, on Nov. 2, this society, in response to an invitation from the chairman of the committee of consulting engineers of the U. S. Bureau of Mines on the prevention of accidents in metal mines, appointed a committee for suggestions and otherwise to give advice, particularly from the standpoint of operators and engineers in the Rocky Mountain region. The committee appointed comprises: Victor C. Hills (chairman), C. W. Comstock, Charles A. Chase, George E. Collins and A. J. Hoskin (secretary).

American Society of Mechanical Engineers—The plans for the meeting of the American Society of Mechanical Engineers with the Verein Deutscher Ingenieure, which promises to be the most remarkable tour of the industries in Germany ever offered to American engineers, are being arranged. Mr. Conrad Matschoss, dozent of the Royal Polytechnic High School, of Berlin, has been visiting the United States as a representative of the German society and has been conferring with the Committee of Arrangements regarding itinerary, professional papers, etc. In general, the date of the departure will be June 11, and the party will arrive in Germany on Saturday, June 21. The plans provide for visits to nearly all the important industrial centers of Germany. The final meeting will be held at Munich, July 7, in connection with the Museum of Technical Arts of that city. The entire trip through Germany and the various official receptions are being arranged by a committee of the most important men of the arts and sciences in the German society, and there is a keen interest shown by municipal authorities and the heads of industrial establishments.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Nov. 6—The gradual advancement in methods of ore treatment and the increased employment of machine drills and electric power, have effected a change in the character of men employed in the mines of California. The old-time hand-drill miner is seldom seen except in the beginning of operations of development of new mines or the reopening of old mines. In most of the mining camps in the northern part of the state, the laborers, car men and shovel men are foreigners who have little knowledge of the English language and a majority of them are wholly ignorant of mining work. In nearly all cases of serious or fatal accidents, the cause has been carelessness or ignorance. The scarcity of labor which is now being experienced at California mines is not confined to the common labor, but to skilled labor as well. The maximum wage paid to drill men in the state is about $3 per day. Common labor is paid about $2 a day. It is believed that an increase in wage would give California more and a better class of machine-drill men, but it is doubtful if an increase in the wage of common labor would effect other decided improvement in the class of men engaged in this work. California has a large mixture of foreign races, not only in the mining districts, but in the agricultural fields. There has been a great deal of complaint of the Japanese in the agricultural districts, but this race has not affected the mining districts, and the Japanese who come to this state are not miners and few of them are found in any mining camp. It is unfortunate, at present, that there is a scarcity of labor in the mining districts for many prospects are being developed and old mines reopened.

Denver

Nov. 19—The federal Bureau of Mines has opened an office in the Foster Building. Doctor Holmes has just returned from Silverton, where he went in connection with proposed sites for temporary metallurgical testing plants, for which purpose $50,000 was provided by Congress. Prof. J. C. Roberts, of the rescue and safety department of the Bureau, has returned from Aspen, where he has been fighting the fire in the Smuggler mine, and will continue his efforts during the winter until it is subdued. There are two fires, one at the eighth level and another at the eleventh. A peculiar feature of the fire in the upper workings is that it is believed that one of the walls of the vein, which is in the uptilted sedimentaries, is shale with sufficient carbon in it to burn, and that is feeding the fire as well as the timbers. The lower fire could be drowned out, but that would necessitate the suspension of ore extraction, to which the managemet objects. The Smuggler company has practically leased the whole of Aspen, with a general pumping agreement.

The prediction of W. A. Garrett, chairman of the association of railways, made in a circular letter issued last August to the 26 railways composing the association, in which he warned them of the coming car shortage, is being fulfilled, and is curtailing the output of ore as well as its marketing, and that of other products of the state. It is stated that in August there were 400,000 empties in different railroad yards, while now there is a shortage of more than half that number.

The output of Leadville is being curtailed by the shortage of cars, which is growing worse instead of better, owing to the enormous crop of fruit and agricultural products which has taken all the cars available. The result is that about two-thirds of the lessees in the district, and many of the big mines, have been compelled to lay off a large number of miners until shipping facilities are provided. About 70,000 was the tonnage for October, to which the Western Mining Co., Yak Mining Co., Iron Silver Mining Co., State Consolidated, Ibex, New Monarch, Castle View, Ethcima, Sugar Loaf Consolidated, and Dinero companies largely contributed. In the outlying districts work will be continued through the winter by the Winthrop, Anderson, Kankakee, Ella Beeler, Gleason Gulch and Rockefeller tunnels. Prospecting for carbonate of zinc ores continues throughout the district and the resulting discoveries of that and incidentally of lead-iron ores, continue to increase the monthly tonnage.

The El Paso company's engineer, T. A. Countryman, has now, it is stated, completed his sampling of the mine, which took three months. The report is to be completed in three weeks, when it will be mailed to stockholders. Its purpose is to give the true value of the stock, and upon it depends the construction of a mill. However, some engineers doubt the reliability of the results of sampling the irregular Cripple Creek veins in the usual manner. The flow of water from the portal of the drainage tunnel continues at about 9500 gal. per min. and the recession in all the deep shafts except the Vindicator and Golden Cycle in about four inches per day.

Butte

Nov. 6—The extension of the Butte, Anaconda & Pacific R.R. from Anaconda to the Southern Cross mine, at Georgetown, was completed Oct. 31, on schedule time, and general manager H. A. Gallwey drove the golden spike completing the laying of the rails. Surfacing and ballasting the track is now all that is left to be done, after which a regular train service will be inaugurated. Two cars of ore were shipped, Nov. 1, over the new road from the Southern Cross mine, and two days later the members of the business men's association of Anaconda were guests of the management on a trip over the line. During the construction of the branch a number of properties have been in the course of development, and part of these are now in a position to begin shipping ore at once. Now that transportation facilities have been completed, the Anaconda company will begin the shipment of electrical machinery and equipment for the Southern Cross mine, preparatory to working the property on a large scale as soon as shaft sinking shall have been finished.

The laboratory of the Washoe smeltery at Anaconda was the scene of a destructive fire on the afternoon of Nov. 4, which resulted in nearly the complete destruction of the building. It is believed that the fire was caused by short-circuiting of electric wires. The laboratory and testing department, as well as several offices, were completely gutted.

In addition to the great activity being displayed in developing the northern portion of the Butte district, the flat directly east of the famous hill is receiving considerable attention. Besides the work being done at the Bullwhacker mine, adjoining East Butte Mining Co. territory, a shaft is being sunk by the Anaconda company on the Tropic claim, northwest of the Bullwhacker, and preparations are being made by the Anaconda company to sink a shaft on the Atlantic claim, northeast of the Tropic. Capt. A. B. Wolvin, who recently bonded the Brundy group of claims in the same district, is now actively developing the Montgomery claim from a shaft 200 ft. deep. Duluth men have acquired control of the

Butte & London property, north of the East Butte, and are preparing to sink the shaft from its present depth of 1200 ft. to the 1600-ft. level. It is planned to crosscut north and south on the 1600-ft. level to the end lines of the property. The original company ran crosscuts on the 1100-ft. level, and opened several veins, without, however, disclosing ore of commercial value. As the bedrock in this portion of the Butte district is covered with 500 ft. of alluvial soil, it is believed that the veins were not intersected at a sufficient depth to correctly gage their contents.

Salt Lake City

Nov. 7—The situation at Bingham continues to improve. Working forces at various properties are being increased. The Utah Copper mine has nearly 2000 men employed, and the mine and mills are being worked at from half to three-quarters capacity. According to officials, a normally efficient working force, capable of a daily production of 20,000 tons of ore, will have been organized in another month. Certain classes of employees at the Magna and Arthur mills are to receive an increase in pay in November. This is understood to be a flat increase, men in different positions receiving a different rate. The scale for locomotive engineers, locomotive firemen and trainmen, working in connection with steam-shovel operations at the mines, will also be increased. The increase, it is said, is not for the purpose of bringing strikers back to work or to avoid a strike, but is made voluntarily for the benefit and recognition of services of those employees who have been loyal to the company's interests, and who have been in its employ before and during the recent disturbances, now practically at an end. The revised scale of wages at the mine and mill is to remain effective while the monthly average price of copper remains at or above 17c. per pound.

During 1911, the Bingham district produced 590,500,000 lb. of blister copper, as shown by the report on copper for 1911, by B. S. Butler, just issued by the U. S. Geological Survey. This production was exceeded by Butte, the Lake Superior district in Michigan, and by the Bisbee, Morenci-Metcalf and Jerome districts in Arizona.

Utah County, though essentially agricultural, takes fourth place in metal mining among the counties of Utah. There are three mining districts; these are American Fork Cañon, which has for some time produced a small, but fairly steady supply of ore; Santaquin, in the southern part of the county, is a comparatively new district, and is attracting attention in its development. About 25% of the output of the Tintic district, which lies on the western line, comes from Utah County, the output from that portion for 1910 being $1964 in gold, 1,478,972 oz. silver, and 18,647,443 lb. lead. The county's total income from metal mining in that year was $1,900,000. There are deposits of coal, marble and asphalt in the eastern part of the county, and marble, onyx, iron, gold and silver west of Utah Lake.

The lead furnaces at the Tooele plant are being operated at full capacity, and much ore is being received. The copper furnaces are still closed down, as the result of the Bingham strike, when operations were discontinued at the Utah Consolidated and other properties. These mines have resumed operations, and shipments of copper ore are being received. The copper furnaces will be blown in as soon as a sufficient supply of ore has accumulated. Shipments of concentrates have recently been received from the Jumbo Extension mill, at Goldfield, Nev.

The Utah Metal Co. is driving its tunnel, and making progress of 10 ft. per day. Two shifts are being worked in driving the Tooele heading, work on the Bingham end having been discontinued for the present. During the week ended Oct. 20, progress of 65 ft. was made. The Tooele end is in about 8000 ft., and there remains about 1050 ft. still to be driven for the completion of the 11,000-ft. tunnel.

Negaunee

Nov. 8—The Cleveland-Cliffs Iron Co. recently held a competitive first-aid contest at Ishpeming. Seven teams participated. The demonstrations included treatment of broken rib, fracture of leg, injury to the temple, and care of a person overcome by gas. Many officials, mining captains, shift bosses and engineers of the Cleveland-Cliffs Co. and of the Oliver Iron Mining Co. witnessed the contests. The judges decided that the first prize, bronze medals, be awarded to the five men comprising the team of the Stephenson Mine at Gwinn. The Austin Mine team won second prize, and the Negaunee Mine third prize. The other mines represented by teams were: Cleveland Lake, Cliffs Shafts, Salisbury and North Lake. Dr. Shields, of the American Red Cross Society, one of the judges, gave a talk on mine rescue work. The present teams at the Cleveland-Cliffs Iron Co. mines have been organized for more than a year. They will now start to train second teams, and it is planned to break in a new team each year, so that in time the knowledge of first-aid treatment will become general among the employees.

Considerable interest has been exhibited at various times in the matter of mechanically drying Lake Superior iron ores at the mines. The ores of the Mesabi range commonly contain from 10 to 16% moisture, Swanzy range ores average about 14%, and the ores of the Negaunee basin and the Gogebic range run almost as high. For example, the Brunt mine of M. A. Hanna & Co., at Virginia, Minn., ships "Brunt ore" which, when dried at 212° F., averages about 56% iron, but in its natural state contains 15% moisture. Practically all of the moisture remains in the ore until it is dumped into the blast furnace. High moisture, besides making greater freight charges, makes trouble by freezing in cold weather, and frequently causes explosions in the blast furnaces. Several years ago, M. A. Hanna & Co. installed a mechanical ore dryer at the Hollister Mine at Crystal Falls, but shortly afterward for various reasons the mine was closed down and abandoned. It is now announced that M. A. Hanna & Co. has contracted with the Ruggles-Cole Engineering Co. for the installation of a mechanical ore-drying plant at the Brunt Mine at Virginia. The plant will consist of two cylindrical dryers, 90 in. in diameter and 55 ft. long, with a capacity per dryer of 23 tons of iron ore per hour to reduce to about 6% moisture.

Toronto

Nov. 8—Difficulties have arisen in connection with the recording of claims in the Nighthawk Lake area. At the time of the first rush to that place in August, 1907, claims were recorded in Haileybury. When Porcupine was discovered and a new mining division created, the Nighthawk Lake area was included in it, but in the meantime many of the claims at first staked had either been patented or allowed to lapse. Many of the records, especially those referring to patented claims, were transferred to Toronto. Owing to loss or mistake in transfer the maps furnished to the Porcupine office were incomplete in showing where claims had been patented. In the last rush several old claims which were supposed to have lapsed through the nonperformance of assessment work, were staked and recorded. It has since been ascertained that some of these old claims, including several adjoining the Hyde-Markey group, had been duly patented and the patents are still valid.

The necessity of the proposed amendments to the law regulating the use and storage of explosives was shown by an explosion which occurred Oct. 23, at the Energite Explosive Co's. plant at Haileybury, Ont., in which five men were killed and three injured. The explosion was supposed to be caused by a fire which originated in the grinding room. At the inquest the Coroner's jury found that the factory owners were to blame on the ground that the building was not fireproof. They were unable to arrive at a conclusion as to the direct cause of the explosion, since the product manufactured, known as cheddite, had been regarded as not explodable by fire.

The Mining News

The Current History of Mining

Alaska

The season's output for the Nome district is estimated at $3,500,000. Nearly all the dredges are still operating, and if the weather continues mild, work may be carried on until December.

Captain Spalding and associates have purchased a two-stamp Hendy mill for their Dome Creek property. The mine is said to be yielding more than $1000 per day.

Alaska Gold Mines—Five hundred men are now at work developing the mine and doing the surface construction work preliminary to the erection of the 6000-ton mill. At the Perseverance, although no actual mining is being done, the stopes are in shape to draw the ore without injury, and the mill of the former company is running full capacity. This mill will be used to test the various methods of treating the ore. In the mine the Alexander crosscut is being widened. At the main station, at the intersection of this crosscut and the Perseverance vein, the incline raise and vertical shaft is progressing satisfactorily. This is the main piece of development work and is being pushed as rapidly as possible. In connection with the power-plant supply, the surface horse tram is completed to the face of the dam site, the flume grade is completed, and the flume is in course of construction. Three sawmills are working steadily to put out the lumber necessary for the various divisions; the site for the power house is excavated and all of the wiring of the transmission lines, with the exception of a small section, is completed. The electrical machinery is beginning to arrive. At the Sheep Creek tunnel, which will be driven to intersect the vein at greater depth, the concrete foundations for all the machinery have been laid and finished, and the compressor is being installed. A crew of experienced men has been secured for driving this tunnel.

Arizona

MOHAVE COUNTY

Mocking Bird—The mill and cyanide plant were recently put in operation under the direction of A. F. Muter. The ore averages about $20 per ton. W. H. Hall is superintendent.

Dixie Queen—This property is reported to be under bond to California men, who contemplate immediate development work.

Mossback—The First National Bank, of San Diego, has applied for patent on the Mossback and adjacent claims, in the Silver Creek district. These claims were formerly owned by C. H. Burlock.

Bi-Metal—An examination has just been made of this property by Walter Bunce and Walter Beam, of Denver. The property is situated in Kingman Cañon, about three miles south of Kingman, along the Sante Fé right-of-way.

San Francisco—The recent strike has given rise to the development of ore, which continues to increase in width and value as driving progresses. At the site of present operations, the vein is more than two feet wide. The strike was made at a depth of about 600 ft. on the vein.

Vivian Mining Co.—This company, under the management of S. R. Porter, is making improvements in equipment. Three 40-hp. gasoline engines, electric generators and motors are to be installed. The shaft is to be sunk to the 500-ft. level.

Gold Reed Mining & Milling Co.—A gasoline hoist has been installed on the Jupiter group of claims. The shaft is below the 100-ft. level, and it is the intention to sink to 500 ft. or more. H. H. Shuck is in charge of the development work.

Metallic Accident—Ross D. McCauseland has taken an option on this mine, in Mineral Park, from Thomas McNeely, and has put a small force of men at work, with Walter Burkhart in charge. In the early days of the district, rich ore was taken from this property, with a comparatively small amount of development work.

California

HUMBOLDT COUNTY

N. C. Halliday and R. Meitz, of Eureka, are contemplating the installation of a stamp mill, at Bonnieville, near claims recently discovered at Willow Creek, where high-grade free-milling ore has been uncovered near the surface. Some of the ore has been tested by cyanidation with reported satisfactory results.

INYO COUNTY

Four Metals Mining Co.—Stockholders and unsecured creditors have made legal protest against the sale of this property to Louis D. Gordon, mining engineer, on a bid of $500. Gordon agrees to pay debts, amounting to $250,000, secured by a trust company of San José, the principal place of business of the company. The mine in dispute is the Cerro Gordo. It is said that part of the zinc and silver in the tailings and the ore dump can be profitably recovered.

KERN COUNTY

Alameda—Litigation which has been keeping this mine idle has been settled; the title is clear and the mine is being reopened. S. J. Montgomery, of Randsburg, is owner.

Mays Consolidated—No. 4 well came in, Oct. 20, and for an hour flowed at the rate of about 25,000 bbl. per 24 hr. It then sanded up. It was beyond control while flowing, the oil being forced by heavy gas pressure over the derrick. The well was drilled to 2000 ft. with a rotary rig by the California Well Drilling Co. It was finished with cable tools at 2950 feet.

Kern Trading & Oil Co.—No. 39 well came in on Oct. 17, and a week later was flowing at the rate of 45,000 bbl. per 24 hr. The oil started at 24.6 gravity and settled to 23 gravity. The drillers were unprepared for the heavy flow, and the Standard and the Associated arranged to carry most of the production, until sumps and reservoirs can be built. A temporary dam broke and 3000 bbl. of oil was lost. The well is said to be making no noise, which is rather unusual in the flow of large gushers. In one day the Standard and Associated saved 45,000 barrels.

MARIPOSA COUNTY

Treasure—Six of the eight liens filed against this property last August have been satisfied. The prospects are fair for reopening the mine, which is in the Quartzburg district.

NEVADA COUNTY

Prudential—Six miners have taken a lease on this mine, which was formerly a producer but failed to meet the demands of promoters. San Francisco men took the mine over, but litigation prevented profitable operation. A. P. Wilson, of Grass Valley, who has been employed for several years in care of the pump and machinery, and the five other men associated with him in the lease, will undertake to reopen and start the mine again.

New Manzanita Mining Co.—The old Manzanita mines, near Nevada City, are to be reopened, and hydraulic mining again introduced in the district. These mines were profitable in the days of hydraulic mining. The new company is making preparations for building a retaining dam that is believed will satisfy the law regarding hydraulic mining.

SHASTA COUNTY

Bully Hill—The experiments in the extraction of zinc ore are still progressing at Winthrop.

Gambrinus—The mine and mill are being equipped for winter work; crushing will be resumed.

TRINITY COUNTY

Bonanza King—Two miners were killed by a cave-in, Oct. 25.

TUOLUMNE COUNTY

Mangante—Work has been resumed at this mine, on the western edge of Jamestown. The mine will be unwatered preparatory to extended development.

Colorado

CLEAR CREEK COUNTY

The mines on Democrat Mountain near Georgetown are credited with a production of about $10,000,000. The Kelly tunnel has been driven 2800 ft. into the mountain and is close to an intersection of the big veins that in the early days produced so largely from the surface. It is now stated that within 30 days an Eastern syndicate will take over the property and resume the driving of the tunnel. The compressor plant and machinery have already been overhauled and made ready for starting. On the La Plata, Parker & Connors, leasing 1200 ft. from the portal of the crosscut tunnel, have opened a vein of smelting ores.

Clyde—Ore proved for 100 ft. in length has been opened in this mine on Lincoln Mountain and 700 lb. of ore sent to the smeltery as a test gave returns of nearly $200 per ton in gold.

Kittie Ousley—This mine in the Argentine district has been cleaned out, retimbered, and is shipping four tons per day of high-grade ore to the local sampler.

Ready Cash—Five tons of ore shipped by John de Votie from this mine, close to the line of Clear Creek and Grand Counties, ran 340 oz. silver per ton. Work had to be stopped for the winter on account of the great altitude, but will be resumed next spring.

Presidential—A contract has been let to W. H. Morris to drive this tunnel another 100 ft. into Republican Mountain, making a total length of 1100 feet.

Empire—This tunnel, on Covode Mountain, which is already in 2200 ft., is being cleaned out and retimbered and the compressor plant and pipe line is being repaired. Machine drills will be started at once.

Seven Thirty—McGuire & Co., lessees, are operating through the Hercules level and recently shipped five tons of ore. Parrachini & Co., leasing in the upper workings, are shipping 15 tons monthly.

GUNNISON COUNTY

Raymond Co.—The Chicago tunnel in Jones Gulch is being cleaned out and will be driven to meet the 1600-ft. tunnel of this company, which has its portal on Ohio Creek and is 3300 ft. in length. It adjoins the Gold Links tunnel, which is 4000 ft. in length and the Carter tunnel, 6600 ft. long, all of which have intersected the system of gold-bearing fissure veins in what is known as the Gold Brick mining district. The Raymond Co. is managed by Eugene Lamont, of Denver, and has just opened a fine vein of high-grade gold ore.

LAKE COUNTY—LEADVILLE

New Discovery—A carload of silver-lead ore has just been shipped from the south end of this claim by lessees Doublecheck & Co. Below this ore is good iron ore from which shipments may be made in a few days.

May Queen—Lessees of this Fryer Hill mine have opened new zinc-carbonate ore in the lower level, and are shipping steadily.

Ella Beeler—About two carloads of lead ore carrying some silver are being shipped by the lessees from the lower tunnel of this mine in Iowa Gulch. The upper tunnel is being driven to the Houston vein.

Fanny Rawlings—This mine, which in 1904 was noted as a gold producer, is now being prospected for zinc-carbonate ore, and recently a vein was opened

Idaho Tungsten Co.—It is reported that the new mill on Patterson Creek is producing daily five tons of 60% tungsten concentrates, which will be stored until spring and then be hauled by wagon to Leadore, the nearest shipping point.

TELLER COUNTY—CRIPPLE CREEK

Gold Sovereign—It is reported by Superintendent Jackson that ore has been opened for 50 ft. along the vein. There are 300 ft. of backs above this strike.

Blue Bird—The shaft is 1770 ft. deep, the deepest in the camp by about 100 ft., but at this depth water was reached and work has been suspended until the water recedes, which it is doing at the rate of four inches per day. There is no change in the formation.

Dead Pine—The output of this mine, which is under lease to Carnduff & Duncan, is a car per day. The ore is mined from the fourth and sixth levels. On the fourth level the shoot is about 150 ft. long and four feet wide and the stope is 75 ft. high. On the sixth level the ore has been opened for about 100 ft. and the stope is 50 ft. high. There is a large tonnage of ore in sight. Royalties amount to $8000 per month.

El Paso—It is reported that 75 men are working on the 12 leases above the 400-ft. level, and that in October they produced ore worth $30,000. A dividend of 10c. per share on the new $5 shares has been declared and the erection of a 500-ton mill is under advisement.

Portland—The fact that at the 1600-ft. level and at about the same level in the Vindicator on the other side of the camp, large bodies of sulphide ore are being opened, equal in value to those of the levels above, is a most encouraging feature about the zone of ore now being mined below the old water level. There is, according to F. G. Peck, the president of the company, a vast body of sulphide ore in the new strike on the Portland 1600 level.

Stratton's Independence—During September, 3049 tons of 11-dwt. ore was produced and 10,600 of low-grade mine and dump ore were milled. The net working profit was $10,410.

Idaho

COEUR D'ALENE DISTRICT

Bunker Hill & Sullivan Mining Co.—Arrangements have been made with the Engineering Construction Co., of Spokane, to replace the timbers recently destroyed by fire, and some of the other timbering in the mine with concrete supports. It is estimated that the initial undertaking will cost $7000, and will be made on a percentage basis.

Marsh—E. J. Carter and Volney D. Williamson have purchased control of this mine, near Burke. Earl W. Greenough will be retained as general manager. Extensive improvements are planned and the sinking of a three-compartment shaft, which will permit operation at full capacity, has been started. The shaft, which starts at a place considerably east of the old two-compartment incline shaft, will be sunk 400 ft. An Ingersoll-Rand 12-drill compressor, driven by a 150-hp. motor, a new air hoist and other necessary machinery, have been installed.

Bear Top Consolidated Mining Co.—Mineral claims, concentrating plant and all appurtenances of the Twin Star Mining Co. and the Bear Top Consolidated Mining Co. were advertised to be sold at auction, at Wallace, Nov. 15. Included in the assets of the Bear Top is a concentrator of 150 tons daily capacity and a water right.

Idora Hill—A 75-ton concentrator will be built on Beaver Creek.

IDAHO COUNTY

Bengal—After driving 60 ft. on the vein from the crosscut and showing up an orebody 5 ft. wide, the owners have decided to build a road to Elk City and ship ore to the Elk City reduction works. The drift shows 3 ft. of oxidized ore.

Revenue—A large shoot of silver ore which can be sorted to $200 per ton, is reported from the tunnel on the American River side. Preparations are being made to ship a car to the Tacoma smeltery.

Michigan

Copper

Mayflower—The results of drilling have been encouraging. No. 22 hole, which recently cut the lode, revealed a core from a depth of 1011 ft. to 1133 ft. that carried copper for practically the entire distance. The assays of the sludges from the drilling for 88 ft. of that distance, or from a depth of 1019 to 1107 ft., showed an average tenor of 30.8 lb. of copper per ton. The copper is in the form of shot and fine copper easily recovered in the mills, and the formation is comparatively soft amygdaloid. Drilling will continue at this hole, which is now sinking below the 1400-ft. level until the basal conglomerate is reached, which is expected at any time. Hole No. 23 will then be started to the north of No. 22, and No. 24 still farther north. These holes will reach the formation at shallower depth. Holes Nos. 15 and 17, the discovery holes, showed about 26 and 32 lb. of copper per ton, respectively, and hole No. 20 ran about 30 lb. It is probable that upon the completion of holes Nos. 23 and 24 active steps will be taken toward the opening of a shaft to develop this lode.

Indiana—The shaft is about 1150 ft. deep and has passed through a vein of copper ore about 25 ft. through and into a native copper formation of good characteristics. Sinking is being continued to cut the felsite formation from which such a remarkable core was extracted a few years ago. The presence of copper was revealed by the core, but it was not thought that it would develop into such proportions as the present indications point to. The shaft is nearing the point where the felsite formation should be reached and further work will be watched with interest.

Oneco—Operations at this property are confined to driving north and south at the 12th level and south at the 11th level with encouraging results.

Superior—For the last two months a slight curtailment has been made in shipments to the Atlantic mill and attention has been paid to putting the property in shape to handle a greater production from the West lode which continues developing ore richer than that in the main lode at No. 1 shaft. As soon as the railroad connections are completed ore will be shipped to the mill of the Lake Milling, Smelting & Refining Co. and normal production will be resumed. A decided improvement should be made in the mineral yield, as the losses in the Atlantic mill are high. During the month of October a little over 11,000 tons of ore was stamped.

Keweenaw—Two diamond-drill outfits are to be started at once on the Delaware tract of this company, which will continue drilling throughout the winter. Negotiations toward taking over the Arnold, Ashbed and Meadown properties have not been completed, but there is little doubt as to the successful outcome of this effort.

Victoria—This company's new, or No. 6 shaft, is down about 900 ft., which corresponds with the 12th level of the main working or No. 2 shaft. A drift has been started from the No. 6 shaft to connect with the main workings, which are about 3450 ft. apart. For a short distance some fine ground was cut but has passed out of the line of drift and a crosscut has been started to pick it up again.

Adventure—Driving on the No. 1½ lode continues and is developing a run of good ground; driving also continues on the No. 3 lode.

Iron

Bengal—Bids are being received for a 105-ft. steel headframe. A No. 7½ McCully gyratory crusher, similar to the one at the Zimmerman mine, will be installed, and a brick transformer house will be built. The brick-and-steel engine house is nearly completed. Electrical power will be supplied by the Peninsula Power Co., of Iron Mountain. Eleven company dwelling houses are to be built.

Verona Mining Co.—The new main offices at Palatka are completed. Four more company dwelling houses are to be built near the offices.

Tully—A contract has been let by Corrigan, McKinney & Co. for the construction of 44 dwelling houses; some will be 1½-story five-room cottages, and others two-story houses with six or eight rooms. Knute Nelson, of Crystal Falls, has the contract.

McGreevy Steel Co.—A site is being cleared for a shaft at the Purcell property north of Iron River; Paul Chamberlain in charge.

Minnesota

Copper

The Keweenaw Western Development Association, that controls a large acreage of lands in the vicinity of Hinckley, Minn., and situated on the theoretical extension of the Keweenaw copper series, has contracted with Buffalo men for the sale of a large block of the association's stock. Development on the property consists of a shaft about 80 ft. deep, sunk on the incline, from the bottom of which crosscuts extend at right angles to the formation. Other surface exploration consists of extensive trenching, in cutting which a number of copper-stained amygdaloid lodes have been exposed. Plans for further development have not yet been announced.

Cuyuna Range

According to reports, hydraulic mining has been instituted on the Cuyuna range, on property owned by the Carlson-Williams interests. The equipment is said to consist of two 100-hp. motors, each connected to duplex pumps delivering 2000 gal. of water per min., under 50 lb. pressure. The dirt is carried away in a large flume. The company expects to handle as much overburden with its two pumps as two steam shovels could do, and at present is cutting away about 1000 cu.yd. in 12 hours.

Some officials of the U. S. Steel Corporation recently visited Cuyuna Range properties.

Cuyuna-Mille Lacs—Returns upon the initial shipment of five cars of ore to the Lake Superior Iron Co. furnaces at Ashland, give a total metal content of 61.9%, including 31.5% manganese.

Mesabi Range

Adams—Two crews will be kept at work all winter to clear the embankments so as to prevent slides, and to prepare in other ways for next season's operations.

St. Paul—The stockpile, estimated as containing 50,000 tons of ore and which has been stocked for five years, is now being shipped. Underground work is being planned for the winter.

Ruddy—The body of the third victim of the flooding of this property two months ago has been recovered. The other two bodies were recovered about a month ago.

Missouri

Joplin District

A rich strike has been made on the Lehnhard land, north of Aurora. Ore was struck at 226 ft., which extended to a depth of 274 ft. Two drill holes 200 yd. apart are in the ore and drilling is to be continued.

American Zinc, Lead & Smelting Co.—Several operators are developing small leases on this company's land, east of Joplin. Swager & Co. are sinking a shaft on a four-lot lease.

Osceola Lead & Zinc Co.—This company has leased all tools and equipment on the Kelley land, north of Webb City, together with right to mine, to the Arville Mining Co. Royalty is to be 20%, length of lease one year.

Gray Mouse—This is a new mine in the Neck City field, which has just been put on the producing list. The company has a 45-acre lease, six drill holes in ore and two shafts down. It is a soft-ground mine with a 17-ft. face. The ore is hand jigged at present, but a mill is contemplated.

Mariposa Mining Co.—This company has been drilling on the Amsden land, northwest of Carthage. Three holes are in ore and a fourth has been started. An 8-ft. face of lead ore was found at a depth of 35 ft., with 22 ft. of zinc "clippings" below it. A second ore run was encountered at 150 feet.

Granby Mining & Smelting Co.—This company has completed 20 drill holes on Sec. 36, southeast of Diamond, Newton County. Lead and zinc "shines" were found in 19 of the holes, but nothing rich. This is virgin territory, and while no plans have at present been formulated for mining, it is believed that the company will eventually develop the property.

Onondaga Mining Co.—This company, operating on its own land, at Spring City, is piling up a heavy tonnage of blende concentrates in its bins. The mine being west of the developed ore run causes the production to be watched with interest. The mill and equipment is new and complete.

No Name—A new shaft has been sunk by Haggart & Jones, on their lease of the Jones land, southeast of Villa Heights. Some lead and much calamine is being mined, the ore being hoisted through two shafts from a depth of 60 ft., and cleaned on two hand jigs.

Aberdeen—An unusual method of mining for this district is used at this mine. Instead of carrying the ore face from the shaft, drifts are being driven to the limits of the ore. Then the ore will be mined back toward the shaft. This is to prevent the danger of a cave-in, as the ground is soft.

Montana

BUTTE DISTRICT

East Butte—Shaft sinking has been resumed at the Pittsmont property, the intention being to continue without interruption to the 1800-ft. level, and possibly 200 ft. lower. Excellent ore has been opened on the 1200-ft. level, and it is principally due to this fact that the management has decided to open the lower levels as soon as possible. The monthly output of the mine averages about 1,250,000 lb. of copper at present, the ore being mined from the 800- and 1200-ft. levels, and it is the intention to maintain this average as long as copper is at the present price, regardless of the amount of development work in progress. Steel for the enlargement of the two furnaces, now in use at the smeltery, is on hand, but as the alterations will necessitate shutting down the plant for one or two months, it has not seemed advisable to lose any time while the price of copper is high.

Tuolumne—During October the production of this mine consisted of approximately 492,200 lb. of copper, and 13,200 oz. of silver. The ore is being mined on the 1600- and 1800-ft. levels, about one-third having an average value of 10% copper from the former level, and the remainder averaging about 5% copper from the 1800-ft. level. Station cutting has been completed on the 2000-ft. level, and sinking will be continued to the 2200-ft. level, after which development work will be started on both levels simultaneously.

Badger State—Fire has broken out in this and the Corra mine of the Anaconda Copper Mining Co., and interferes with operations in the Badger State. It is reported that the fire will be easily controlled and is confined to old workings.

CASCADE COUNTY

Mammoth—Guy Stapleton, John Mahoney, and other Butte men, who are operating this group of five claims under a two-year lease, with an option to buy for $70,000, have a force of five men at work. Some good copper ore carrying gold and silver, has been opened during recent development work. The Schulenberg Estate, of St. Louis, Mo., and others are the owners of the Mammoth group.

DEER LODGE COUNTY

Butte & Anaconda—A vein of ore assaying well in gold was recently struck at this company's property in the Georgetown district. The ore is free-milling and shipping to Anaconda over the newly completed railroad will probably begin in the near future.

JEFFERSON COUNTY

Boston & Corbin—The foundations for a 200-ton concentrator have been finished, for this property near Corbin. Erection of the building, the material for which is now arriving, will be started at once. It is hoped by the management that the mill will be ready for operation by April, 1913. A vein of silver-lead ore was recently opened on the 1200-ft. level, and driving in both directions on the vein is under way.

Exvein Mining Co.—Butte men recently filed articles of incorporation of this company, organized to operate the Bullock group of claims, 12 miles northwest of Basin on Basin Creek. The company is capitalized with 500,000 shares of $1 stock, and officers and directors are, J. D. Slemons, P. W. Blake, P. J. Brophy, A. J. Bullock and W. C. Lewis. There are six claims in the group, and A. J. Bullock, former owner of the property, has done much development work and shipped high-grade silver-lead ore. The company plans to begin cleaning out some of the old workings within a week or so, and then to start development work.

LEWIS & CLARK COUNTY

St. Louis—A 100-ton mill and cyanide plant is being erected by this company. Concrete walls are now being placed and as soon as the framework is finished the tube-mill and tanks will be put in place. It will be several months before the mill is in operation. In the mine there are large bodies of low-grade ore which can be treated at a profit in this new mill.

Nevada

COMSTOCK LODE

Mexican—October was marked by a heavy production both from mine and mill. The ore mined had a gross assay value of $92,000. The mill treated 1626 tons of ore, the head sample, indicating the total value for the month as $62,620. The apparent extraction was about 95%, and the bullion yield was between $55,000 and $58,000. The company has just acquired control of the Keyes and Monte Cristo mines in Sevenmile cañon, and an aërial tram will be built from the properties to the mill, a distance of more than two miles. An electric hoist is being installed at the Keyes, and exploration work has already been started on the 250-ft. level of the Monte Cristo.

Crown Point—The ore mined in October had a gross assay value of about $18,000 and was milled in the Yellow Jacket mill. Two shipments of concentrate were made.

Consolidated Virginia—The north drift on the 2300-ft. level shows the vein to have widened to eight feet, with five feet of quartz on the hanging wall. The assays continue low.

Ophir—A west crosscut has been started from the main southwest drift on the 2500-ft. level, in an endeavor to find the vein in that direction. The south drift has reached the Consolidated Virginia north line.

Union Consolidated—An air-lift pump is being installed at the 2500 station of the joint Union-Sierra winze, preparatory to resumption of work below the 2500-ft. level.

Sierra Nevada—The south vein on the 2500-ft. level continues to give high assays. In driving north it was found that the vein has been faulted. A crosscut is now being driven to pick it up to the west.

CLARK COUNTY

Yellow Pine—The production for September consisted of 360 tons of lead concentrate, and 1550 tons of zinc concentrate, the net returns from which will exceed $35,000. The regular dividend of 2c. per share was declared Oct. 25. A crosscut on the fifth level has intersected the vein south of the main fault, showing that the fault had a lateral displacement of 130 ft. This fault cut the main orebody on its dip, and since it is now located, sinking will be resumed at once. On the third level, the vein has been stoped to a width of 60 ft. The new cars and equipment for the railroad have been shipped and it is expected that the company will have two locomotives in operation within 30 days.

Columbia—On this property, a force of men, under the superintendence of B. T.

Hickman, is engaged in cleaning out the old workings, preparatory to sinking the main shaft. New hoisting and surface equipment will be installed. Joseph Dederich, of Los Angeles, is principal owner.

Lincoln—At a depth of 200 ft. in the shaft, a vein of gold and silver ore has been found. The property is six miles west of Jean, and has made occasional shipments of high-grade ore.

South Nevada Gold Mining Co.—This company, which operates the Frenchman mine, six miles south of Las Vegas, has a force of men at work on development, which will be increased to 50, as soon as accommodations are prepared. Some gold ore is already blocked out, and it is reported that a mill will be built in the spring.

ESMERALDA COUNTY

Goldfield Consolidated—The estimated October production is: 30,442 tons of ore milled for a gross recovery of $401,000; net realization $216,000.

HUMBOLDT COUNTY

The Iron Cañon, and Iowa Ore Purchasing & Reduction Co. are operating small mills. Much leasing and prospecting is being done in this county.

The Gold Circle camp is commanding considerable attention; the Esmeralda Mining Co. and the Rex Mining Co. are operating mills. Among the other active properties are the Elko Prince, Colorado Grande, and Eastern Star Mining Company.

Golconda Gold Ledge Mining Co.—This company plans to increase the capacity of the plant. At present there is a scarcity of water.

LYON COUNTY

Mason Valley—During October 27,319 tons of ore was treated, from which 1,646,000 lb. of copper was produced. Shipments during the month amounted to 1,726,000 pounds.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Nov. 2, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,400	117,819
Tonopah Belmont	3,321	108,186
Montana-Tonopah	989	45,152
Tonopah Extension	1,070	44,193
West End	885	33,557
Midway	50	770
MacNamara	380	16,389
North Star		266
Mizpah Extension		40
Jim Butler	300	33,400
Totals	10,395	400,072
Estimated value	$259,875	

WHITE PINE COUNTY

Nevada Consolidated—Mill and smeltery are now operating at three-quarters capacity and it is expected that normal capacity operations will be attained within a fortnight.

Oregon

BAKER COUNTY

Snow Creek—Operations at this mine near Greenhorn are to be resumed at once, and new machinery will be installed.

Golden Eagle—This company has been reorganized, and additional capital put into the property in the Greenhorn district.

LANE COUNTY

Vesuvius—Manager F. J. Hard states that development work will be continued on this property all winter, and that he expects to run the 10-stamp mill part of the time.

Utah

JUAB COUNTY

Crown Point—Driving is being done on the 600-ft. level, which is to be thoroughly prospected before shaft sinking is continued further. Most of the recent prospecting has been done on the 500-ft. level.

Chief Consolidated—The output for the week ended Nov. 1 was 10 cars, taken out in doing development. New orebodies are reported to have been opened recently. The working force, at present concentrated on development work, will be increased and a larger tonnage mined. The mine has lately been sending out as much as 23 cars weekly.

Iron Blossom—A cave mineralized with copper has been opened 50 ft. below the 600-ft. level of the No. 3 workings. The dimensions are 15 to 20 ft. wide by 100 ft. long to the north and south. Ore is being mined from stopes above the 500 in the No. 1 workings.

Gemini—Zinc ore has been found, and leases on ore of this character are being sought.

United Tintic—The workings at this property, which is a consolidation of the Bullock and Aspinwall, are being cleaned of caved material, and a small amount of ore is reported. The shaft is down 280 ft., and driving to the west is being done; the Bullock vein has been reached.

Grand Central—Copper and lead ore of good grade are reported on the 2300, and it is stated that the shaft will be sunk to the 2500 level. The present lowest workings of the mine are the deepest of any in Tintic.

May Day—The October output is given as 18 cars of zinc ore.

Gold Chain—This property has been closed down with about 12 cars of ore in the bins, owing to the engines on the Mammoth high line being laid off for repairs.

Opohongo—This property, which is operated through the Gold Chain, has been closed down. The weekly production has been about 200 tons, the ore coming largely from the 300- and 600-ft. levels. The offices have been moved from Provo to the McIntyre Building in Salt Lake City.

SUMMIT COUNTY

Park City shipments for the week ended Nov. 2 amounted to 2,384,380 pounds.

Mines Operating Co.—Two new roasters have been ordered for the mill, which is to treat the old stope fillings at the Ontario, the roasting capacity having been demonstrated to be insufficient.

Barry-Coxe—Under this name this property made several shipments during the last year. Now it is reported to have reverted to James Conelly, the original locator.

TOOELE COUNTY

Work is being done in the South Stockton district. There has been a fall of about two feet of snow, which it is thought will melt before the coming of winter snows. The camp is connected with Stockton on the Salt Lake Route by a 10-mile wagon road, and road and weather conditions are important. There is talk of a betterment of transportation facilities.

Consolidated Mercur—Operations will be continued until the beginning of 1913, or later. The output, though lessening, is sufficient to keep the mill in operation, and it is planned to continue work as long as expenses can be met.

Washington

KING COUNTY

A. E. Hanford, of Seattle, has awarded a contract for building a $30,000 dredge to the Schaake Machine Works, of New Westminster.

STEVENS COUNTY

Lead-Zinc—Work has been started on the foundations for the lead-zinc ore concentrator to be erected on this property near Metaline Falls. J. Jenson is in charge of the work.

Wyoming

ALBANY COUNTY

Utopia Mining & Milling Co.—Active development work is being done on the property of this company in an endeavor to block out enough ore to justify the erection of a stamp mill. Gold ore of good grade has been found in several tunnels, some of which are 500 ft. above the main adit.

CARBON COUNTY

The Fram, Klondyke and Cable properties in the Snowy Range district, 12 miles west of Centennial, are now on the shipping list. It is reported that money will be forthcoming in the spring to build a mill and that some custom ore will be treated in it, as other properties in the district have developed ore that could be profitably treated at a local plant.

FREMONT COUNTY

A. E. Minium, who has been working ground near the Hidden Hand, is in Denver purchasing mining machinery.

Wisconsin

PLATTEVILLE DISTRICT

A local company has been formed to develop the Barreis and Pross land, including the site of the old Hibernia mine, within the city limits of Platteville.

Wisconsin Zinc Co.—This company is drilling on the Wallace and Thompson farms adjoining the Winskell mine in the New Diggings district.

Klar-Piquette—This company is sinking a new shaft on the Weigel land where a discovery of rich zinc ore was made by churn drilling; the company is also drilling on the Seitz farm southwest of Platteville.

Vinegar Hill Zinc Co.—This company is drilling on the Bainbridge land, east of the Gritty Six mine, at Cuba City.

Wallace—This mine, at Highland, has been reopened after having been shut down for two years.

Canada

BRITISH COLUMBIA

Silver Standard—Extensive improvements are to be made at this property near New Hazelton. The mine is owned by Patrick Welsh and associates, of Spokane.

Granby Consolidated—This company will finance the completion of the Hidden Creek smeltery, and the further development of its copper mines out of the treasury, the surplus fund having attained proportions justifying such a decision, according to an announcement of President W. H. Nichols, of the company. Approximately $500,000 has been spent to date in development of the Hidden Creek mines, and at the smeltery site at Granby Bay, and it will require not less than $1,500,000 more fully to mature the plans for that place, which contemplate the erection of a 2000-ton smeltery, a hydro-electric power plant and other buildings. It will require fully another year to complete the project.

NOVA SCOTIA

Dominion Iron & Steel Co.—The output for October exceeded that for any previous month in the company's history, owing to the blowing in of the new blast furnace, bringing the number of furnaces up to five.

ONTARIO

Cleveland—Two cars of machinery, including two 40-hp. boilers and a four-drill compressor, are on the way to this property, in the Manitou Lake gold district.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Nov. 9, and for the year to date, were:

Bailey		21.57
Beaver	64.37	363.75
Buffalo		989.50
Casey Cobalt		255.15
City of Cobalt.		887.99
Cobalt Lake	20.70	827.88
Cobalt Townsite		1,641.37
Chamb.-Ferland		427.83
Comagas	200.38	1,874.33
Crown Reserve		388.21
Drummond		383.05
Hudson Bay	30.90	600.22
Kerr Lake		651.07
La Rose	66.00	3,048.05
Lost and Found		27.80
McKinley-Darragh	63.04	2,278.58
Nipissing	31.62	1,735.62
O'Brien	31.80	292.44
Penn.-Canadian		63.45
Provincial		22.22
Right of Way		242.82
Timiskaming	35.96	884.56
Trethewey	26.50	474.69
Wettlaufer	30.28	376.70
Colonial		63.14
Dominion Reduction Co.		56.64
Totals	601.55	18,878.63

Buffalo—The high-grade mill is rapidly approaching completion, and it is hoped to make the first run during the latter part of November. The mill is planned on the general lines of the Nipissing mill for treating high-grade ore.

Cobalt Townsite—The striking miners returned to work on Nov. 5, under the old conditions.

ONTARIO-PORCUPINE

Vipond—The mill has been closed down for a few weeks, in order to make some alterations, which must be made before the cyanide plant is installed.

Plenaurum—Good ore is being obtained from the winze below the 200-ft. level.

Burns—A diamond drill will be installed under the direction of C. R. Pope.

Nighthawk Lake—This property has been sampled by the Canadian Mining & Exploration Co.

Porcupine Lake—A shaft is being sunk to a depth of 400 ft., in order to develop the territory underneath the lake.

North Dome—The work of this company is being retarded by lack of water.

Three Nations—Work on the foundations for a 10-stamp mill has been started.

Scottish Ontario—A vein, showing good ore on the surface, has recently been found.

Tough—A shaft has been started on the No. 2 vein of this Swastika property. Some ore, running as high as $1000 per ton, has been sacked.

Schumacher—This property is to be reopened.

Dome Lake—Good ore has been found in a crosscut from the 180-ft. level.

Mexico

MEXICO

El Oro Mining & R.R. Co., Ltd.—During October, 21,090 tons of ore and 15,920 tons of tailings were treated, from which bullion worth $170,990 was recovered. Working expenses totaled $91,170, net profits $56,750.

PUEBLA

Puebla Smelting & Refining Co.—This company has acquired the Mexican group of claims, aggregating 200 acres. The purchase price is said to be $400,000, and the Antigua mine is included, the ore in which is said to contain about 6% copper and $3 in gold.

SONORA

Greene-Cananea—Much work is now being done on the various properties. At the smeltery the new Great Falls type converters are giving satisfaction and four more are on the way from Milwaukee. The Capote shaft, which is to be used as the main shaft for that property, is down to the 300-ft. level, and will be sunk to the 1000-ft. level before sinking is stopped. It is to be connected on every level with the old shaft, which is a short distance away and the big new orebody will be worked from the new shaft. The Capote orebody is known to extend from the 300- to the 800-ft. level. Drifting on the 900-ft. level is now underway to ascertain the extent of the ore on that level. The whole deposit is sulphide ore, except close to the surface where there is some carbonate. As a whole, it will average between 4% and 5% copper. Shaft No. 12 in Democrata Gulch, has been connected with drifts from the Veta mine, on the third level. A new electric hoist was recently installed. A new electric hoist has been installed at the Duluth shaft. It is the largest electric hoist in the district.

South America

CHILE

Braden—According to a cable, the last 111 meters in the No. 1 Teniente tunnel, or about 350 ft., assayed over 4% copper. This is above the average of reserves, which is placed at 2½% copper. The present development is in a heretofore undeveloped part of the property, and the face of the tunnel is now approximately 1500 ft. beneath the surface. During October, 42,500 tons of ore, containing about 2.8% copper, was treated. In the old mill a recovery of about 61% was made, while on the 46,000 tons treated by the Mineral Separation process the extraction was 75½ per cent.

Africa

TRANSVAAL

Gold production in the Transvaal in October is reported at 768,681 oz., which is 20,788 oz. more than in September, and 60,017 oz. more than in October, 1911. For the 10 months ended Oct. 31. the total was 6,808,095 oz. in 1911, and 7,591,556 oz.—or $156,917,463—in 1912; an increase of 783,461 oz. this year.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Nov. 13—Coal trade in the West continues to suffer from transportation troubles. The scarcity of cars is not quite as acute, but there is still much delay in deliveries.

The seaboard bituminous trade is also in better shape, supplies coming forward more freely than for some time past, though they are hardly sufficient yet.

The anthracite companies are still behind in deliveries. Demand is pressing, but that for domestic coal has eased off a little in consequence of continued mild weather. The steam sizes are in fair supply.

Anthracite shipments in October were the heaviest ever reported for one month, reaching a total of 6,665,321 long tons. For the 10 months ended Oct. 31 the total shipments were 57,645,658 long tons in 1911, and 51,500,540 in 1912; a decrease of 6,145,018 tons, or 10.7%. Only about one-half of the decrease caused by the April-May stoppage has been made up so far.

German Foreign Trade—Exports and imports of fuel in Germany, nine months ended Sept. 30, in metric tons:

	Exports	Imports	Excess
Coal	23,415,270	7,471,865	Exp. 15,943,4351
Brown coal	39,788	5,397,183	Imp. 5,357,390
Coke	4,179,116	439,483	Exp. 3,739,634
Briquettes	2,000,109	126,758	Exp. 1,873,355
Total	29,634,283	13,435,289	Exp. 16,198,9

Of the briquettes exported 415,731 tons were made of brown coal or lignite.

IRON TRADE REVIEW

New York, Nov. 13—The markets show little change, except that new orders are coming in more freely. Prices continue about the same, but there is more pressure for deliveries, and some premiums are being paid.

The testimony of many steel producers is that there has been no change in the business situation since before the election; in other words, that the election has had no effect. There is reason to believe, however, that there is considerably less forward business being placed than 30 days ago, although this may be simply because buyers are already covered and producers already sold. There is a distinct disinclination on the part of buyers to make commitments after July 1, at any rate with the freedom with which first- and second-quarter business was placed.

As to early delivery business, if the election has had an effect it has been a negative one, for the pressure upon mills for deliveries is undoubtedly greater than it was a fortnight or 30 days ago. Premiums are the rule on finished-steel products, and not simply for prompt shipment, but for any shipment this year.

The basic pig-iron market in the Central West shows apparently a slightly easier tone, for three large interests have made purchases in the week totaling 45,000 tons and secured all the iron at $16, Valley, when advices had been that it might be difficult to pick up any large tonnage even at $16.25. Bessemer has sold freely at $17, the former price. Foundry iron in the valleys, however, has stiffened to $17, furnace.

The scarcity of crude steel has become still more pronounced, one of the signs being the development of several sales of ingots, which are not ordinarily a market commodity. It is probable that some of the independent finishing mills will not be able to run full in the first quarter, having been unable to cover all the steel required.

The United States Steel Corporation reported 7,594,381 tons of unfilled business on books at the close of October, indicating an increase during October of 1,042,874 tons, a record gain for a month, passing the previous record of 942,806 tons in December, 1911. The increase surprised practically the whole steel trade. Shipments having been at substantially the full capacity during the month, or about 1,200,000 tons, it is evident that bookings were almost double the shipments. The corporation sales policy was somewhat different from that of the independents, as it made a special effort to sell against specific jobs, such as structural work and railroad cars, at prices slightly lower than the independents would accept on ordinary contracts. The corporation has foregone $1 or $2 a ton in profits for the privilege of picking its sales and securing the most substantial business possible. Should general conditions become less satisfactory next year, the corporation will be in particularly good position.

Pig Iron Production—The monthly reports of the furnaces, as collected and published by the *Iron Age* show that on Nov. 1 there were 281 coke and anthracite stacks in blast, having a total daily capacity of 88,300 tons: an increase of 5700 tons over Oct. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in October was 2,720,000 tons; for the 10 months ended Oct. 31 it was 24,234,425 tons. Of this total approximately 17,803,900 tons, or 73.5%, were made by furnaces owned and operated by steel companies.

Baltimore

Nov. 11—Exports for the week included 3,903,323 lb. rails and track material to Cuba. Imports included 81 casks silicospiegel and 1477 tons manganese ore from Liverpool; 279 tons ferromanganese from Rotterdam; 6700 tons manganese ore from Poti, Russia; 15,900 tons iron ore from Cuba.

Birmingham

Nov. 11—Even with the quotations advanced 50c. per ton, there is some business being transacted and pig iron is being sold by Southern manufacturers for delivery during the first and second quarters in next year. Spot iron still sells at $14@14.25 per ton, No. 2 foundry, while $14.50 is the minimum on iron for the first three months in 1913. For the first half, or rather through the second quarter of the year, $15 is the price asked and some sales have been made. The aggregate business transacted the past week is not very strong, but the furnace companies have books well filled for delivery during the rest of this year. The output during October was the largest of any month this year. The production already secured and the prospects for the balance of the month indicate that November's output in the South will also be a record. The railroad-car shortage is being felt by the iron manufacturers, as well as by the coal operators. During the past week a request for five cars with which to move steel billets for export was responded to with one car, while 20 cars needed for moving cast-iron pipe was answered with two cars. The Alabama pig-iron production for October went above 158,000 tons. For the 10 months of the year the production has gone to 1,493,459 tons.

Steel activities are showing further improvement, additional orders for rails having been received. Billets, fabricated steel and steel-wire goods are in demand.

Chicago

Nov. 12—The pig-iron market is quiet, but prices are firm and there is much confidence on the selling side, while melters show no lack of confidence in the continuance of conditions that have made the market strong for the last six months. Election results seem to have had no effect on the market except to quiet a slight speculative element. Buying continues to be in small lots widely distributed; the average user of pig iron is buying often and piling up a fairly large tonnage. Deliveries for the first half are the rule; a little spot delivery iron is constantly in demand and some requirements for the first quarter only remain to be filled. Beyond the first half there is yet no demand, though inquiries are plentiful and sales may soon occur.

No. 2 Northern pig iron brings $17.50@18 at furnace, which means 18@18.50 delivered. No. 2 Southern sells for $14.50 at the furnace, or $18.35, Chicago, on most sales, some few perhaps having occurred at 50c. above and below this price. Lake Superior charcoal iron is quiet at $18.75@19, Chicago. No difference is made for deliveries up to the end of the first half on ordinary sales. Furnaces are not striving for business and the buyer of pig iron is manifesting more anxiety about the future than the seller.

Heavy requirements continue in the market for iron and steel products, railroad supplies being specially active. The roads are buying largely for next year's needs, in every line. Structural material has a steady sale, though the volume is not so large as in former weeks, and the difficulty is yet to get the material from the mills in time. Bars are being bought largely in this territory, but from Eastern mills, local producers being sold up far into next year. For sheets, plates and minor lines there is a continuation of the old condition of large demand and limited mill capacity.

Cleveland

Nov. 11—Ore shipments are being rushed and there is again a demand for wild boats.

Pig Iron—The market is quieter, but furnaces are rushed to make deliveries. There is some delay in shipping, owing to scarcity of cars. Bessemer pig is $17.90 and No. 2 foundry $17.25@17.50, Cleveland delivery.

Finished Material—Specifications are coming in heavily, but new orders are not quite so numerous, though some good contracts have been let. Jobbers report a heavy trade from warehouses.

Philadelphia

Nov. 13—The general trend of pig-iron prices is upward. The extraordinary activity in basic and bessemer in this and other markets has precipitated a buying movement, not only for as early delivery as possible but in many cases for delivery far into next year. Not only are stocks exhausted at all but a few scattered furnaces, but there is very little capacity to sell for the rest of the year. Today's nominal quotations for basic shows a further advance than 25c. and the activity in forge iron has taken up a great deal of the remaining capacity for this year as well as first quarter next year and besides, has resulted in marking up quotations 25c. Low phosphorus iron has been very active and foundry grades have moved up. It is impossible to make any statements as to the probable course of the market which would be based on present conditions. Quotations are for No. 2 X foundry $18.50; a few lots of No. 2 plain sold at $18; gray forge is $17.75; basic $18.50 and low phosphorus $24 per ton.

Billets—Basic openhearth rolling billets are not easily to be contracted for and actual prices cannot be given, though the nominal quotation is $32. Forging billets are selling about as usual.

Bars—The bar mills are crowded to the limit. Most of the current business for the past few days has been done at 1.75c. for the best possible delivery and some mills are refusing to load up for the early winter at current rates. Steel bars are selling at 1.85c. for early delivery.

Sheets—Sheet orders are monotonously regular, most of them for large quantities.

Pipes and Tubes—A steady volume of business is being done and stock is not always received according to contract terms. Cast pipe is quiet at present.

Plates—The latest inquiries for plates call for large supplies for early delivery but the requests cannot be accommodated, except to a limited extent. Quotations, 1.75c. delivered. Much new work is in sight.

Structural Material—The mills are meting the requirements with much satisfaction to the consumers and quite an amount of work has been booked within a week for December delivery. Additional shipyard work has just gone to the mills and a batch of orders for bridge work has been booked for scattered delivery during the winter.

Scrap—Scrap is pretty well cleaned up and yardmen's terms are paid without questioning.

Pittsburgh

Nov. 12—The local market has been devoid of important developments in finished steel, unless the increased pressure upon the mills for early delivery, with a decrease in the buying of far forward deliveries may be considered developments. Specifications have been coming in at a very rapid rate, if not as rapid as in October, at least well in excess of shipments, so that mills have a larger volume of specifications on books than at any previous time in this movement, the equal, on an average, to about three months of full operation.

The regular bimonthly settlement of the Amalgamated Association scale for union iron mills in the Central West was made in Youngstown this morning, disclosing an average realized price of shipments of base sizes of iron bars from the selected mills during September and October of 1.3351c., against 1.2518c. in July and August. This advances the puddling rate from $6 to $6.15, for November and December, and other tonnage rates by about 1%. The next settlement will probably put wages on a 1.35c. or 1.40c. basis, giving a further advance of 15 or 30c. in the puddling rate and corresponding advances on other work.

Pig Iron—The Jones & Laughlin Steel Co. has bought 10,000 tons of basic iron for immediate shipment at $16, Valley, this following purchases of 6000 tons by the Republic Iron & Steel Co. for delivery January to June, and 29,000 tons by the Cambria Steel Co. for delivery November to April, all at $16, Valley. The market had been quoted at $16.25, Valley, and it was represented that it might be difficult to pick up any considerable tonnage even at that figure, so that it is possible the market has eased off a trifle. A large tonnage of bessemer has sold at the old figure, $17, Valley, the Republic Iron & Steel Co. taking 24,000 tons for delivery January to June, the Cambria Steel Co., 30,000 tons for delivery November to April and the Youngstown Sheet & Tube Co. 25,000 tons for first quarter. Foundry iron has stiffened, sales being made at $17 and $17.25, Valley. There appears to be a very limited tonnage available, and it is suggested that the furnaces prefer to make basic iron at prices ruling. We quote: Bessemer, $17; basic, $16@16.25; No. 2 foundry, $17@17.25; malleable, $16.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The scarcity has increased, there being only occasional lots of prompt available. The nominal contract price for the first half of next year is $61, Baltimore, but contracts are only accepted upon occasion. Prompt material is quoted nominally at $70@75, Baltimore.

Steel—A development of the unfinished-steel market illustrating the scarcity is the occasional sale of ingots, one mill having a slight surplus of furnace capacity, and another a slight surplus of rolling capacity, whereby a trade can be made. Ingots have sold at $24@25, maker's mill, generally in about 1000-ton lots. Billets and sheet bars are scarcely quotable, sales being very rare. We quote, largely nominal: Bessemer billets, $26.50; sheet bars, $27; openhearth billets, $27.50; sheet bars, $28, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods have stiffened and are quotable at $30 at mill.

Sheets—Premiums are being paid for any delivery this year, while occasionally contracts are made for next year at a premium. Specifications continue to exceed shipments, and mills are an average of about 11 weeks behind. We quote: Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.50c.; blue annealed, 10 gage, 1.65@1.70c.; painted corrugated, 2.45c.; galvanized corrugated, 3.45c. per pound.

Iron Ore Market

Shipments of iron ore from the Lake Superior region by ports are reported by the Cleveland *Iron Trade Review* for the season to Nov. 1 as follows, in long tons:

Port	1911	1912	Changes
Escanaba	3,764,654	4,663,879	I. 899,225
Marquette	1,956 147	3,082,331	I. 1,126,184
Ashland	2,260,381	4,382,877	I. 2,122,496
Superior	9,315,002	13,100,043	I. 3,785,041
Duluth	6,457,706	9,415,511	I. 2,957,805
Two Harbors	5,853,212	8,703,960	I. 2,850,748
Total	29,607,102	43,348,601	I. 13,741,499

The total increase this year over 1911 was 46.4%.

A sale of 35,000 tons Wabana ore from Newfoundland is reported to an Eastern furnace at 7¼c., f.o.b. cars Philadelphia, equal to 8 or 8¼c. per unit at furnace.

Foreign Iron Trade

German Iron Production—The German Iron & Steel Union reports the make of pig iron in the German Empire in September at 1,479,285 metric tons, being 8163 tons less than in August. The daily average was 49,309 tons in September and 47,982 in August, an increase of 1327 tons. For the nine months ended Sept. 30, the make was, in metric tons:

	1911	1912	Changes
Foundry iron	2,276,678	2,420,577	I. 143,899
Forge iron	400,356	400,905	I. 549
Steel pig	1,285,719	1,594,707	I. 308,988
Bessemer pig	261,083	286,715	I. 25,632
Thomas(basic)pig	7,283,913	8,156,472	I. 872,559
Total	11,507,749	12,859,376	I. 1,351,627

The total increase was 11.8%. Steel pig includes ferromanganese, spiegeleisen and all similar alloys.

METAL MARKETS

New York, Nov. 13—The metal markets have shown no marked changes from last report, but business continues generally active.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January	110	111	July	112	114
February	115	109	August	117	120
March	112	111	September	111	127
April	114	115	October	112	133
May	118	118	November	111	
June	115	117	December	110	

Year 1909, 115; 1910, 115; 1911, 112. Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Sept. 1912	$568,302	$4,200,682	Imp. $3,632,380
" 1911	2,352,861	4,704,096	Imp. 2,351,235
Year 1912	43,728,274	38,789,793	Exp. 4,938,481
" 1911	18,263,310	45,177,106	Imp. 26,913,796
Silver			
Sept. 1912	6,011,221	3,648,883	Exp. 2,362,338
" 1911	4,940,391	4,161,706	Exp. 778,685
Year 1912	52,547,946	36,501,752	Exp. 16,046,194
1911	49,527,961	33,696,430	Exp. 15,831,531

Exports from the port of New York, week ended Nov. 9: Gold, $110,000; silver, $813,011, chiefly to London. Imports: Gold, $209,987; silver, $249,460, from Mexico, South America and Australia.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for India, most of the arrivals going to the Bank of England.

Platinum—The market is steady and unchanged. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Iridium—This metal is quoted at $67@70 per oz., New York.

Palladium—Supplies are rather scarce and $72 per oz. is asked.

Silver—The market is fluctuating between a narrow range of figures. Profit-taking sales by holders in India have checked the advance which was in force when silver touched 29d. in London.

SILVER AND STERLING EXCHANGE

Nov.	7	8	9	11	12	13
New York	62⅞	62⅝	62¾	62⅜	62½	62⅝
London	29	28 15/16	29	28 13/16	28⅞	28 15/16
Sterling Ex.	4 8560	4.8540	4.8545	4 8535	4.8530	4.8505

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Oct. 31, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£7,558,600	£8,950,500	I. £1,391,900
China	989,700	1,081,000	I. 91,300
Total	£8,548,300	£10,031,500	I. £1,483,200

India Council bills in London brought an average of 16.06d. per rupee for the week.

Shipments of gold from London to India continue heavy.

Gold in the United States, Nov. 1, as estimated by the Treasury Department: Held against gold certificates outstanding, $1,056,017,169; in treasury current balances, $190,203,780; in banks and circulation, $610,614,208; total, $1,856,835,157, an increase of $15,452,722 during October.

Coined silver in the United States, Nov. 1, as estimated by the Treasury Department: Standard dollars held against silver certificates, $489,266,000; standard dollars in treasury balances and in circulation, $76,176,020; subsidiary coins, $172,078,534; total, $737,520,554, an increase of $4,848,068 in October.

NEW YORK

Nov.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
7	17½ @17⅝	17.20 @17.25	50¾	4.65 @4.75	4.50 @4.55	7.35 @7.45	7.20 @7.30
8	17½ @17¾	17.25 @17.30	50½	4.65 @4.70	4.50 @4.55	7.35 @7.45	7.20 @7.30
9	17½ @17¾	17.25 @17.30	50½	4.65 @4.70	4.50 @4.55	7.35 @7.45	7.20 @7.30
11	17½ @17¾	17.25 @17.35	49¾	4.62½ 4.67½	4.47½ @4.52½	7.40 @7.50	7.25 @7.30
12	17½ @17¾	17.25 @17.35	49¾	4.62½ 4.67½	4.47½ @4.52½	7.40 @7.50	7.25 @7.30
13	17½ @17¾	17.25 @17.35	50	4.62½ 4.67½	4.47½ @4.52½	7.40 @7.50	7.25 @7.30

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Nov.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
7	76	[illegible]	[illegible]	229	229	18¼	[illegible]
8	[illegible]	[illegible]	82	[illegible]	[illegible]	[illegible]	27
9							
11	[illegible]	[illegible]	82	227	226¾	[illegible]	27⅛
12	[illegible]	[illegible]	[illegible]	227	[illegible]	[illegible]	[illegible]
13	77	[illegible]	82¾	[illegible]	228	[illegible]	26⅞

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Copper—At the beginning of the week an improvement in demand became manifest, which was thought to be the forerunner of general replenishment of stocks by manufacturers, but the movement quickly petered out and the market became dull again. Several millions of pounds of electrolytic were sold at a small advance, both to domestic and foreign buyers. The highest price realized was 17½c., delivered, usual terms, and at the close electrolytic copper is freely offered at that price. Some small sales of Lake copper are reported as high as 17.70@17.75c., cash, New York. The largest agencies are maintaining the pegged price of 17¾c. for electrolytic copper and expecting the market to come to them when buyers have sufficiently starved themselves, and the expected is likely to be the consummation. At the close Lake copper is quoted at 17½@17¾c.; and electrolytic in cakes, wirebars or ingots, 17.25@17.35c. Casting copper is quoted nominally at 17.10@17.15c. as an average for the week.

The London market for standard copper fluctuated within narrow limits at around £76½@77⅝ for spot and £77⅛@77¾ for three months until Nov. 13, when a decidedly better feeling made itself felt and spot advanced to £77⅝ and three months to £77⅞.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 4309 long tons. Our special correspondent gives the exports from Baltimore at 276 tons for the week.

Tin—On Nov. 11 the market, which had ruled steady during the remainder of last week, became weak and declined almost £2½. This was ascribed to larger shipments from the Straits, which will unfavorably affect statistics. At the same time, orders which were expected in the London market from this side failed to materialize. Instead, domestic sellers appeared rather anxious to liquidate their holdings and were eagerly competing for consumers' orders. The market closes steady at £228¼ for spot and £228 for three months, and at about 50c. for November tin here.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in September, at 2358 tons, including 2338 tons from Bolivia and 20 tons from South Africa.

Lead—The entrance of a new producer into the market has been disturbing. Several interests have been pressing lead for sale during the last week, and the demand being not very good, the market has receded materially from the schedule named by the A. S. & R. Co. At the close, New York is quoted at 4.62½@4.67½c., and St. Louis at 4.47½@4.52½c.

The London market for lead is unchanged at £18⅜ for Spanish and £18½ for English lead.

Spelter—The market is quiet. A fair business is reported at somewhat better prices, particularly for early shipment. At the close St. Louis is quoted at 7.25@7.30c.; New York, 7.40@7.45c.

The London market for good ordinaries held around £27⅜ until Nov. 12, when it declined to £27⅛, and closed on Nov. 13 at £26⅞ for good ordinaries and £27⅛ for specials.

Zinc dust is quoted 7¾c. per lb., New York.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Imports and Exports of Metals

Exports and imports of metals in the United States, nine months ended Sept. 30, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess
Copper, long tons	276,450	134,231	Exp. 142,219
Copper, 1911..	264,047	115,472	Exp. 148,575
Tin, long tons....	432	39,090	Imp. 38,658
Tin, 1911.... ...	920	37,840	Imp. 36,920
Lead, short tons.	51,171	67,264	Imp. 16,093
Lead, 1911......	78,830	68,314	Exp. 10,516
Zinc, short tons..	6,520	5,215	Exp. 1,305
Zinc, 1911......	4,426	1,325	Exp. 3,101
Nickel, lb........	19,359,538	29,501,031	Imp. 10,141,493
Nickel, 1911....	18,888,877	21,901,523	Imp. 2,012,646
Antimony, lb.....	50,684	13,067,813	Imp. 13,017,129
Antimony, 1911.	160,844	7,824,178	Imp. 7,663,334
Platinum, oz.....	....	76,600	Imp. 76,600
Platinum, 1911.	95	89,696	Imp. 89,601
Aluminum, lb....	211,086	13,158,551	Imp. 12,947,465
Aluminum, 1911	....	....	....
Ores, etc.			
Zinc in ore. lb...	13,480,634	24,568,311	Imp. 11,087,677
In ore 1911....	16,396,226	26,279,745	Imp. 9,883,519
Zinc oxide, lb. ..	26,684,147	....	Exp. 26,184,147
Zinc oxide. '11..	21,176,252	....	Exp. 21,176,252
Zinc dross, lb....	403,918	....	Exp. 403,918
Zinc dross, '11..	7,170,517	....	Exp. 7,170,517
Chrome ore, l.t..	....	36,646	Imp. 36,646
Chrome ore '11	5	28,386	Imp. 28,381

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Quantity of zinc ore imported in 1912 was 33,001 tons; exported, 17,815. Imports of aluminum were not reported previous to July 1, 1911. Exports of manufactures of aluminum were valued at $945,668 this year. The metal exports given above, include re-exports of foreign materials.

Other Metals

Aluminum—The market has been rather quiet and prices are not quite so firm. Quotations for early deliveries continue at 27c. per lb. for No. 1 ingots. Futures are off, at about the same price.

Antimony—Business has been rather more quiet, but the undertone of the market is firm. There has been some liquidation of stocks, chiefly in the outside brands, but it is about over. Cookson's is quoted at 10⅜@10½c.; Hallett's 9⅞@10¼c.; while 9¼@9½c. per lb. is named for Chinese, Hungarian and other outside brands.

Quicksilver—Business is good and the market here is steady, with no material changes in prices. New York quotations are $42 per flask of 75 lb., with 60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price is £7 12s. 6d. per flask, with £7 10s. named from second hands.

Cadmium—The latest quotation from Germany is 725@750 marks per 100 kg., f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

Nickel—Shot, blocks and plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets[1]

Platteville, Wis., Nov. 9—The base price paid this week for 60% zinc ore was $54@55. The base price offered for lead ore was $60 per ton of 80% lead.

SHIPMENTS WEEK ENDED NOV. 9

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb
Benton.................	718,300	....	838,600
Mineral Point.........	684,800	.	.. .
Platteville	619,780	......	146,000
Shullsburg............	600,000	. .	.. ..
Galena	444,500	......	.. .. .
Highland	348,200	. ...	.. . .
Hazel Green........	300,000	....	. ...
Rewey	85,000	....	.
Linden	66,260	. ...	....
Harker......... . .	63,490	....	.. ...
Montfort..	60,000	.... ..	.... .
Cuba City.	50,000	......	64,660
Total.......... ...	4,040,330	......	1,049,260
Year to date..........	173,026,180	7,218,960	32,179,210

Shipped during week to separating plants, 2,111,190 lb. zinc ore.

Joplin, Mo., Nov. 9—The high price for zinc sulphide ore is $60, the base per ton of 60% zinc $52@57. Zinc silicate sold at $30@33 per ton of 40% zinc. The average price for all grades of zinc is $53.80. Lead sold at $57@59 per ton of 80% metal, the market weakening all through the week. No ore assaying above 80% metal was sold. The average for all grades of lead was $58.44 per ton.

Lack of cars for ore transportation is responsible for the zinc shipment lowering each of the past three weeks. The smelters are buying the ore and own the

SHIPMENTS WEEK ENDED NOV. 9

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,430,700		1,004,230	$151,141
Joplin	2,526,930	....	253,380	78,100
Duenweg.	860,440	.....	64,500	25,531
Galena.	491,680	.....	198,640	19,280
Miami .	567,300	......	357,610	19,185
Alba-Neck...	602,490	.....	21,220	17,784
Carl Junction	357,480	....	3,510	10,469
Granby	14,300	435,700	10,640	8,350
Jackson	241,070	.....	55,740	8,125
Wentworth...	258,910	.....	....	6,731
Carthage .	126,610	....	...	3,292
Spurgeon	....	64,610	76,220	3,244
Oronogo	118,040	......	...	2,168
Lawton	110,210	.....	....	2,142
Springfield .	68,800	....	.... .	2,100
Quapaw	63,300		.... .	1,580
Cave Springs	62,130	. ....	.....	1,717
Aurora . .	52,110	. . .	....	1,300
Totals .	10,752,830	500,310	2,045,690	$362,539
45 weeks..	184,609,930	30,268,820	81,194,930	$15,766,019

Blende val the week, $294,011; 45 weeks $12,970,632
Calamine, the week, 8,734; 45 weeks, 478,460
Lead value, the week 59,794; 45 weeks, 2,316,927

reserve stock in the bins at the mines with the exception of possibly 1000 tons, most of which is held for a higher level of prices.

MONTHLY AVERAGE PRICES

Month	Zinc Ore — Base Price 1911	Zinc Ore — Base Price 1912	Zinc Ore — All Ores 1911	Zinc Ore — All Ores 1912	Lead Ore — All Ores 1911	Lead Ore — All Ores 1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.40	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.3[illegible]	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	57.00	40.89	55.97	54.72	63.22
November	45.40		43.25		57.19	
December	44.13	..	40.76	..	62.03	.
Year	$41.45		$39.90		$56.76	. .

NOTE—Under zinc ore the first two columns give base prices for 60 per cent zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Zinc Ore Prices

Zinc ore is not commonly bought by American smelters upon a formula, but if their terms be translated into those of a formula they would agree fairly with the following, in which V is the value of 2000 lb. of ore, P is the price of spelter at St. Louis in cents per pound, and T is the number of units of zinc in the ore, R being the returning charge, which is variable.

$$V = 20P(T - 8) - R$$

At present, calamine ore is in strong demand and the returning charge may be as low as $13@14 per ton, delivered at smelter's works. On Rocky Mountain blende, on the other hand, returning charge at present would probably be in the neighborhood of $20 per ton.

Reduced to the terms of this formula, the present returning charge on Joplin blende is about $19 f.o.b. Joplin, and on calamine about $13.50 per ton.

Chemicals

New York, Nov. 13—Washington dispatches report that the representatives of a Norwegian company are trying to secure control of a large water power in Oregon, for the purpose of establishing there the manufacture of nitrogen compounds.

Arsenic—Spot supplies are better and there is less pressure to secure material. The market is easier, $5@5.12½ per 100 lb. being asked for spot and $4.62½ for futures.

Copper Sulphate—Trade is good and the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is rather quiet, but the market is steady. Quotations are 2.57½c. per lb. for both spot and futures.

Petroleum

Production of petroleum in California for the nine months ended Sept. 30 was 66,534,217 bbl., an increase of 4,729,895 bbl.; consumption was 61,113,326 bbl., an increase of 8,184,640 bbl. over last year.

MINING STOCKS

New York, Nov. 13—On Nov. 7, after election, there was a marked recovery on the Exchange. The Curb was also active, mining stocks selling well at firm prices.

Nov. 8, there was some reaction from the previous advances on the Exchange, but it was followed by general recovery. On the Curb there was a sharp advance in Braden Copper, but other coppers were quiet, and trading in the rest of the mining stocks was slow.

Nov. 9, the Exchange was strong, though affected by the general weakness abroad. Mining stocks on the Curb were dull and irregular.

Nov. 11 the Exchange was dull and inclined to weakness. The Curb was dull. Braden Copper advanced, but was the only mining stock selling well.

Nov. 12 and 13 the Exchange was irregular, small declines and recoveries alternating. The Curb was rather quiet and mining stocks were not in much demand, but were generally firm.

Boston, Nov. 12—Notwithstanding the weakness of the general market, copper shares have been giving a good account of themselves since election. The activity has been chiefly in spots, although this has resulted in generating some activity in other and lesser companies. The further increase in the American surplus copper during October does not seem to enter as a market factor,

Granby Consolidated has, by all odds, been the feature of the market, advancing over $15 during the week to $77.75. This price is within $2.25 of the price stockholders paid for the new stock during the early part of 1910, or just before the perpendicular drop to $30 occurred. Utah Consolidated responded to the declaration of the $1 dividend, by advancing $3 to $14.25.

This declaration is believed to be but the start of many more increases to come. Directors of eight other copper-mining companies will meet within the next two or three weeks for dividend action—Quincy, Copper Range, Calumet & Arizona, Calumet & Hecla, St. Mary's Mineral Land, Shannon, Utah Copper and Nevada Consolidated. Shattuck & Arizona has risen $8.25 to $34.25 on a revival of reports of consolidation with the Calumet & Arizona. In the lesser stocks, Superior & Boston has risen, and there is talk here of a consolidation with the Arizona Commercial.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies (except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	August	Sept.	October
Alaska shipments	[illegible]	1,726,715	1,435,235
Anaconda	[illegible]	24,500,000	25,250,000
Arizona, Ltd	[illegible]	[illegible]	3,200,000
Copper Queen	8,040,424	9,103,861	8,184,575
Calumet & Ariz.	4,514,000	4,462,000	4,404,000
Chino	3,485,278	3,217,369	[illegible]
Detroit	1,882,289	[illegible]	1,934,828
East Butte	1,410,500	1,250,000	.
Mammoth	1,802,590	1,834,937	
Giroux	774,844	1,005,208	
Mason Valley	[illegible]	1,200,000	1,563,700
Nevada Con.	6,551,030	5,607,578	.
Ohio	620,000	. .	
Old Dominion	[illegible]	2,204,000	2,523,000
Ray	[illegible]	2,978,404	
Shannon	1,400,000	[illegible]	[illegible]
South Utah	224,855	[illegible]	.
United Verde*	2,500,000	[illegible]	. .
Utah Copper Co.	11,248,992	[illegible]	
Lake Superior*	[illegible]	19,250,000	21,500,000
Non-rep. mines*	8,195,156	8,094,792	8,250,000
Total production	110,211,367		
Imports, bars, etc.	23,561,161	. . . .	
Total blister	[illegible]	. . .	
Imp. in ore & matte	[illegible]	.	. . . . .
Total American	[illegible]	. . . .	
Miami†	[illegible]	[illegible]	[illegible]
Brit. Col. Cos.:			
British Col. Copper	[illegible]	. .	[illegible]
Granby	[illegible]	[illegible]	
Mexican Cos.:			
Boleo†	.		
Cananea	[illegible]	3,500,000	[illegible]
Moctezuma	[illegible]	[illegible]	3,045,667
Other Foreign:			
Cape Cop., S. Africa	.	. . .	
Kyshtim, Russia	1,400,000	[illegible]	
Spassky, Russia	[illegible]	[illegible]	. . . .
Tilt Cove, Newfd	. . .	. . . . .	. . . . .
Exports from:			
Chile	8,512,000	[illegible]	[illegible]
Australia	8,064,000	7,616,000	9,520,000
Arrivals in Europe‡	20,200,320	8,518,720	13,771,520

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U. S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
X, 1911	118,255,442	64,068,307	60,084,349
XI	111,876,601	[illegible]	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	[illegible]
II	116,035,809	[illegible]	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	[illegible]	[illegible]	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	[illegible]	60,121,331
VIII	145,628,521	[illegible]	70,485,150
IX	140,089,819	[illegible]	[illegible]
X	145,405,453	84,104,734	47,621,342

VISIBLE STOCKS

	United States	Europe	Total
XI, 1911	[illegible]	176,825,600	311,823,242
XII	[illegible]	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	[illegible]	141,142,400	[illegible]
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	[illegible]	[illegible]
VI	[illegible]	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	[illegible]	163,579,621
IX	[illegible]	[illegible]	160,269,374
X	63,065,587	107,408,000	[illegible]
XI	76,744,964	103,801,600	180,546,564

Curb trading has been of good volume, and prices, in the main, have been strong. The old Rhode Island Coal Co. has been ordered shut down and the stock of its successor company, Portsmouth Coal Mining Co., was quoted 3c. bid, 10c. asked.

Assessments

Company	Delinq.	Sale	Amt.
Alpha Con., Nev	Nov. 13	Dec. 4	$0.03
Best & Belcher	Nov. 6	Nov. 25	0.05
Buffalo, Ida	Oct. 28	Nov. 28	0.002½
Consolidated Virginia, Nev.	....	....	0.15
Crown Point, Nev	Nov. 11	Dec. 4	0.10
Crown Point, Utah	Nov. 15	Dec. 10	0.01
Eastern Star, Ida	Oct. 12	Nov. 12	0.003
Exchequer, Nev	Oct. 30	Nov. 20	0.03
Franklin, Mich	Oct. 18	......	2.00
Laclede, Ida	Nov. 18	Dec. 9	0.003
Holy Terror, Ida	Oct. 18	Nov. 18	0.00¼
Hub, Ida	Nov. 14	Dec. 14	0.001•
Hugo, Ida	Nov. 9	Dec. 9	0.001
Indiana, Mich	Oct. 16	....	1.00
Leroy Gold & Copper, Ida	Nov. 28	Dec. 28	0.002
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Melcher, Utah	Nov. 23	Dec. 12	0.02
National Copper, Ida	Nov. 15	Dec. 10	0.01
North Star, Ida	Nov. 30	Dec. 30	0.001
Oneco, Mich	Oct. 10	...	1.00
Ophir, Nev	Nov. 11	Dec. 9	0.15
Rhode Island, Ida	Oct. 31	Nov. 30	0.00½
Sierra Nevada, Nev	....	....	0.10
Sunshine, Ida	Oct. 30	Nov. 30	0.001
Tar Baby, Utah	Nov. 2	Dec. 2	0.002½
Yellow Jacket, Nev	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	63.471	25.596	24.594	29.299
November	55.635	55.719		25.680	25.649	..
December	54.428	54.905	..	25.160	25.349	...
Year	53.486	53.304		24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	76.389
November	12.616	.	12.769	....	57.253	.
December	13.552	.	13.768	.	62.068	.
Year	12.376		12.634	. .	55.973	.

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.185	43.923	October	41.185	50.077
May	43.115	46.053	November	43.125	.
June	44.606	45.815	December	44.655	..
			Av. Year	42.281	... ..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.655
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265	5.071	4.139	4.894	15.332	20.630
November	4.298	.....	4.181	......	15.821	
December	4.450	....	4.332	......	15.648	...
Year	4.420	......	4.286	.....	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	. .	6.223	......	26.795	. . .
December	6.301	......	6.151	......	26.849	......
Year	5.758	......	5.608	......	25.281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	17.90	13.44	17.18	14.34	17.22
November	14.92	......	13.30	. ....	14.25	......
December	15.15	......	13.10	....	13.90	.. .
Year	$15.72	......	$13.94	......	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Nov. 12		SALT LAKE Nov. 12	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.04½	Beck Tunnel	.09
Cripple Cr'k Con.	.01½	Black Jack	.10
C. K. & N.	.16⅝	Cedar Talisman	.01
Doctor Jack Pot	.06	Colorado Mining	.15
Elkton Con	.64½	Columbus Con	.10
El Paso	5.40	Crown Point	.03½
Findlay	.04½	Daly-Judge	6.00
Gold Dollar	.19¾	Grand Central	.69
Gold Sovereign	.02¾	Iron Blossom	1.15
Isabella	.21	Little Bell	.75
Jack Pot	.04½	Lower Mammoth	.05
Jennie Sample	.06½	Mason Valley	12.00
Lexington	.006	May Day	.16
Moon Anchor	.01	Nevada Hills	1.50
Old Gold	.03½	New York	.00½
Mary McKinney	.73	Prince Con	1.70
Pharmacist	.01	Silver King Coal'n	3.15
Portland	1.04	Sioux Con	.02½
Vindicator	.88	Uncle Sam	.12
Work	.01½	Yankee	.12

TORONTO Nov. 12

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.50	Foley O'Brien	.25
Hudson Bay	‡63.00	Hollinger	14.75
Temiskaming	.42½	Imperial	.02½
Wettlaufer-Lor.	.24	Pearl Lake	.22
Am. Goldfield	‡.40	Porcu. Gold	.18½
Apex	.01½	Preston E. D.	.02½
Crown Chartered	.02¾	Rea	.35
Dobie	‡.25	Standard	‡.01
Dome	20.12½	Swastika	.08½
Dome Exten	.10½	West Dome	‡.13

SAN FRANCISCO Nov. 12

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.00
Belcher	.31	Jim Butler	.60
Best & Belcher	.05	MacNamara	.19
Caledonia	.99	Midway	.41
Challenge Con	.02	Mont.-Tonopah	2.00
Chollar	.02	North Star	.32
Confidence	40	West End Con.	1.65
Con. Virginia	.36	Atlanta	.17
Crown Point	.31	Booth	.05
Gould & Curry	.09	C.O.D. Con	.05
Hale & Norcross	.11	Comb. Frac	.10
Mexican	1.80	Jumbo Extension	.31
Occidental	70	Pitts.-Silver Peak	.90
Ophir	.51	Silver Pick	.07
Overman	.37	St. Ives	‡.30
Potosi	.04	Tramp Con	.02
Savage	.08	Argonaut	‡2.00
Sierra Nevada	.35	Bunker Hill	‡4.50
Union Con.	.42	Central Eureka	‡.20
Yellow Jacket	.40	So. Eureka	‡2.00

N. Y. EXCH. Nov. 12

Name of Comp.	Clg.
Amalgamated	84¼
Am. Agri. Chem.	56⅞
Am. Sm. & Ref., com	80
Am. Sm. & Ref., pf.	107¼
Am. Sm. Sec., pf. B	84
Anaconda	43½
Batopilas Min	1½
Bethlehem Steel pf	73½
Chino	48¾
Federal M. & S., pf.	44
Goldfield Con	2⅞
Great Nor., ore., ctf.	46
Guggen. Exp	55¼
Homestake	98
Inspiration Con.	20⅛
Miami Copper	28½
Nat'nal Lead, com.	61½
National Lead, pf.	110
Nev. Consol	22
Phelps Dodge	215½
Pittsburg Coal, pf.	92
Ray Con	22¼
Republic I & S, com.	29½
Republic I & S, pf.	92
Sloss Sheff'd, com.	55
Sloss Sheffield, pf.	95
Tennessee Copper	41¼
Utah Copper	63¾
U. S. Steel, com	75½
U. S. Steel, pf.	112½
Va. Car. Chem.	45½

N. Y. CURB Nov. 12

Name of Comp.	Clg.
Barnes King	‡.60
Beaver Con	40
Braden Copper	8⅞
B. C. Copper	4½
Buffalo Mines	2⅛
Caledonia	40
Con. Ariz. Sm.	7/16
Davis-Daly	2⅛
Diam'field-Daisy	6
Ely Con	19
Florence	72
Giroux	4¾
Gold Hill Con	5/16
Greene Cananea	9⅝
Greenwater	05
Internat. S. & R.	‡124
Kerr Lake	2 11/16
Keystone	2
La Rose	2½
McKinley-Dar-Sa.	2¼
Min. Co. of A. new	2⅞
Motherlode Gold	‡15/16
Nev. Utah M. & S.	‡01
Nipissing Mines	8¼
Ohio Copper	1⅝
Pacific Sm. & M.	¼
Puebla S. & R.	‡1 11/16
South Live Oak	2
South Utah M. & S.	⅝
Standard Oil (Old)	1110
Stand'd Oil of N. J.	395
Stewart	1 5/16
Tonopah	6½
Tonopah Ex.	2⅝
Tonopah Merger	.92
Tri-Bullion	¼
Tularosa	1 1/16
Union Mines	‡10
United Cop., pfd.	10
Yukon Gold	3¼

LONDON Nov. 13

Name of Com	Clg.
Camp Bird	£1 5s 3d
Dolores	1 10 0
El Oro	0 17 6
Esperanza	1 19 3
Mexico Mines	6 15 0
Oroville	0 5 0
Stratton's Ind.	0 3 1½
Tomboy	1 7 0

BOSTON EXCH. Nov. 12

Name of Comp.	Clg.
Adventure	‡6
Ahmeek	‡330
Algomah	3½
Allouez	‡39½
Am. Zinc	31¾
Ariz. Com., ctfs.	4⅜
Bonanza	.30
Boston & Corbin	6¼
Butte & Balak	‡3⅞
Calumet & Ariz	78¾
Calumet & Hecla	570
Centennial	‡19
Cliff	‡3
Copper Range	56
Daly West	3⅝
East Butte	15⅛
Franklin	10½
Granby	76¼
Hancock	24
Hedley Gold	‡25
Helvetia	85
Indiana	17½
Island Cr'k, com.	‡55
Island Cr'k, pfd.	88
Isle Royale	34¼
Keweenaw	‡2
Lake	30¾
La Salle	5¼
Mass	6½
Michigan	2
Mohawk	63
New Arcadian	2½
New Idria Quick.	‡7
North Butte	36
North Lake	1
Ojibway	3
Old Dominion	59
Osceola	107
Quincy	85
Shannon	14⅛
Shattuck-Ariz.	34
Superior	43
Superior & Bost.	2¾
Tamarack	‡41
Trinity	5½
Tuolumne	‡2¾
U. S. Smelting	45¾
U. S. Smelt'g, pf.	50½
Utah Apex	1¾
Utah Con	13¼
Victoria	‡2½
Winona	4½
Wolverine	76
Wyandot	‡1¼

BOSTON CURB Nov. 12

Name of Comp.	Last
Alaska Gold M.	8¾
Bingham Mines	4¾
Boston Ely	1 1/16
Boswyocolo	01
Butte Central	6 3/16
Cactus	08
Calaveras	2½
Chief Cons	1½
Corbin	.27
Cortez	¼
Crown Reserve	3½
First Nat. Cop.	2 3/16
Majestic	43
Mazatan	‡½
Moneta Porc.	‡04½
Nevada-Douglas	3 11/16
New Baltic	1¾
Oneco	2½
Raven Copper	.27
Portsmouth Coal	03
San Antonio	‡3
Smokey Dev.	2¼
S. W. Miami	5¼
South Lake	6½
Trethewey	30
United Verde Ext.	55

‡ Last quotation.

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E.C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour,' N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94 NOVEMBER 23, 1912 No. 21

The Baghouse in Lead Smelting

The baghouse was introduced in the zinc industry many years ago, was later adopted successfully in connection with the smelting of galena in the ore hearth in Missouri, and was tried in silver-lead smelting in Colorado at a relatively early date. For reasons that need not be given here, the first attempts to adapt it to the conditions of Colorado were unsatisfactory, but in 1887 the new Globe works at Denver were thus equipped and gradually it became a standard part of the modern silver-lead smeltery. The full results achieved by its aid have, however, been shrouded in mystery, which was for the first time unveiled by Anton Eilers, in a paper presented at the eighth International Congress of Applied Chemistry, recently held in New York.

In the smelting of 1,666,857 tons of charge, containing 177,346 tons of lead, in 4⅔ years at the Murray plant of the A. S. & R. Co., the baghouse increased the lead extraction by 1.269%, besides saving a little copper, gold and silver, that might otherwise have been lost in smoke. The value of the metals gained, however, was only $6547 more than the direct operating cost, but after allowing 6% interest on the cost ($127,195) of the plant and 5% amortization (which is none too high), there was a loss of $58,746.

On account of the advisability of extracting the arsenic content of the fume, it had to be shipped to another plant. If there had been an arsenic department at Murray the cost would have been less and the net loss in operation would have been reduced to $24,101.

The blast furnaces at the Omaha plant in the year 1910-11 treated 74,112 tons of charge, from which the baghouses yielded 580 tons of fume, containing 230 tons of lead. In this case there was a net profit of $7684, reckoning 6% interest and 2½% amortization on the cost of the baghouses ($60,000). Here, the cost of smelting the fume was much less per ton than in the case of the Murray plant, and amortization is reckoned at only 2½% instead of 5%.

The A. S. & R. Co., in its Omaha plant, has made a specialty of the treatment of lead-copper matte, which once was attended by large metallurgical loss, especially of the lead. This was overcome by passing the converter smoke to a baghouse. In the treatment of 53,667 tons of charge there was saved in the baghouse 1551 tons of fume, containing 1325 tons of lead, at a profit of $98,712, after allowing 6% interest and 2½% amortization on the cost of the baghouse plant (about $42,000).

In the words of Mr. Eilers, these figures show that "taking the immediate financial outcome only, baghouses are not profitable in lead-smelting works which treat ores low in the precious metals and especially in lead. But there is another consideration to be taken into account when smelting works are, like Murray, located in the midst of farms and villages. This is the elimination of constant lawsuits, which are bound to be of frequent occurrence, when arsenious oxide and the sulphates of lead and other metals are permitted to drop down into the fields. It must be decided, therefore, in the case of each smelting plant, whether it is not good business to expend the money for a baghouse and for operating the same, though an immediate profit is not apparent."

When the lead content of the ore rises, the use of baghouses becomes more and more profitable, which no doubt is at the maximum in the works of the Mississippi Valley that treat high-grade galena. In these works the introduction of baghouses increased the extraction of lead from about 90% to upward of 98%. We wish that Mr. Eilers had added some figures from the Federal plant. However, we are duly grateful for the valuable data that he has given, which is the first important contribution that has been made from the practice of the A. S. & R. Co.

We recommend a study of his figures, not only by metallurgists, but also by our conservationist friends, who harp upon the woful waste of the smelters without any consideration of the dollars and cents of the respective cases.

The Purity of Metals

Elsewhere in our columns we present an abridgement of the complaints of Ernest A. Lewis with regard to the new American standard copper specifications. The first feature that strikes us in Mr. Lewis' complaints is that either he or the American refiners of copper are in grievous error as to what can be done with electrolytic copper. Mr. Lewis says that the very best recast electrolytic copper would only just pass the analytical test of 99.88% Cu. According to the American copper refiners, material is being poured almost daily from their wire-bar furnaces, which is not only 99.88% copper, but is occasionally 99.93 per cent.

In regard to his statement that in England the percentage of arsenic is usually specified to be from 0.35% to 0.6% of arsenic for arsenical copper, while the only American specification given for arsenical copper is the unnecessary conductivity test, it might be said that the above specification by the American Society for Testing Materials cannot prevent anyone specifying and obtaining copper carrying 0.6% arsenic for his special use. And indeed we know that certain American refineries recently have had to cater to just such a specification.

While we feel that a portion of Mr. Lewis' argument is based on impossibility of regularly producing copper carrying 99.88%, and is hence unsupported by facts, and that another portion is wrong, in that it fails to take any account of individual contracts, there is something to be said against over-purity of commercial metals.

A leading wire drawer recently complained to us that, although the specifications were calling for about 99.88% copper, yet the companies were consistently supplying material analyzing about 99.92%. He stated that the last two or three years had seen a gradual slowing down of practically all of his drawing machines, using the same dies and machinery, due to the increasing purity of electrolytic copper. At the old speeds, the wires now constantly broke. Recently he had special lots of bars cast at about 99.86 to 99.88%; using this more impure material he had been able to speed up his machines to the old limits, while the wire drawn from these bars would still pass the conductivity test of his customers. The result is that he is now attempting to get a constant supply of electrolytic wire bars that will carry between 99.86 and 99.90% Cu. As a matter of fact, this would be as favorable to the concerns from whom he is buying, as it would be to him, for the reason that any impurities (except gold and silver) which they can sell as copper is so much clear gain.

It has also been stated on good authority that certain troubles recently occurring in the shop of a large maker of lead pipe were found to be due to an over-purity of the lead, that faster and better work could be done with certain brands of lead that proved on analysis to be more impure, through minute quantities of copper, than that which had given trouble in the machine.

Consequently it seems to be the case that impurities in the nonferrous metals are not always the unmixed evils that many chemists and metallurgists have long been accustomed to regard them, and that the workers in the nonferrous metals and alloys must begin to recognize the beneficial influences of infinitesimal quantities of certain impurities, as the workers in iron and steel were long ago forced to do.

Convertible Bonds

The great success of investors in certain issues of convertible bonds made by mining companies during the last four or five years, is likely to make this form of financing a favorite one in the future. Possibly the opinion will come to be held that there is some particular magic about it.

The success of the Utah, Nevada, Miami and other convertible bonds was due, however, to the increase of real value experienced by those companies. In all cases the promoters were obliged to make repeated demands for capital, either because they had underestimated the requirements, or feared to ask for such huge sums all at once. Too many issues of stocks might not have been regarded favorably, wherefore the idea of convertible bonds in the last demand for money.

These bonds gave the holders a mortgage on the property, thus securing their money, and by their converting conditions gave them a speculative interest which might become very valuable. In fact it did become valuable in these cases, because continued developments showed that the resources of the mines were much greater than when the bonds were issued.

Attention is called in the steel trade to the fact that, notwithstanding the large increase in steel production this year, the supply of the manganese alloys used in steel making has been practically stationary. Combining production and imports there has been this year a small increase—about 7%—in ferromanganese, with a larger decrease in spiegeleisen; the two about balancing each other, when the respective manganese contents are considered. This condition fully explains the large increase in prices of ferromanganese. The contract price of the imported alloy, which was $36.50 per ton at the beginning of the present year, is now $61; while for spot lots which are needed as much as $70 or $71 is charged, and such supplies are hard to get.

The important effect of Indian prosperity on the demand for the precious metals is well known. The remarkable feature of the present year is that the Indian demand, which has been very large, has run rather to gold than silver. For the 10 months to Oct. 31 India has taken from London a total of £10,947,463 in gold, an unprecedented amount, while the total value of its silver purchases has been £8,950,500, or about £2,000,000 less than the gold. The silver takings have not fallen off, but are greater than for several years past. The approximate quantities represented by these values are 2,816,100 oz. gold, and 77,270,500 oz. of silver being, respectively, about 15 and 35% of the world's production. The important question is what effect the growing demand for gold may have on future takings of silver, and consequently on the future price. An important point is that the gold and silver taken by India is nearly all absorbed, little being exported.

By the Way

In a certain mining town in the West, a Lutheran preacher was trying to improve the local cemetery by putting a fence around it, and was requesting help from the individual miners. A "Cousin Jack," who was asked for a small donation, replied: "I wunt give ee bloomin' cent, cause taint needed." "Why is'nt a fence needed?" the preacher asked. "Cause they aint nobody in, what can get out, an nobody out what wants in."

To John Mabbs, agent of the Isle Royale mine, in the Lake Superior district, belongs the credit for having introduced the power drill to the mining world, says A. H. Meuche, in a recent publication of the Michigan Geological Survey. Mr. Mabbs induced Mr. Rand, who was manufacturing a heavy drill for tunnel work, to make a light and portable one for mine use. With some old engines at the mine he made a compressor and with cast-iron pipe conducted his compressed air underground.

The *South African Mining Journal* celebrated its 21st birthday, September, 1912, by issuing an elaborately illustrated number containing 466 pages, 10x14½ in. in size. The history of this journal and the history of South African mining are practically coeval, and in this number the attempt is made to present a good epitome of the growth of the Rand in mining, metallurgy, geology and finance. Congratulations are due the *South African Mining Journal* on its anniversary number, and we hope it will continue to have a long and prosperous career.

In discussing the new regrinding plant at Calumet & Hecla, a correspondent, in the JOURNAL of Nov. 2, 1912, stated that the company was building, in its own shop, the tube mills and other apparatus to be used in this plant. The inference from this item would be that the old-style tube mills were to be used. This is not a fact, however, as these have been superseded by the Hardinge conical pebble mills of which 64 will be placed in this new plant. A tube mill was used in the old plant for over a year in competition with the Hardinge mill, with the result that the Hardinge type was selected.

An experience in regard to the early use of steam power in the Lake Superior copper country is told by Graham Pope. When they brought in the boilers for the Albion Mining Co. in 1854, no canal had been cut at the Portage and the Entry was not navigable for large boats. When these boilers were brought into the Entry no lighters were to be had on which they could be placed, says A. H. Meuche, in a publication of the Michigan Geological Survey. "Finally, under the charge of J. B. Lyon, all the openings being plugged, the boilers were launched overboard. One of these came back at the steamer and knocked a big hole in her side, but fortunately above the water line. The boilers were well roped together, the domes being kept upright by means of heavy planks bolted across them. A large sail was hoisted and the boiler catamaran sailed into the river. A large Mackinac sailboat was then chartered to go ahead with a long cable, and the whole outfit sailed up Portage River and Portage Lake 15 miles to Houghton, where the boilers were pulled ashore by cattle power."

The Standard Oil Co., of New Jersey, from whose control 34 subsidiary companies were taken by the decree of the United States Supreme Court, has, within the year, paid $20 per share to its stockholders, and, counting the payments made by the subsidiaries of the old trust, the holders of Standard Oil stock have within this period received more than $52,000,000 in dividends. This is equivalent, says the *Times*, to more than 52% on the parent company's stock. The highest dividend ever paid by the trust before its dissolution was forced by the government's suit under the Sherman law was 48%. In the year immediately preceding dissolution the trust paid only 37 per cent. Several of the subsidiaries are yet to be heard from.

Mining in the anthracite region of Pennsylvania has acquired new thrills in these days when no one can walk over the surface with the assurance that he may not be engulfed at this next step. A few weeks ago we chronicled the disappearance of a part of a railway train in a mine cave. Last week the daily papers reported the hair-breadth escape of Wally Buronski, who had started from the No. 2 stope of the Natalie colliery at Shamokin with John Stenchock and three mules drawing 10 cars. Stenchock rode the leading mule, Buronski being on the third. The ground broke, hearing which Stenchock looked back and saw the 10 cars disappearing into the earth, with the last mule struggling to retain its footing. Buronski crawled over his animal's head and grabbed the traces of the second mule just as his own disappeared into the chasm.

Reference was made in the JOURNAL of Oct. 26 to the beginning of work on the Myron Stratton Home, provided for in the will of W. S. Stratton. Secretary William Lloyd writes us that an injustice has been done the board of trustees in our comments on the delay in inaugurating this work. Mr. Lloyd reports that it was found by the executors of the Stratton estate that the discoverer of the Independence mine had left a very diverse and complicated property, largely undeveloped. It consisted of real estate in Denver and Colorado Springs, a large part of which was practically unimproved; mining property in Cripple Creek that had been operated at a loss for months; the street-railway system of Colorado Springs, which he had been rebuilding regardless of expense, but was still unfinished; a disputed mortgage on the Brown Palace Hotel; miscellaneous stocks and bonds; and a small cash balance. The executors were immediately assailed with numerous claims and litigation; they had on the one hand the task of building up the estate and on the other that of defending it from all kinds of attacks. The real estate and mining property have been put on a remunerative basis; the street-railway system demonstrated as a paying investment; the Brown Palace Hotel litigation won and possession taken; other litigation has also been met and defeated, aggregating over $22,000,000, or approximately three times the value of the estate. In January, 1910, the Myron Stratton Home was incorporated. The Broadmoor property of about 2700 acres was purchased and a comprehensive plan of development outlined for an irrigation and agricultural operation, including a model village that should be "a home for all ages and sexes;" the latter comprises houses for girls, boys, infants and the aged, dormitories and central dining hall for the infirm aged, schools, hospital, library, museum, assembly hall, dairies, power plant, administration buildings, etc. The bulk of the estate was to be applied to this purpose.

"With a view to exposing fraud in the exploitation of worthless mining properties and to standardize mining practice, the Cave Men's Association of New York has been incorporated," says the *Sun*. The directors are: Herbert Hall, Walter F. Pyne, Milton S. Salisbury, William C. Schmidt, Jr., and Edward A. Rugen, of New York, and Otto N. Rugen, of Brooklyn. Such an association would fill a long-felt need for laymen, could they be induced to patronize it before making their surreptitious "plunges," from which they expect ultimately to surprise their friends with mountains of wealth. A case in point is that of Augustin Max, "the blind banker of Paris," who, on Nov. 15, gave himself up to the police of that city, confessing to having spent $2,000,000 of his clients' wealth in New Caledonia mines, which he is now convinced will never pay a profit. A "mining dostor" whom the people may consult is needed, but the people do not know to whom to apply—and if they did, it is not at all certain that they would make the application. People like to make mining investments surreptitiously; we know plenty of mining engineers whose lay relatives do not consult them until it is a "coroner's job." But returning to the Cave Men's Association, investigation discloses that it is not organized along the above lines; it is, in fact, a student society at the Columbia School of Mines, a new rival for the Senior Mining Society.

Electric Power for the Copper Country

HOUGHTON CORRESPONDENCE

While the construction of power plants having for their object the sale of electrical power to mining companies has been a recent and rapid development in the iron-mining districts of the Lake Superior country, no developments along this line have occurred in the Michigan copper country, until within the last few weeks. The only possible exception to this is the compressed-air plant at the Victoria mine at the south end of the coppr range. The enormous quantity of air that is compressed in this plant has frequently raised the question as to why some of it has not been converted into electric power and transmitted to the mines further north. Perhaps one reason that this has not been done is that this amount of power is not constant throughout the year but is dependent to a large degree upon the water conditions prevailing in the Ontonagon River. There has, however, been little question as to the market for electric power in the copper country. The tendency of the developments there is to use this form of power, even to the extent of purchasing it from the only commercial electric plant in the country, situated at Houghton. In some cases, a company operating several mines in a given vicinity, has maintained a central plant for such a group.

It is interesting to note, therefore, that a company has been organized to develop water power, to convert such power into electricity, and to transmit the latter some distance into the heart of the copper district. Through the activities of Walter S. Prickett, of Sidnaw, Mich., the Sturgeon River Land & Development Co., has been organized, under Michigan laws, with a capital stock of $500,000. Joseph Morge, of New York, is president; William P. Belden, of Ishpeming, vice-president, and William M. Blain, of New York, secretary and treasurer. The New York officers are connected with the General Utilities Corporation, of New York, an organization that has devoted considerable attention to the development of water powers in various parts of the country. The engineers employed on the project to date, are Viele, Blackwell & Buck, of 49 Wall St., New York.

The Sturgeon River is fed by a large watershed and the lands embraced in the undertaking are situated in both Baraga and Houghton Counties, Mich. The principal storage dam, it is said, will be in Baraga County, at a point about three miles north of Covington, a station on the Duluth, South Shore & Atlantic Ry. This dam, according to present designs, will form a lake about six miles long and one and one-half miles wide, and will have a depth of about 22 ft., when filled. The flow line of the lake will be at an elevation of 1247 ft. while the elevation of the top of the dam will be 1250 ft. The spillway will be 300 ft. long. The power house will be about four miles from the foot of the lake, on the northwest quarter of the southeast quarter of Sec. 10, T. 48 N., R. 35 W., the elevation of this point being 247 ft. below the top of the spillway at the upper storage dam. About three miles above the power house, water from the Perch River will be brought through a pipe line to the power house, connecting with the large pipe line from the upper dam. The plans also provide for a second development on Sec. 8, T. 59 N., R. 35 W., four miles further downstream. The distance that power will have to be transmitted from the lower location to Houghton is about 40 miles.

The lands secured by Mr. Prickett include a right-of-way, 100 ft. wide, from the power house to the towns of the copper country, and constitute about 25,000 acres, so it is said. The line is planned to run north and to pass through the properties of the Globe and Copper Range mines, on its way to Houghton. It is estimated that about 20,000 hp. can be generated in these plants, and that half of this will be supplied in the initial plant. The field for such power in the copper country is a large one, as it has been said that the total power requirements of the district are about 200,000 hp. This undertaking, construction on which is soon to start, will unquestionably have far-reaching effects throughout the district, not only as it relates to the mines, but as to other industrial development.

Potash Explorations in Nevada

The results of explorations for salines in Silver Peak Marsh, Nev., recently made by the U. S. Geological Survey have just been published. Silver Peak Marsh is a salt playa or dried-up lake, about 20 miles west of Goldfield and 25 miles southwest of Tonopah. The exploration was made to ascertain whether deposits of potash salts in commercial quantities lie within easy reach of the surface. No extensive beds of such salts were discovered, although the salts in certain samples of brine contain as much as 3.80% of K_2O. Drill holes were sunk at several points in the old lake bed by means of a small, portable drilling outfit, operated by a burro, the borings being carried to a depth of about 50 feet.

Practically the entire surface of the playa, 32 square miles, is covered with salt that averages in depth about one-quarter inch. The upper muds, averaging probably 10 ft. thick, contain not less than 2% of salt. It is estimated that not less than 15 square miles of the northeastern part contain a 10-ft. saline bed, of which at least 60% is salt. Salt is being produced on a small scale by Frank Porter, of Silver Peak, who states that about 150 tons have been bagged and sold in three years.

The New Chief Geologist

In Washington, Nov. 13, the Secretary of the Interior announced the appointment of David White as chief geologist of the U. S. Geological Survey, to succeed Waldemar Lindgren, who leaves Washington to become Rogers professor of geology and head of the Geological Department of the Massachusetts Institute of Technology.

Mr. White entered the Geological Survey in 1886, slightly in advance of his graduation from Cornell University. His first appointment was as assistant paleontologist, his study of the fossil plants having been begun in the university. He served as assistant to Prof. Lester F. Ward, who, for many years, was in charge of the paleontological work of the survey and under whose direction Mr. White specialized in the study of the fossil floras of the older geologic formations. He pursued the study of these floras for many years, contributing to the history of the deposition of the coal measures in several basins and making many correlations of formations and individual coal beds.

Mr. White has also, in an honorary capacity, had charge of the Paleozoic plant collection in the National Museum, of which he is now associate curator. Familiarity with coal-bearing formations of the Eastern coalfields, gained in the study of the fossils, and technical knowledge of coal, gathered in the course of investigations of their microscopic composition, and of the problems concerning the origin of coal, led to his choice as section chief, charged with the economic work of the survey in the Eastern coal, oil and gas fields. Mr. White is a member of several scientific societies, including the National Academy of Sciences, and is president of the Paleontological Society and vice-president of the Geological Society of America.

Dr. F. L. Ransome succeeds Mr. Lindgren as chief of the section of economic geology of metalliferous deposits; Mr. Lindgren retains his position as one of the geologists of the survey and it is likely that he will, in the intervals of his new duties at the Massachusetts Institute of Technology, have even greater opportunity to continue his work on Western mining districts than was possible in his position as chief geologist. He will probably take up for the survey next summer the study of the Homestake mine, South Dakota, and has in view also some reconnaissance work in southwestern Arizona.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Is Mining Languishing?

In an editorial in the JOURNAL of Nov. 9, 1912, it is questioned, in view of the dividends paid by mining companies, whether the general mining interests are less. It seems to me that there is only one answer.

Any active mining man knows dozens of good mining men and engineers, men of experience, who have been forced into other lines of business for a livelihood. Of late years, it has been almost impossible to interest anyone in a prospect—it used to be easy, if one had something of merit. Formerly any honest, well known prospector could always get a grubstake —let him try it now—nothing doing. And there is no prospecting being done.

Stop and consider, each of you, of your own personal knowledge, how many new mines do you know, that are being developed? Ten years ago you knew dozens, now you may count them on your fingers, possibly of one hand. I doubt, very much, whether there have been lately many worthless holes in the ground being developed with the expectation of selling them; that day has gone by, it is only occasionally now that a sucker can be found, or a hole salted on one. Some one, that the buyer has confidence in, is now sent to examine.

The inauguration of the extensive sale of "wild cat" stocks at Cripple Creek, Colo., which a few years later reached its zenith in the boom days of Goldfield, Rhyolite, Bullfrog, Rawhide and all over Nevada, when several shares being sold on every rock, and piece of one, in the state, so demoralized the confidence of the general public, in mining, that it has not yet recovered. But we will probably always have the professional fake-stock seller with us, or at least until the world becomes more honest than this generation.

While there are many things that enter into the causes of less interest in mining, I believe that the conservation movement, in the establishment of so many forest reserves, and the arbitrary rulings and construction of our laws, by the Land Office, to be the principal ones. The prospector has learned from experience that it is not worth while for him to attempt to buck against the ranger, as he loses out in the long run, and he has quit.

Over at Highgrade, a new camp, in California, the ranger has made the miners pay a ground rent for erecting a cabin, and the firewood which the prospector uses while working his prospect, must be paid for. A recent ruling of the Land Office requires that, in order to made a valid location, one must not only have ore in place, but it must be pay ore, a commercial proposition, at grass roots.

How many of the dividend-paying mines, mentioned on p. 877, Nov. 9, 1912, were commercial propositions at the grass roots? We venture not 50%; we know that 25% of them were not. Then what is the inducement to prospect? Without the prospector in the hills, to discover new mines, where will the mining industry be in 10 to 15 years, when the present mines are worked out?

I, personally, know of a discovery of a 30-ft. vein of good coal, last August, within about 15 miles of the Copper River R.R., Alaska, that cannot even be located, since, owing to Pinchot's conservation press-bureau movement, all lands were withdrawn from entry. This alone, so near present transportation, would be worth millions, and would save the people of Alaska 500% on the cost of coal. Conservation has helped to drive 700,000 farmers to Canada, and is killing the mining industry, in my judgment.

G. L. SHELDON.

Ely, Nev., Nov. 15, 1912.

The Mexican Mill, Virginia City, Nev.

I note with interest the very good article of Mr. Symmes, describing the Mexican mill at Virginia City, in the JOURNAL of Oct. 12, 1912. In the synopsis at the head of the article, attention is directed to the impossibility of obtaining a clear overflow from the Dorr thickeners because of the gelatinous clay in the ore. One of the illustrations shows a Dorr thickener covered with what we in the Black Hills have always been accustomed to term "foam," but which the author explains is not foam because it contains above 40% solids.

Without being interested in quibbles over words, I will say that my experience has been that with ore containing clay or oxidized iron there is a great tendency for an accumulation on top in continuous-operating settlers of what starts out as a foam containing solids but becomes in time practically pure clay or slime, entirely dry on the surface; and the fact that this contains 40% solids does not seem to me any reason for saying that it is not foam.

In the matter of the overflow from the thickener I would infer that Mr. Symmes has the same experience we have had, and which most plants with which I am familiar have had in continuous work in cyanide solution, that is, it is necessary to hold back the foam and take an overflow from underneath it; also that it is necessary to clarify the solution before precipitating it. I know of only two out of a great number of settlers where they undertake to precipitate settled liquid without clarification, as even the minutest trace of solids accumulates in the press and so causes a poor precipitation.

While I think that a man thoroughly familiar with cyanide practice would not consider the reference in the synopsis any reflection on the thickener, the average man with but a casual acquaintance with the same might easily so interpret it.

J. V. N. DORR.

Denver, Col., Oct. 28, 1912.

The St. Helen's Mining District

I have just read H. V. Winchell's article on the Mt. St. Helen's mining district in the October *Bulletin* of the A. I. M. E., after seeing the abstract in the JOURNAL of Nov. 2, 1912. As I made a trip into this district in September for the purpose of making a preliminary examination of the property of the Mt. St. Helens Consolidated Mining Co., I should like to add a few of my observations to those of Mr. Winchell.

I found that the Sweden vein, near Spirit Lake, has been followed by a tunnel for 2300 ft., and by surface showings for 2000 ft. further. Though the main portion of the tunnel shows low-grade pyritic material, the vein appears better near the breast, disclosing two oreshoots consisting of quartz carrying copper and iron sulphides. One is 190 ft. long, averaging 2 ft. wide, carrying 4% copper, the other is 85 ft. long or possibly longer (not enough development work having been done to expose its full length), averaging 2½ ft. wide, carrying 6% to 7% copper. The breast of the tunnel is at the beginning of another shoot, and carries 4% copper across 4 ft. The copper ore is accompanied by 1 to 2 oz. of silver per ton with a few cents in gold.

These assays do not include a soft gouge streak of several inches width, carrying some secondary sulphides, but represent hard primary ore that was formed prior to the extensive regional metamorphism to which this whole country has been subjected in early Tertiary times.

A well defined plane of movement with abundant gouge follows the vein the whole distance, and though evidently postmineral, yet it is somewhat of an indication of the continuity of the original vein. The ore exposed by the tunnel lies at a depth of approximately 400 to 500 ft. below the surface, and is as good, if not better, than the ore exposed in a small tunnel on the same vein, 350 ft. directly above the aforementioned oreshoots. Fifteen hundred feet further along the strike there is exposed in a creek bottom a fine quartz outcrop of this vein several feet wide.

On the Chicago group there is exposed by a short tunnel a quartz vein fully 6 to 8 ft. wide, of similar character to the Sweden, and what is believed to be the extension has been opened up 1500 ft. further on. Work on the Washington and Lilbia claims has shown similar copper-bearing veins.

One of the pioneers of this district reports that at the head of Norway and Grizzly Creeks there are numerous outcrops of veins, which have been exposed by the removal of the heavy covering of pumice. However, this part of the district lines at an elevation of about 6000 ft., and is rather inaccessible at present.

Over on the Green River Basin, about eight miles by trail from Spirit Lake, are the Polar Star, Index and several other groups. The Polar Star shows scattered stringers and bunches of pure chalcopyrite, and does not appear favorable. The Index is a body of sulphide ore of contact metamorphic type, alongside a porphyry intrusion into the granodiorite, and a body of ore 5x80 ft. in horizontal dimensions, averaging $20 in gold, has been exposed.

The whole district has been covered by a heavy layer of pumice, probably thrown out by Mt. St. Helens, a volcanic cone, in recent times, and the underlying rocks have been exposed only in a few steep cliffs, and in some of the creek bottoms. This has been and will be a serious hindrance, in the proper exploitation of the district. I have gone into these matters in some detail for the reason that there has been conflict between the timber interests and the mining interests regarding the value of the district.

On the whole, my conclusions are that although no large deposits have yet been discovered, still the facts are that: (1) One vein, showing occasional shoots of ore, has been proved to have considerable continuity; (2) that there are a number of other veins of similar character outcropping, whose continuity might also be proved if not hidden by the thick covering of pumice; and (3) that the amount of development work done so far is extremely small, makes me feel that the wholesale condemnation of the district is altogether unwarranted.

Irrespective of the merits of the Mt. St. Helen's mining district, Mr. Winchell, in his article, makes some broad geological generalizations, which do not seem to me to be entirely safe. Lack of a gossan hat is not always an unfavorable indication. The gossan of most contact metamorphic deposits is a decidedly unimportant feature. Also in regions of recent and heavy erosion, all traces of gossan are usually removed.

Extensive softening and decay of the wall rock below the oxidized zone, adjacent to extensive and important ore deposits, may be true of certain types, but there are many exceptions. Contact metamorphic ore deposits and those bordering on that type show none of these phenomena. Instances are as follows: San Pedro copper mine, New Mexico; Adelaide copper mine, Nevada; Shasta County copper mines, California; Lost Packer mine, Idaho; and many others, too numerous to mention.

Another point which Professor Winchell brings out is the fact that the presence of tourmaline is unfavorable. Tourmaline is often the result of regional or dynamic metamorphism and is one of the common minerals in the many famous pre-Cambrian quartz-pyrite gold deposits of the world. Its presence or absence does not seem to be any criterion of value.

THAYER LINDSLEY.

New York, Nov. 4, 1912.

Settling El Tigre Slimes

Mr. Jakin's letter on p. 872 of the JOURNAL for Nov. 9, 1912, offers a good starting point for remarks on the right use of experimental results in laying out a plant; and for some other remarks which have no special relation to his letter.

To assist in calculating the volumes of the settled slimes that he mentions, I assume a specific gravity of 3 for the total solid in each case; and take for granted that there was approximately clear water above the final settled products. In his first case, it required an average of 8.8 min. to produce one inch depth of clear water in the tank, and 9.6 min. in the oil can (the ordinary 5-gallon oil can being 14 in. deep). In the second case, the times were 17 min. in the tank, and 17.1 min. in the can. The difference in times for the tank and the can, in the first case, may be easily accounted for by the uncertainty as to my assumed specific gravity of the solid

These calculations indicate that the laboratory results were reliable; but they were not used in the right way. Mr. Jakin's statement that they were not reliable, is a little surprising in view of the fact that Mr. Mishler's article of Oct. 5, 1912, lays special stress on the rate of settling, while the time naturally depends on the distance to be settled. The principle established is the rate; the factors of time and distance enter in applying the principle to the conditions and necessities of practice. Small-scale experiments are useful if planned and carried out with due regard to the conditions of the full-scale work. If good judgment is exercised in doing this, and in applying the results, the mill installations will be successful. Whatever else it may be, engineering is the application of clear thinking and sound judgment.

In connection with this subject of clear thinking, it needs to be emphasized that many comparisons that are made of machines and of processes are useless, and often positively misleading, because the experiments are not parallel: Different types of grinding machines, or of concentrating machines, are not infrequently compared on the basis of results with different ores in different mills, without regard to the preceding preparation, quantity of water or other essential conditions. Sometimes, when different types of apparatus are tested under parallel conditions, false conclusions are reached because the results are compared and analyzed by illogical methods. There has sometimes been misleading discussion as to the relative merits of reverberatory and blast furnaces for smelting, without recognizing that, *per se*, the two are not properly comparable, one being adapted to fine and the other to coarse material.

The ability to see the essential points in a problem, and to deal properly with them, comes from experience intelligently utilized. Not from experience alone, for that may justify the common remark—"I have been in the business 20 years, and I ought to know." The pity is that so many who ought to know do not know. However, the ambitious young man in any business must realize that experience is absolutely essential if he is to amount to anything. Without it no really adequate knowledge can be acquired; and only with it can there develop that sound judgment which enables one to usefully apply knowledge to specific conditions. The sooner any young man gets out of his system the notion that "a relative who is a heavy stockholder helps most," and appreciates that patient, cheerful and enthusiastic "sticking to it" is essential to results, the sooner he will become a real man and be of genuine use in the world. The difference between effective and ineffective experience is the difference between the man who stumbles along blindly and the one who goes with his eyes open, his head working intelligently and smoothly, his hands on the throttle and the lever, and his heart right. The latter type learns to think clearly, judge wisely and do well.

C. D. DEMOND.

Anaconda, Mont., Nov. 13, 1912.

The Value of Surveying

By James Higginson

Mining claims are frequently inaccurately measured at first, and in event of a proposed consolidation, it is an important point to have everything resurveyed, so that all fractions can be taken up. A good surveyor is an insurance against law-suits.

A phase in the consolidation of mining properties that is not often discussed, but which is of considerable importance, is the work of checking the surveys of the claims taken over by the consolidation, tying in all adjoining claims, patented and unpatented; and taking up all unlocated ground within, say, 600 or 700 ft. of the apexes of the veins that are to be worked. While the following remarks may apply more particularly to the development of fissure veins under United States law, they can be of fairly general application.

Reasons for Consolidation

When veins are so situated that by reason of inaccessibility and climatic conditions, it is impossible to follow them down from the surface it is necessary to work through a tunnel. If the tunnel is to be a long one, it is frequently advisable to consolidate several claims In order to finance the consolidation and drive the tunnel, outside capital is frequently enlisted and plans, maps, etc., are placed before those whom it is desired to interest.

The maps showing the claims to be consolidated are usually taken from the Surveyor General's records, or what amounts to the same thing, from the records of one of the U. S. Deputy Surveyors of the district. The claims shown consist of a backbone of patented property surrounded by a mass of locations, some of which have been surveyed and some not, the whole forming a fairly compact group. The claims that have not been surveyed always show the legal length and width and to the uninitiated look just as good as the ones that have been surveyed, and it is only in the mind of one who has been "through the mill" that the perfection of the group arouses the suspicion that things are not what they seem.

There are, of course, fractions between some of the claims, these are to be expected and are not a source of danger if they are noted and taken up without undue delay, but they must be taken up even if they do not show any mineral deposit and thus seem not at all necessary to the consolidation. The unsurveyed claims are then properly surveyed and staked. It may then be thought that safety has been attained and no one can take up any ground valuable to the company. Nine times out of 10 this is correct, but the other time the lightning strikes and the damage done is often large.

Occasionally errors are made in surveying claims for patents; these errors are usually small, and so long as a claim is worked by itself they are unimportant, but when an error is once made and the claim is patented, this error is carried along and covered up when adjoining claims are patented and its significance is finally forgotten. To a surveyor the reasons for covering up errors need no explanation; to the uninitiated it may be sufficient to say that some years ago it took from one to two years to have corrections made in patented claims, and when, in order to patent a new claim, it was necessary to show errors in prior patents, the unfortunate surveyor who attempted to make the changes drew upon himself the dislike of everyone mixed up in the case, particularly that of the owner of the new claim, because of the long delay in getting it through the Surveyor General's office.

Rectification of Patents Difficult

At one time the department held that errors in prior patents could only be changed by the prior patentee giving up his patent and patenting all over again at his own expense. Sureyors are fairly reckless, but I never knew one that made such a suggestion to a prior patentee. I do not know what the present regulations are, but it is a thankless job to make corrections, and it is not undertaken without important reasons.

It thus happens that errors creep into patented claims, and may amount at times to 40 or 50 ft. in length or direction, thus the position of the claim as shown on the maps is not the same as on the ground, and under the law the latter position governs. In this way the following conditions may arise: The consolidation maps may show a continuous length of 4500 ft., or three claims on the vein. The middle one may, by an error in surveying, be 1550 ft., instead of 1500 ft., thus covering more than the law allows. This error would only be found out by either a resurvey of the claim, or should a parallel claim adjoining on the side line be laid out, and might go undiscovered for years.

The above may seem to be an exceptional case, but it actually occurred—fortunately it was discovered by the company engineer, who promptly took the steps necessary to protect the company. If it had been discovered by an outsider, and it lay unnoticed a long time, there would have been an excellent opportunity for the discoverer to cut off $750,000 worth of development and improvements from three-quarters of the mine.

Another interesting case was that of a claim that was supposed to be 1500 ft. long, and patented for that length, but as the stakes were set 1450 ft. was all that they covered. The official maps of the district showed the claim 1500 ft. long and butting up against the claims to the north and south. A consolidation of this claim and others surrounding it was decided upon, and the new company immediately employed a surveyor to run survey lines through the whole group, take up all fractions and in all possible ways make the group as law-suit-proof as possible.

In regard to the claim under consideration it was found that the north corners were standing and there was no fraction there. The discovery had been obliterated by the mine workings, and the south corners had been destroyed to make way for mine buildings, roads, etc. From all information that could be gathered, however, there was reason to believe that the claim as it had been surveyed had been only 1450 ft. long, in which case there was a 50 ft. fraction in the middle of the company's holdings. By reason, however, of all evidence of the discovery and of the south corners being missing, it was safe enough to see that the north corners were kept in their places. When some enterprising citizens located the supposed fraction and attempted to sell it to the company, they ran into a patent for 1500 ft. of ground from the north corners which were standing, and wisely saw the uselessness of their efforts. If the surveyor had done nothing else than find and keep in repair the standing corners of this claim, he would have saved the company more than they paid him altogether.

Following the Apex

The United States mining law which gives the owner of a vein apex the right to follow it downward indefinitely may be theoretically admirable, practically it is a delusion and a snare. It is extremely rare to find an apex showing through the whole of a 1500 ft. claim. More frequently it is found that the only place on a claim where the vein shows is at the discovery point, and in a consolidation the presumption is that the vein runs from one discovery to another in a comparatively straight line. Heavy slide rock or other overburden may make it tremendously expensive to follow the apex so that the first information that the apex may be approaching a side line, through either faulting or a swing, is usually obtained from the mine workings. If this information is acted on quickly and adjoining ground immediately taken up trouble is sometimes averted, as the company has the first information on which to act and if their surveys above and below ground are detailed and accurate they can go immediately to the point in danger, while anyone else would have to do a good deal of guessing to get to the right spot. The company also has on its side the presumption that it has left no valuable ground unlocated and a certain amount of proof must be forthcoming before anyone else will go to the expense of locating and indefinitely holding adjoining claims.

Precautions for Safety

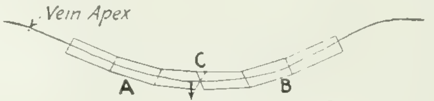
From several years experience in protecting consolidations and following their careers I think it is safe to say that the following procedure is well worth the cost. Immediately a consolidation is decided upon a competent surveyor should be employed, and by competent is meant not only that he can survey correctly, but he must have a good knowledge of mining law and also be thoroughly acquainted with Land Office rules. This surveyor should run meander lines through the group of claims tying in every corner standing.

It is not alone sufficient to tie to one corner of a claim and presume that the claim has been correctly surveyed, but every monument or bearing mark must be located; all adjoining and adjacent claims should be similarly tied in. The corners of nearby claims that have only been roughly staked by prospectors or others should have special care, as it is wonderful how these claims can swing about when their owners decide that they are not covering the ground where they will do the most good, or harm, and the only way that this change can be proved is to be able to show exactly where the original monuments were. While the surveying is going on all unlocated ground should be taken up, particularly any fractions large or small, that may exist between the claims of the group. This sounds like a lot of work; it is, and it costs a good deal of money, but any company that is so protected reduces the danger of a law suit by 90%, and all the work outlined above won't cost 10% of what a real lawsuit will.

Adjoining Claims

An interesting problem that comes up frequently in making a consolidation lawsuit-proof is the case of a prospector who has an adjoining or adjacent claim which he has staked without the aid of a surveyor, and which for various reasons may not have been included in the consolidation. These locations are almost invariably larger than the law allows, being anywhere from 1800 to 2000 ft. long and from 400 to 450 ft. wide where the legal width is 300 ft. The owner, of course, when he gets ready to survey can take up any part of this ground. As the prospector is seldom financially able to have his claim surveyed and as it is important to the company to know just what ground he intends to hold, I have usually found the following plan to work out to the best interests of both parties: First to place enough discovery stakes so that no matter what part of his 2000 by 400 ft. the prospector wants there will be no vacant ground left between his ground and that of the company, then see him and offer, if he will show what ground he wants, to survey it for him and give him a correct location certificate for record, at the same time explaining that the company wishes to patent the adjoining ground and has no desire to conflict with his rights, and that a correct survey of his ground is necessary to exclude it intelligently.

Should such an offer be refused by the prospector, the only thing for the company to do is to go ahead and start patent proceedings ignoring the owner of the claim entirely, then if he wants to hold his ground, he finds himself under the necessity, not only of having a survey made but also having to go to the expense of an adverse suit. I have known this to happen, but as a general rule just as soon as the prospectors find that the company will carry out its agreements to the letter they will accept such an offer and friendly relations will be established with adjoining owners. I have on occasion carried the agreement further and by giving him an agreement to deed the conflicting ground have patented this ground giving proper deed when receiver's receipt issued. This is often the better procedure, particularly if there is a probability of the ground becoming valuable, as when an unpatented claim is abandoned no one knows anything about it and anyone may restake it, but when a portion has been patented notice is always given through the tax sales that the portion has become delinquent, and if important it can be bought by the company.



An Unclaimed Fraction

Another interesting case in taking up ground occurs in the case of a vein of considerable continuity and with a dip of say 40° from the vertical. The apexes of these veins breaking over the ridges and down into the basins form curves, and often locations work toward one another from opposite directions, the result being as shown in the accompanying illustration. The two groups *A* and *B* come together at *C*. No part of the apex is left uncovered but there is at *C* a gradually widening wedge of the vein which belongs neither to *A* or *B*. I have seen cases where the angle at *C* was 25°.

Unowned Fractions May Prove Annoying

When deep mining is contemplated and a large capital necessary fair protection should be allowed, particularly when no one else is interfered with. In such cases it is not too much to take up 600 ft. of extra ground to cover the dip of the vein and 300 ft. of extra ground on the other side; no fractions however small should be left, they may appear useless to the company but are apt to be most annoying if they fall into other hands. It is safe to say that over 80% of the ground taken up is useless for mining purposes but under the present law it is absolutely necessary for protection.

Under present departmental rulings it is in cases impossible to find showings that will come up to the demands of the Land Office, and then the width above mentioned cannot be patented. It is a good thing to make the attempt, however, and if it fails the ground can be held by doing the annual assessment for which the ordinary mine development will count. The company has to be content with the assurance that if it can't get the ground no one else can.

With detailed and correct surface maps and all loose ground acquired not only is the danger of law suits reduced to a minimum, but the position of each and every part of the underground work can be located on surface in relation to every corner and line, and the danger of getting into foreign ground unknowingly is avoided. The management having ample warning that such a condition is likely to arise, if unable to acquire the ground can suspend work in that part of the mine until reasonable arrangements can be made to work it.

With adjoining claims in an inaccessible position and surrounded by company property, it is usually only when the company by trespass or otherwise puts itself at the mercy of an adjoining owner that it is difficult or impossible to come to a fair arrangement.

Temperature of Flames

According to a lecture delivered by J. A. Harker, at the Royal Institution, London, the accompanying table gives the temperatures obtained in various forms of commercial apparatus:

Working Temperatures	Deg. C.
Bunsen burner	1100–1350
Meker burner	1450–1500
Gasoline blast lamp	1500–1600
Large gas furnaces	1600–1800
Oxyhydrogen flame	about 2000
Oxyacetylene flame	about 2400
Thermit	about 2500
Electric arc.	about 3500
Electric arc (under pressure) . . .	about 3600
Sun	about 5500

Camp Bird, Ltd.

The directors of Camp Bird, Ltd., state that the profit for the 14 months ended June 30, 1912, were £287,326, while at that date it was estimated that the ore reserves at the Colorado property would yield a further profit of approximately £41,000. Since then more ore has been uncovered, which would apparently yield about £20,000 more profit.

There were 66,505 tons of dry ore treated, on which the extraction was 94.68%, yielding $26.15 per ton. The costs, exclusive of depreciation, were $7.81 per ton. In addition 98c. per ton was expended in 2920 ft. of development work.

As is known, Camp Bird, Ltd., owns £1,116,096 worth of shares in the Santa Gertrudis Co., Ltd. In addition it holds 574,830 shares of the total of the 3,000,000 one-dollar shares of the Imogene Basin Gold Mines Co., situated in the San Juan country, Colorado, and in the period under review has purchased shares in the Amistad y Concordia company, at a cost of £79,255. In addition, on Feb. 26, 1912, Camp Bird agreed to guarantee the interest for five years on an issue of £250,000 of 6% debenture stock of the Messina (Transvaal) Development Co., Ltd. In consideration of this guarantee Camp Bird received a commission of £2129 and an option until March 1, 1915, to subscribe for 125,000 Messina shares of five shilings each at 20s. per share.

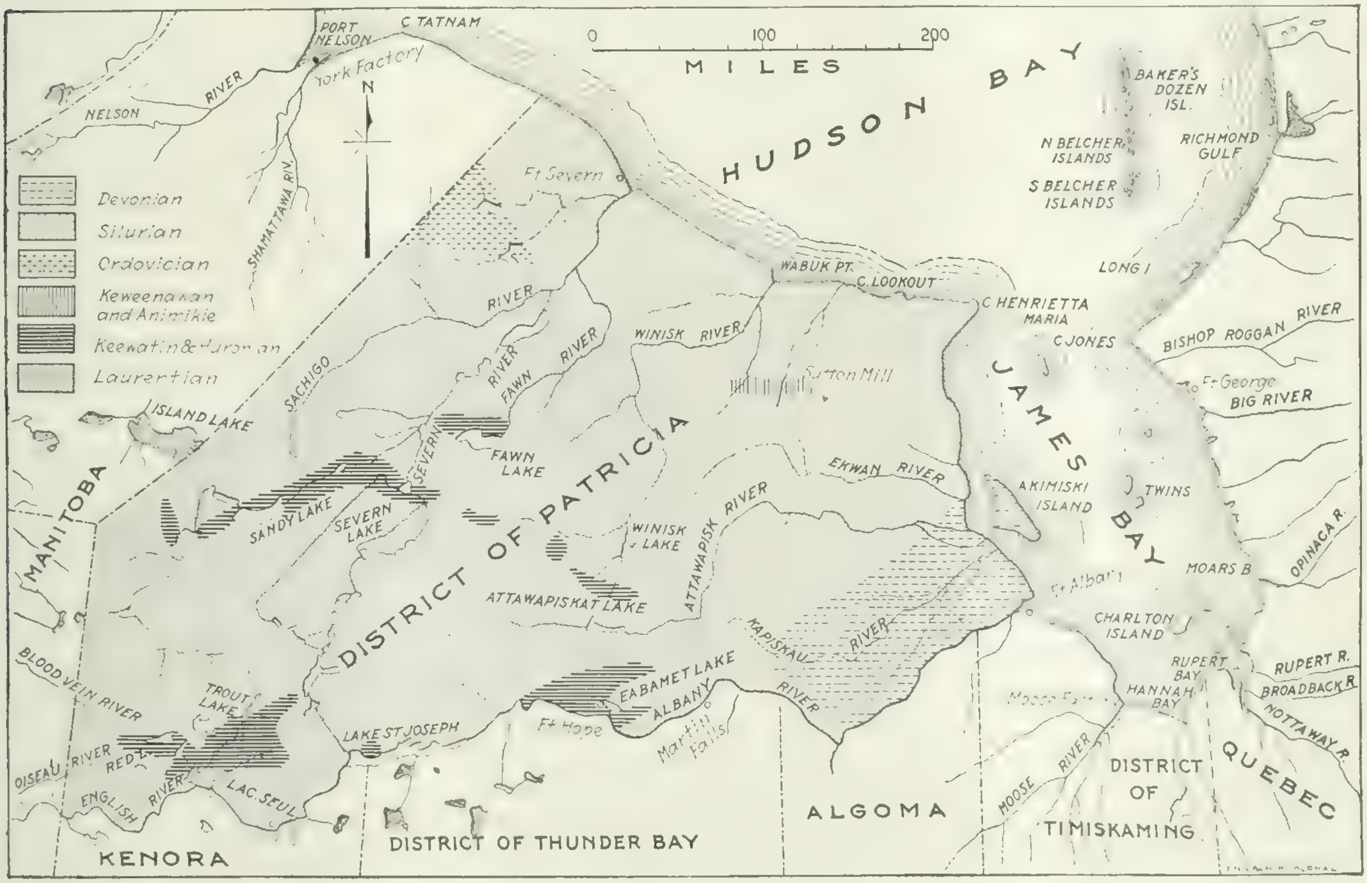
It is with regret that we note the depleted ore reserves are now beginning to affect the working of the Camp Bird mill. Up to January 9, 1912, the production was kept at about normal, the entire 40 stamps running; from Jan. 10 to Apr. 28, 30 stamps; on Apr. 29, 15 stamps, and from Apr. 30 to June 30, 20 stamps.

Patricia District, Ontario

The part of what was formerly known as the district of Keewatin, recently added to the Province of Ontario and renamed Patricia, comprises over 146,400 square miles, and adds over 56% to the area of the province. It is bounded on the west and northwest by the Province of Manitoba, on the south and southeast by the English and Albany Rivers, and on the east and north by James and Hudson Bays.

Explorations have been made in this district from time to time during the last 40 years by the Geological Survey of Canada, and much valuable information so obtained is scattered through the annual reports of the survey in a form inaccessible to the public. The data contained in these reports, together with some information obtained from other sources, has been compiled by Willet G. Miller, provincial geologist. This report embodies practically all that is known concerning the natural features of the district, and contains an introduction and summary of the contents by Doctor Miller.[1]

In elevation, the presence of numerous water courses and lakes and character of the rocks, Patricia differs but little from the older districts, and while the vegetation over a portion of the area is similar to that of the other sections of northern Ontario, there are certain differences in the more northern part. The greater part of the district is underlain by rocks of pre-Cambrian age, but along the coasts of James and Hudson Bays the rocks are of Paleozoic age. The accompanying geological sketch map, taken from the report, shows the distribution of the various series.



Sketch Map of the Patricia District, Ontario

The exploration parties which have visited it have practically confined their attention to the water courses, but so far as can be judged from what is known of the geology, the district should contain important mineral deposits. The Keewatin rocks, which are found in considerable volume, should furnish deposits of gold, iron and other ores, such as occur in rocks of this age in other parts of northern Ontario. Limestones, similar to those of the Hastings and Grenville series of southeastern Ontario, are found at Red Lake and some other places. Just south of Nibinamik Lake, on a branch of the Winisk River, a mass of hypersthene gabbro, similar to the nickel-bearing intrusive of Sudbury, occurs in a belt of Keewatin rocks.

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[1] Report of the Bureau of Mines, 1912, Vol. XXI, Part II.

Rocks comparable to the Animikie, at the head of Lake Superior, or to the Nastapoka series of the east coast of Hudson Bay, are found at Sutton Mill Lake and outcropping through the Paleozoic on the Winisk River, 26 miles from its mouth. At the former place they are intruded and overlain by diabase, giving rise to conditions similar to those prevailing in the silver area at the head of Lake Superior and at Cobalt. The Animikie formation, at Sutton Mill Lake, contains iron ore in sufficient quantity to justify the hope that deposits of economic value may occur. The Paleozoic rocks extending inland from the coast of James and Hudson Bays are similar in age to those in the Erie-Huron peninsula of southern Ontario, and may, therefore, contain petroleum, natural gas, gypsum, salt and other valuable minerals.

Water in the California Oilfields

Discussing the danger from water in the California oil fields, W. H. Storms and Paul Prutzman draw the following conclusions (*Petroleum Review,* Nov. 2, 1912): Some competent authority must be set up to determine whether a dangerous condition really exists, and whether the extent of the danger justifies the probable cost of doing away with it. The first requirement is absolutely impartial advice from a competent engineer, commission, or association. The plan must provide either for a decision as to whether such work shall or shall not be done, by an official with arbitrary powers, or it must hold out a reasonable prospect of agreement in most cases among the parties at interest. Scattered and haphazard work will be of but slight and local value. A competent and permanent engineering staff must be provided for the supervision of work undertaken by individuals.

A State officer or a commission, is advised. The duties of this office would be:

(1) To determine accurately the extent and location of danger from water, and make a comprehensive report as a basis for further work; (2) to obtain, with or without the aid of an act of the legislature, the logs of the greatest possible number of wells in all fields affected, and to publish cross-sections and other data explaining underground conditions; (3) to trace, as far as possible, the responsibility for all occurrences of water in oil wells, and to distinguish between those subject to remedy and those that are beyond correction; (4) to analyze and determine the source of all waters, and all varieties of oil; (5) to formulate and publish plans for corrective work, and to urge those plans on individuals, local water associations and county supervisors, and where these plans are adopted, to supervise the work as carried out, and direct it, as far as possible, into the most profitable channels; (6) to promote the formation of local water associations and assessment districts, and suggest such plans for these (in regard to organization) as seem most in keeping with local conditions; (7) to furnish detailed advice and instructions to individuals who wish to undertake correction work, but lack engineering skill.

Michigan Iron Ore Reserves

NEGAUNEE CORRESPONDENCE

The "Mineral Resources of Michigan" recently prepared by R. C. Allen, state geologist, contains a statement of the iron-ore reserves of the state as compared to those of Minnesota. As compiled by the State Tax Commission, the total reserves of Michigan are 196,354,883 gross tons with an assessed valuation of $93,933,629, or $0.473 per ton in the ground. The State Tax Commission of Minnesota estimates 1,347,596,291 gross tons, with an assessed valuation of $220,423,038, or $0.163 per ton. It is thus seen that Minnesota's reserves are about seven times the known reserves of Michigan, and are assessed at approximately two and one-half times the Michigan valuation.

STEEL CORPORATION RESERVES IN MICHIGAN IRON MINES.

District	Total Reserves 1911 Gross Tons	Controlled by U. S. Steel Corporation Gross Tons	Per cent.	Controlled by Independent Companies Gross Tons	Per cent
Gogebic	43,000,000	19,600,000	45.5	23,400,000	54.5
Iron River	42,122,000	1,400,000	3.3	40,722,000	96.7
Menominee (including Metropolitan, Calumet)	19,306,074	10,800,000	56	8,506,074	44.0
Marquette	77,126,651	21,616,335	28	55,510,316	72.0
Gwinn	6,746,158	266,000	3.9	6,480,158	96.1
Crystal Falls	8,054,000	625,000	7.7	7,429,000	92.3
Total	196,354,883	54,307,335	27.7	142,047,548	72.3

However, it has been confidently predicted that Michigan will be steadily mining iron ore when the Mesaba is a barren waste, the reason being that the shallow resources of the latter range are blocked out "like a bag of flour," while the more complicated Michigan districts are but partially explored.

It is interesting to note that J. R. Finlay's appraisal of Michigan mines gave the average value of developed but unmined iron ore at $0.61 per ton, while the State Tax Commission values it at $0.473 per ton.

In regard to the proportion of ore reserves, on the different Michigan ranges, owned by the U. S. Steel Corporation, the accompanying table is given by the state geologist.

These figures, of course, apply to ore which is merchantable today, and not to the immense tonnages of lower grades that will some day become available. It is seen from the table that, contrary to the general belief, the U. S. Steel Corporation controls only about one-quarter of Michigan's ore reserves.

The yearly shipments of the U. S. Steel Corporation and the independent companies are about in proportion to reserves controlled, as regards the State of Michigan.

In 1909, the United States Steel Corporation shipped 24.08% of Michigan iron ore; in 1910, 25.07%. On the other hand, in Minnesota the Steel Corporation occupies a much greater relative position, so that, in 1909, of the total tonnage shipped from the Lake Superior region as a whole (including Minnesota, Michigan and Wisconsin) the Corporation shipped 51.4%, and in 1910, 51 per cent.

Smoke Troubles at Sudbury

SUDBURY CORRESPONDENCE

The smelter fume issue, which has not heretofore been raised in the Sudbury nickel district, is now appearing and the outcome will be watched with interest. A suit has been commenced by J. F. Black, of Sudbury, against the Canadian Copper Co., asking damages for alleged injury to the plaintiff's garden and conservatory, situated in the city limits of Sudbury, about three miles east of the Copper Cliff smeltery. The damage is ostensibly due to the fumes from the roast heaps, which, at certain seasons, settle over the country for miles around the plant, causing a distinctly sulphurous atmosphere, and, it is alleged, destroying certain vegetation. Heretofore the agricultural development of the region has been slight and the company itself is the fee owner of many thousand acres near the plant, so the issue has not been raised, although the fact of the fumes has at times been self-evident to all the residents. Prior to Mr. Black's suit, Major Leckie subscribed to a public protest against the alleged fume nuisance, and other suits are, it is claimed, in preparation awaiting the outcome of the Black test suit, which only asks for damages, while others, perhaps from hostile motives, are talking of an injunction to prevent the continuation of the roasting process in the immediate vicinity of Sudbury.

Both the Canadian Copper Co. and the Mond Nickel Co. resort to heap roasting, and the result, of course, is more or less sulphur fumes, as the ore contains from 27% to 35% of sulphur.

Details of Practical Mining

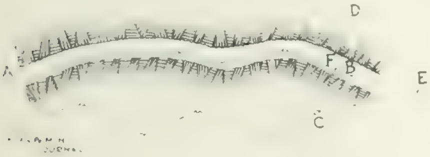
Accounts of Useful Ways of Doing Many Things in the Day's Work

Survey Method of Locating a Shaft

By H. G. Henderson*

A mine surveyor is frequently called upon to make the surveys for sinking a shaft from the surface to a particular point required below, and in some cases a certain amount of difficulty is presented in deciding the best method to pursue. This is, of course, determined to a considerable extent by the local conditions. The following, however, will be found a suitable method:

In the diagram let the point *A* represent the mouth of an adit *A* to *B*, where *B* represents the end at which point it is desired to sink the shaft from the surface. The first step in the operation is to survey the adit itself from *A* to *B*, and in this way it will be possible to gain a fairly accurate idea of the point on the surface at which the proposed shaft will have to be sunk. When this point has been thus approximately fixed, the surveyor should proceed to the spot, and around it he should place three pegs at positions such as those indicated by *C*, *D*, and *E*. It will then be necessary to take the triangle *CDE* as the starting point and survey back as illustrated by the dotted lines to the mouth of the adit, this survey being, of course, conducted on the surface. The work up to this point should then be carefully plotted in the office. The line *EB* should be produced to the point *F*, joining the points *CD* on the surface, and the distance *CF* and *FB* should then be measured by scale.



Method of Surveying for Shaft Location

It is then an easy matter to proceed to the locality and to measure off on the surface these two distances, and it is evident from the diagram that when this is done the exact spot at which the sinking must be commenced will have been accurately determined. It is only necessary to add that in certain instances it may be found that this spot falls outside the triangle owing to the fact that the first approximation as described above was not sufficiently closely determined. When this happens the line *CF* and *FB* should be measured as before, the point *B* then falling outside the triangle, but as a practical rule it will be found to be considerably safer to work on interior lines as shown.

Suspending a Diamond Drill in a Stope

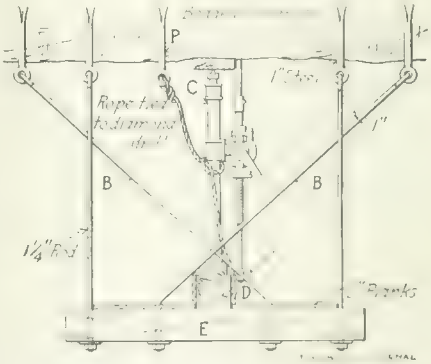
A method of hanging a diamond drill from the roof of a stope about 40-ft. high is shown in the accompanying drawing. A diamond drill was hung in this way at one of the mines of the St. Louis Smelting & Refining Co. in the southeastern Missouri lead district. A diamond-drill hole had been sunk from the surface and was being reamed out. The reamer stuck when about 10 ft. above the top of the stope. To recover the reamer it was necessary to rig up a drill and ream out the hole from below.

A light stage was put up similar to those used in the district in trimming down backs of high stopes after mining has progressed ahead and slabbing of the dolomite occurs. From this stage, which was about 34 ft. high, a hole was drilled a distance of about 18 in. so as to "bottom" in the second or third bed of dolomite above the roof. An eye-pin, split at the end and with an iron wedge fitted into the split, was put in the hole and driven in until the spreading of the split end by the wedge resulted in firmly anchoring the eye-pin in the hole. Three pieces of wood were wedged in around the pin at the collar of the hole to prevent any possibility of the eye-pin coming loose through side movement. A rope was tied in the eye of the pin and thence taken down to the top timbers of the stage so as to secure the stage to the roof. Then the other holes shown in the drawing were drilled and eye-pins put in as before, in a double row so as to fasten securely each end of the stage.

The main timbers of the stage were held by two vertical pins into which were fastened two swing bolts passing clear through the sill timbers. These were made of 1¼-in. iron. Then the side swing was taken care of by two rods *B* passing through the main timbers *E* on opposite sides of the blocking beam *D* and crossing just above it. On the beam *D* the column *C* of the diamond drill was set up and jacked tight.

The diamond drill was set up on this column directly under the hole that was to be enlarged, but before drilling began the rope from the main pin *P* was tied around the diamond drill and the column so that in case the pin came loose, the weight of the drill would be held by the pin *P*. On the sill timbers *E* a staging of 2-in. planks was laid. This was only an auxiliary stage, for the main stage from which the men worked was the top floor of the movable stage used to gain access to the roof when putting in the pin holes.

The reamer bit was recovered only an hour or so after the drill was set. As the original hole had come through into the stope, the whole problem was to rig the drill from the roof. A Western miner from another district would have hesitated before drilling the eye-pin hole from the top of a staging 40 ft. high, the legs of which were only 2x6-in. planks. Fortunately the miners in southeastern Missouri are accustomed to rigging these stagings to stand upon, while barring down or drilling holes to blast loose slabs of rock from the back of high stopes. Nevertheless the idea of hanging a diamond drill from the roof of a stope 40 ft. high is ingenious.



Diamond Drill Supported from Roof of a Stope

Simple Method of Jacketing Trommels

Often in changing the product of a revolving screen, or in reducing the amount of screen space so as to pass over more fine material, there is a delay caused by changing the screen plates or by putting on steel jacket plates.

A simple method of jacketing a portion of the screen is to wrap it with manila rope, says Benedict Shubert (*Coal Age*, Aug. 31, 1912). There is always a large amount of old manila rope lying around every mine and this can be quickly wrapped around any portion of the screens so as to close as much, or as little, of the openings as may be desirable. The rope can be wrapped quickly by fastening the rope at one point and then starting and revolving the screen slowly, allowing the rope to wrap itself around the screen cloth.

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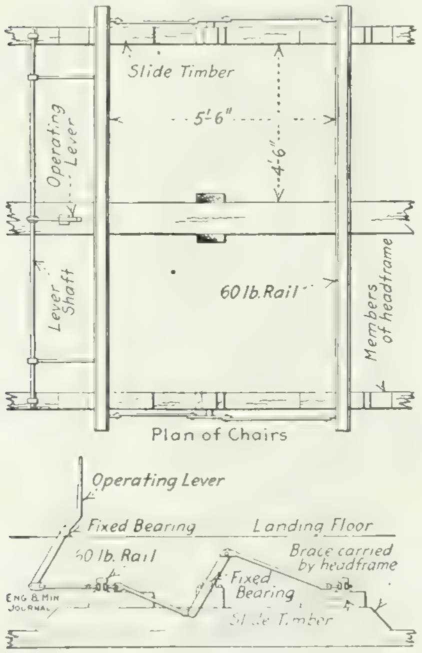
Simple Landing Chairs

In the accompanying sketch are shown the general features of the design of the landing chairs used at the shaft of the Desloge Consolidated Lead Co. in the lead district in southeastern Missouri. The chair, which is simple, is of the sliding and not of the leg type. It is made to serve both compartments of the shaft. The landing bars are 60-lb. rails placed head up. These slide upon blocks carried by the beams of the headframe. From the first beam the motion is transmitted by means of connecting rod through a double-arm lever to the landing beam on the other side of the shaft which in this way is thrown in at the same time as the other, without the necessity of a second lever shaft extending clear across the shaft at the other side from the operating lever.



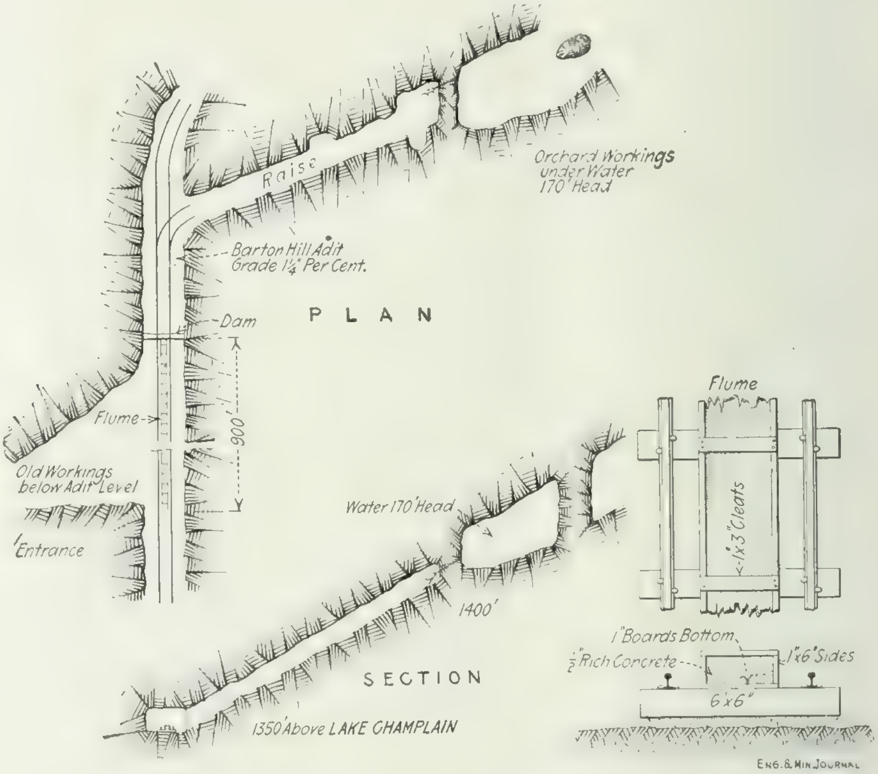
Desloge Landing Chairs

The operating lever is attached to the middle of the lever shaft so that it will be handy when landing either cage. Little handling of the two cages at the same time is ever necessary at the collar of a shaft, so there does not seem to be any special reason for not using a double chair at the surface. Of course, a double chair could not be used at intermediate shaft stations so safely, as it is often necessary to lower a cage past the one that is landed in the shaft.

Unwatering Old Workings

An adit (now 3500 ft. long), is being driven at Mineville, N. Y., into the magnetite deposits in Barton Hill. The ore left in the old workings, originally worked by inclined shafts, sunk on the outcrops near the summit of the hill, will be taken through the adit, but at present only the ore resulting from development drives is trammed and this is drawn in three-ton cars by an electric locomotive and stocked at the mill site.

To improve the ventilation and for development purposes, a raise, 140 ft., was recently driven from the main adit to unwater the old Orchard workings. When the surveyors showed the drive to be near the Orchard, the raise was widened, as shown in the accompanying drawing, and the machine was set up for the test hole. A wooden flume, 6x16 in. and 900 ft. long, lined with concrete, had been laid in the center of the tramroad on a 1¼% grade to carry the water beyond the lower old workings, which had been unwatered and were being developed below the adit level. A dam was built across the adit floor near the raise, to deliver the water into the wooden flume. The latter allowed tram cars to be run and was figured as being of sufficient cross-section to carry the entire volume of water across the lower workings, provided the test drill should stick when the drill holed. The machine was anchored to accomplish this. The flume proved to be satisfactory by carrying the full flow of water, permitting tramming, and being 75% cheaper than pipe of the necessary cross-sectional area. The 1x5-in. cleats, spaced three feet centers, strengthened the box and served as walking steps for the trammers. The bottom of the flume was covered evenly with ½ in. of tailings, and ½ in. of 1:3 concrete was troweled over this and rounded up a little higher on the sides of the flume.



Method of Unwatering Old Workings at Mineville, N. Y.

While having no bearing upon the unwatering method, it may be interesting to know that the adit at 100 ft. penetrated the old "Lovers' Hole" workings, from which 50,000 tons of beautifully crystalline magnetite, analyzing 70% iron, was mined 20 years ago.

Underground Survey Stations

The survey stations at the Baltic and Champion mines of the Lake Superior copper country are made of heavy wire nails about three inches long, which have a hole drilled in their heads just big enough to receive a match and hold it securely in an upright position. The surveyors drive these nails into the ties along the drifts, the top of the nail being flush with the top of the tie, and leave markers usually painted on the drift walls. In sighting a match is stuck in the hole and candles set one on each side of the match; no other illumination is required and a sharp, clear target is obtained. It is claimed that as instruments can be set up over the station instead of under it, much time is saved as compared with the usual type of roof station. Little trouble has been experienced due to movement of the ties.

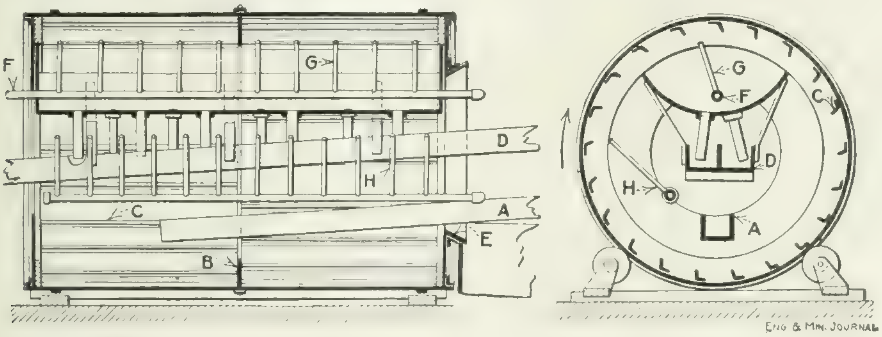
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

The Major Classifier

A classifier used at one of the mills in the Black Hills district of South Dakota operates on a principle rather different from that utilized by the majority of successful mechanical classifying devices. The machine referred to is known as the Major classifier and has been used in the Minnesota mill at Maitland, S. D., for 18 months, sufficient time to give it a thorough working test.

The classifier consists of a cylinder or drum mounted upon rollers so that it can be revolved, and having a bevel-gear arrangement for applying the power for rotation. The ends of the cylinder are partly closed, leaving openings varying in size with the requirements of the machine. The cylinder is divided in two portions by a ring, the height of which is somewhat less than the height of the end walls of the cylinder. Inside the cylinder are longitudinal ribs or blades fastened to the drum, these blades forming pockets or gutters with the cylinder shell.



Major Classifier Used at Minnesota Mill, Black Hills

The operation of the machine is as follows: The pulp is introduced into the drum, revolving at from 1½ to 2 r.p.m., by means of a launder which enters through the overflow end of the cylinder and delivers the pulp at the opposite end of the drum. The launder is shown at *A*, Fig. 1, and at *B* is shown the ring which divides the interior into two parts. The blades, shown more clearly at *C*, Fig. 2, tend to agitate the pulp, and the lighter portion is overflowed past the dividing ring into the second compartment; the coarse sand settling in the pockets of the blades is elevated as the drum revolves and discharged with the assistance of a water or solution spray into a launder conveniently placed to receive it. This launder is shown at *D*, as are also the pipe and spray connections, *F* and G, for dislodging the coarse sand elevated in the pockets.

The portion of pulp which overflows into the second compartment repeats the same process exactly, except that the material is finer, and there may be a different arrangement of the blades or ribs with the object of taking out a product finer than that extracted by the primary compartment and leaving a pure slime product to be overflowed from the machine at the rear point *E*, this wall being lower than the wall partially closing the opposite end of the machine.

As the sand and middling are carried upward by the blades in their respective compartments, they are washed by a spray *H*, after which the discharging spray washes the material off into the proper launder or tray. In order that there may be two distinct products kept separate, the discharging launder is usually divided into two parts, or made as two launders running side by side, arrangement being made to dump each class into its particular launder. These launders may be arranged to discharge in different directions if it is so desired, but it has been found better practice to have them discharge at the same end, the one opposite to that through which the pulp enters. The drawings show the arrangement and operation of the machine.

The particular advantages obtained by the use of the machine are a saving of almost the entire fall, as the machine acts as an elevator as well as a classifier, and it occupies less floor space than the usual mechanical devices used for the purpose. The power consumed is small and the machine has a large capacity. A machine six feet in diameter and 7½ ft. long, when handling 30-mesh and finer solids at a ratio of one of solids to seven or eight of liquid, has a capacity of about 150 tons of solids per 24 hours.

Three products can be obtained, a coarse sand for regrinding, a finer sand, or middling, for leaching, and a slime for agitating, or any other convenient utilization of these products. If it were considered desirable, the machine could be easily developed to deliver additional products as required. No attention is necessary, as the machine works efficiently with varying feeds up to its maximum capacity. In case of a forced stoppage of the mill, the machine does not choke up and can be easily started even if filled with pulp.

The machine installed at the Minnesota mill is 6½ ft. in diameter and eight feet long and handled over 200 tons of solids per day with ease. Its cost is low and maintenance is slight. It was designed by Edmund Major, superintendent of the Minnesota mill, and has been patented in the United States, Canada and Mexico.

Joplin Types of Bucket Elevators

Two types of bucket elevators are in general use throughout the mills of the Joplin district. These are known as the mill or "dirt," and tailing elevators. The former are built inside the mill, are of low lift, 28 to 30 ft., and are required to raise the pulp from one piece of apparatus to another through which the pulp must pass in the process of concentration, because it is the practice in the district to place all mill apparatus, excepting screens and trommels, on the floor. The tailing elevators are often built outside the mill and are sometimes 60 or 80 ft. high in order that a high dump may be built up, and at some of the mills, especially those at mines of unusually long life for that district, a dummy elevator rope driven from the first elevator is used to elevate still further the discharge from the tailing elevator. Both types of elevator are driven slowly, and in order that the wet material may discharge cleanly the mill elevators are built at a pitch of 1:6, while for tailing elevators a pitch of 1:8 or 1:9 is common.

A satisfactory construction of elevator for raising wet material has been evolved in the district, but it may be said that in general the pulleys used are too small. The smaller the pulleys the greater the difference between the strains on the two sides of the belt. In order to secure longer service, belts of more than the usual number of plies for elevator belts are used. It would seem to be preferable to use thinner belts made with fewer plies but of greater tensile strength because with thick belts crinkling of the inner face occurs on which the wear appears to concentrate. When the belts begin to wear dirt and water enter the holes, causing blistering of the belt and enlargement of the holes, especially when passing over the pulleys. Some millmen are now beginning to use woven belts of the balata and Scandinavian types.

The tailing-elevator buckets are from 16 to 24 in. wide, 18- or 20-in. buckets usually being used; the mill elevator buckets are 18 to 24 in. wide because they raise so much material for regrinding. The buckets are made locally of No. 10 or No. 12 sheet steel riveted together; No. 8 steel is sometimes used. It is the practice to rivet a center partition in buckets that are more than 18 in. wide as this partition reinforces the bucket and tends to prevent bending of the lip.

The tailing elevators are gear driven; the mill elevators are driven directly by belts. The elevator pulleys are from 18 to 36 in. diameter, the smaller sizes being more common. A belt speed of 325 to 400 ft. per min. for elevators driven by a small pulley is usual, but in the best practice the speed is 260 to 300 ft. per minute.

The elevator housings are always made with a sloping front and vertical back, so that all slippage may fall unimpeded to the boot. In order to give access to all parts of the elevators when it is necessary to make repairs, the housing is built so that there is 15 in. clearance on each side of the belt. The front of the housing at the mill floor is removable and is held in place by buttons, so also is the front section of the hood, the top of which is removable, and, as shown in the accompanying illustration, a ladder is provided at the side of the high tailing elevators. Below the floor line the front of the housing is generally made 12 to 18 in. wider than above and a ladder is put in to afford access to the boot. The clearance between the belt and the front of the housing is 12 in. At the top the housing is contracted six inches on each side.

A concrete boot is used in some mills, but it is the usual practice to use a simple box 12 in. deep. The feed box is put in front of the well and about 12 in. above the point where the buckets take the feed. The catch box at the top of the elevator is placed low so that the dump board can be put in under the overhang of the bucket and still allow two inches clearance between the lip of the bucket and the dump board. Then no matter how slowly the belt moves, the spillage at the top will run into the catch box and not fall into the housing. The top of the dump board is capped with a piece of pipe, which is quickly worn through by the tailing which then packs in the trough formed by the remnant of the pipe, making a bed of tailing to protect the edge of the dump board from wear.

The shaft of the lower pulley is carried in grooves cut in the ends of two pieces of 6x6-in. timber, which slide in guides nailed to each side of the elevator housing. These sliding timbers can be depressed to tighten the belt by levers. The levers are then held in place by pins. In some mills the double lever is used, in others the single lever, described in the JOURNAL of Jan. 21, 1911. A bolt is often used to close the forked end of these sliding timbers, so that the lower pulley will not drop out should the belt break. The housing of the elevators is generally made 10-in. wider on each side below the floor line, and the take-up device is placed below and inside the housing, so that the overhang protects it from wear from the spillage falling into the boot.

The frame of the housing of the tailing elevators and some of the larger mill elevators is made of 6x8-in. main timbers. The boxing of 1x12-in. boards is nailed to the inside of the main timbers, 2x6-in. timbers being used in the corners to make box joints. Putting the lining inside the frame prevents wear of the frame by the slippage and also prevents the main timbers from becoming waterlogged and warping out of shape upon drying when the mill is shut down. In building the smaller mill elevators, 2x6-in. planks nailed into a box corner are used as the main frame timbers for the housing. In the tailing elevators 2x6-in. diagonal braces are used to gain greater stability and often a brace is carried back to the frame of the mill building. The highest of these elevators are steadied by $\frac{3}{16}$-in. guy wires or old hoisting cables.

The bearings of the lower elevator pulley are not lubricated, as they generally turn in the water that accumulates in the boot. The upper pulleys of some of the mill elevators are equipped with large grease cups, but in others the bearings are so inaccessible that they get little lubrication. Hot boxes in the mill elevators have been known to start fires that caused loss of the entire mill.

Shafting and Belting Calculations

The accompanying charts represent a simple graphical solution of the problems which arise concerning shafting and belting. While presenting nothing new in theory, the application will be found useful, says Miles Sampson (*Power*, Oct. 8, 1912).

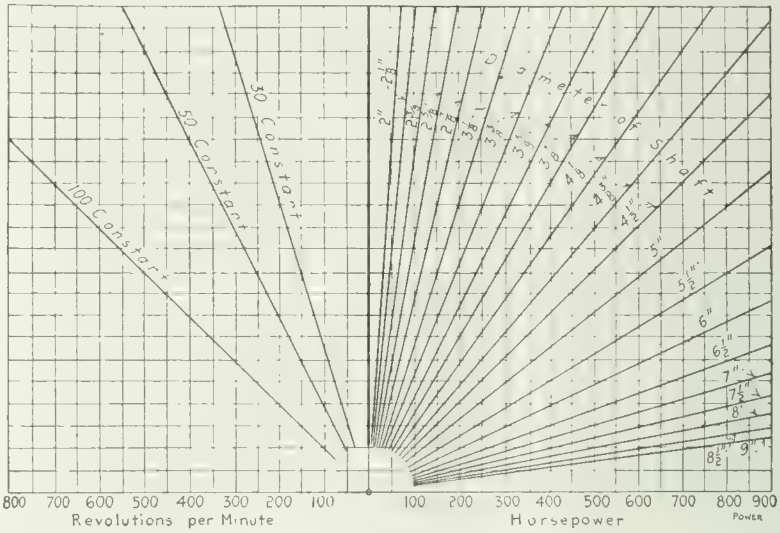


FIG. 1. CHART FOR CALCULATING SHAFTING

The chart for shafting is based upon the commonly used formula for the strength of shafting:

$$Horsepower = \frac{(diameter\ of\ shaft)^3 \times r.p.m.}{constant}$$

In explanation of the constant, it may be noted that 100 is used for head-ends of shafts receiving large amounts of power. By largely increasing the size of shaft necessary to carry a given power, it takes account of the large transverse stress due to the belt pull, and of the necessary stiffness. Any shaft carrying pulleys with belts over 6 to 8 in. wide should be figured using this constant. The constant 50 should be used to calculate countershafts driving ordinary machinery, and shafting carrying small belts. When 30 is used only the transmission of power should be expected of the shaft, no transverse stresses being considered.

The method of using the chart follows: On the scale representing the given speed follow vertically to the line denoting the proper constant, then across horizontally to the line representing the shafting size. The abscissa of this point on the horsepower scale gives the allowable load. Thus, at 300 r.p.m. a 3⅛-in. shaft carrying small belting (constant 50) would transmit 180 hp. Problems having different given conditions may be solved in a similar manner. For example—to carry 400 hp. at 400 r.p.m. a head-end shaft must be 4½ in. diameter.

The chart for belting is based upon a speed for double belts of 600 ft. per min. per horsepower per inch of width. This is conservative in the light of present practice, but represents a standard toward which belt users are tending. For wide belts it may doubtless be decreased to 500 ft. per min. with perfect safety. For single belts the 600 becomes 1200, and for triple belts, 400.

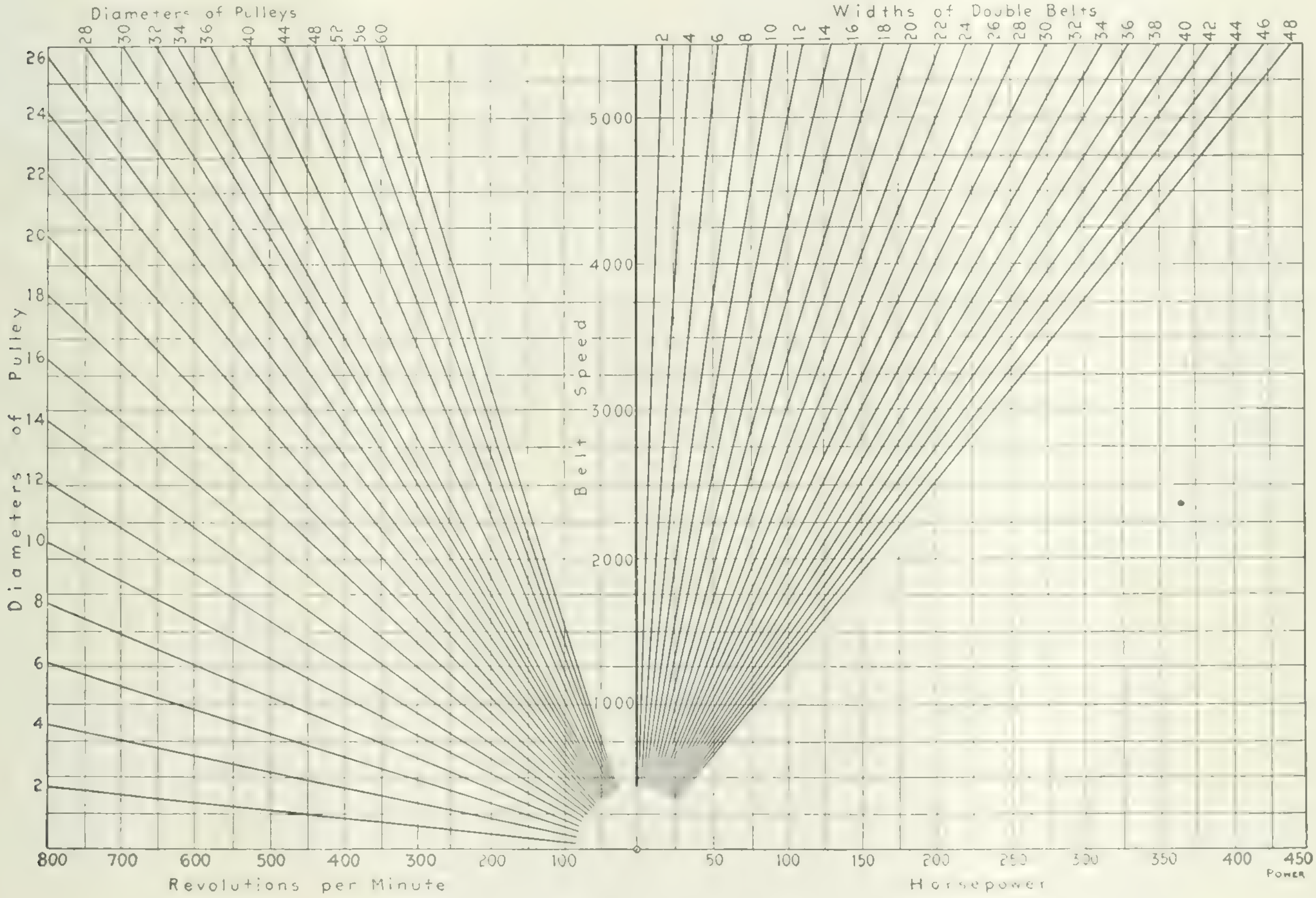


FIG. 2. CHART FOR DOUBLE BELTING

For using the chart at any number of revolutions per minute follow vertically to the line representing the pulley diameter, which gives, on the vertical scale, the belt speed in feet per minute. Follow across horizontally to the belt width and down to the required horsepower. Thus at 400 r.p.m. on a 36-in. pulley (3770 ft. per min.) a 20-in. double belt will transmit 126 hp. Similarly, if a 30-in. belt is the maximum width available for transmitting 250 hp., a belt speed of 5000 ft. per min. is necessary; this requires a 60-in. pulley running 320 revolutions per minute.

Treatment of Tin Ore in Cornwall

BY ALBERT WASSON

The treatment of ore obtained from tin mines has been developed considerably since the days when the Cornish mines provided the tin of ancient Rome, and there are some remarkable examples now to be found in Cornwall of complete installations for the concentration of the crude ore. It is the purpose of this note to describe a plant which has been installed by the Falmouth Consolidated Mines at its Carnon works near Falmouth, Cornwall, of which the chief point of interest consists of two Humboldt multiple-hearth roasting furnaces. This plant will shortly be increased by a third Humboldt roaster, in order to obtain increased capacity, together with a Humboldt rapid percussion table for the enrichment of the roasted concentration, to improve further the quality of the tin. By the introduction of the roasters only, the quality, and hence the price, of the tin has gone up to a considerable extent, and the roaster is therefore worth detailed attention.

CRUSHED BY BREAKERS AND STAMPS

In the plant under consideration, the crude ore arriving from the mine is first crushed by coarse and fine breakers to about 25mm. and further reduced to below 20-mesh in a 40-stamp battery, the weight of each stamp being 1250 lb. The pulp from the stamp goes after preliminary and suitable classification, over spitz-launders on to shaking tables, round percussion tables and round tables. The concentrates from these tables contain besides tin stone, chiefly iron pyrites, and small quantities of copper and arsenopyrite. The average percentage of metallic tin in the concentrates is 120 lb. per ton. The concentrates are further treated in the following manner: They are fed into a revolving drying trommel, the inside of which is lined with refractory stones, having the firing at the discharge end. In drying the material special attention is paid to fine and coarse concentrates being as uniformly mixed as possible. The dried material is lifted by an elevator into small storage bins placed above two mechanical rotary Humboldt roasters.

Such roasters have recently come

more and more into favor as against furnaces of older types with only one hearth, and consequently less utilization of heat and unsatisfactory roasting results. The furnace consists of a cylinder supported by cast-iron columns and inclosed by a sheet-iron mantle. The inside of the furnace is fitted with refractory lining and divided by fireproof arches into five stories. There is a cast-iron hollow shaft through the axis of the furnace, fitted in each story with rabbling and raking teeth. It is by the arrangement of the rabblers, and the way they are fixed to the shaft, that this furnace offers great advantages over other systems and the condition that the interchange of rabblers should be effected without any disturbance in working is fully accomplished by the Humboldt furnace.

The bottom of the vertical shaft is fitted with holes allowing cold air to enter, which, itself warmed in passing through, effects in this way intensive cooling of the shaft. Driving of the hollow shaft to which the rabblers are fixed, is effected by means of bevel wheel and worm gearing. In the case of several furnaces, as with the Carnon works, two or more furnaces can be connected to a worm drive and provision is made for puttng a furnace in and out of operation by means of couplings. The advantages offered by the new mechanical roasters at the Carnon works against the older types are their simple and rigid construction, minimum space, easy supervision, and low working cost, and last, but not least, to their perfectly satisfactory roasting to the desired degree.

SULPHUR IN ROAST MUST BE BELOW 2%

Since the tin concentrates, after roasting, require further treatment on shaking tables and round tables, to yield pure tin stone, it is of great importance that no crude pyrites are left in the roasted product and therefore roasting of the tin concentrates to at least 2%S is necessary to separate sufficiently the tin stone from the pyrites. In case this degree of roasting is not obtained the output in tin stone is decreased owing to the insufficiently roasted pyrite particles still containing a small quantity of tin stone which is difficult to separate and which for this reason partly goes to middlings and partly to the tailings. In the case of sufficient roasting the pyrites become easily friable and allow separation of the tin stone even if ever so finely ingrained.

The Humboldt roaster is highly adapted to obtaining the desired degree of roasting, warranting the highest output of pure tin stone after washing the roasted concentrate. The two roasters at Carnon are bringing 16 tons of pyritic tin concentrates below ½% in 24 hours; the sulphur contents of the unroasted material is about 25%, but of course not sufficient to generate the required roasting heat without any heat from outside, for which purpose each roaster is fitted with a forehearth the coal consumption of which amounts to 2% of the concentrates fed. The speed of the hollow shaft is 1¼ r.p.m. at a minimum power consumption. The roasted material leaving the furnace is perfectly free from any sintered pieces, whereby it is proved that the Humboldt furnace also in this respect gives highest satisfaction.

The roasted material, after having been moistened with water, goes to two small tube mills, where it is carefully crushed, that is, while the easily friable oxides are being finely reduced the tin stone, owing to its greater hardness, remains uncrushed, and is freed through the rubbing process, of all inclosing particles. The pulp from the small tube mills goes into a small spitzkasten whence the coarser material goes on to shaking tables and the finer on to Acme and round tables. The concentrates obtained from the shaking tables are rewashed on round buddles, and separated into pure tin stone and middlings; the latter are further reduced and definitely treated.

It is proven that since the introduction of the Humboldt roaster the quality of the concentrates produced has improved in a most striking manner, besides an increased output of tin owing to the extremely uniform and thorough roasting. The introduction of this plant, therefore, marks a distinct advance in tin production.

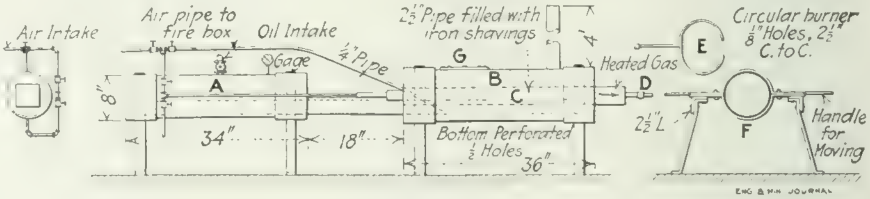
Screen Stamp Battery Feeder to Bypass Fines

At the mill of the East Rand Proprietary Mines, as reported in "Rand Metallurgical Practice," Vol. I, p. 45, a shaking-screen feeder supplies the stamp batteries. This serves to separate, by the aid of a water spray, the fine product (—9 mesh per sq.in.) from the mill ore feed before entering the mortar box. The pulp thus obtained bypasses the mortar box and joins the battery discharge.

Gripping Roll Shells on Cores

When wet crushing is practiced it is generally customary to use wooden wedges to hold roll shells tightly on the cores. The method is entirely satisfactory in such cases since the moisture keeps the wedges constantly damp and consequently tight; in dry crushing the roll shells become heated, causing wooden or iron wedges to work loose. To obviate this difficulty, the practice in the lead district of southeastern Missouri is to grip the shell on its core by means of heat. The shell, with the two conical members of the core in position, is heated. As the shell expands, the bolts of the core are tightened as much as possible, thereby drawing the conical parts into the shell. The contraction of the shell on cooling causes it to grip the core tightly.

The equipment used at the mill of the Federal Lead Co., Flat River, Mo., for heating the shells, is shown in the accompanying engraving. The apparatus consists esentially of a gasoline tank *A*, made of 8-in. pipe; a firebox *B*, made of 10-in. pipe; a gasifying compartment *C*, of 2½-in. pipe filled with iron shavings, within the pipe *B;* the circular burner *E*, made of 1-in. pipe, with ⅛-in. holes, 2½ in. apart, punched in its inner circumference. Both gasoline tank and firebox are made of wrought iron; sleeves and plugs are used to make the ends tight. Charcoal is put into the firebox through a 6x10-in. door *G*. A 4-in. pipe, about 4 ft. long, serves as a chimney. The whole apparatus is carried in a frame, which is long enough to support both pipes.



DEVICE FOR HEATING ROLL SHELLS

Gasoline is fed to the gasifying compartment with compressed air at 80 lb. pressure. A ¼-in. pipe leading from the air main serves as a blower to keep the charcoal burning in the firebox. The burner is placed around the roll shell and the gasified mixture ignited. It takes about 10 minutes to heat a shell hot enough so that it will grip the cones tightly when it is cooled. The shells give as good service as those tightened by wedges.

At the Doe Run and Leadwood mills a mixture of equal parts of coal oil and gasoline, atomized by compressed air, is fed directly to a circular burner similar to the one described above. This makes a simpler arrangement, but by the use of a gasifying tank a hotter flame is obtained and the gasoline is used more efficiently.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Lake Copper Co.

According to the annual report of the Lake Copper Co., Lake Superior Copper district, Michigan, for year ended Apr. 30, 1912, the company has expended since its organization in 1905, $1,015,040, of which $162,900 was for mine location and $852,140 for development, construction, equipment and other expenses. Up to date the total receipts amount to $1,074,503, but all of this except $64,310 came from the sale of capital stock. Accounts payable are $2330 in excess of supplies on hand, which brings the total expenditures up to $1,017,370. Copper on hand was valued at $30,380, which, added to the receipts, would make the receipts from sources other than the sale of capital stock as follows: Sale of copper, $73,486; miscellaneous, $8315; interest on bank deposits, $12,889; total, $94,690. In other words, out of receipts from the sale of stock amounting to $1,010,193 there still remains $87,513, indicating that the net expenditures to develop and equip the property to date, after crediting the earnings, amount to $759,780. The development work during the last year included 218 ft. of shaft sinking at an average cost of $129.40 per ft., and 11,538 ft. of drifting and crosscutting at $5.28 per foot.

Kerr Lake Costs

During the year ended Aug. 31, 1912, according to the annual report of the Kerr Lake Mining Co., Cobalt, Canada, 1,855,495 oz. of silver were produced, of which 1,741,804 oz. were from high-grade ore and the remainder from mill ore. The cost of production per ounce of silver was 18.3c.; of this 12.1c. was for mining, 5.55c. for shipment and treatment charges and 0.65c. for administration charges and general expenses. A deduction of $45,000 was made to cover loss on miscellaneous stock or share holdings, which is equal to approximately 2.42c. per oz. of silver produced.

The development work consisted of 4674 ft. of drifts, 609.5 ft. of raises, 197 ft. of winzes and 2252.8 ft. of crosscuts, making a total of 7733.3 linear ft. The cost of development, as represented by the figures given in the cost statement, was about $4.42 per linear ft., but judging from other items in the statement of expense, it is likely that this figure does not include a proportionate charge for such costs as hoisting, tramming, drill steel, etc., which would undoubtedly make the average cost per foot much higher.

Previous cost of production has been as follows: 14.69c. per oz. in 1911, 13.27c. in 1910 and 12.28c. in 1909. The mining and development cost in 1911 was 9.71c.; in 1910, 7.54c., and in 1909, 7.26c. per oz. A metal deduction is made by the smelters which is, in reality, a smelting charge. The deductions made in the last three years are shown in the accompanying table. This indicates an average deduction or difference of about 4.94% on the shipment assays at the mines and the smelter returns. With silver selling slightly above 60c. per oz., this would mean a charge of about three cents per ounce in deductions. The Kerr Lake costs are based upon the silver contents as indicated by shipment assays.

METAL DEDUCTIONS ON KERR LAKE SHIPMENTS

	Mine Assays	Smelter returns	Deductions
1910	3,125,400 oz	2,976,611 oz	148,789 oz
1911......	2,269,680 oz.	2,167,293 oz.	102,387 oz.
1912......	1,889,042 oz.	1,780,470 oz.	108,572 oz.
Total...	7,284,122 oz.	6,924,374 oz.	359,748 oz.

Barima Mine, British Guiana

By J. Barkley Percival*

A good illustration of the equitable operation of the new gold-mining ordinance in British Guiana is seen from information furnished by the general manager of the Barima mine. From Aug. 1, to Dec. 31, 1911, this mine crushed 5757 tons of ore at a cost of $19,418.18, or $3.37 per ton, which yielded 1161 oz. of bullion worth $20,946.26, or $3.63 per ton of ore crushed. This leaves a profit of $1,528.08 or 26c. per ton. The costs covering the period mentioned are given in the accompanying table.

COST OF ORE CRUSHED, BARIMA MINE, BRITISH GUIANA

	Mine Development Cents per ton	Ore Extraction Cents per ton	Milling Cents per ton	Total Cents per ton
Supplies	12.9	11.9	4.4	29.2
Salaries and Subsistence	7.5	5.2		12.7
Wages and Rations	52.9	56.2	5.6	114.7
Repairs and Maintenance	22.7	10.5	0.8	34.0
General Expenses...	12.3	21.9	21.4	55.6
Trucking		14.8	1.1	15.9
Trading	0.1	0.9		1.0
Power			49.2	49.2
Crusher			10.1	10.1
Machinery and Plant Stores			2.4	2.4
Bullion Costs			0.9	0.9
London Expenses...				11.5
	108.4	121.4	95.9	337.2

Under the old ordinance of 1903 a royalty of 70c. per oz. of gold produced was collected, whereas under the new ordinance an annual duty of 5% of the profit is required of all companies milling gold ores with an equipment equivalent to 10 stamps or over. Thus under the old ordinance the Barima mine would have been assessed $812.70 or 53% of the total profits, against $76.40 or 5% under the new ordinance. Operation under old conditions in this case would have brought such a small return on the capital invested that a shutdown of the mine would have followed inevitably. In milling this 5757 tons of ore 20 stamps worked 624.6 hours.

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*Paramaribo, Dutch Giana.

Granby Consolidated

The annual report of the Granby Consolidated Mining, Smelting & Power Co., British Columbia, for the year ended June 30, 1912, states that the production consisted of 13,231,121 lb. of copper, 225,305 oz. of fine silver and 33,923 oz. of gold for the year. According to the cost statement given in the report, its cost of producing copper may be figured as follows: Working expenses at mine and smeltery, freight, refining, selling and general expenses, 16.1c. per lb.; foreign ore purchased, 1.2c. per lb.; total, 17.3c.; deducting gold and silver values equal to 6.2c. per lb. of copper makes a net cost for operating of 11.1c. There was a depreciation charge of $600,562, or 4.5c. per lb. of copper, which brings the total cost of production to 15.6c. per lb. of copper produced.

During the year $48,266 was spent on new construction and equipment at the mines and smeltery; 6365 linear ft. of development and 6311 linear ft. of diamond drilling were performed. The new construction was equal to about 6.5c. per ton of ore treated at the smeltery. The entire plant was closed down for four months and six days on account of a shortage of coke. Assuming the production to be maintained at the rate for the time worked, the normal year's production should be about 1,180,000 tons of ore, including purchases of custom ore.

The total cost per ton of ore treated, including custom ore purchased and depreciation, was about $3.90 per ton. It is stated that the average mining cost, including development, was 74.4c. per ton during the last six months of operations, the average for the entire period was 77.1c. It is estimated that during the winter the expenditures for mining should average $12,000 per month, and that one diamond drill in operation should average about 1000 ft. of drilling per month.

In the smelting department a change was made in the method of handling slag; formerly the slag was hauled and dumped hot; it is now granulated, the water carrying it to the bins centrally situated, where it is dewatered and then conveyed up an incline 100 ft. above the present dump by conveyor belt and stacked. The first cost of this installation was $44,256. The regular supply of coke used at the Granby smeltery comes from Crow's Nest, the eastern coke used in time of shortage costs $10.55 per ton, at Grand Forks, B. C. About 261 lb. of coke are used per ton of ore smelted.

The ratio of foreign ore treated is approximately one to 40.5 tons of Granby ore; converter slag and matte about one to 26 tons of ore smelted, and flue dust one to 167 tons of ore treated. In the converter department during the period operated, the cost was 8.4c. per ton of ore, which would figure about 0.47c. per lb. of copper produced. This department handled 19,500 tons of 33.9% matte. The average cost of smelting was $1.256 per ton, as compared with $1.172 in 1911 and $1.187 in 1910. The cost during the last five months was reported as $1.20 per ton. The average loss of copper in slag was 4.2 lb. per ton.

Low Converting Costs

The low costs that are being obtained in the converting of low-grade matte in acid-lined converters, at Kennett, Calif., are noteworthy. At the plant of the Mammoth Copper Mining Co., the 15 or 20% copper matte is being converted at a cost of about 0.75c. per lb. of copper. In plants where a small amount of low-grade matte is thus converted the costs are often as high as 1 or 1½c. per lb. The low cost obtained at the Mammoth plant is due to the use of a very good lining material and to feeding into the converter a large amount of loose siliceous ore. Doubtless a lower cost could be obtained in converting the Mammoth low-grade matte in basic converters, if there were a sufficient quantity of such matte to make a really large-scale operation. It has been figured, however, that the saving on converting the comparatively small quantity of matte would not justify the basic-converter installation and the royalty asked. It should, of course, be borne in mind that these costs do not compare with those obtained on higher-grade matte in either basic or acid converting.

Broken Hill South Silver Mining Co.

The following data are from the report of the Broken Hill South Silver Mining Co., Broken Hill, N. S. W., for half-year ended June 30, 1912. The total number of employees engaged during the period amounted to 1391, of whom 379 were employed on the surface and 1012 underground. The daily attendance, however, averaged only 1120, or about 80.6% of the employees. Of the 379 surface men only 351, or 92.6% were in daily attendance, and of the 1012 underground men 769 men, or approximately 76%, were regularly at work. The major portion of the men employed underground were on contract and their average earnings per eight-hour shift were: Miners in development, $4.40; miners stoping, $3.70; truckers handling ore, $3.18; truckers handling mullock, $3.12 per shift.

During the period mentioned, 165,995 tons of ore were mined; of this amount 96.9% was secured by contract labor, 1.2% by wage labor, 0.1% preparatory to stoping and 1.8% from development. In trucking this ore to the shaft, 98.8% was handled by contract. These figures indicate that the average annual output per man employed underground is equal to about 332 tons. The development work consisted of 2515 linear ft. of drifting, winzes, crosscuts, etc., including 172.5 of shaft sinking, which is equal to about one foot of development work for every 66 tons of ore produced, including ore from development at the rate of 1.19 tons per linear foot performed.

A total of 48,664 cu.yd. of filling for stopes, consisting of 42,811 yd. of tailings, 1489 yd. of ashes and 4364 yd. of waste from development, were sent down for distribution in stopes. The total cost of purchase, handling on surface and conveying to depleted stopes was $1.22 per cu.yd. of filling, compared with 91c. for half-year ended Dec. 31, 1911. The cost per ton of ore for filling during the two periods was 35c. and 32c., respectively. The consumption of water amounted to 31,629,400 gal., which is equal to about 192 gal. per ton concentrated. The working costs were: Mining, $3.13 per ton; filling depleted stopes, 35c.; development, 38c.; and concentrating, 91c.; a total of $4.77 per ton. The cost per ton of concentrates was $29.72 per ton.

Cananea Consolidated

Herbert S. Kohlberg, of Pilares de Nacozari, Sonora, Mex., calls attention to certain errors in calculation present in the last paragraph of the article under the above caption, which appeared in the Journal of Oct. 26, 1912. Instead of 119 cu.ft., 140.6 cu.ft. and 281.2 cu.ft. per man-hour, respectively, for mucking and tramming, for mucking from a plat and tramming, and for loading from a chute and tramming, the figures should be 35.8, 42.2 and 84.4 cu.ft., respectively.

Iron Mining in Swanzy District, Michigan

The Swanzy district is in Marquette County, Michigan, and has been described by Doctor Leith as an isolated canoe-shaped basin of Upper Huronian rocks surrounded by granites, south of the Marquette district. The axis of the basin is northwest-southeast, with minor cross folding. The ores are in tabular deposits with gentle dip. The Cleveland-Cliffs Iron Co. controls all the mines of the district except the Stegmiller, a property owned by the Oliver Iron Mining Co. Besides this property the other principal mines are the Stephenson, Austin, Princeton No. 1 and Princeton No. 2. During a five-year period, 1906-1910, these mines shipped 1,670,263 tons of ore.

The total profits from profitable operations amounted to $1,047,803, and unprofitable mines, including developments, showed a loss of $528,496. Mr. Finlay's appraisal of the mines of the district, $2,530,000, was based on an expected tonnage of 6,746,158, or a yearly output of 456,000 tons. The average cost of producing ore in this district and delivery to Cleveland, basing the average value of the ore at 100%, was as follows: Mining, 49.4%; exploration and development, 2.2%; construction, shafts, machinery, etc., 2.5%; general expenses, including administration, 2.5%; royalties, 8%; taxes, 1.5%; rail freights, 10%; lake freights, 16.2%; a total of 92.3%, indicating an average profit of 7.7% of the average value of the ore.

Burma Mines

The 1911 annual report of the Burma Mines, Ltd., Burma, India, states that the development work consisted of 83 ft. of shaft sinking, 4.5 ft. of winzes, 1558.5 ft. of drifting, 611 ft. of crosscutting and 78 ft. of "plat culling," a total of 2335 ft. According to the figures given in the profit and loss statement, this work was performed for an average cost of about $19.75 per ft. The total tonnage extracted from the mines was 3917 tons, at a cost of about $1 for stoping. Old lead slag is being recovered from a stream below Bawdwin and treated; 6717 tons were recovered at a cost of 71c. per ton for sluicing. Recently the smeltery was moved to Nam Tu, in the vicinity of the mines. The first smelting works was brought into commission about Dec. 10, 1911; the cost of treating 1619 tons of slag and ore during the initial run was $5.73 per ton, as compared with $5.89 at the Mandalay smeltery, where 34,340 tons of ore and slag were treated.

Cyaniding at the Dome Mill

By Herbert A. Megraw

A modern mill for cyaniding gold ores in the Porcupine district, Ontario. The predominant feature is a crushing and grinding system of circulation in water, entirely separate from the treatment in cyanide solution. Weak cyanide solution is used to dissolve gold by agitation in unusually tall and narrow Pachuca tanks. Zinc-dust precipitation is practiced. The pressure filter installation is eminently satisfactory but could be improved by giving the cake a water wash. Melting and refining of precipitate are done in blast furnace and cupel.

Note—This is the second of a series of articles on American cyanide practice by Mr. Megraw. The first article appeared Nov. 2, 1912.

The property of the Dome Mines Co., Ltd., is situated about 2½ miles west of the town of South Porcupine, Ont. The property is famous as the first discovery in the district, and has been the subject of great interest and discussion among mining men. It has been developed for some time, and is now equipped with a modern mining plant, a power plant, a modern 40-stamp mill and cyanide plant, started in March of this year.

Orebody is Quartz and Schist

The ore is white quartz and schist, the quartz occurring as stringers and veins of various width running in different directions through the schist country. Within the payable zone the rock is so impregnated with gold that no attempt is made to separate it, the whole product being sent to the mill as mined. The ore is similar in character to that of the Hollinger mine, but the Dome ore is harder, though it does not reach a point where it could be called difficult to crush. In common with the ores of the camp and district in general, it has a high specific gravity, the dry slime treated in the mill having a specific gravity of about 2.8, and the resultant slime is largely granular in character. It has been determined that the pulp under treatment contains about 35% colloid slime, the rest of the product being granular and heavy.

The Dome Mill, Porcupine District, Ontario

A Modern Steel-frame Mill

The mill is a modern structure with steel frame, concrete foundations and floors, and, a feature which is often forgotten in mill construction, excellently lighted with windows and skylights, making it easy and convenient to work in any part of the mill without artificial light in the day time. In view of the prevailing gloomy weather of the district, this is a distinct advantage tending toward more and better work and has a real value in dollars and cents. The building is heated by steam, a separate boiler installed in the mill for that purpose being of sufficient size to make the building comfortable at all times.

The ore going to the mill comes from two different places, two sets of tracks entering the crusher house. The crusher house is separate from the mill and is on the ground level. The ore, entering in cars moved by a hoist with an endless wire rope, is thrown first into a No. 7½ Kennedy gyratory crusher. This crusher discharges to a grizzly with 1½-in. openings. The oversize is put through two No. 3 Kennedy gyratory crushers. All the ore, after passing through these crushers, will pass a 1½-in. ring. This is somewhat smaller than is usually necessary for feeding stamps, but in the case of the Dome ore experience has proved that if crushing is not rather fine, slab-shaped pieces of ore are likely to pass through the crushers without being sufficiently reduced. To avoid this condition, the crushers are set rather close, and the result is that the product is all of a good size to go through the feeders and into the mortars.

Ore Delivered to Mill on Belt Conveyor

The ore from the final crushers falls upon an inclined belt conveyor by means of which it is carried into the mill bins. The belt is 20 in. wide and rises at an incline of about 20½°, the belt traveling at the rate of 350 ft. per min. At the point where the conveyor enters the mill the conveyor way is closed with an iron door and a heavy iron wall is interposed between it and the mill building, only a small opening being left through which the belt passes. This arrangement is for protection against fire, the crusher house and the conveyor way not being constructed in a way to resist fire as the rest of the mill is. The halftone engraving shows the conveyor reaching from the crusher house to the mill.

The inclined conveyor delivers the ore to a second conveyor which reaches across the bins. The second conveyor is provided with a tripper so that the ore can be delivered into any desired part of the bins. This belt is also 20 in. wide.

The mill bin is of steel construction and has a flat bottom. It has a capacity of about 1500 tons of ore and is placed back of the stamps. The ore going to the bins is not weighed, but carloads are weighed at intervals and an estimation of the quantity is made. A rough sample of the coarse ore is taken, also one of the pulp issuing from the battery at the lip of the mortar, but no absolute system has been devised to record the content of the ore milled. According to the general results obtained it may be said that the ordinary milling ore averages about ½ oz. in gold.

Entire Crushing System Uses Water

From the bins the ore is fed into 40 1250-lb. stamps by means of suspended Challenge feeders. The stamps drop through 6½ in. 100 times per minute and crush through a rolled slot wire screen equal to 10 mesh. On this ore and with the screen mentioned the stamps have a capacity of 10 tons per stamp per day, but owing to the limitations of the cyanide plant the actual crushing is a little under that figure, the 40 stamps crushing generally about 380 tons per day. Water is used in crushing at the rate of about 6½:1 of ore.

Just outside the batteries are the primary amalgamating plates, one for each ten stamps, 54x144 in., in two sections, the grade being 1½ in. per ft. These plates are intended to recover coarse gold coming from the batteries, in which there is no provision for amalgamation, but due to the scouring effect of the heavy rush of coarse pulp they are of little use. One of these plates has already been experimentally discontinued and it is likely that the others will be put out of commission.

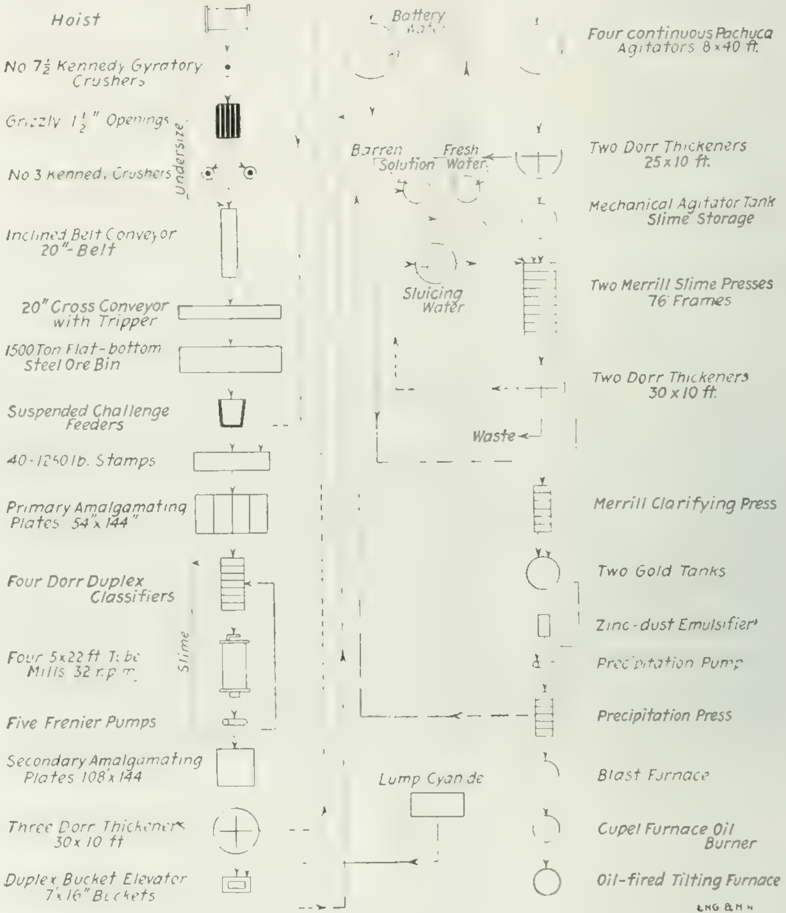
From the primary plates the pulp is passed through four Dorr duplex classifiers where the sand is taken out and sent to four Allis-Chalmers tube mills, each 5x22 ft., having spiral scoop feeders and reverse-spiral discharge, which tends to prevent pebbles issuing from the mill and also is convenient for the introduction of the regular daily addition of pebbles which can thus be fed into the discharge end of the mill without trouble. From the tube mills the pulp is returned to the Dorr classifiers by means of five Frenier pumps, each 8x54 in., the tube mills and classifiers thus being in a closed circuit. The tube mills make 32 r.p.m., which is somewhat excessive, the general speed of mills of this size being about 28 r.p.m. Due to the weight of the pulp it may be fed into the tube mills somewhat thicker than in usual practice.

From the classifier the fine pulp, or slime, goes over a second series of plates, called the secondary plates, where amalgamation takes place. These plates are 108x144 in. with a slope of ½ in. per foot. On these plates under present conditions of operation about 60 to 65% of the gold content of the ore is recovered.

The whole of this crushing and grinding operation is carried out in water, the reason being that a flow of cyanide solution is believed to be prejudicial to good work on the amalgamating plates.

Pulp Thickened Previous to Cyanidation

From the secondary plates the pulp is led to three Dorr thickeners, each 30x10 ft., where the pulp is thickened as much as possible, the usual effluent being about 1:1. From the thickeners it goes to the boot of a duplex belt-and-bucket elevator, 70 ft. between centers and carrying 7x16-in. buckets. This elevator delivers to the agitation system.


Hoist
No 7½ Kennedy Gyratory Crushers
Grizzly 1½" Openings
Undersize
No 3 Kennedy Crushers
Inclined Belt Conveyor 20"-Belt
20" Cross Conveyor with Tripper
1500 Ton Flat-bottom Steel Ore Bin
Suspended Challenge Feeders
40-1250 lb. Stamps
Primary Amalgamating Plates 54"x 144"
Four Dorr Duplex Classifiers
Slime
Four 5x22 ft Tube Mills 32 r.p.m.
Five Frenier Pumps
Secondary Amalgamating Plates 108"x 144
Three Dorr Thickeners 30x 10 ft
Duplex Bucket Elevator 7"x 16" Buckets
Battery
Barren Solution
Fresh Water
Sluicing Water
Waste
Lump Cyanide
Four continuous Pachuca Agitators 8x40 ft.
Two Dorr Thickeners 25x10 ft.
Mechanical Agitator Tank Slime Storage
Two Merrill Slime Presses 76 Frames
Two Dorr Thickeners 30x10 ft.
Merrill Clarifying Press
Two Gold Tanks
Zinc-dust Emulsifier
Precipitation Pump
Precipitation Press
Blast Furnace
Cupel Furnace Oil Burner
Oil-fired Tilting Furnace
ENG & M N JOURNAL

Flow Sheet of Dome Mill, Porcupine, Ont.

In the boot of the elevator the cyanide necessary for treatment is added, the material in lump form being suspended in the flow of pulp where it dissolves. The solution is made to a strength of one pound per ton of solution, the average consumption in total being about 0.8 lb. per ton of ore treated. The dilution ratio varies between 1:1 and 1½:1.

The classification of the pulp going to agitation is about as follows: +100 mesh, 8%; +200 mesh, 32%; —200 mesh, 60%. The fineness of grinding is controlled entirely by the comparison of cost and recovery, and the most efficient condition for both considerations has been found to be the condition above stated.

The water from the pulp is returned to the battery circuit for further use, the circulation being maintained separate. It is of course necessary to take out as much water as possible from the pulp which is to go to cyanidation treatment, in order that the consumption of cyanide shall be as low as possible.

Agitation in Pachuca Tanks of Special Design

For agitation of the pulp Pachuca tanks are used, but the design varies from the usual standard. These tanks are 8 ft. in diameter and 40 ft. deep, resembling a chimney more than a tank. This form was adopted in view of the especially heavy character of the slime to be treated, it being considered that in a wider tank there would be danger of settling of the solids. It is stated that 35 to 40 lb. of air pressure is sufficient to secure satisfactory agitation in these tall tanks. They seem a peculiar form of agitator, but if they are, as is claimed, the most satisfactory form for agitating this heavy pulp, no criticism can be made of them.

The agitation is continuous through the

Pachuca tanks, of which there are four, the last tank being arranged so that its overflow may take out a quantity equal to that which enters the tank, or may be changed so as to take out more or less, according to the desirability of increasing or reducing the amount of material in the tank. The dilution of the pulp during this treatment is from 1:1 to 1½:1 and varies somewhat in accordance with the work of the thickeners. The height of these tanks results in an advantage in that a considerable fall is secured to the filters, allowing them to be filled by gravity.

The pulp from the agitation system goes into two Dorr thickeners, each 25x10 ft., where the pulp is thickened for filtration and then into a mechanical agitator tank where the slime for filtering is stored, the slow agitation preventing the solids from settling in the tank. The overflow from these two thickeners is passed through a Merrill clarifying press and is precipitated.

Dome Mill Crusher House and Incline in Foreground

Glass bottoms are used in many of the launders at the Dome mill in order to facilitate the flow of pulp. It has been shown that with the same grade a launder having a glass bottom runs cleaner and easier and at the same time lasts longer than one without it. The glass seems to reduce friction, so that often a launder which gives trouble when made of wood or iron will flow easily and without trouble when glass bottoms are put in. A sudden drop or fall of the pulp on glass must be avoided, for in such cases the glass grinds out sooner than when iron is used. The cost is low, scrap plate glass being used, which may be bought for about seven cents per foot for pieces of various length 12 in. wide.

Merrill Pressure Filter Used

The pulp is led from the mechanical agitator to two Merrill slime presses, standard type, having 76 frames 4 inches thick. The press is filled by gravity and the slime being thick, there is no segregation and a homogeneous cake is made. Once made, the cake is washed with barren solution, an amount equal to the weight of the cake being used. During this wash there is an appreciable additional solution of gold. After the solution wash the cake is discharged, there being no actual water wash in the press, but as it requires four or five parts of water under 80 lb. pressure to discharge the slime, there results a form of washing, as most of the water is afterward recovered in the two Dorr thickeners, each 30x10 ft., through which the sluicing mixture is passed.

Only an equal amount of water is discharged with the slime, the rest being recovered from the thickeners and used again to sluice out the presses. The amount of wash water discharged is about equal to the quantity of water taken into treatment from the crushing system. The slime is discharged from the thickeners by gravity. This system is well adapted to the character of the pulp, the heavy solids having no time to settle previous to filling the press, with the result that a cake which can be thoroughly washed with solution is formed.

Zinc Dust Precipitation Used.

The Merrill system of zinc-dust precipitation is used, the zinc being added to the solution from the clarifying press which passes to the two pregnant-solution sumps, from where it is pumped into the precipitation press, which has ten 2-in. frames. The zinc is added by a spiral-screw conveyor which feeds the dust into a miniature tube mill where an emulsion of solution and zinc is formed, this emulsion going into the stream of solution entering the pump.

The amount of zinc added is approximately ⅛ lb. for every ton of solution. As there are about two tons of solution precipitated for every ton of ore treated, the consumption of zinc is about ¼ lb., or approximately two cents per ton of ore milled.

A small amount of lime is used in the treatment, the system being the formation of milk of lime by placing the dry pulverized lime in a barrel and adding a constant stream of solution, the outgoing solution, or milk of lime, entering the treatment at the desired points. About three-fourths of the total lime consumption is added to the thickeners which prepare the pulp for the agitation treatment, this being to assist settlement and aid in the production of a thick pulp; the remaining one-fourth is added to the thick pulp going to treatment. The total consumption of lime is a little under three pounds per ton of ore treated, as the ore is not extremely acid, and the lime is used more to assist settlement than for any other purpose.

A total of approximately 95% of the gold content of the ore is recovered, about 65% of which is recovered on the plates as has been mentioned, and the remaining quantity in the cyanide treatment. The percentage recovery is governed by the economic question, there being no difficulty in recovering 98 or 99% of the gold if it is desired to do so. Experience has shown that it is more advisable to stop at the point now established than to attempt to extract more of it. The costs established are proportionately less than if the higher extractions were obtained.

The power used by the company is generated in their own power house by steam, using coal as fuel, and is higher than would be the case were hydro-electric power available. It is expected that such power will be delivered at the plant within the next few months, when a corresponding reduction of cost is expected. Detailed treatment costs are not given at this time as such figures to be of any service should be representative of permanent conditions.

Precipitate Melted in Blast Furnace

The precipitate is melted in a small blast furnace with litharge, the resulting lead bullion being afterward cupelled in an appropriate test. The cost of this system of refining seems to be less than the older method of direct melting and a practically fine bullion is obtained, with the advantages which come with a product of that kind. The lead stack is easy to operate and does not entail the severe labor attendant upon pot melting, and the cupelling operation is also comparatively clean and convenient. A comparison of the cost will add the deciding factor, and I expect to give especial attention to this matter in future papers on the subject.

At the Dome mill the cupelled bullion is melted and made into bars in a small oil-fired tilting furnace. For this purpose the tilting furnace is satisfactory.

The cupel furnace is heated by means of an oil burner, but the operators consider that it is not as satisfactory as when wood fuel is used. The cupel itself is made of a mixture of ground limestone and Portland cement in the proportions of about 1 : 3, which makes a properly absorbent test. The saturated portions are melted down in the blast furnace together with scraps, sweepings, etc., in a scavenger run which is made at intervals.

Points for Discussion

The first point in the Dome mill which is open to criticism of any kind is the fact that no accurate weighing or sampling is done on the ore which enters the mill. Estimations are made, but these can hardly be considered an effective substitute for absolute methods and probably much more satisfaction would be obtained with accurate weighing and sampling systems such as are being installed in the newer mills. The pulp from the Dorr thickeners, going to the agitation treatment is estimated by measurement and specific gravity determinations which are taken at regular intervals and the operators believe that in this way a good estimate of the tonnage is obtained.

Pachuca tanks as here used seem to be a subject for some discussion, but personally I think there might be some more satisfactory and economical method of obtaining the same result. I am not convinced that Pachuca tanks are most efficient agitators, particularly where the time of contact is short and where great agitation is not necessary. The fall for the filters could as well be secured by using tanks of different form, even if the elevation were made equal to that now obtained.

A comparison of the design of the Hollinger and Dome mills presents a good illustration of two ways of doing the same thing. In both mills the original design contemplated the removal of coarse gold which might not be dissolved in the cyanide solutions and which, it was feared, might be discharged undissolved with the residues. At the Hollinger the attempt was made to extract this coarse gold on concentrators, while at the Dome mill the same result is sought through the medium of amalgamating plates. It is probable that neither system is necessary.

At the Hollinger mill it has been demonstrated that this coarse gold is more than likely to be retained in the tube mill as long as it is coarse, and being there scoured and subjected to attrition it is generally reduced and dissolved. The concentration system is already under suspicion of being useless and may be dispensed with. At the Dome the system of amalgamation on plates is done in water which has to be carried through the whole grinding system and this presents the serious defect of losing the dissolving effect of the solution during crushing and grinding, and particularly the highly efficient dissolving action of the tube-milling operation.

I am of the opinion that the simplification of the mill through the discarding of the plates and grinding directly in cyanide solutions would obtain a result as good or better than the one now in use and perhaps at less cost. A great advantage about the latter system is that not so much water would be necessarily taken into the circulation. None would be taken in through milling and what water is required could be taken into circulation through giving the filter cake a water wash. This would reduce the loss in dissolved gold and also the mechanical loss of cyanide, which constitutes at present about two-thirds of the total loss.

The logical addition of water to milling systems is through the filter cake where it will do the most good, and not into the agitation circuit where it merely dilutes solutions and necessitates the addition of cyanide to keep strengths up to normal.

It is still an open question whether or not economies could be introduced by using a system of partial leaching, agitating only the natural slime formed during grinding and passing the fine, granular solids to a leaching system. This question can only be solved by a series of experiments establishing the point to which grinding must be carried to liberate the maximum quantity of gold and the desirability of either leaching or agitating the fine sand, according to cost.

The filtration system at the Dome mill, using the Merrill pressure filter, is the best I have seen in Canada. The character of the pulp makes the machine especially applicable to handling it, and filtration is performed at a minimum expense and with beautiful simplicity. The pressure system ought to be installed in all mills to be built even if it does not displace vacuum plants already installed. With the change from the Dome practice of adding a water wash to the cake, it seems to me that most admirable results might be obtained.

At the Dome mill the metallurgical difficulties are negligible. The problems are all mechanical, due to the handling of the heavy pulp and the devising of a system of manipulation which will give the highest economy.

Hardenberg Mine, California

San Francisco Correspondence

The reopening of the Hardenberg mine, near Jackson, Amador County, Calif., has reached a point which warrants the erection of a 20-stamp mill now in course of construction by Knight & Co., at Sutter Creek. The mine is one of numerous old producers in the Mother Lode region that have lain idle for a number of years. It is situated north of Mokelumne River, about four miles south of the Kennedy mine, which is in Amador County, and about three-quarters of a mile east of the Gwinn mine, which is in Calaveras County. The old mine was worked by inclined shaft to a depth of 900 ft., and is reported to have paid dividends on ore crushed in a 10-stamp mill, averaging about $8 per ton. The old shaft was sunk on the foot wall following the vein at a dip of about 62° east.

The new vertical shaft has three compartments and is 1078 ft. deep; it is sunk on the hanging-wall side of the vein. According to the old surveys the vein should have been encountered at a distance of 220 ft. from the new shaft. A drift at the 1070-ft. level cut the vein at a distance of 215 ft. west. Since the west drift was driven a drift has been run to the south for a distance of 100 ft., and has encountered a good vein, showing the true Mother Lode characteristics, as in the west drift. The hanging wall is in schist slate, the foot wall black slate. The ore averages by assay $5.58 per ton and is from 4½ to 7 ft. wide.

A bond was taken on the Hardenberg and adjoining claims by John Martin and H. Malloch, of San Francisco, in November, 1910. They first equipped the property with hoist, compressor and motors, making the equipment equal to the demands of a 40-stamp mill. The hoist has a double-drum carrying ⅞-in. cable and is capable of hoisting from a depth of 2000 ft. The compressor is 10x16x14, Ingersoll-Rand machine. The installation of electric power was begun in March, 1912. In starting the new shaft, hand drills were employed. Later four 2¾-in. Pacific drills were installed, and two more have since been added. Electric power is furnished by the Pacific Gas & Electric Co., generated from Mokelumne River, about 3½ miles east from the mine.

At the time of reopening the mine the old shaft was closed, making entrance to the mine through that working impossible, so that the new operators had only the surveys and early history of the mine as a guide to the proposed development. The mine is now capitalized at $300,000, and articles of incorporation were filed Sept. 25, 1912, by H. Malloch, John Martin, W. S. Coleman, L. W. Pryor, A. H. Reddington, of San Francisco. N. S. Kelsey, of Jackson, is superintendent.

Determining SO_3 in Flue Gas

By F. G. Hawley*

The ordinary methods of gas analysis for SO_3 in presence of SO_2 are based on an indirect determination, and subject to the usual errors of such methods. The method herein described depends on filtering the SO_3 out from the SO_2 and then determining it.

When analyzing smelting and roasting gases I have had occasion to make a number of determinations of small amounts of SO_3 in presence of much larger quantities of SO_2. Several of the methods usually used for this determination were tried but none proved satisfactory, so a new method was worked out which seems to be an improvement on those previously described.

Hempel's Method an Indirect One

The method first tried was that given in Hempel's "Gas Analysis," in which are the following directions:

> To determine sulphur trioxide in the presence of sulphur dioxide, the mixture of the two gases is led through a standard solution of iodine; the amount of iodine acted upon by the sulphur dioxide is determined with sodium arsenite, and after acidifying with hydrochloric acid the sulphuric acid is precipitated by barium chloride.

One disadvantage in this method which is common to all indirect methods is that an error in determining either the SO_2 or the total S will affect the SO_3. As the SO_3 is very small compared to the total S, the error even with careful work, may easily be greater than the total SO_3 present. An example may make this clearer: Suppose the total S is 104 mg. and the S in SO_2 is 100 mg. This gives 4 mg. of S to form SO_3. Now if the total S were reported as 106 mg. and the S in SO_2 as 98 mg. there would then be 8 mg. of S reported as SO_3, or if the errors were reversed, there would be no SO_3 found.

Also while this method estimates the total SO_3 present it does not indicate how much is present as free sulphuric acid and how much combined as sulphates; an appreciable amount of the latter is always present in furnace fume or roaster gases. A further disadvantage is that the SO_3 is surprisingly hard to absorb; unless unusual precautions are taken, some will escape.

Another indirect method which has some of the same objections as the one just given is that found in the "Technical Chemist's Handbook" by Lunge. In this method the gas is passed through a *N*/10 solution of sodium hydroxide containing some phenolphthalein indicator, until it is neutralized. This gives the total acidity. The SO_3 is determined by bubbling the gas through a *N*/10 solution of iodine. The acidity due to SO_2 is now subtracted from the total acidity, the difference giving the amount of SO_3.

CO_2 Bars Phenolphthalein as Indicator

An objection to this method is that it cannot be used on furnace gases because of the action of CO_2 on phenolphthalien. Even in roaster gases, for which it is recommended, there is likely to be some CO_2 formed by the oxidation of small amounts of organic matter usually present in ores, as well as from small amounts of carbonates which may evolve CO_2 during roasting.

Sulphates of the heavy metals are always present in the fume and will react acid to phenolphthalien and thus affect the result.

Another method tried, which determines total SO_3 but does not indicate how much is present as H_2SO_4 and how much combined as sulphates is as follows: Slowly pass the gas through a solution of $BaCl_2$ acidified with HCl, collect and weigh the $BaSO_4$ formed. When this is done in a cold solution, the $BaSO_4$ precipitated is too fine to filter satisfactorily, and it is usually not practicable to pass the gas through a hot solution at the place of sampling the gas.

Dissolved SO_2 Can be Expelled by CO_2

When the gas was passed into water, either with or without first acidifying, and the solution boiled before adding $BaCl_2$, it was found that some of the SO_2 was slowly oxidized to SO_3. This can be overcome by expelling the SO_2 from the cold liquid by bubbling CO_2 through it for about 30 min., but this makes the method tedious.

The following experiments were made to test this: Pure SO_2 was prepared and from 20 to 400 c.c. passed into 100 c.c. of distilled water contained in wide-necked bottles. When CO_2 was passed through the cold solution to expel SO_2 and the liquid then acidified, boiled, and $BaCl_2$ added, there was no trace of a precipitate formed, but when it was attempted to expel the SO_2 by boiling, either with or without first acidifying with HCl, it was found that from two to four milligrams of SO_3 were always formed.

This amount was about the same whether there was much or little SO_2 present. It was less when the liquid was heated quickly and more when heated slowly, or when the liquid had stood for some hours before heating.

The oxidation is apparently caused by atmospheric oxygen, as precautions were taken to insure the absence of all other oxidizing agents.

If the precaution is taken to expel the SO_2 by means of CO_2 before determining the SO_3, this method is accurate, although too long for ordinary work. It may be used to advantage in checking other methods.

New Method Based on Filtering Out SO_3

In working out the method now used, advantage was taken of the fact that SO_3 at ordinary temperature is a solid and not a gas. This will combine with H_2O, either liquid or vaporized, to form H_2SO_4. At the temperature at which the flue gas passes through the apparatus the SO_3 is in the form of minute particles of fume which may be readily separated from SO_2 and other gases by a properly arranged filter.

The details of the method are as follows: Place a double Munktell's filter No. 0, about 3½ in. in diameter between two 3-in. glass funnels with their large ends placed together. The rims of the funnels are held in place and the joint made air-tight by means of a strip of sheet rubber would around them. Electrician's tape might answer in place of the sheet rubber.

Before placing the funnel together a little water is run through the stem of one of the funnels so as to moisten it; after joining the funnels by means of the rubber the stem which has been moistened inside is heated in a small alcohol flame and at the same time a current of air is drawn through the funnels. The water is vaporized and part of it condenses on the filter. There should be enough to moisten the paper slightly but not enough to make it wet, as this would prevent the gas from freely passing through the filter, besides weakening the paper so that it might break.

By means of a short rubber tube connect one end of the filtering apparatus to a glass, or better, a fused-silica, sampling tube. Connect the other end to an aspirator capable of measuring the amount of gas taken. Draw four to 10 liters of the gas through the filter at the rate of about one liter per minute.

When the required amount has passed disconnect the sampling tube and draw about one liter of air through to expel all traces of SO_2 from the filter. Remove the paper and place in a wide-mouthed glass bottle. As some sulphuric acid will usually condense on the glass and rubber, rinse the inside of the funnel and tubes into the bottle containing the filter. This is taken to the laboratory and the contents diluted to about 100 c.c., a little methyl-orange indicator added, and then titrated with $N/10$ sodium-carbonate solution until neutral. The H_2SO_4 is calculated from the amount of Na_2CO_3 used. Phenolphthalien cannot be used for an indicator as the sulphates of the heavy metals react acid to it.

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If it is desired to determine the combined SO_3 present it may be done by acidifying the solution with HCl, filtering and precipitating the total S with $BaCl_2$. After deducting the S equivalent to the H_2SO_4 from the total S, the balance is calculated to SO_3.

Proof of Correctness of Method

The method was tested as follows: H_2SO_4 was heated to boiling in a flask and the fumes, mixed with air, passed through the filter, then bubbled through water and then passed through moist glass wool. In front of the filter, the air in the funnel appeared foggy from the dense fumes of SO_3, but after passing the filter it seemed absolutely clear. No acidity could be detected in the water beyond the funnels, through which the air had bubbled, or in washings from the moist glass wool, while 12 mg. of H_2SO_4 were found on the filter and sides of the tube and first funnel.

A similar test was made on SO_3 obtained by heating potassium pyrosulphate to dull redness. No acidity could be detected in the water of the absorption apparatus beyond the filter.

A quantitative test was then made by heating small known quantities of H_2SO_4 in a hard glass tube and passing the fumes, mixed with air, through the filter and determining the acid caught by means of a standard solution Na_2CO_3.

	Grams	Grams
No 1	Took 0.064	Found 0.060
No 2	Took 0.050	Found 0.047
No 3	Took 0.034	Found 0.032

At first it was feared that the moisture of the filter paper might absorb some SO_2, thus giving high results. Tests were made by passing pure SO_2, free from SO_3, through the apparatus and it was found that if sufficient air was drawn through after the gas, all SO_2 was expelled from the filter, which would then give no trace of acidity.

During some experiments it was found while using a dry filter paper, that when considerable amounts of H_2SO_4 were caught and allowed to stand for some time, the strong acid would slowly attack the paper with mutual decomposition. When this occurred the acidity would always be too low.

In practice it is found that when using a damp filter which is put in water, soon after use, any amount of SO_3 likely to be found in flue gas would not be great enough to cause this disturbance.

After a rather thorough trial of this method I consider it satisfactory. It is simple, results are quickly obtained, and I have found them to be more uniform than those obtained by any other method.

Magnetic Dressing of Tin Ores

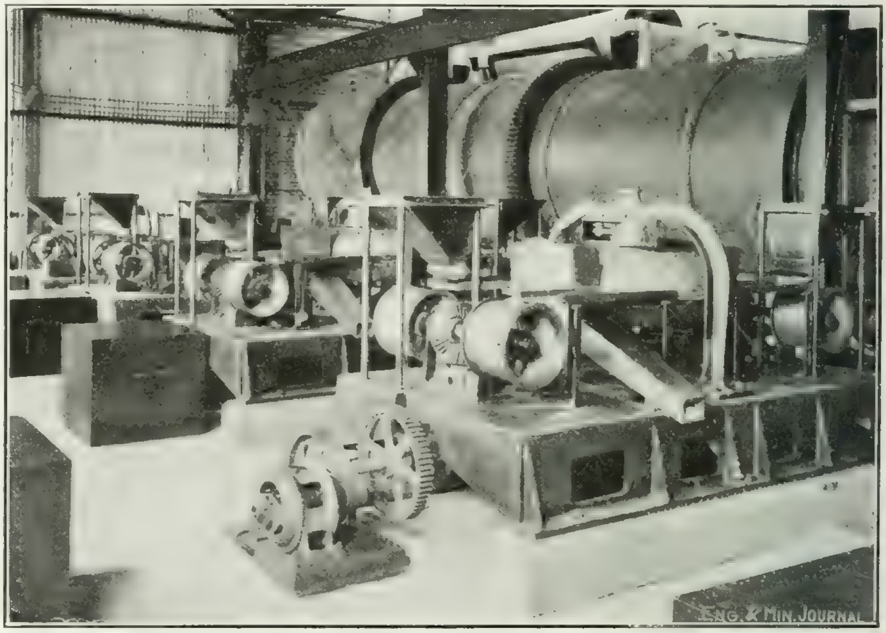
By J. B. Van Brussel*

The complex tin ores of Cornwall, England, have for many years been dressed for tin by methods which are crude, but have been tenaciously adhered to and the average Cornishman is so wedded to these primitive methods as to be fully convinced that there is nothing in the world to equal them.

The accompanying illustrations show the essentials of a mill which is a radical departure from the Cornish method of dressing Cornish tin ores. In a comparison of the two methods it may be well to state what the old method is.

In Old Method Stamps and Tables were Used

The ore, as it comes from the mine is stamped in a battery, either of the California or of the pneumatic type. The pulp from the battery is run to tables of different types, the Wilfley being largely used. The rough concentrates from these tables, which contain all of the complex minerals of the ore, tin, copper, wolfram and pyrrhotite, are known locally as "whitts." The whitts are roasted for the elimination of arsenic and sulphur, the arsenic being caught in suitable chambers. The iron on being changed into an oxide swells so that its specific gravity is lessened. In the second washing, to which the material is now subjected, the iron is washed out, the tin in the form of cassiterite not having been changed by this roasting. Any copper in the whitts has been made soluble by the roasting, and is washed out. Frequently this wash water is run over scrap iron and a portion of the copper recovered as cement copper. In the fine crushing required to liberate the various minerals, much of the tin is slimed, and good Cornish practice does not recover over 65%. The above condition of affairs has led to extensive research, the magnetic separation plant at Loughborough, England, being the result of investigations in the dressing of these ores.



Magnetic Separators at Loughborough Mill, England

New Mill Uses Rolls and Magnetic Separators

The Loughborough mill is terraced on a hillside. The crude ore, as mined, is crushed in an ordinary rock breaker which is followed by a screen. Since 15% of the ore from the rock breaker is 30-mesh material, it is removed to prevent sliming, as well as to avoid re-handling material that is fine enough. The oversize from the first screen is fed to a pair of high-speed, heavy-steel rolls, set ¼ in. apart. These rolls are 44 in. in diameter with a 6-in. face, making 200 r.p.m. and crush 10 tons per hour. Of the product of this crushing 45% will pass a 30-mesh screen. The oversize from this screening is fed to a second pair of rolls of the same description, but set close. The roll product is combined with the undersize from the screening operations and fed to a gas-fired furnace. The object of this roasting is to give a flash roast making the minerals magnetic. The cooled ore is then fed to magnetic separators or concentrators; the magnetic flux is so great that all material containing the least trace of iron is withdrawn.

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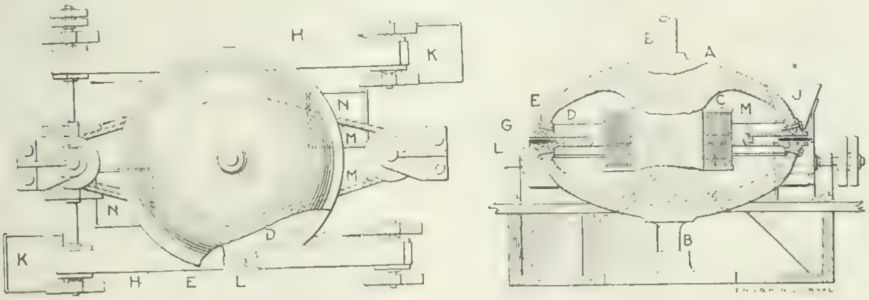
The mode of operation of the apparatus is indicated in the accompanying engraving. The double mushroom magnet *A* is mounted on a vertical spindle *B*, running in suitable bearings, and has a central core, around which is wound the exciting coil *C*. The magnetic field is used in the gap at the periphery, the upper pole-piece *G* being beveled to concentrate the field, while the lower pole-piece *L* is left flat. A channel *D* of non-magnetic material is secured by flanges to the inside of the pole-pieces, and annular brackets *E* of the same material are bolted to the outside. By means of the belts *H*, the crushed ore is conveyed between the pole-pieces; the magnetic particles are attracted and adhere to the upper pole-piece, whence they are swept off by the rope *M*, which is driven faster than the mushroom magnet. The magnetic particles fall into a receptacle *N*, while the unattracted particles are carried away by the belts and fall into the receptacles *K*.



Magnetic Separators for Treating Complex Tin Ores

Everything of value, with the exception of about half the tin which is in the form of pure cassiterite, is saved in these machines. The tailing or residue from this magnetic concentration is clean rock and cassiterite, which are fed to Cornish buddles, where the quartz is washed away. By this method of working the recoveries rise from 65% to 95 per cent.

Wolframite Removed Magnetically

Many of these ores also carry wolframite, which is the ore of the tungsten. Wolframite has practically the same specific gravity as cassiterite and in ordinary water dressing goes with it. In this magnetic concentration the wolframite is withdrawn by the magnet. This magnetic concentrate may be subsequently treated by magnetic separation, using different magnet strengths, the most weakly magnetic minerals being brought out last and the most strongly magnetic materials first. The magnetic concentrates freed from wolframite are roasted to drive off arsenic and are then smelted for an alloy of tin and copper which results in what may be properly called a virgin bronze.

All of the expense of separating the tin and copper, as well as the attendant loss of each in the separation are thus avoided. Much of the tin and copper of the world's markets is used by founders, in making alloys of these metals. It is therefore the height of folly to throw away a large proportion of the economic metals occurring in these ores to effect their separation, when they are recombined by the founder in his alloy. It has been the object of this work therefore to make large savings of the individual metals by never separating them at all and carrying the smelting out in such a way that a finished alloy acceptable to commerce is produced. It may be well to speak of the individual units of the plant in the order of their use.

Revolving Grizzlies Used

The screens, having to handle a large tonnage of heavy coarse material and yet withdraw only the portions fine enough to pass a 30-mesh screen, were designed in the shape of what may be called a ring grizzly; the component parts of the screen are made up of hard rings of V-section with point of the V outwards. A number of these rings assembled in a frame with distance pieces between, makes the screen. These screens handle a large tonnage of coarse material, removing the fines with practically no wear.

The rolls are also worthy of attention. They are of the high-speed, narrow-tread type, with heavy steel shafts running in self-oiling reversible bearings. The main feature of the rolls, however, is in their truing device. Such rolls, if not kept absolutely true, are a source of great annoyance and do poor work. At each end of the machine is a table planed true with each roll shaft. On this table is a motor-driven emery wheel which keeps the rolls ground true. The bearings are self-oiling with large oil cellars and dust covers. All of the machines are individually motor-driven; in the case of the rolls, two motors are run in opposite directions so as to avoid a crossed belt.

The outfit, grinding 10 tons per hour, consumed 60 kw. A plant, treating identically the same rock with 40 California stamps weighing 1050 lb. each, had a capacity of five tons per hour and consumed 86 kw. A comparison of the two methods of crushing is thus afforded.

The Michigan Gold Mine

Ishpeming Correspondence

The Michigan Quartz Silica Co., of Milwaukee, has finally granted a year's option on 40 acres of its holdings at the old Michigan gold mine, five miles northwest of Ishpeming, to Morgan Jopling and Morgan Wright, of Marquette. Mr. Wright will be in charge of the exploration work during the year, and has already commenced preparations.

The Michigan gold mine has produced about $18,000 in gold, most of this in 1890, when there was a lively trading in its shares. When gold was first discovered the surface showing was rich, and incidentally "high-grading" among the miners became a profitable business. A few feet below the surface the rich oreshoot gave out and the quartz vein became barren; a little deeper, smaller oreshoots were encountered, and a small mill was erected. With two shafts less than 90 ft. deep work was abandoned, due to the low grade of the ore and lack of interest.

Beside the main vein, there are several others, all in Keewatin schist; the veins strike nearly east and west. In many respects the geological features are similar to those of the Porcupine district of Ontario.

Swedish 1911 Mineral Output

The official report of the Swedish mineral output for 1911 shows the following: Iron ore, 6,153,778 metric tons; zinc ore, 51,242; silver-lead ore, 2999; iron pyrites, 30,096; manganese ore, 5377; copper ore, 1623 metric tons. Of the iron ore produced, 4,094,581 metric tons carried between 60 and 70% of Fe, and 1,270,566 tons more carried between 50 and 60% Fe.

The metal production, excluding iron, was: Copper (including production from imported ore), 3221 metric tons; zinc, 2124; lead, 1134 metric tons; silver, 1289 kg.; gold, 11 kg. Other products and byproducts of the mineral industry were: Zinc sulphide, 37,537 metric tons; feldspar, 36,235; quartz, 24,927; copper sulphate, 320; alum, 159; ferrous sulphate, 156; graphite, 65; powdered pyrolusite, 56 metric tons. All figures are arranged in order of descending value.

Determination of Oxygen in Iron and Steel

The importance of oxides in determining the chemical and physical properties of iron and steel was brought out by Ledebur in 1882. His method for the determination of the combined oxygen consists in reduction at a red heat by hydrogen, but as this method does not attack the oxides of manganese, aluminum, silicon, titanium, etc., it is obvious that the method is not a satisfactory one.

At the Eighth International Congress of Applied Chemistry, William H. Walker and Walter A. Patrick described a method for determining oxygen in iron and steel by converting all the oxides into the corresponding carbides by heating in an electric furnace with an excess of carbon. The oxygen is evolved as carbon monoxide, which is then determined, the deoxidized metal being converted to carbide.

A vacuum furnace of the Arsem type, as supplied by the General Electric Co., is used, shown in Fig.1. The gun-metal chamber *A*, of the furnace of 20 capacity, rests inside the water-jacket *R*. The cover *B* is fastened to the chamber by means of 18 capscrews *D*, and the joint is made tight by a rigid lead gasket. The tube *J*, through which the air is exhausted, is soldered into the cover.

The window tube *G* is fastened to the cover by six capscrews, the joint made tight by another lead washer. The mica window *E* is placed in the top of the window tube. Current is led in by the electrodes *W*, which are brass tubes containing running water. The graphite heater *L* is fastened to the electrodes, by means of the clamps *U*. The crucible is supported by the stand as shown in the illustration, and is thus placed in the hottest part of the furnace.

Twenty to 25 grams of the sample are placed in a small graphite crucible, and four or five grams of finely powdered graphite added. The crucible is then placed in the furnace and by means of a small rotary oil pump operated in series with a Geryk pump, a vacuum of 0.01 mm. is obtained in less than 15 min. After exhausting the furnace, the cooling water is turned on and crucible and contents heated to about 500° to 600° with the pump still running.

This is done to pull away the oxygen absorbed by heater and crucible as completely as possible. As carbon does not begin to reduce these oxides below 900°, there is no danger in this heating. After 15 min. the furnace is allowed to cool, and nitrogen, which has been pumped over sulphuric acid and phosphorous pentoxide, is allowed to fill the furnace half full. This is then pumped out and the furnace again heated gently. It seems impossible to pump the absorbed oxygen completely out of the furnace, but by washing with dry nitrogen, it can be almost eliminated.

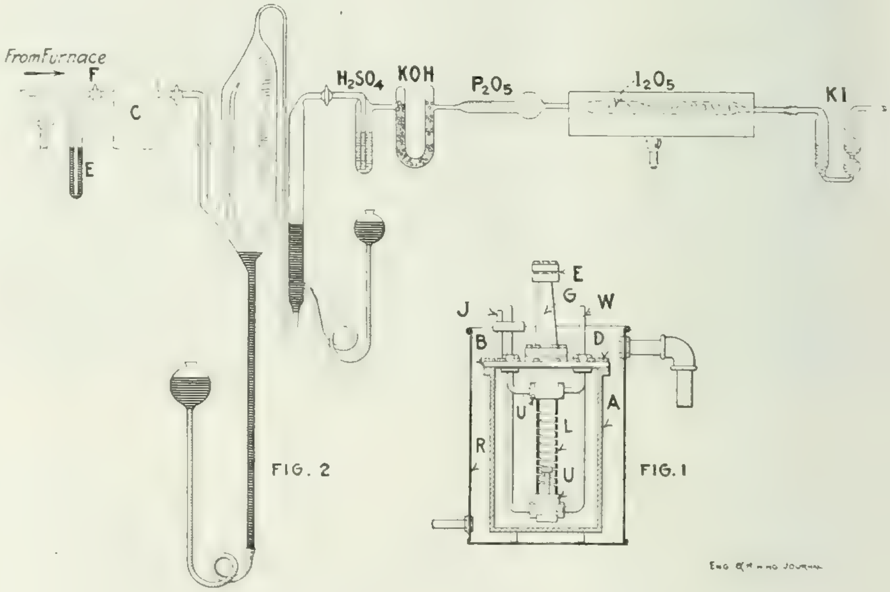
The stopcock leading to the pump is now turned off and 70 volts applied to the electrodes, which causes a current of about 200 amp. to flow through the heater. The metal melts in three or four minutes, and just as it melts violent ebullition often occurs. This is checked by opening the circuit for a few minutes, then after the metal becomes quiet, heat for 20 min. The furnace is allowed to cool thoroughly, and is then completely filled with air, or better, pure nitrogen which has been passed over sulphuric acid and phosphorus pentoxide.

ANALYSIS FOR CARBON MONOXIDE

The vessel *C*, in Fig. 2, is exhausted by means of a Toepler pump, and connections made with the furnace as shown in the diagram. The stopcock from the furnace is opened and if the gas in the furnace is under a pressure other than atmospheric, the pressure is shown by the differential gage *E*. From this the pressure inside the furnace can be calculated. Stopcock *F* is now opened and the vessel and pump filled with gas. A decrease in pressure corresponding to the volume of gas taken from the furnace, is then shown by gage *E*, and we can thus calculate the fraction of gas taken from the furnace.

The gas is then forced slowly over iodine pentoxide heated to 130° C., which oxidizes CO to CO_2 liberating an equivalent quantity of iodine. The latter is absorbed in 10% potassium-iodide solution, and subsequently titrated with $\frac{N}{10}$ sodium thiosulphate.

The accuracy of the method was tested in various ways, given at length in the original paper. It is also noted that the decomposition of iodine pentoxide is at a minimum at 130° C. while it will still oxidize CO, but at 150° C., iodine pentoxide will give up considerable amounts of iodine in a current of air or nitrogen.



Determining Oxides in Iron of Steel

Siberian Lead-Zinc Deposits

The richest deposits of zinc and lead ore in Siberia and all the Far East are found in the Oglensky mines, near the town of Vladivostock, on the course of the River Tyutyuche, 20 miles from the Gulf of St. Vladimir, with which gulf they are connected by a narrow-gage railway (*Min. Journ.*, Oct. 29, 1912). This ore contains 22.19% of lead, 18.90% of zinc, 27.49% of iron, 28.38% of sulphur, and 160 grams per ton of silver. There is a similar mine in the Soadnsky property of the Caucasus, in the Vladikavkaz district. The ore there contains 18% of zinc, 5% of lead and 110 grams of silver per ton. All the ore produced at the Olgensky mines is shipped in a crude state, by way of the Pacific Ocean, to Germany. At present the government desires to impose a high export duty on this ore, and the German company which owns the property is constructing, near the mines, reduction works, which will be the first on the Pacific. Other similar mines in this district are near a place called Stolboff, in the Gulf of Preobrazhenie, and again in the valley of the River Uan-Chan, about 14 miles from the sea, and also further north of the Gulf of St. Vladimir, near the village of Tazome.

Compressing Natural Gas

Compression is used to increase the capacity of natural-gas pipe lines; slow-speed steam engines preferable for this service. Certain natural gases give highly volatile liquid byproducts, which can be used to enrich gasolines, or sold as liquefied gases.

The original paper under this title was devoted mainly to the design of the power plants employed for expediting the delivery of natural gas from producing fields to consuming centers. The author's conclusions on this subject may be briefly summarized before referring to the occurence and character of the gas itself.

COMPRESSION USED TO INCREASE PIPE LINE CAPACITY

The average original rock pressures in the gas fields, 825 lb. per sq.in., in Pennsylvania; 450 lb., in Ohio; 326 lb., in Indiana; 1000 lb., in West Virginia; and 400 lb., in Kansas, have diminished greatly, in some cases to less than atmospheric pressure. On the other hand, consumption has increased enormously. To conduct the required output through long pipe lines of reasonable diameter, it is now customary to compress the gas near the point of production, and sometimes also at relay stations along the line. For example, a 16-in. line 100 miles long, with an initial pressure of 100 lb., and a terminal pressure of 10 lb., would carry about 12,700,000 cu.ft. per 24 hours; raising the initial pressure to 350 lb., would increase the delivery to 41,300,000 cu.ft. Exhaust pumps at the delivery ends of pipe lines have not been found satisfactory.

Gas compressors for this service are practically identical with air compressors, but are designed to operate at higher pressures, and with a medium containing more or less grit. The desirable features of such a compressor are: A long stroke and slow rotation, together involving a piston speed of not over 650 ft. per min.; conical cylinder heads; solid, one-piece, poppet valves with short lifts; removable liners in the compressing cylinders; and adequate piston strength and bearing surface. Water jackets are essential.

For motive power, the cross-compound Corliss engine, direct-connected to the compressing cylinders, is preferred, for the following reasons: (1) Reliability of operation and endurance; (2) ability to start at slow speed; (3) adaptability to the long, slow stroke found most efficient in gas compressing; (4) flexibility and high overload capacity; these are specially desirable features for this work, as the inlet and delivery gas pressures are liable to sudden and violent fluctuations; (5) cheapness compared to a gas engine of equal capacity.

The only serious competitor of the steam engine for this work is the internal-combustion engine, and this the author deprecates on account of its high speed, both while starting, and normally; its inability to handle an overload; its unreliability except under the most skillful management; and the danger introduced by having a combustion engine and an inflammable compressed gas in the same room. The larger sized slow-speed gas engines have been found liable to cracking of the cylinders, due probably to difficulty in jacket circulation, and the present tendency is toward smaller units.

GAS USUALLY USED FOR FUEL

For fuel, most of the compressing plants in the country are now using gas, in the ratio of 1 to 5% of the amount delivered. At a modern station in West Virginia, the recent test on a 31x68x60-in. Corliss engine showed a consumption of only 13.36 cu.ft. of gas per i.hp.-hour. Where the market for gas is exceptional, and the compressing plant is near an oil or a coal field, and is on a railroad, the use of these latter fuels is recommended. One ton of Pittsburgh coal, or 180 gal. of Texas petroleum, is about equivalent in heat units to 18,000 cu.ft. of natural gas. The boilers are always situated in a separate building at a distance from the compressors. The cost of erecting a steam-operated plant ranges from $30 to $90 per hp. The operating cost per hp.-hour, ranges from 3.7c. down to 0.71c. in favorable circumstances. The average cost per engine-hour varies from $1.11 to $0.45, depending on the load factor and other conditions.

Further data of this nature were supplied by H. D. Hildebrand, in the discussion following the reading of the paper. Figures are based on 10 plants; five of which were operated by steam and five by gas engines; the average rated capacity of the 10 was 4500 hp.; units of 1300 hp. were generally adopted. Half of the plants were situated on railroads and the other half in remote districts. The average initial cost, including sites and dwellings, was $56.33 per rated horsepower. The operating cost per rated horsepower-year included: Oils, grease, water, packing, etc., $0.62; labor, $1.95; repairs and upkeep, $1.33; total, $3.90, exclusive of fuel, which was gas, of which 23 cu.ft. was required per hp.-hour, costing 2½ to 10c. per cubic foot.

PROFITABLE TO PUMP FROM LOW-PRESSURE WELLS

The question is often raised as to whether it is profitable to pump gas when the intake pressure is below that of the atmosphere. This depends upon the size of the pool and the porosity of the rock; with a good-sized pool, and an open rock it is profitable to pump against even a high vacuum. In the Indiana field, some of the large compressing stations operated profitably for years with an intake pressure four or five pounds below atmosphere, while at some stations a vacuum of eight or nine pounds was not unusual. Operation under these conditions was strenuously opposed by the oil companies of the district. In the Pennsylvania and Kansas fields many pools are being pumped at rock pressures below one atmosphere.

Gas from the wells contains a quantity of vapor, oil vapor from the vicinity of an oil pool, or water vapor if from contact with salt water. Compression and cooling of the gas reduces its vapor carrying capacity, and oil or water is thereby deposited in the pipe lines. In a hilly country, these liquids are readily drained from the lines by suitable drips placed at low points, but in a flat country like Indiana the problem of keeping long pipe lines free from liquid is a serious one. During the period of greatest production in the Indiana gas fields this task was successfully accomplished by first cooling the gas from the compressors in a large cooling pond, then conducting it slowly through large pipes, in order to give it time to drop most of its moisture. This cool and partially dry gas then passed through a dehyrating system, expanding ammonia still further reduced the temperature and more liquid was thrown down.

The idea was to reduce the gas to the lowest temperature while it was under the highest pressure, and the result was a practically dry gas for transportation.

As the Indiana natural gas was about 94% marsh gas, which liquefies at 2700 lb. per sq.in. and 12 deg. F., there was no danger of liquefying the gas under the dehydrating treatment. But this practice resulted in what was probably one of the earliest experiences in recovering gasoline from natural gas. For, in 1902, at one of the Indiana stations which was compressing gas from near an oil pool, we obtained from the drips of the cooling system an average of 80 bbl. of gasoline each day. Most of the natural gas found in the large gas fields in this country contains from 83 to 99% methane, and a small per cent. of ethane; it has a specific gravity about six-tenths that of air, and a heating value of from 1100 to 1200 B.t.u.

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*Abstract of a paper in the Proc. Eng. Soc. of Western Pennsylvania, June, 1912, by E. D. Leland, superintendent of compressing stations, Philadelphia Co., Pittsburgh, Penn.

This is sometimes called a "dry gas" and is the kind we usually have in mind when discussing gas compression. But in recent years an industry has sprung up which compresses and liquefies the gases or oil vapors drawn from oil wells. These "wet gases", of greater specific gravity and higher heat values, contain large percentages of propane, butane, and other hydro-carbon vapors which, when under pressures of from 600 lb. down, liquefy at ordinary temperatures. This briefly is the work of the so called natural-gas-gasoline industry, and the failure to recognize the difference in the composition of the two types of gases has led to some unfortunate investments in gasoline-recovery plants.

CARBON MONOXIDE AND HYDROGEN LACKING IN NATURAL GAS

In the discussion following the reading of the paper, G. A. Burrell gave some interesting results of recent investigations conducted by the Bureau of Mines. Some natural gases contain methane as the only hydrocarbon, and these are distinctly "dry gases;" the same name is applied to natural gases in which methane predominates, but is accompanied by small amounts of ethane and still smaller traces of the higher paraffin hydrocarbons. The "wet gases" are those commonly found in the oil fields, and contain commercial quantities of easily liquefiable hydrocarbons. The line of distinction is not sharply drawn. In the natural gas of Pittsburgh, the hydrocarbons consist of about 84% methane and 15% ethane. Carbon dioxide is present to the extent of about 0.03% and the balance is nitrogen. The specific gravity of the gas is about 0.64 and the heating value about 1100 B.t.u. per cu.ft., at 0 deg., and 760 mm. pressure.

The other natural gases of the Appalachian region appear to be of a slightly higher heating value than the Western gases. Carbon dioxide is usually present in very small quantity. Contrary to the usual information, oxygen, carbon monoxide, hydrogen and olefine hydrocarbons have not been detected in the natural gases thus far examined.

Regarding the wet gases, we find that some of them contain enough of the higher paraffin hydrocarbons that gasoline extraction therefrom is a profitable industry. Many plants are producing three or four gallons of gasoline per 1000 cu.ft. of gas. In some cases this production is exceeded. These figures refer to the gasoline actually sold. The condensate received in the storage tank may be more than this, but so volatile are some fractions that they volatilize upon exposure to normal temperatures and pressures.

SEPARATION OF LESS VOLATILE HYDROCARBONS

Further details as to the manufacture of the new "Gasol" were given by Dr. W. O. Snelling. The process consists essentially in the preliminary condensation of "wet" gas, such as oil-well gas; the separation of gasoline from this first condensate, followed by the further separation of the lighter hydrocarbons, with the exception of methane, by a system of rectification. This consists essentially in volatilizing all of the hydrocarbons present under pressure of about 1000 lb. per sq.in., and then condensing upon heated coils certain fractions of the material thus volatilized, the condensation being selective, and based upon the difference in critical temperature of the gases present. It is a well known physical fact that for each gas there is a certain temperature above which pressure, no matter how great, will fail to reduce the material to a liquid condition. By taking a number of gases and passing them, under high pressure, past coils which are heated to a temperature higher than the critical temperature of certain of the gases present, but lower than the critical temperature of others, it becomes possible to prepare pure fractions of the hydrocarbons.

"Gasol" is a colorless and transparent liquid, which can be conveniently transported in steel bottles, and which upon release of pressure forms a pure gas of homogeneous nature and high heating power. Under pressures of more than 400 lb. per sq.in., the material is liquid at ordinary temperatures, but at any pressure less than 400 lb. it is resolved into gas. The calorific power of the gas is 2400 B.t.u. per cu.ft., and has therefore about four times the heating power of coal gas, and somewhat twice the heating power of ordinary natural gas.

International Atomic Weights, 1913

In the JOURNAL of Jan. 13, 1912, appears the table of the accepted International Atomic Weights for 1912. The 1913 report of the International Committee, F. W. Clarke, T. E. Thorpe, W. Ostwald and G. Urbain, has now appeared (*Journ. Am. Chem. Soc.*, Nov., 1912), in which it is announced that there is only one change in the table, as previously published in the JOURNAL, the inclusion of holmium (Ho), 163.5. This makes 83 recognized elements.

The Badirahuato District, Sinaloa, Mexico

By G. L. SHELDON*

The Badirahuato district is in the State of Sinaloa, Mexico. It is due north of the Culiacan district and extends eastward to the state lines of Chihuahua and Durango. The town of Badirahuato is 45 miles by wagon road from Retes, a station on the Southern Pacific of Mexico R. R., or it may be reached from Culiacan, by the old San Fernando wagon road to Las Higueras, thence by trail to Badirahuato, a total distance of about 50 miles. It may also be reached via Mocorito from Guamuchil on the Southern Pacific. The town of Badirahuato has a population of about 2000 and is situated on the river of the same name.

In the vicinity of the town there are large lava flows and no veins are known. There are placer deposits in several places in the district but the greater number of claims are for vein mines; although silver is the principal mineral, gold, copper, lead and zinc ores are found in the veins, many of which have been extensively mined in a desultory manner near the surface. The ores as a rule are heavy sulphides but in many of the veins there is sufficient free gold or easily recovered silver to permit a profitable recovery of these metals by the crude methods within the command of the native miners. No large company is operating in the district and although no one vein is systematically mined, the small shipments occasionally made from the many veins amount to a fair total. Mining on a small scale has been going on for many years so that the total value of the ore shipped to Culiacan, especially silver ore, represents no small amount of money.

HIGH GRADE ORE ALL REMOVED

In nearly every instance all except the low-grade ores have been removed from the numerous small adits and shafts that have been driven or sunk on the vein by the *gambucinos,* who seem to have developed great skill in following pay ore.

At Carrizal, a few miles northeast of Badirahuato and on the north side of Naranjos Arroyo, is a small gold-placer area, the depth to the bedrock being from 10 to 20 ft., of which a foot or two is pay gravel, and worked by the natives in a small way with fair results. Upon Guajalote Mountain, a few miles northwest of Carrizal, is the Guajalote mine worked 12 or 15 years ago by a Mr.

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*Box 135, Ely, Nev.

Dickerson. After developing a quantity of gold ore, carrying pyrite, he bought a mill, but he was killed at a dance while the mill was being brought in and the mine has since caved and is idle. To the north is the Last Chance gold and silver mine of Ysebel Serrano, and near it some locations have been made by Enos Jennings.

At Los Naranjos, a few miles above, Serrano sold the Jesus Maria prospect about four years ago to Atenacio Rocha of Copalquin, Durango. A half-mile east of the Jesus Maria, on a limestone and granite contact, a large gold vein, 40 to 50 ft. wide, was discovered last year. On the side hill and flat below this discovery, the ground was placered with good results years ago. Below, at the junction of the arroyo with that of Los Naranjos, a German took out several thousand dollars in gold a number of years ago. On the right-hand side of the creek, a mile above the Serrano house, is the Bueno Suerte prospect which contains a large vein of gold-silver-zinc ore at the granite contact.

Silver Mines at Santiago de los Caballeros

On the same arroyo, 12 miles northeast of Naranjos, is the old town of Santiago de los Caballeros, where are several old silver mines. Los Tajos, an old property, has been well developed by James Fitzgerald and J. B. Shepherd of Denver; a cyanide plant has been under contemplation for some time. The vein is a narrow one and besides its silver contents carries a little gold, some zinc and pyrite. Three miles south of Los Tajos mine is the Concepcion, worked 20 years ago by Spanish owners who ran two long adits on the vein and treated the ore on the ground. In a dispute over surveying the property, one of the owners was killed and it has since been idle. The vein can be traced for a long distance to the east in the andesite. Three miles south but higher in the mountains, Luis Fonseca has a gold prospect, also in andesite.

At Santiago, Pedro Palacio, a Spaniard, runs a good country store which is a convenient place for outfitting. Three miles west of Santiago, J. B. Shepherd developed the Mina Grande. It has a large silver-lead vein, but the value of the ore is too low to warrant operations without concentration. On the divide to the north and east of Santiago is the Puertocitos mine, which has been operated with good results.

Silver and Copper Near Alisos

Near Alisos, five miles west of Santiago, there are several silver and copper prospects on the arroyo. To the north three miles is La Plata mine, worked 10 or 15 years ago for silver, but now idle. A short distance above and across the arroyo is the Rosendeña mine owned by J. D. Murray; this was worked 20 years ago. The ore was high in silver and the gold occasionally ran as high as three or four ounces. The mine is wet and caved at present. This and the La Plata are both in the porphyry and it may be that they are working the same vein, but faulted. The Rosarita silver mine about one mile east, at Nogales, was worked 10 or 15 years ago, and more recently two Englishmen secured a lease, but after taking out some good ore they got into litigation with the owners and quit.

At Portreo de Tepaca, J. Johnson owns the Concepcion mine, formerly worked by the Spaniards. This is in limestone about 400 ft. above the granite and was developed by five adit levels. The ore contains gold and silver, but on account of the pyrite content, the owners were compelled to roast and treat the ore on the ground. From the old Trinidad mine, on the opposite side of the arroyo, a *gambucino* last year took out two *cargas* (600 lb.), which had 500 oz. of silver in it. Farther west on the same creek is the old Manta mine, with a good record for silver production. There are several other prospects in this vicinity with more or less development and from which some small shipments of good ore have been made; native silver was found in one instance.

The Crawford Silver Mine

On the Tamapa arroyo, a few miles below the town of Tamapa, is the San Roque mine, worked 12 to 20 years ago, from which much silver-lead ore was shipped to Culiacan. The mine is close to the arroyo and has been idle for some years, due to flooding. About 10 miles below on this creek Juan Crawford has a silver mine, from which he has taken much good ore from time to time during the last ten years, probably the largest production of any one mine in the district during this time. He shipped to Culiacan and has been fortunate in selling the mine twice and in receiving substantial payments down each time, but the mine has reverted to him on account of the purchasers not being able to complete payment.

Two or three miles below the town of Ocotios, on the same arroyo, near its junction with the Humaya River, is the San Jose del Oro mine, on a small hill, from the surface of which the natives have dug out numerous small pockets containing free gold. J. B. Shepherd acquired it several years ago and drove a tunnel near the base of the hill, but here the ore was low grade and contained much pyrite. A small arroyo comes in from the west and three miles above is the Terreo vein, 100 to 200 ft. wide. The vein crosses the creek, making a dam there and permanent water for a few families that live at this place. On the west side of the creek, 50 ft. above, there are thousands of tons of broken material. It must have been sorted for the rich ores, as occasionally a little free gold can be seen, although as a whole too low grade to ship. Possibly it could be cyanided. About 1200 ft. from the creek, at the contact with the granite, there has been considerable work done and some good pockets of free-gold ore removed. Two or three miles above there is little placer gold in the arroyo, which was located by Los Angeles men two years ago. Above Tula, about five miles east of Tamapa, the arroyo is rather flat and contains some placer ground where the natives sink to the bedrock nearly every year 10 to 20 ft. and obtain some gold. Over a small divide two miles south of Tula is a small village known as Placeras, near which some placer ground has been found in the arroyo.

A mile east of Portreo de Spaices is Alisitos, a small silver-lead camp where an American, M. Root, worked for a number of years, first operating the San Manuel, which he afterwards sold to the West Coast Mining & Smelting Co. Later he located the extension of the San Manuel on the north, and this proved even better than the San Manuel. Finally he sold to a former partner, a Mr. Ellic, of Oakland, Calif., who worked the mine in a small way for several years, but was waylaid and killed last year while returning from Santiago with his payroll money. Why will Americans continue to pack their payroll money, when it is an easy matter to get an entirely trustworthy Mexican to do it for a few pesos? And, why travel without a mozo?

The San Luis de Gonzaga Mine

About 25 miles east of Tamapa is La Tuna, and five miles farther east is the San Luis de Gonzaga in one of the best mineralized sections in the state. Some of the ores are pyritic in character, and one large vein 10 to 20 ft. wide can be seen on the surface for five miles. At one place where considerable work was done it shows gold, silver, lead, zinc, antimony, a little copper, and much pyrite. J. T. Canfield, of Culiacan, worked it 12 or 15 years ago for silver, obtaining some high-grade though refractory ore. He ran a long crosscut adit and cut the vein in a barren place and was compelled to quit for lack of funds. He still owns the Trinidad mine, a short distance north.

The Tres Reyes mine, a few hundred feet to the west, has half a dozen openings, including a long tunnel and inclined shaft on the vein, which dips into the hill at about 30°. The property contains gold and silver ore in a hard quartzite about 200 ft. above the granite, with a production of upward of $100,000 during recent years. Above the Tres Reyes are two or three parallel veins and crosscutting them all is a six-foot vertical vein carrying gold and silver. All of these five veins could be developed by an adit on the vertical one.

About a mile to the south is the Rosario gold mine, with several hundred feet of work done at various periods in the last 10 years. Three or four miles above is the San Luis de Gonzaga, on which there is an old 10-stamp mill. This property made a large production since 1875. About six years ago it was bonded for $400,000 by some Americans who started a long crosscut tunnel but failed to complete it.

A few miles south, the three states, Sinaloa, Chihuahua and Durango, corner in the mountains at an altitude of about 7000 ft. In this section are several prospects; one a 20-ft. silver vein carrying a little copper; another is an iron gossan carrying silver and copper; a third is a 150-ft. quartz outcrop that extends down the mountain from an altitude of 7000 ft. to an elevation of about 3500 ft.; it runs from a trace to $5 in gold and up to 16 oz. in silver. All these can be located, but they are 100 miles from the railroad. In this section are some narrow high-grade silver veins in limestone, on which a little work has been done, some rich pockets having been taken out a few years since.

In the Sierra Monterey, 10 miles north of Tamapa, M. Root owns a 20-ft. copper vein and at another place narrow streaks of copper glance can be seen on the surface for a distance of 1000 ft. On the east side of the mountain, Florentino Flores, of Tamapa, owns the Gausamer silver mine which has produced some rich silver ore and has been worked recently. The Copalitos mines, about 20 miles north of Tamapa, were worked for many years, five different haciendas having been erected and operated from 1850 to 1892. There are six veins, from 10 to 60 ft. wide, and on account of their great width were only worked to a depth of about 60 ft. The ore carried silver sulphide and a little gold, and is an excellent ore for cyaniding. The Sinaloa River is less than two miles distant and could supply power for a large operation, which will doubtless be undertaken some day.

Trigo Ore Was Roasted and Lixiviated

About 20 miles north of Copalitos, is the San Javier mine worked by the Martinez de Castro brothers for 12 years. They treated about 24,000 tons, crushing dry in a 10-stamp mill, then roasting and lixiviating. Northwest of the San Javier about 20 miles is the Trigo, worked by an English company for about 20 years. The ore was ground and roasted and lixiviated and though a large production was made the company never paid a dividend. Roads were built over the mountains for hauling wood and a generally expensive management prevailed. At a depth of about 600 ft. the silver content became lower and about this time the company purchased the San Jose de Gracia gold mine, and abandoned Trigo. Within the last two years, the tailings dump was purchased by Ziegler brothers who undertook the erection of a cyanide plant.

As a whole, the district has had little development. Except the Trigo, no strong company has operated there, but it is evident from the numerous shipments of good ore that the district contains many prospects worthy of development.

Santa Gertrudis Co., Ltd.

The gross earnings of the Santa Gertrudis Co., Ltd., for the 12 months ended June 1, 1912, were £631,432, the operating expenses £355,934, and net earnings from operations £275,498. To this must be added £1150 for miscellaneous revenue, making the net surplus £276,648, from which £24,227 was deducted for depreciation, leaving a net profit of £252,421. Out of this on June 28, 1912, a dividend of 15 per cent. (three shillings per share) amounting to £205,200, was declared.

In order to simplify matters connected with the mines and mills under existing contracts, two companies have been formed in Mexico, one to operate the mines and the other to treat the ores, the whole of the capital of both of these companies being owned by the San Gertrudis Co., Limited.

A total of 16,249 ft. was driven, raised or sunk in the various workings. The ore reserves as at June 30, 1912, are estimated at 586,000 tons of positive and partly developed ore, estimated to yield a profit of £899,590, and 551,000 tons of probable ore, estimated to yield a profit of £632,170.

The new mill started operations on June 14, 1911. The plant was originally designed to handle 600 metric tons per day, but to meet the increased production from the mine it was decided to enlarge the capacity to about 850 tons per day. This new section will be ready for service in November, 1912.

In the period under review 269,839 dry tons of ore and tailings were treated, with a gross value of £714,047, or £2 12s. 11d. per ton. There was recovered in bullion 88.43 per cent., or £2 6s. 10d. per ton. The bullion contained 26,006 oz. of gold, and 4,420,326 oz. of silver.

Based on operating the entire 60 stamps continuously, the new mill averaged for the last seven months of the year 26.71 days running per month. No interruption to work was experienced locally from the revolution in Mexico, conditions in Pachuca and throughout Hidalgo being reported in a satisfactory state.

Mineral Resources of Colombia*

Colombia is not a poor man's mining country. A prospector without capital or backing stands little show, largely because of the lack of transportation facilities, the rugged character of the country, the climate, and the difficulty of securing supplies and food except at high prices. Moreover, no quantity of "panning" or "rocker" ground is to be found from which the prospector can recoup his fortunes, writes U. S. Consul, I. A. Manning, of Barranquilla.

Scientific prospecting alone will succeed in Colombia. Few profitable lodes have been discovered, and they are frequently much disturbed or contain horses of barren rock. That there are numerous deposits yet awaiting discovery cannot be doubted, but as a general thing these will be found, if placer, to carry such an overburden of surface material as to require machinery for satisfactory prospecting or development; if quartz, to be of low grade and, in the main, to carry refractory ores.

Copper Deposits of Great Variety

In a recently published article Ricardo Lleras Codazzi, professor of mineralogy and geology in the University of Bogota, says that the deposits of copper in Colombia are of great variety. Natagaima is celebrated for its copper deposits and also produces considerable quantities of gold. This mineral zone reaches from Ataco to the *paramo* of Dolores, crossing the Magdalena River. The plains of Tolima extend from Nevia on the south to Honda on the north. In the mineral region one may see the different strata of Cretaceous rock, broken and dislocated by intrusions of eruptive rock. Contact metamorphism is marked in some places, especially in Natagaima and Nanurco.

In Ataco the rock is like that of Natagaima, largely diabase, porphyry, and trap. In the Dolores region the copper is associated with zinc and lead. In some parts chalcopyrite is seen in fragments the size of an almond, in a crystalline matrix. In Ibague the copper occurs in lodes in hornblendic and chloritic schists. These mines are worked only for gold and silver, although some veins carry as high as 20% of copper. In Sumapaz, on the eastern slope of the mountain, have been found quartz lodes crossing the schists. This is true also of Quetama.

Ore Occurs in Slates and Sandstone

In the eastern *paramos* of Boyaca the geological formations are similar to those above described and contain ledges of chalcopyrite with quartz gangue. The slates of western Cundinamarca contain numerous lodes with chalcopyrite in a gangue of siderite. In northern Moniquira, aside from the old mines formerly worked by an English company and now completely abandoned, there are strong lodes with chalcopyrite or bornite in quartz. They are in sandstones, which are stratigraphically under the slates and calcareous rocks.

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*Abstract of an article in Daily Consular and Trade Reports, Oct. 31, 1912.

In Bolivar, copper deposits occur in dark Lower Cretaceous limestone, which is eroded into fantastic forms. The ore is in some places only eight inches thick, and appears to occur mainly as a flat-lying deposit at the base of the limestone. This zone is extensive and is found between the crest of the hills and the Valley of Cuevas.

In the mineral region of La Paz and La Guaira, a little farther north, the limestone contains small veins of malachite. In Ocana there is found chalcopyrite, chrysocolla and cuprite. Of similar character are ledges in the mountains of Pamplona. Recently deposits of chalcopyrite have been found in the schists which form the lower spurs of the mountains of Santa Maria.

Garnet, in crystals outwardly dark green but leaving a bright-red nucleus, occurs in the Talco River basin and at the Sapo mine in Tolima, where the crystals have been mistaken for emeralds. The mineral occurs near the contact of granite with limestone and has been formed by contact metamorphism.

Deposits of Iron Ore

Large deposits of iron ore have been found in various parts of Colombia, but the best known deposits are in the district of Upper Cundinamarca. In La Calera, La Pradera, La Caldera and Pacho, iron ore has been found in great masses, running from 52 to 60% iron and the ore in sight has been estimated at 480,000 cu.m. The rock formations are as follows: Fine-grained sandstone, shale, iron ore, and shale overlain by coal and limestone. There is plenty of water power in these regions, and probably these iron ores will at some time attract attention.

Coal has been found in various parts of the republic. In Mustiscuo, Choco, and the *paramo* of Tamar there are said to be abundant deposits of coal of a superior quality. The cannel coal of Tamaita, in Toledo, is of first quality, and in the sandstones there are lodes of graphite. As some of these deposits are found in almost immediate juxtaposition to the iron beds it would seem that at some time in the near future they may be well developed. Coal and even well-defined beds have been found in many places in the lower territory of Colombia, near Rio Hacha, a few miles east of Banco, in the Sinu Valley, and near the Atrato. These seem to be lying awaiting the arrival of capital for their easy development.

Gold Ores Refractory

Most of the gold veins in Colombia are of a refractory nature and can be worked to advantage only with the most modern machinery. It is this complexity of character that has retarded the prospecting of the quartz lodes of Colombia.

The principal gold-mining development of the country is now taking place in the alluvial region. Here, however, the early Spaniard and the miners who followed him for the past four centuries have left little on or near the surface. The result is that almost any gold property in Colombia today depends for success on the expenditure of sufficient capital to establish a dredge, hydraulic process or other mechanical means of working the property. Thus the accuracy of the statement that this is not a poor man's country is evident.

Placer Ground Being Developed

Great areas of land, presumably gold bearing, have been denounced and titles thereto have been applied for during the last three or four years. This has been brought about by the entry of American capital into the field of mineral development in Colombia. Comparatively little of this ground, however, has been prospected in a manner sufficiently scientific to satisfy even the locators that it is pay ground. The capitalists who are financing such projects in Colombia are sending capable, practical engineers with uptodate drilling machinery to prove the land, which they hold under options or which they have purchased. In this manner a minimum amount of money is spent until they have become absolutely satisfied that the ground will pay for the investment of capital on a large scale.

The main gold belt of Colombia lies to the westward of the Magdalena River and above the junction of the Cauca with that stream, and the chief development is taking place in the region lying between the Cauca and the Magdalena and extending as far south as Manizales. This territory can be reached by steamboat and rail for most of the way, but the mining district itself is usually sufficiently distant from the river and railway routes as to require several days of muleback travel.

Petroleum Area Extensive

While the people who have been boring for petroleum at Cartagena and near Barranquilla have not developed oil in paying quantities, widespread interest is being taken in the petroleum deposits. A short time ago I was shown samples of petroleum brought from a spring which gushes from the mountain side not far from Bucaramanga, and I am told that oil signs are found over a great extent of country there. The same is said to be true of the lower Sinu Basin and of the territory near Puerto Cesar and the mouth of the Atrato River, and I am also informed that oil is in evidence on the surface in the district of the Goajira and also near Rio Hacha. The districts where oil has already been discovered are many miles apart and reach the entire length of Colombia. Asphalt is also found not far from the Magdalena River, but too distant from the seashore to have seemed attractive to capitalists as yet.

Federal Mining & Smelting Co.

The report of the Federal Mining & Smelting Co., operating in Idaho, for the fiscal year ended Aug. 31, 1912, shows an operating profit of $858,266, and miscellaneous earnings of $108,676. From these are to be deducted construction and betterments of $98,106, and miscellaneous non-operating expenses of $71,512, leaving a net balance of $797,323, as compared with $1,009,751 for the previous year.

There were mined at all the properties taken together 836,947 wet tons of ore, of which 46,087 were first-class. There were 762,550 dry tons milled. The large increase in first-class ore shipped was due to the doubling of the amount of low-grade first-class sorted at the Morning mine, and to the sorting-plant operations at Wardner.

There were produced during the year 118,734 tons of lead concentrates and shipping ore, averaging 42.9% lead and 20.8 oz. of silver per ton, and 2532 tons of zinc concentrates, averaging 46.93% zinc. Of this total, 40,087 tons were first-class, or shipping ore, which carried from 22.2 to 52.2% lead and averaged 33.7%. The first-class shipped from Wardner averaged 44.9%, from Mace 40.6% lead, and from the Morning 27.7% lead. From the Omaha lease, 1869 tons were shipped, averaging 26.6% lead and 47.7 oz. in silver per ton, not included in the above 46,087 tons first-class from the Federal operations proper. The Omaha lease ore also contained 27,233 lb. copper.

Development work amounted to 18,947 ft. of drifting, raising, sinking and crosscutting. Among interesting changes in the mills may be mentioned substituting Deister slime tables for direct-feed vanners, 8-ft. Hardinge ball mills for grinding, as well as a 7x12-ft. P. & M. tube mill, and 128 more Macquisten tubes at the Morning mill.

Six claims or fractions of claims were bought adjoining the Mace mine from the Idaho Investment Co., all patented, for $180,000, and negotiations are going on to buy, lease, or consolidate with adjoining Green Hill properties.

Total dividends on the preferred stock of $749,131 were paid, and the surplus account stands at $1,324.027, practically all in liquid assets.

American Standard Copper Specifications

In June, 1911, the American Society for Testing Materials issued new proposed standards for copper, which, although they have met with approval by many American users and manufacturers of copper, are, according to Ernest A. Lewis (*Met. and Chem. Eng.*, September, 1912), most unsatisfactory compared with the high-class copper approved by English users.

The American electrolytic refined copper is in his opinion, excellent for high-conductivity wire, and brass alloy, but for wearing properties it is decidedly inferior. To advocate the use and adoption of this exceedingly pure electrolytic copper where a tough arsenical copper is needed is similar to advocating the use of wrought iron for chisels and knives and the disuse of steel. According to Mr. Lewis, it is impossible to work *pure* copper, and the copper as recommended by the American Society for Testing Materials is a nonarsenical copper with just sufficient oxygen in it to enable it to be rolled hot. But such a copper is too soft to be of commercial value from the coppersmith's point of view. If this copper were subjected to a process for hardening it, such as the addition of phosphorus and the removal of oxygen, it would then pass the chemical test, but would fail on electrical.

While the conductivity test is considered of paramount importance in the United States, and is of importance for electrical work, for copper for sheets, tubes, rods or casting ingots, it is, in Mr. Lewis' opinion, valueless and misleading, and what is really wanted is bending, opening, swaying and tensile tests and chemical analyses, limiting certain impurities. None of these tests appear in the American specifications.

The specifications to which Mr. Lewis objects are as follows:

"All wire bars shall have a conductivity of at least 98½% (annealed), and all ingots and ingot bars shall have a conductivity of at least 97½% (annealed) excepting only arsenical copper, which shall have a conductivity of not less than 90% (annealed).

"Of what use is an electrical conductivity test of any kind in arsenical copper? What use is such a test for billets, for tubes, or tubes for rolling into sheets? It would be possible to produce a copper which will pass the conductivity test, but would not be satisfactory for working.

"Again, the standard specification says that the copper content must be at least 99.88%, and to see that the shipment is of good quality it is proposed to take two pieces and drill them, and from the mixed drillings of these pieces the whole shipment is to be rejected or accepted. The best recast electrolytic copper would only just pass the analytical test of 99.88%. As it is absolutely impossible for any refiner to make such recast copper without adding to it 0.08 to 0.1% of oxygen as cuprous oxide, it would be impossible to cast the copper as tough pitch without the oxygen. It would be highly improbable that such copper contained lead, owing to the property which lead has, that in an acid-sulphate solution it separates out as oxide on the anode. But this does not apply to bismuth, and as the tendency of refiners will be to get over-poled rather than tough-pitch copper, in order to pass the analytical test, bismuth might be present in such copper in minute quantity in such a form as to render it unsuitable for making brass alloys for rolling, etc. Why is not the percentage of bismuth limited to 0.005%, and why is not the proportion of oxygen specified?

"Putting on one side the fact that such copper would be too soft in practice for hard wear, it could not be cast from a refinery without oxygen. It is possible to cast billets from crucibles for rolling into tubes with only 0.03% oxygen, by the addition of 0.05% to 0.09% phosphorus, but this variety of copper would not pass the conductivity test, although such copper is excellent from the point of view of hard wear and tear.

"This is an example of an excellent variety of copper, which would pass one test in a specification and fail in another. The only specification given for the arsenical copper is the unnecessary conductivity test. In England the percentage of arsenic is usually specified to be from 0.35 to 0.6%. Many users have found it necessary to limit the lead to 0.1%. In many cases it is essential to have at least double the quantity of arsenic as there is of lead."

In conclusion he states that the American standard specifications are in urgent need of revision for the following reasons:

(1) They do not represent the modern views of metallurgists as shown by recent researches and are not drawn up in accordance with known facts published by practical users and makers of copper.

(2) They put makers of "tough" copper at a great disadvantage, although modern research shows that "tough" arsenical copper is more suitable for making into tubes, rods, and plates (other than electrical work) than the copper recommended.

(3) The methods of rejection or acceptance of parcels of copper by the method of sampling and analysis as described by the specification are unfair to the maker and are against the experience of practical refiners and chemists.

(4) The physical tests are quite inadequate as they contain no reference to tensile strength, elongation or bending tests.

(5) Chemical tests are of no value unless the various impurities likely to be in copper are specified and limited.

(6) Copper which is suitable for one purpose may be quite unsuitable for another purpose, therefore no one specification can cover copper for all purposes.

Jeffrey Storage Battery Truck

A few years ago the Jeffrey Manufacturing Co. designed a storage-battery truck for use in transporting raw material and finished products around its plant in Columbus, Ohio. The trucks proved so successful in facilitating the handling of material and decreasing the cost of this work that the truck was placed on the market. It is now used in industrial plants, lumber yards and smelting works, being well adapted to the service since the truck can haul material on its platform or on separate trucks as a trailing load, as shown in the accompanying illustration. At the Buffalo smelting works a 6-ton locomotive is used in hauling train loads of anodes; the truck is also used by the Anaconda Copper Mining Company.

JEFFREY STORAGE BATTERY TRUCK

The Jeffrey trucks are equipped with Edison, Exide or other makes of storage batteries as desired. The battery will operate from one to two days on a single charge, depending upon the amount and severity of the service. This truck is so simple in design and rugged in construction that skilled labor is not required and the maintenance and operating costs are correspondingly low.

South Australian Radium

According to the official Review of Mining Operations in South Australit, for the half year ended June 30, 1912, vigorous work is in progress at the Radium Hill mine, near Olary, and 35 men are employed. The ore is concentrated by electromagnetic separators, and the concentrates shipped to Sydney for treatment. It is stated that pure radium bromide has been prepared by the Woolwich works. The work at the Radium Extraction Co.'s mines at Mount Painter have been disappointing, for no large deposit of ore has been found, only a few small, rich patches of torbernite and autonite.

Colorado Fuel & Iron Co.

This company owns blast furnaces and steel works at Pueblo, Colo.; coal and iron ore mines in Colorado, New Mexico and Utah. The report for the year ended June 30, 1912, shows capital liabilities as follows: Common stock, $34,235,500; preferred stock, $2,000,000; bonded debt, $20,813,000. The total funded debt, including that of subsidiary companies, was $41,188,823 at the close of the year.

The production statement for two years is as follows, in short tons:

	1910-11	1911-12		Changes
Iron ore mined	841,699	813,728	D	27,971
Limestone.......	425,704	459,913	I.	34,209
Coal mined......	4,233,756	4,038,852	D.	194,904
Coke made......	753,192	777,993	I.	24,801
Pig iron made...	397,701	426,659	I.	28,958
Tin, iron & steel..	424,421	485,743	I.	61,322

Of the coal mined last year, 1,347,469 tons were used in making coke; 672,132 tons were used at the company's plants; 2,019,251 tons were sold. The coal used in making coke was 1.73 tons per ton of coke.

The financial statement for the year is as follows:

	Earnings.	Expenses	Net
Iron department.	$15,140,523	$12,373,748	$2,766,775
Fuel department.	9,127,929	8,122,423	1,005,506
Total	$24,268,452	$20,496 171	$3,772,281
Interest and miscellaneous.............			676,693
Total income..............			$4,448,974
Charges for the year			2,747,746
Balance to profit and loss			$1,701,228

The charges included $226,737 taxes; $2,039,622 interest on bonds; $138,317 sinking funds; $64,104 insurance, sociological work, etc.; $178,965 renewals and other charges; $100,000 dividend on preferred stock. Adding surplus from previous year, the total credit balance of profit and loss was $3,904,061 at the close of the year.

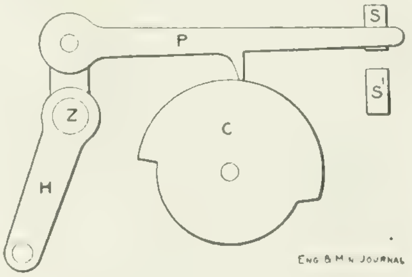
The report says: "The decrease in coal output is accounted for by a falling off in railroad consumption of somewhat more than that tonnage but an increase in general sales. The result in fuel-department earnings was a decrease of $31,092 in gross and an increase of $29,724 in net. As prices of domestic coal were generally lower than in previous years and an advance in miners' wages made effective April, 1912, added at least $20,000 per month to producing cost for three months of the year, the showing in the fuel department is considered particularly favorable.

"There was an increase of 14% in tonnage sales of steel, yet as most of the smaller products, representing about 30% of total output, were sold at generally lower prices than ruled the previous year, there was not a corresponding gain in steel-department earnings, though the ratio of increase in gross was maintained in the net earnings. The year's steel output fairly represents the capacity of the plant, limited as it is by the capacity of the openhearth department of 12 furnaces, and if the increased demand for all kinds of steel products proves to be fairly permanent, authority will be asked in the near future to construct six additional openhearth furnaces to place the company in a position to supply its natural part of that greater demand. Sales of heavy rails already made will take the output of the rail mill for the current fiscal year, and orders for other products now on the books will keep the smaller mills running well into 1913.

"At the special meeting of stockholders, held Oct. 19, 1912, the charter of the company was renewed for 20 years from Oct. 21, 1912, when the previous charter expired.

Controller for Small Electric Furnaces

The plan given herewith was described by Charles B. Thwing, of Philadelphia, before the International Congress of Applied Chemistry, and is used for regulating a 10-kw. carbon-plate resistance furnace, for which only direct current was available. It aims to dispense with the use of a power-consuming rheostat, by automatically opening the circuit once per minute, then closing it after a predetermined time.



ELECTRIC FURNACE REGULATOR

The control is effected by means of a small motor consuming about 50 watts, which drives, by small gears, a cylindrical cam *C*, 250 mm. long and 50 mm. in diameter, which is cut away on a taper from 350° at one end to 0° at the other. The pawl *P* is carried on a screw *Z*, which can be turned by a handle *H*, to set the pawl quickly and accurately in any desired position. When the pawl is resting upon the cam, the control switch *S* is closed. This automatically closes the clapper switch carrying the current; when the pawl drops, the control switch *S'* is closed, opening the clapper switch and cutting off the supply of energy from the furnace.

It is evident that the fractional amount of time during which the current is supplied to the furnace varies with the position of the pawl on the cam. While heating the furnace, the automatic switch is at rest; when the desired temperature had been attained, the motor which actuates the switch is started and the cam set to the position which has been found by trial to furnish the energy required to balance the losses by radiation. The pawl may easily be set to within 1.0 millimeter.

The control of the furnace is further effected by placing in series with the carbon resistance, an auxiliary resistance of 0.2 ohm of nichrome tape, which increases to 0.3 ohm at the maximum temperatures attained. The furnace is usually operated at 1300° C, and as this is too high for the nichrome to withstand permanently, the latter is placed in the base of the furnace, where the temperature will not exceed 1100° C. The increase of resistance of the nichrome with the rise of temperature tends to offset, in some degree, the diminishing resistance of the carbons, and so to prevent any accidental overheating of the furnace in case of failure of the operator to look after the adjustment of the controlling device.

California Oil Dividends in October

The following is a list of dividends paid during October, 1912, by listed California oil stocks, as compiled by the San Francisco *Chronicle*, making a very flattering showing:

Amalgamated	$1.00	$50,000
American Pet., pfd	0.005	8,755
do common	0.00 1-3	39,607
Caribou	0.00 1-3	8,070
Central.	0.0075	7,500
Claremont	0.01	5,000
Columbia	0.01	9,992
Fullerton.	0.10	60,000
Home	0.01	5,000
Monte Cristo	0.025	12,500
Mount Diablo	0.015	7,500
New Pennsylvania	0.005	5,000
Olinda Land......	0.0075	15,000
Pacific Crude....	0.10	60,000
Paraffin	0.01	3,000
Record	0.01	5,000
Rice Ranch	0.015	4,500
S. F. & McKittrick	0.01	5,000
Sauer Dough	0.0075	2,992
Section Twenty-five	0.50	20,000
State Consolidated	0.01	5,000
Traders'	0.006	9,000
Union Oil......	0.006	184,744
Union Provident	0.006	91,402
United Petroleum	0.006	48,451
W. K.	0.02	10,000
Western Union...	0.005	5,000
Total Cal. companies		$668,113
Mexican Pet. pfd.........	0.20 2-3	80,000
Grand total		$748,113

During 1911 the U. S. Geological Survey had 13 parties employed in Alaskan surveys and investigations. The personnel included 12 geologists, four topographers, two engineers and 30 packers, cooks and other auxiliaries. The length of the field season ranged from three to six months.

Personals

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Applicants are requested to call in person.

L. Vogelstein sailed for Europe on Nov. 14, expecting to return in about four weeks.

H. H. Johnson, of Johnson & Hoffman, has returned to London from British Columbia.

Harry J. Wolf has recently examined mining property in the Cripple Creek district, in Colorado.

Charles F. Rand, president of the Spanish-American Iron Co., went to Cuba on Nov. 16, and is due back on Dec. 10.

Samuel Price, Ontario mining commissioner, has resigned, and T. E. Godson, of Bracebridge, has been appointed as his successor.

P. L. McCardell, deputy mineral surveyor, is surveying the Luthy group of claims in the Gold Basin section, in Arizona, for patent.

Berthold Hochschild, president of the American Metal Co., sailed for Europe on Nov. 21, intending to return in about a fortnight.

E. F. Thompson, well known in Mohave County for the past 20 years, has opened up a mining office in the Lovin & Withers Block, Kingman, Arizona.

Edward E. Slick has been appointed general manager of the Cambria Steel Co., Johnstown, Penn. H. W. McAteer has been named comptroller.

M. J. Butler, who recently resigned his position as general manager of the Dominion Steel Corporation, will shortly leave Canada on a visit to England.

Percival Johnson has been elected general manager of the Pulaski Iron Co., operating Pulaski furnace at Pulaski, Va. He succeeds John W. Eckman, resigned.

Information is asked from anyone who may know the present whereabouts of W. Bertram Hancock, who in 1901 had charge of the operations of the Boston & Seven Devils Copper Mining Co., in Idaho.

Frank H. Probert has left Los Angeles for Clifton, Ariz., to make a geological examination of the Shannon Copper Co., for which company he has recently been appointed consulting engineer.

Dr. L. D. Godshall, of Los Angeles, Calif., has been in Kingman, Ariz., to look after his business interests in the county. He expects very soon to open a low-grade lead property at Tecopah.

Capt. Robert W. Hunt is to be awarded the John Fritz medal this year. The exercises in that connection are scheduled to take place in New York, Dec. 5, under charge of the American Society of Mechanical Engineers.

William H. Wright, who for eight years has been with the Zenith Furnace Co., Duluth, Minn., has resigned, and after Jan. 1 will be with the United Coke & Gas Co., New York, in charge of its operating department.

W. H. E. Royce, formerly general superintendent of the coke operations of the Republic Iron & Steel Co., Youngstown, Ohio, at Uniontown, Penn., has gone to the Connellsville Basin Coke Co., at Rock Forge, W. Va., as manager.

Frederick K. Brunton has resigned from the testing department of the reduction works, at Anaconda, Mont., to accept a position at Greenwood, B. C., as assistant superintendent at the British Columbia Copper Co.'s smelting works.

Eugene R. Pickrell has been appointed chemist in charge of the laboratory at the Customs Appraiser's office in New York. He has been connected with the office for some time, and was formerly at Kansas City and at the Denver mint.

Edward B. Cook, until recently general manager of the Warwick furnaces, Pottstown, operated by the Eastern Steel Co., Pottsville, Penn., has resigned and accepted a position in the ore and blast-furnace departments of Pickands, Mather & Co., Cleveland, Ohio.

John Hulst, formerly chief engineer in the Youngstown district for the Carnegie Steel Co., has been appointed chief engineer at Pittsburgh to succeed E. E. Slick, who resigned Nov. 1 to become general manager of the Cambria Steel Co. Mr. Hulst entered the employ of the Carnegie company in 1901, and has been continuously with it since.

Obituary

James Collins died at Salt Lake City, Utah, Nov. 8, aged 58 years. He was born in New York, and went to Utah 25 years ago. He was engaged in mining for some 22 years, retiring from active work about three years ago.

William Ogilvie died at Winnipeg, Manitoba, Nov. 13, aged 66 years. He was noted for many years as an astronomer and explorer and came into especial prominence as the first governor of Yukon Territory. He was born at Ottawa and educated at local schools. He was employed by the Geological Survey of Canada, and by the Department of the Interior for a number of years, and was intrusted with important surveys with regard to the boundaries between Canada and Alaska, Ontario and Quebec, and the Northwest Territory and British Columbia. He was in the Yukon on exploration work when gold was discovered on the Klondike, and was appointed governor of the new territory then formed, holding office for three years, through the great rush which followed the discoveries. He was made a Fellow of the Royal Geographical Society in 1891, and in the same year received the Murchison medal in recognition of two years' continuous exploration in the Yukon and Mackenzie regions. He was the author of a book, "Early Days of the Yukon and the Klondike;" also of many official reports on his work. Recently he had been engaged in gathering water-power statistics for the Canadian government, his latest investigation being at Point du Bois, near Winnipeg. He leaves a widow and two sons.

Societies and Technical Schools

Geological Society of Washington—The regular monthly meeting was held in Washington, D. C., Nov. 15. The papers presented were: "The Work of the Conservation Congress," by David White; "Reconnaissance in the Southern Wasatch Mountains," by G. F. Loughlin, and "New Data on the Knox Dolomite in Tennessee and the Ozarkian in Missouri," by E. O. Ulrich.

Geological Society of America—The 25th annual meeting will be held at New Haven, Conn., Dec. 28-31. The society meets at Yale University on the invitation of the university. The meetings will be held in the university buildings. The unsatisfactory nature of the hotel accommodations in New Haven has heretofore prevented the society from holding its annual meeting in that city. The erection of the new Taft Hotel has, however, placed at the disposal of conventions admirable accommodations.

Coal Mining Institute of America—The annual meeting will be held at Pittsburgh, Dec. 18 and 19. The sessions will be held in the School of Mines building of the University of Pittsburgh. The tentative program includes a sketch history of the institute by its first secretary, William Seddon; papers by Eugene B. Wilson; one on "Roof Action," by R. N. D. Hall; one by W. L. Affelder on "Rib Drawing by Machine"; one on gas producers from the viewpoint of a mining man, and one on "Crushers," by George R. Delmater.

American Institute of Chemical Engineers—The fifth annual meeting will be held at Detroit, Mich., Dec. 4-7. The program includes papers on important chemical subjects, and ample opportunity for discussion is given. A full program of excursions to the many interesting chemical industries of Detroit and vicinty has been arranged. A wide variety of industries is represented, affording something of interest to every chemical engineer. One day will be spent at Ann Arbor, Mich., where opportunity will be given for the inspection of the laboratories of the state university.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Nov. 13—The 16th annual convention of the California Miners' Association will meet in Native Sons' Hall, San Francisco, Dec. 9, 10 and 11. The chief business to be presented to the convention is the preparation for mineral exhibits from all mining states at the Panama-Pacific Exposition, in 1915. The special matters to be considered in the interests of Californa and other Pacific Coast States embrace conservation and the employers' liability laws. The governors of the several mining states have been requested to appoint delegates to the convention to consider the matter of proper representation at the exposition, and a number of the governors have made the appointments. Boards of supervisors and chambers of commerce and other like bodies in California have also been requested to appoint delegates to the convention. The railroads have announced a rate of one and one-third fare to delegates. Invitations have been sent to the Secretary of the Interior, the director of the U. S. Geological Survey and the director of the U. S. Bureau of Mines, to attend the convention. Appointments of delegates have been made by Massachusetts, Texas, Nevada and California. Governor Eugene N. Foss has appointed W. B. Buckminster to represent Massachusetts. Governor O. B. Colquitt has named the following delegates to represent Texas: Dr. William B. Phillips, of Austin; M. Blumenkrantz, Hon. William Bugess, R. G. Canby, William Crosby, L. H. Davis, Martin Fishback, James J. Ormsby, M. B. Parker, W. W. Turney and Horace B. Stevens, of El Paso. Governor Tasker L. Oddie, of Nevada, has named the following: James L. Butler, Frank Keith, Charles E. Knox, John G. Kirchen, of Tonopah; H. C. McTerney, of Eureka, Frank Bradshaw, of Tonopah, Hon. J. A. Miller, of Austin, W. Brougher, of Carson City, E. A. Julien, of Fairview, and John C. Skuse, of Mina. The following named have been appointed by Lieutenant-Governor A. J. Wallace, to represent California: Will. J. French, J. A. Pillsbury, Willis I. Morrison, George C. Pardee, Curtis H. Lindley, E. C. Hutchison, of San Francisco; Prof. C. D. Marx, of Stanford University, Harold T. Power, of East Auburn, J. P. Baumgartner, of Santa Ana, and Francis Cuttle, of Riverside. The following compose the executive committee of the California Miners' Association: Charles G. Yale, C. M. Belshaw, E. C. Voorhies, Edward H. Benjamin, A. A. Tregidgo, S. B. Christy, Louis Rosenfeid, Thomas Clark, J. J. Hamlyn, E. B. Braden, Edward Coleman, N. Cleveland, F. W. Bradley, George W. Starr, Louis Sloss, Frank H. Buck, A. Carrigan and J. D. McGilvray.

There has been a large amount of rain in California during the latter part of October and the first half of November. In the higher elevations and in some of the foothill mining districts there has been an appreciative amount of snowfall. The last mining season was considered a dry one, owing to the light snowfall of last winter, and some of the gravel mines were affected, though only a few quartz mines were seriously disturbed by a lack of water for milling purposes. There are comparatively few quartz mines in California at present directly dependent upon water for power. Electricity is rapidly displacing water power, to the betterment of the mining industry. The present indications are that there will be a plentiful supply of water during the coming season.

Denver

Nov. 16—The Moffat tunnel bill, recently referred to in this column of the JOURNAL, was defeated in the state vote, though carrying a big majority in this city. Now, however, a plan is being considered by which the city and county of Denver will undertake the work. The opinion has been given by the city attorney, that the quickest way in which the city can give its aid, is to vote bonds under the 20th amendment to the state constitution, for the purpose of boring the tunnel so that it can be used to bring a water supply for Denver from the head waters of the Fraser River from the western slope, the tunnel to be made large enough for railroad puposes. The governor of Utah and the Salt Lake City Commercial Club are coöperating with the Denver chamber of commerce, and there is a possitive feeling now that the tunnel will be built, and that an eastern outlet will be provided for the coal of the Yampa field, and the various products of the rich strip of country between that place and Salt Lake.

On Nov. 13, Governor Shafroth appointed the following delegates to the American Mining Congress, which meets in Spokane, Wash., Nov. 25-29: A. V. Hunter, Leadville and Denver; David R. C. Brown, Aspen; Allen Burris and James T. Burns, Colorado Springs; John T. Roberts, Jr., Ouray; Victor C. Alderson, Golden; John Campion, A. E. Reynolds and Philip Argall, Denver.

Butte

Nov. 13—E. O. Meinzer, of the U. S. Geological Survey, has been engaged for about a month in making an investigation of the valley south of Butte, locally known as the "Flat," to determine the possibilities of obtaining water for irrigation purposes from underground sources. In a preliminary report he states that the territory is underlain with granite, thus admitting small possibility of obtaining artesian water, but he continues, saying that the wash underlying the flat is saturated with water, confined by the rock walls of the basin, nearly to the surface. The supply is the result of precipitation and flowing water from a few small streams from the surrounding mountains, and while extensive pumping would without doubt exhaust the supply, it would be sufficient, if used judiciously, to irrigate a large area. In order to develop the water supply, he recommends that a pit be sunk to water level and a pump installed in it; that a vertical hole be then bored from the bottom of the pit, of sufficient size to admit a six-inch casing freely, and after perforating the bottom of the casing, allow it to follow the drill; whenever a promising water-bearing deposit, such as gravel, is penetrated, sink the casing with the perforated end in the deposit, and by hard and long pumping clear out the silt and fine sediment in order to develop a porous bed of coarse grit and gravel to act as a natural strainer. After the hole has been sunk to the desired depth, the casing can be perforated at every point where it passes through satisfactory water-bearing deposits. If this well should prove successful, Mr. Meinzer recommends the installation of a single-stage centrifugal pump and electric motor, with capacity to lift to a height of from 40 to 50 feet.

Salt Lake City

Nov. 14—A meeting of the Utah branch of the American Mining Congress has been called for the evening of Nov. 21, by Duncan MacVichie, president of the Utah branch, and John Dern, a director and former president of the congress. There will be considered the question of compiling statistics in regard to the cost of production of lead and zinc, to be placed, if necessary, before the Ways and Means Committee, at Washington, when the matter of the metal tariff comes up. The meeting will also take up the question of defeating any attempt to amend the national right-of-way laws, as well as the necessity of bringing about a reversal of the recent ruling of the Department of the Interior in regard to patents for mining claims.

Conditions at Bingham are steadily improving. The mines are gradually increasing their working forces and adding to their output, although these are not yet up to normal. Many miners left the camp at the time of the strike to avoid possible trouble, and the war in the Balkans has brought about a general exodus of foreigners. New men are coming in, and old ones returning. At the Bingham mines, at Lark, 45 men are employed, two shifts being worked. Utah Consolidated has 150 men at work, and the Bingham-New Haven mill is running.

Negaunee, Mich.

Nov. 15—The results of the 1912 appraisal of the mines of Iron County have been announced by the state tax commission, which is now engaged in revaluing Michigan's iron mines, to determine changes since the Finlay appraisal a year ago. The valuations given for the new explorations are especially interesting as denoting what success has been met by the different companies in the active fields of Iron River and Crystal Falls. The Nevada Land Co. explorations, including the famous "Mastodon find," at Crystal Falls, are assessed at $565,000. As nothing has been done at these properties beyond diamond drilling, the figure indicates that a large orebody is estimated.

The Carpenter property of M. A. Hanna & Co., where a shaft is being sunk, is estimated at $275,000, and the Monongahela and Ravennah at $75,000 and $100,000, respectively. The Amasa-Porter lands are assessed at $180,000. At Iron River, the Sherwood property of the Republic Iron & Steel Co., where drilling has been in progress for two years, is assessed at $740,000. The Bengal mine, being developed by the Verona Mining Co., is assessed at $1,139,000; the big Caspian mine of the same company has the record valuation of the county at $3,861,000. The Forbes mine, of Jones & Laughlin, the Rogers mine, of the Munro Iron Mining Co., and the Zimmerman mine, of the Spring Valley Iron Co., all new mines, are assessed at $450,000; $414,000, and $481,000, respectively. The Bates mine, of the Florence Iron Co. interests, and the Erickson exploration, of the Cleveland-Cliffs Iron Co., are only figured at $80,000 and $81,000, respectively.

The new Wickwire mine is assessed at $145,000. The Mineral Mining Co.'s James mine, which in 1911 was raised from $75,000 to $623,000, is now increased to $660,000, and the company's Konwinski property is figured at $97,500.

The old Hemlock mine, of Pickands, Mather & Co., at Amasa, was lowered from $68,000 to $51,000. The Chicagon mine, of the Munro Iron Mining Co., which has been a heavy shipper during its two years of activity as a producing mine, was lowered to $44,000. Taking the county, as a whole, the deductions made for ore mined were more than compensated by new discoveries.

Porcupine

Nov. 16—The Porcupine branch of the Western Federation of Miners called a general strike, Nov. 15, a vote taken by ballot the previous day being in favor of a strike by a large majority. All the union men employed in the camp went out, and nearly all operations are suspended. The original dispute affected only five mines near Pearl Lake, the operators of which introduced a new scale of wages involving some reductions. The federation took up the matter and appealed to the Canadian Department of Labor, which appointed a board of conciliation to investigate the case, consisting of Prof. H. E. T. Haultain, representing the mine owners, E. Thompson, secretary of the miners' union, and Peter MacDonald of St. Thomas, chairman. A majority report of the commission was brought in, to the effect that with one minor exception the wages offered were fair and adequate. The operators decided to put the new wage schedule into effect, whereupon the men rejected the recommendations of the commission, and submitted the question of a strike to a referendum vote. The scale offered to the men is the same as prevails at Cobalt where a nine-hour shift is worked, and as the rate at the Dome and Hollinger, but the other mines have been paying slightly more. The mine managers state that the mines around Pearl Lake early in the history of the camp established a scale of wages higher than the average, because the men were then required to work under conditions less favorable than those which now prevail. The number of men out on strike at the leading mines is given approximately as follows: Dome, 300; Hollinger, 300; Vipond, 50; McIntyre, 60; McEnaney, 80; Dome Lake, 60; Hughes, 40; Porcupine Lake, 50; Hollinger Reserve, 50; Jupiter, 25; Pearl Lake 20; Plenaurum, 30; Dome Extension, 25; Three Nations, 20; Krist, 10. Some other smaller properties in the district are affected. The mine owners are expected to make a strong stand as it is generally believed that the men have little grounds for grievance. The wages paid compare favorably with those of the western camps as the machine workers are paid $3.50 per day and other labor in proportion with 75c. per day charged for board. While the trouble may interfere with operations to a considerable extent for some time, it is believed that the strike will not be of long duration. Financially, the union is in poor shape, and the men are going out without strike pay. On account of the Magpie and Helen mines in the Lake Superior district, closing down for the winter, about 500 men will be let out there and it is believed that sufficient men can be brought into the camp to carry on the work. The mine owners prefer to close down for the winter rather than pay higher wages. The Hollinger and Dome, however, will probably bring in men from the outside.

Juneau

Nov. 16—The practical completion of one of the largest power projects in southeastern Alaska was marked by current coming over the transmission lines, Nov. 10, from the Nugget Creek power plant to the distributing station at Treadwell. From the dam site at Nugget Creek basin, which is at an elevation of 530 ft., a tunnel 635 ft. in length, 12 ft. wide and 8 ft. high was driven to the ridge that divides the basin from the bench above Mendenhall glacier. From this place 3850 ft. of wood pipe 48 in. in diameter was laid to the place known as Lookout, where it was connected with 2060 ft. of 36-in. steel pipe, which brings the water to the power house. The laying of this pipe in itself was a big undertaking, and was accomplished by aërial cables that lifted the sections from a distributing point and carried them to their destinations. All the pipe had to be securely anchored against slides and the heavy pressure that would be on the pipes at all times. The power house, which was recently completed, has a capacity of 3000 kw. Only one generator of 1000 kw. capacity has been installed, but another is on the way from Seattle and is to be installed in the spring. The power plant consists of three Pelton waterwheels driving two units, one of 1000 kw. and one of 2000-kw. capacity, with necessary waterwheel governors, exciters, etc. Electrical power is generated at 2300 volts and transmitted to the distributing board at Treadwell where it is stepped down. Fourteen miles of transmission line have been built connecting the power house with the central electric plant at Treadwell. To provide for the storage of water so that power can be generated all the year round a reinforced-concrete dam will be built at Nugget Creek basin. This will be 100 ft. high and 615 ft. across the face. The dam will have a storage capacity capable of furnishing 4000 hp. for four months. The total cost of the undertaking will be about $600,000.

The Mining News

The Current History of Mining

Alaska

On account of the heavy frost practically all the workings at Fairbanks have been closed down, including the McGuire & Chapman, Two-Step, Louis Schmidt and Charles Schieck, all on Nome Creek.

The total cleanup of the Long Creek district this season will be in excess of $100,000.

Pioneer Mining Co.—The biggest strike at Nome since 1905 has been made by this company in an old channel opposite No. 3, Anvil Creek. The pay dirt runs 25c. per pan.

Arizona

MARICOPA COUNTY

Smith Bros. have been developing copper and gold prospects northeast of Morristown

The placer claims on the Hassayampa River near Brill's ranch, Wickenburg, have been bonded to Georgia men and active development will be started at once. A. J. Kellis and associates were the locators.

Harry J. Bennett has bonded a group of claims in the Picacho district near Morristown to Eastern men. Work on the claims is to be commenced in December. Some work has been done on some of the claims and copper ore opened.

Vulture—A survey for a pipeline from the Hassayampa River to the mine has been completed, but as sufficient water for the concentrator has been obtained by drilling wells near the mine, it will not be necessary to build the pipeline immediately.

Tip Top—The dumps at this old silver mine are being milled and shipments of concentrates will probably be made at an early date. The concentrates contain silver as well as tungsten. The tungsten is of more value than the silver contents.

Congress—The dumps have been sold to the United Verde for lining converters at the new smeltery which is being built at Clarksville. The tailings are almost pure quartz and there are several million tons in the dumps.

Carney—A carload of copper ore will soon be shipped from these mines to the smeltery at Hayden.

North Star Mining Co.—Development work has been done on this group of claims, south of Phoenix, near Telegraph Pass. Present showings justify a continuation of the developments; the veins are large on the surface and the assays are satisfactory.

MOHAVE COUNTY

An examination of the Smith & Sawyer molybdenite property, in Copper Cañon and Deluge Wash, about five miles north of Cedar, was made last week by Anson H. Smith, O. B. Stanton and Philip Smith. Mr. Smith reports about 300 tons of ore on the dump, a sample from which showed more than 24% molybdenite and about 3% copper. About 140 ft. of driving has been done on the property.

Cyclopic—A strike has been made below the old workings by S. C. Bagg, who has been operating this property for several years.

Tom Reed—It is reported that a rich strike has been made on the 800-ft. level.

Last Chance—Due to the failure of the O. & C. Development Co., this mine and the recently erected mill have reverted to the original owners. W. E. Frost, Walter Meyer and Harry Mehaffey are engaged in stoping out sufficient ore for a mill run of several days duration.

Tennessee—It is stated that at this mine, at Chloride, a large shoot of lead ore has been discovered on the 700-ft. level. The shaft is being sunk to the 800-ft. level where the evidence indicates that the same oreshoot will be encountered. The railroad extension to the mine will soon be completed so that shipments to the Needles smeltery may be resumed.

Williams—Ten tons of ore from this tungsten property will soon be shipped for a concentration test. The property was recently examined by Edward B. Sturges, of New York, and, upon his recommendation, was taken over by a company formed by James A. Roberts, of the Frisco Gold Mines Co.

Arizona Southwestern Copper Co.—The drift from the 200-ft. level of the main shaft has been driven a distance of 1400 ft. and is within about 100 ft. of connecting with the north shaft at the 300-ft. level. The main shaft is to be sunk an additional 200 ft. The new 150-ton mill is rapidly nearing completion, the building and foundations for the machinery being finished, and the equipment is now being placed in position.

SANTA CRUZ COUNTY

The Southern Pacific R.R. has fixed the minimum load at which ore can be sent at the car rate, at 30 tons; it was formerly 15 tons. This will make a little difference with silver-lead shipments which are apt to come forward in small lots, but will have little or no effect on copper shipments from this county.

Blue Eagle—McDonnel, Kane & Stevens have taken a lease on this copper mine in the Patagonia district, and have some good ore on the dump.

Royal Blue—Thomas Fraser, who has a lease on this mine, has just struck copper ore and a heavy flow of water in the lower east tunnel. The ore contains copper with some gold and silver, and is in demand by the smelters. One carload is in transit.

California

ALAMEDA COUNTY

The Corral Hollow manganese deposits have been purchased from the McLaughlin company by Atkins, Kroll & Co., of San Francisco. It is reported that a road will be built from the mines to Castle Rock spur on the Tesla branch of the Western Pacific Ry.

AMADOR COUNTY

South Jackson—A station has been cut at the 500-ft. level in the shaft.

BUTTE COUNTY

J. F. Upton has filed on 100 miners inches of water in McCabe Creek to be used for mining purposes in the Forbestown district.

Hupp—An incline shaft is being sunk in this gravel mine at De Sabla to cut the gravel in what is known as Indian Spring channel, which in early days was one of the largest producers in the county; G. K. Orr, superintendent.

Berry Creek—The final payment for this property has been made and new buildings are being erected. J. N. McClung and John Kincaid, of Berry Creek, are owners.

CALAVERAS COUNTY

Dolling—This mine, formerly known as the North Star, has recently been explored from the 400-ft. level by a winze that has developed ore above average value. Preparations are being made for stoping. It is expected that the stamp mill will soon be in operation again.

Brown-Smith-Ryland—The mill has been started on good ore recently disclosed in this mine near Angels Camp. The property had been idle for 30 years, and work was resumed this year. Charles D. Smyth is the only remaining member of the original locators.

Kern County

King Solomon—A recent cleanup of 25 tons of ore from the Teagle-Lamberson lease plated $1100, or more than $40 per ton at the Red Dog mill. The ore was taken from the 75- and 125-ft. levels.

Consolidated Mines—A strike is reported at the west end of the 236-ft. level in the Good Hope claim. It is reported that a vein of $40 ore was disclosed. This will be driven on. The shaft is being deepened and has now reached a depth of 300 ft. About 50 tons of ore has been hauled to the Red Dog mill.

Inyo County

Custer—A large shoot of lead-silver ore is reported to have been disclosed below the 220-ft. level. The main shaft has been straightened. Regular shipments are being made; John Thorndyke, owner.

Lucky Jim—A new 50-hp. gasolin hoist and a compressor have been installed. Sinking on the lower level will be continued; J. P. Fitting, superintendent.

Defiance — This property has been leased by John Gunn, of Independence. The mine was formerly a large producer. There is now a large quantity of ore blocked out.

Green Monster—This mine, near Citrus, has been leased by Edward Chaffy. Three carloads of copper ore were recently shipped to the Wabuska smeltery.

Madera County

Lucky Bill—This mine, near Ahwahnee, is reported to have been bonded by Mr. Richardson, of San Francisco. Extensive development is contemplated.

Mariposa County

Schoolhouse—This property, near Hunters Valley, has been bonded to P. G. Gow, of Berkeley. Should development warrant, the machinery formerly used at Big Oak Flat will be used in mill construction; W. Taylor, superintendent.

Melvina—Preparations are being made for reopening the mine, in Coulterville district, which has been idle for about 10 years. The power line of the Pacific Gas & Power Co. is being extended from the Oro Rico mine to the Melvina; Merced Mining Co., owner.

Merced County

It is reported that arrangements are being made for the development of the marble quarries near Planada. The marble will be hauled to the railway station at Planada with auto trucks.

Modoc County

Consolidated Mines Co.—The attachment of James Williams has been disposed by J. M. Stone, the principal owner, who bought in the property at $29,500. Preparations are being made for reopening the mine in the spring. This is reported to be one of the best properties in the Hoag district.

Lucky Dutchman—The new shaft house is completed. The new shaft has reached the 42-ft. point, passing through the rhyolite and disclosing good ore in the porphyry; A. L. Arnold, manager.

Colorado

Clear Creek County

Virginia City—Ore, 1½ to 3 ft. wide has been opened in this mine on Lincoln Mountain, by Arthur Robert, lessee, the first shipment made giving returns of $77 per ton in gold and silver. It is being operated through the Lincoln crosscut tunnel 1350 ft. from the portal. The shoot has been proved for 100 ft. in length and two men are breaking two tons per day.

Lake County-Leadville

The lack of cars to transport ore continues. In October the shipments fell off 300 carloads for that reason. The shortage is so great that the Rio Grande is hauling ore from Leadville to Salida in narrow-gage cars and transferring ore billed to Missouri, Kansas and Oklahoma to broad-gage cars. The farmers and fruit men are suffering more than the miners; their products being perishable, they must be served first.

Yak Tunnel—A winze is being sunk in the tunnel near the center of Big Evans basin, to develop Diamond and Vega ground. It is down 150 ft. and will be sunk another 100 ft. when it will be 1100 ft. below the surface; then drifts will be driven into Yak territory to open the known ore.

St. Louis—The winze in this Breece Hill mine is 320 ft. deep and has 140 ft. more to go, when Manager Stewart says he will start driving to the ore.

Adelaide—Manager Covey is now hoisting ore at the south end of this claim in Adelaide Park, and is increasing shipments of high- and medium-grade ores.

Baby—Lessees on the shaft are shipping richer ore and in greater quantity. They state that if they can continue doing this a little longer, an increased force will be put on.

Alicante—A strike has been made on this Collier-Lewis claim and it is reported that in a raise a vein of rich ore 18 in. wide has been opened. Two tons has been sacked for shipment; W. B. Anderson in charge.

San Juan Region

The shipments of crude ore and concentrates shipped from Ouray during the 10 months of 1912 are given at 15,101 tons, the major part of which was shipped by the Camp Bird, Wanakah, Atlas, Revenue, and Wedge mines.

O. B. Willmarth, buyer of carnotite ores, is building a storehouse at Placerville, the shipping station for the carnotite ores bought in Paradox Valley. There are five carloads on the ocean *en route* to Europe.

Smuggler Union—This company has taken a three-years' bond and lease on nine claims on Cornet Creek owned by the Moorehead Mining & Milling Co. They adjoin the Mendota of the Smuggler company, and the general ,manager Bulkely Wells, is already working them through the Mendota mine. It is said that the acquisition of this property will add many years to the Smuggler Union Property.

Teller County-Cripple Creek

Forest Queen—It is, reported that G. Johnson, a lessee on this Ironclad Hill mine, has opened a flat vein of good gold ore, of which he may be able to mine three carloads this month.

Blue Bird—The 21st-level station has been cut at a depth of 1750 ft. and crosscuts both to east and to west from the shaft are being advanced at the rate of five feet per day, No. 8 Leyner drills being used. The bottom of the shaft is just two feet below water level. No water is pumped. By keeping the bottom of the shaft in water the difficulty due to foul air is overcome. This air always manifests itself as soon as the bottom of the mine becomes dry. A winze is being sunk from the 20th level south to prospect ground to water level at this place. E. S. Johnson is manager.

Isabella—A rich strike is reported to have been made in the bottom level, in territory operated on company account.

El Paso—The new hoist installed at the Nichols shaft will soon be in operation. The company is preparing to operate on the tunnel level.

Golden Cycle—The new electric pumping plant is in operation. This plant will drain the lower workings of both the Golden Cycle and Vindicator mines, and the cost of pumping at both mines will be greatly reduced as compared with former methods.

Six Points—The October production by lessees, Polly & Chilson, was nine carloads of mill ore. It came from the seventh level of the Los Angeles shaft.

Gold Sovereign—A dividend of ¼c. per share has been declared upon a capitalization of 2,000,000 shares, amounting to $4500, this coming from royalties paid the company by lessees.

El Paso-Gold King—Three strikes of ore of unusual width and richness are reported from this mine by lessees.

Anchoria Leland—It is anticipated that this mine on Gold Hill will again commence shipping to the Valley mills, as late extensive development has shown several good oreshoots.

Idaho

BONNER COUNTY

Idaho-Montana—The first carload of lead-silver ore has been shipped and the second will follow shortly. The ore comes from the strike made recently on the 320-ft. level.

CŒUR D'ALENE DISTRICT

"V" Group—An oreshoot, carrying galena of shipping grade was encountered in the upper tunnel, and crosscutting has been begun to determine the width of the shoot. The ore shows a good tenor in lead and silver and an absence of zinc, which is common in most of the Pine Creek mines.

Tuscumbia—The management has decided to continue development throughout the winter, opening up the strike recently made on the 600-ft. level through the No. 3 adit on the Idora Hill.

IDAHO COUNTY

South Fork—A bar of bullion, valued at $3000, was recently shipped to Spokane.

Michigan

COPPER

A transaction was recently concluded and the transfer made of about 18,000 acres of land in Houghton and Baraga Counties for a hydro-electric plant on Sturgeon River. It is estimated that this plant can eventually develop about 20,000 kw. Right-of-way for the transmission line has been secured, which will take in the South range group of mines in Houghton County and also enter the village of Houghton. Development work will be started at an early date.

None-Such—M. P. O'Brien will be in charge of development and exploratory work at this property. The Calumet & Hecla company held this property under option at one time and did much exploratory work, but allowed the option to expire. However, the developments at the adjoining White Pine property of the Calumet & Hecla have been so successful that attention is again to be given this property. The ore carries much copper in a flaky state and the problem of successful operation seems to be one of concentration.

New Arcadian—This company's shaft is sinking below a depth of 250 ft. at the rate of from 70 to 80 ft. per month. At a depth of 500 ft. a station will be cut and crosscuts will be driven east and west to cut the other two lodes. The shaft is going down on the middle of a series of three lodes that were exposed in drilling.

Winona—Production is gradually on the increase at this property. Additional labor has been secured for underground work and a tonnage is now being handled that is sufficient to keep one of the stampheads working continuously at full capacity and the other about half time. The introduction of tube mills has made a material saving in the copper that was previously going out in the tailings.

Hancock—Crosscuts are to be extended at the 2600-, 3600- and 3900-ft. stations of No. 2 shaft to cut the formations and to become the main working levels. Within the next few months this property will be producing and sending ore to the Lake Milling, Smelting & Refining Co. mill at Point Mills. Openings on the No. 3 lode are satisfactory and the mill run showed that this formation can be mined at a substantial profit with a fair price for the metal. The surface equipment is equal to the finest in the district, the property being equipped to handle a large tonnage just as soon as the underground workings can be put in shape to yield the ore; 8-ton skips have recently been put in commission.

Isle Royale—The pit at the site of the new No. 7 shaft has been started and as the overburden is not very heavy, solid rock will soon be reached when the collar can be put in and sinking go forward on the lode.

Osceola Consolidated—The construction of the new steel rock-house at the No. 1 shaft of the North Kearsarge branch of this company is progressing satisfactorily and the building will be inclosed within a few days. A temporary hoisting equipment has been rigged up to take care of the shaft repairs while this work is being done. Production from this shaft has been suspended for some time, but the tonnage from shafts No. 5 and 6 of the main mine are about equaling the amount of decrease.

La Salle—Preparations are being made to resume operations at this property, which have been suspended for about one year. At shafts Nos. 1 and 2 larger rock-houses are being built and put in shape to handle an increased tonnage. No. 1 shaft on the Tecumseh tract is opened extensively and the lower levels were developing some good ground at the time operations were suspended, but owing to the prevailing low price of copper it was deemed advisable not to spend any more money at that time in further opening the property, but at the present price of the metal the company will make a substantial profit.

Calumet & Hecla—This company has put an enlarged hoisting engine in commission at its No. 15 shaft on the Osceola lode and has put the two compartments of the shaft in shape to handle ore, so that production from this shaft will be materially increased. The company is also installing new underground pumps in No. 4 shaft of the Calumet branch of the mine, to supplant the air-driven pumps.

IRON

Warner—A decision has been handed down by the state supreme court, in the case of the German Aid Society *vs.* the German Corporation, confirming the decision of Judge Flannigan given a year ago. The Warner land in the Cascade district was deeded to the German Aid Society of Negaunee by the owner, Charles M. Warner. The surface rights were later sold as farms to individuals by the society, but the mineral rights were reserved. The 38 members of the society attempted to deed the mineral rights to themselves under the name of the German Corporation, planning to exclude later members of the German Aid Society from a share in the Warner land. Ore has been found on the property and on adjoining lands, and the later members of the society sued for a share in the mineral rights.

Volunteer—This mine of the Volunteer Ore Co., sometime called the Maitland shaft, at Palmer, has reopened with a force of 150 men. The mine was closed last June because of the low prices prevailing for iron ore; previous to closing 200 men were employed. The mine has been kept pumped out and repairs to the shaft have been made. A stockpile of 80,000 tons of high-grade bessemer ore is on hand. The company is controlled by Duluth men, including T. F. Cole, G. A. Tomlinson and C. A. Congdon. Thomas Pellow, of Negaunee, is general superintendent.

Oliver Iron Mining Co.—Following a visit of officials of the U. S. Steel Corporation, extensive improvements are being started at the Oliver water power plant at Quinnesec Falls on the Menominee River. Additional power will be obtained for operating the company's mines on the Menominee range.

Missouri

JOPLIN DISTRICT

Yellow Jacket—A third shaft is being sunk on this lease by O. W. Sparks. Ore is found in soft ground, and heavy timbering is required.

Athletic Mining Co.—Two 40-acre leases are being developed by this company, in the north Webb City sheet ground. The terms of the lease specify that new plants be put up on each "forty."

Bull Moose Mining Co.—This company, operating near Belville, has made one of the richest strikes in recent years. In sinking a shaft through the ore run, 103 to 123 ft., enough mineral was taken out to pay all costs of sinking.

Reo Mining Co.—This company has just been incorporated for $32,000, the stockholders being Carthage and Carterville men. They have a lease on a prospected tract of 15 acres five miles west of Sarcoxie.

Betsy Jane—The initial yield of this mine, valued at $15,000, has just been transported by wagons to the cars at Thoms Station, for shipment to the smeltery.

Hoo Hoo Mining Co.—This company is building a mill of 150-tons capacity on a 15-acre lease of the Expansion Realty Co. Shallow operations were conducted on this land in the early days of the camp, but it has lain idle since. The company has two shafts in ore, one in soft gound at 140 ft., and the other in sheet ground at 180 feet.

Thomas C.—Carterville and Duenweg men have procured a 40-acre lease on the Four Hundred Prospecting Co.'s land, southeast of Duenweg. It is understood that they intend to reopen the old Thomas C. mine, in which good ore was opened by former operators, but no systematic mining has been done. Pumps have been started to drain the old drifts.

Captain—A sludge mill, with an equipment of four tables, has been installed on a lease of the Continental Zinc Co. land, to treat tailings from this old mine.

Montana

BUTTE DISTRICT

Davis-Daly—During the year ended June 30, 1912, this company received $106,299 from ore shipments, and from interest on capital, $7029, a total of $113,328. The expense of development and mining amounted to $199,029, and general expense to $41,638, a total of $240,667, making a total excess expenditure of $127,339. The loan of $50,000 made to the Ohio Copper Co. by the former management was returned, with interest at 6%, accompanied by a $5000 bonus. Also money invested in a Porcupine property was returned, with the addition of a stock bonus. The Colorado shaft has been sunk 200 ft. to the 1900-ft. level and much development work has been done from this shaft on the 1400- and 1700-ft. levels without, however, opening any new orebodies of importance. The crosscut now being driven on the 1900-ft. level of the Gagnon mine of the Anaconda company, to develop the western territory of Davis-Daly, has advanced about 650 ft., and is expected to intersect the Silver King vein at a further distance of 300 ft. Two crosscuts have been driven on the 1900-ft. level from the Colorado shaft, in both of which fault veins from one to three feet wide, and carrying from 3% to 5% copper, have been opened. Lessees are operating the Lizzie claim, in the eastern part of the company's ground, and a crosscut is being driven to develop this territory at a depth of 1000 ft. On the extreme northwestern portion of the holdings, lessees are operating the Silver King claim, with promising results. Ore shipments now amount to about 65 tons per day, which is an increase of 15 tons daily over the quantity shipped during the year prior to the first of October.

LEWIS & CLARK COUNTY

The proposed installation of an electric power line at Marysville is meeting with some opposition from some of the mine owners in the camp, who as yet have proved unwilling to bind themselves to an agreement to use the power for the time demanded by the power company as a safeguard to their interests. It is believed, however, that the matter will be arranged satisfactorily. Because of the high cost of transporting fuel to the district, an electric power line is almost indispensable to successful mine operation.

Bald Butte—On account of the bad condition of the road between this property and the mill where the ore is treated, mill operations have been temporarily suspended. As soon as a sufficient fall of snow occurs to make sleighing possible, operations will be resumed. The mine is being worked steadily in the meantime and the ore placed on a stockpile ready for hauling.

Eureka—Butte men recently began operations at this property in Mitchell Gulch, 12 miles east of Helena. The property has produced good ore in the past. A 300-ft. shaft is being sunk preparatory to a systematic course of development work.

Nevada

COMSTOCK LODE

Mexican—A statement prepared by the company for the bullion-tax collector, shows that the ore recovery for the quarter ended Sept. 30, was 6055 tons, and that 5297 tons was treated at the mill. The gross bullion yield for the quarter was $125,945, and upon the net yield, a bullion tax of $1073 has been paid. The financial statement of the company as of Nov. 1, gives a cash balance of approximately $70,000 in the treasury, and at the next meeting of the directors, it is expected that a dividend of 20 or 25c. per share will be declared.

C. & C. Shaft—No. 2 vertical pump at the 2500-ft. level, the second unit of the temporary plant at that place, has been installed and works successfully. No. 1 hydraulic elevator is being removed, leaving only electrically driven pumps in the sump.

Ward Shaft—The work of dismantling the shaft has been completed, and all pumps and machinery have been taken from the 2100 and 2475 stations. Further attempts to unwater the Middle group of mines will undoubtedly be made through the Combination shaft.

Crown Point—Run No. 8 at the Yellow Jacket mill has been completed and two railroad cars of concentrates shipped to the smeltery. Plans are being made by the management for work along broader lines in this mine, as well as in the Belcher and Yellow Jacket. It will probably include the recovery of deeper levels.

Union Consolidated—Sampling the quartz stringers cut by the west crosscut on the 2500-ft. level has been completed, and development work will be carried on at the most favorable point.

Sierra Nevada—Two feet of quartz was recently cut on the hanging wall of the fault on the 2500-ft. level, which is said to be a drag from the main vein. The north drift is being driven across the fault for the main vein, which, it is believed, was thrown about 70 ft. off its regular course.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Nov. 9, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,250	151,009
Tonopah Belmont	2,647	110,843
Montana-Tonopah	617	46,669
Tonopah Extension	1,050	45,243
West End	745	34,302
Midway	50	820
MacNamara	390	16,779
North Star	45	311
Mizpah Extension	..	40
Jim Butler	350	3,750
Totals	9,154	409,226
Estimated value	$228,850	

Tonopah-Belmont—A new vein of good milling ore has been opened on the 1100-ft. level.

Tonopah-Merger—The last drift on the 1070-ft. level is now cutting stringers of rich ore. Shipments from the mine will commence in a few days.

Montana-Tonopah—The production for October was 49 bars of bullion valued at $42,270 and 34 tons of concentrates.

Jim Butler—This mine has increased its shipments to 350 tons weekly and is now making monthly profits.

Nevada Wonder Mining Co.—The report for September states that 3406 tons of ore was treated for a net profit of $31,402.

WHITE PINE COUNTY

There are still rumors of again calling a strike, owing to alleged discriminations in the reëmployment of old men. Several men, representing the different unions, are investigating these charges. It is said that the American Federation of Labor, in session at Rochester, N. Y., will decide the question. If left to a vote of the men now employed, it is believed that they will not go out, as they lost $225,000 in wages, during the October strike, and nothing was gained.

Nevada Consolidated—The concentrator at McGill, commenced running full capacity, Nov. 11, for the first time since the strike. The ore bins are full.

Giroux—The Bunker Hill, Brooks and Morris shafts will be retimbered and probably be sunk deeper. The ore shipments have come from these shafts, during recent months. Surface ore bins will also be built at the Morris, heretofore temporary ones have been used. The steam and water pipes in the Giroux shaft, need overhauling and some replacements, so that it is probable that no production will be made for several months. A large force is grading at the Brooks shaft, for a timber yard.

Ely Central—Under the management of R. T. Pierce the new company is prospecting its ground with a churn drill.

Butte & Ely—This company, owning ground between the Nevada Consolidated and Giroux, will start two drills. This work will be in charge of the Giroux company, as it owns half the stock.

New Mexico

Socorro County

Socorro—Custom ore is now being received from three properties, and two more are getting ready to ship. Good ore is coming from lowest levels of the mine. The shaft is going down steadily and will soon be to the 900-ft. level. The average daily tonnage handled in the mill is 165 tons.

Ernestine—The output for the last 11 days of October was 10,530 oz. of gold and silver bullion and 9600 lb. of high-grade concentrate; the total for the month was 33,080 oz. bullion and 25,100 lb. concentrates. The regular monthly dividend of 1% was declared Nov. 1. Mine developments continue in the same excellent grade of ore.

Deadwood—Before using the new automatic sampler for the custom ores, the equipment is undergoing a series of tests in conjunction with the old system of sampling, to determine its accuracy and, after a few further adjustments, all ores will be handled by it. The mill is running steadily, averaging 350 tons per week.

Oaks Co.—Grading is under way for the permanent shaft at the Johnson mine and plans perfected for extending the tunnel through to the end line. At the Pacific, good ore is coming from the stope and the several development headings. The Consolidated, being worked under lease from Socorro Mines, is yielding an excellent grade of mill ore.

Trilby Group—Work has just been started on this group, and it is the intention to ship ore to one of the custom mills. A gasoline hoist may be installed within a few weeks.

Mogollon Gold & Copper Co.—Arrangements have been made with one of the local plants to furnish current and an electric hoist will be installed at the Little Charlie mine.

Oklahoma

Ottawa County

Miami, with 15 mills in operation, shows a great improvement over last year, when there were only four or five mills running. It is estimated that 30,000 ft. of drilling has been contracted for, and that it is to be done within the next six months. Numerous strikes have been made in the north end of the camp, showing that the main run of ore extends in that direction.

Chapman & Lenon—The 14-in. pump installed by this company has lowered the water level by about 12 ft. in the last 30 days. The pump is throwing about 2000 gal. of water per min.

Prairie Mining Co.—After prospecting the 20-acre lease the second time, this company found 30 ft. of good lead and zinc ore in two drill holes. This was found at the depth of 225 ft. The company is now erecting a 250-ton mill and expects to be operating early in January, 1913.

Oregon

Baker County

Oversight—This property, in the Bull Run district, has been bonded to F. L. Hamilton and T. F. McGinty, of Seattle, who will start driving a 300-ft. tunnel at once.

Grant County

Maid of Oregon—This company is considering the purchase of a 10-stamp mill for the property, near Alamo, to be installed early n the spring. George W. Sherf is manager.

Utah

Beaver County

South Utah—At present, development work only is being carried on. Water was struck on the lower levels, and was left alone to see if it would rise to the 600 or tunnel level, but did not come above the 700. Some pumping is being done.

Cortez—Finley & Burke, lessees at this property, in the Star district, are still at work, and are mining some good ore.

Moscow—The new strike on the 500-ft. level is considered of much importance. The ore was cut about 250 ft. east of the shaft in the old Moscow vein. Drifting has been done for 125 ft., and the ore has measured from two to five feet in thickness. It is high-grade lead-carbonate ore, stained with copper, and assays well in silver. The south face shows ore of the same character, but the vein has not been drifted on in this direction. At present 15 cars per month are being shipped, exclusive of that from the new strike, largely from winzes and raises from the 500 level and above. Ore carrying lead, silver and copper has been opened on the 300 level. There is some talk of a new working shaft for more economical mining and development. The boilers, compressor and equipment are new, and the property is in excellent condition.

Juab County

Tintic shipments for the week ended Nov. 8 amounted to 194 cars, or about 9700 tons, exceeding the output of the week preceding by about 300 tons. There is still a shortage of cars, but it is thought transportation will be normal soon.

May Day—Shipments of zinc ore for October are stated to have left a balance of $12,000 in the treasury. The company began the month with an overdraft of about $8000, and during the month spent about an equal amount on supplies, etc. Zinc ore is being mined from between the 200- and 1000-ft. levels, and lead ore of shipping grade, running well in gold with some silver and a little lead, i reported on the 1100; 50 men are employed.

Uncle Sam—The capital stock was a short time ago increased from 500,000 to 750,000 shares, the par value remaining as formerly, $1, the company acquiring entire control of the Richmond-Anaconda, in which it already owned 400,000 out of 500 000 shares. The Uncle Sam now announces itself ready to issue the new stock to both Uncle Sam and Richmond-Anaconda stockholders. There will remain 200,000 shares in the treasury.

Gold Chain—Operations suspended a short time ago, on account of repairs to engines on the Mammoth high-line, have been resumed, at this, the Oponhongo and Mammoth mines. The output for the week ended Nov. 8 was 15 cars. New ore carrying copper with some silver and lead has been opened on the 500-ft. level.

Eagle & Blue Bell—There are two orebodies in this mine over 100 ft. apart, one carrying lead ore of good grade and the other gold and silver. These are reported on the 1350-ft. level, and the ore appears to be going down.

Salt Lake County

Ohio Copper—This company is milling from 100 to 2000 tons of ore daily. There are between 150 and 200 men working in mine and mill.

Michigan-Utah—This company's tramway has been repaired, and shipments down Little Cottonwood Cañon have been resumed.

Flagstaff—There is some talk of a consolidation of this Alta property with the Columbus Extension and the Columbus Consolidated. The properties adjoin, and might be operated through a drain and haulage tunnel, starting some distance down the cañon, which would eliminate all water difficulties.

Columbus Consolidated—This company, together with the Columbus Extension, is the defendant in a suit recently filed, alleging that these companies have extracted 25,000 tons of ore, valued at $500,000, from the Haskell claim, and three times this amount is asked.

Alta-Emerald—Work has been discontinued, on account of deep snow.

Iowa Copper—Work has been resumed at this property, in Big Cottonwood Cañon, and a contract for further development has been given.

Washington

FERRY COUNTY

Ben Hur—The shaft has been completed to the 500-ft. level and production has been resumed, ore being shipped from the second and fourth levels.

Swamp King No. 2—Work is to be resumed on this property in the Orient district. A 50-ft. shaft will be sunk.

KITTITAS COUNTY

Cougar—This mine is being operated with two shifts of men, with satisfactory results. J. H. Barry, Swauck, is manager.

OKONOGAN COUNTY

Dividend—This property near Oroville, J. C. Fisher, manager, is now on a paying basis, and improvements are being planned.

Keller & Indiana Smelting Co.—The smeltery lands and water rights of this company were sold recently at public sale to H. J. Lefever and Jasper King, of the Walla Walla Mining Co.

STEVENS COUNTY

Bornite Mining & Smelting Co.—A vein of ore assaying $6 per ton in gold and measuring two feet wide was struck recently on the 200-ft. level.

Blue Star—Mark Mitchell, operating this property under lease, will install a pump to unwater the shaft.

Imperial—Operations have been discontinued for the rest of the winter, to be resumed in March when sinking of a 300-ft. shaft will be begun.

Montezuma—Portland men are planning to resume operations on this property this month.

First Thought—Plans are being made for a mill and cyanide plant of 100 tons capacity, and construction work will be begun next month.

Aurora Copper Mining Co.—The property of this company, in the Chewelah district, is to be thoroughly developed by Spokane and Seattle men. An order has been placed by Conrad Wolfle, president and manager, for a compressor. Orders have been issued for a concentrator and a short tramway. The plant and its accessories will cost $40,000. It is proposed to have the mine ready for making shipments by spring and the mill producing concentrates in July.

Canada

BRITISH COLUMBIA

Ore production in the Kootenai and Boundary districts totaled 51,041 tons, for the week ended Nov. 9, making a total for the year to date of 2,162,902 tons. Smeltery receipts for the week were 44,756 tons; for the year 1,939,934 tons. The Lucky Jim mine at Bear Lake shipped 213 tons of high-grade ore and the Standard shipped 140 tons of zinc concentrates. Ore production and smelter receipts in detail were: Rossland, week, 1805 tons; year 209,141 tons; Nelson production, week, 1805 tons, year 60,958 tons; Boundary, production, week, 41,301, year, 1,753,165; Slocan, production, week, 2278 tons, year, 101,704; East Kootenai, production, week, 496 tons, year, 38,294; British Columbia Copper Co., Greenwood, week, 15,008 tons, year, 575,143 tons; Granby smeltery, from Grand Forks, week, 24,214 tons, year, 1,091,975 tons; Consolidated company, Trail, smeltery receipts, week, 5534 tons, year, 272,816 tons.

Payne—Three shifts of miners are driving a deep tunnel with machine drills on this mine, in the Sandon district. The tunnel will be driven to cut an orebody that yielded well on the upper levels.

Last Chance—Eight feet of gold and copper ore has been struck in this mine four miles north of Rossland; Hugh McQuade and Earnest McQuade owners. After prospecting the surface they sunk a shaft to a depth of 70 ft., using a gasoline hoist. The ore is regarded as of a concentrating grade. Development will be started in the spring.

Granby—The net earnings for October were $145,000 as compared with $181,000 for September. Despite the decrease in October it is stated that the earnings of that month were above the same month of last year.

Ajax—Reports are circulating in Kaslo that a strike of high-grade galena has been made on this mine at Ferguson Camp.

Hidden Creek—The directors have authorized F. M. Sylvester, acting general manager, who is now in Vancouver, to call for bids at once for the construction of a smeltery, at Granby Bay, Observatory Inlet, Portand Canal district, as well as for all the machinery and equipment. The mine is owned by the Granby Consolidated Mining, Smelting & Power Co. It is the intention of the company to have the smeltery ready by the end of 1913. It will have a capacity of 2000 tons daily. The equipment will comprise three blast furnaces and converters. Custom ores will be treated, and in order to encourage other branches of the mining industry, it has been decided to install a lead furnace for handling custom silver-lead ores shipped from the Hazelton district. The program calls for the expenditure of about $1,750,000.

ONTARIO COBALT

Shipments of ore and concentrates, in tons, from Cobalt for October, 1912, were:

Bailey	21.57
Buffalo	95.09
Chambers-Ferland	65.50
Cobalt Lake	123.74
Cobalt Townsite	285.33
Coniagas	158.39
Crown Reserve	37.12
Hudson Bay	30.85
Kerr Lake	90 95
La Rose	251.17
Lost & Found	17.80
McKinley-Darragh	296.77
O'Brien	107.32
Penn-Canadian	31.25
Tretheway	66.25
Timiskaming	96.51
	1,775.61

Lumsden—A pocket of rich ore has been struck on the 200-ft. level.

Penn-Canadian—A new vein, carrying high-grade ore has been discovered on the 285-ft. level.

Seneca - Superior — Shipments have started from this Peterson Lake lease. The ore in the face is about 14 in. wide, and is high grade.

Cochrane—A pipe line is being extended to this property from the Timiskaming to supply air for the drills, and as soon as this work is completed, underground work will be begun on contract by Robert Perew and David Raney.

Hitchcock—This property has passed into the hands of a Buffalo syndicate.

General Mines Co.—This company, recently organized, has taken over the Green-Meehan power plant, from which it will furnish air to the drills operating on the Red Rock.

Casey-Cobalt—David Roberts, mine captain and Charles Lundburg, miner, were drowned at this mine, Nov. 10. They were overcome by gas in a winze and fell into 4 ft. of water at the foot of the workings.

Nipissing—Ten stamps of the new low-grade mill have been put in operation.

ONTARIO-PORCUPINE

Hollinger—Diamond-drilling operations from the 300-ft. level are stated to have resulted in finding rich ore at depth. Another dividend of 3% for the four weeks ended Nov. 20 has been declared.

Dome Lake—The vein has been cut at the 180-ft. level, showing two feet of good ore.

Delora Mohawk—A contract has been let for sinking a 100-ft. shaft.

QUEBEC

Raleigh—This gold property, comprising 1000 acres, in Dudswell and Westbury Townships, in Wolfe and Compton Counties, has been acquired by a Montreal syndicate, headed by D. Lorne McGibbon. Two shafts are being worked with good results and further development is being planned.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Nov. 20—The coal markets in the West continue active, with transportation as a controlling factor. Car supply continues poor. The Lake trade is approaching its close for the season, but still takes a good many cars.

The seaboard bituminous trade is in better condition, but there is a demand for coastwise shipments which is not fully satisfied.

There is still complaint of slow deliveries in the anthracite trade. They are really behind, though not to the extent that retail dealers represent to customers for their own profit. It is doubtful whether the shortage can be made up by the end of the year.

Coal passing through the Sault Ste. Marie canals season to Nov. 1, short tons:

	1911	1912	Changes
Anthracite..........	1,769,567	1,682,355	D. 87,212
Bituminous........	11,894,878	10,937,049	D. 957,829
Total...............	13,664,445	12,619,404	D.1,045,041

The total decrease was 7.6% this year, indicating that heavy shipments are needed for the rest of the season.

German Foreign Trade—Exports and imports of fuel in German Empire, nine months ended Sept. 30, metric tons:

	Exports	Imports	Excess
Coal	23,415,270	7,421,865	Exp. 15,993,405
Brown coal....	39,788	5,397,183	Imp. 5,357,395
Coke	4,179,116	439,483	Exp. 3,739,633
Briquettes.....	2,000,724	126,752	Exp. 1,873,972
Total	29,634,398	13,385,283	Exp. 16,249,615
Total, 1911...	24,901,847	13,781,324	Exp. 11,120,523

Exports this year included 24,768 tons coke to the United States.

United States Coal Imports—Imports of coal and coke into the United States, nine months ended Sept. 30, long tons:

	1911	1912	Changes
Anthracite....	20	1,030	I. 1,010
Bituminous..........	928,311	1,185,634	I. 257,323
Coke	55,958	69,572	I. 13,614
Total....	984,289	1,256,236	I 271,947

Canada furnished this year 1,050,394 tons of coal and nearly all the coke; Australia, 108,925 tons of coal; Japan, 20,228 tons.

United States Fuel Exports—Exports of coal and coke from the United States; with coal furnished to steamships in foreign trade, nine months ended Sept. 30, long tons:

	1911	1912	Changes
Anthracite...... ..	2,625,582	2,601,631	D. 23,951
Bituminous	10,124,872	10,983,293	I. 858,421
Coke	722,621	618,450	D. 104,171
Bunker coal.......	5,012,097	5,495,719	I. 483,622
Total............	18,485,172	19,699,093	I. 1,213,921

The bunker coal is practically all bituminous. Canada took this year 10,317,787 tons of coal; Cuba and the West Indies, 1,358,013 tons; Panama, 362,277 tons; Mexico, 239,402 tons.

IRON TRADE REVIEW

New York, Nov. 20—The iron and steel trades continue in the same condition of active demand as for several weeks past. There has been little change in prices, though in some lines premiums for early delivery are called for.

Instead of the close approach of winter easing off the demand upon the mills for delivery of finished steel, the pressure has, on the whole, increased, though, of course, in certain lines, such as structural shapes and wire products, there is somewhat less pressure. In plates the increased demand for car purposes more than makes up for the seasonal decline in requirements for outside work. An inquiry for a round lot of a common size of flat merchant bars developed offers from some Pittsburgh mills to ship in five months, from others to ship in five or six, while some mills suggested eight or ten months, disclosing an unprecedented condition in this community.

Prices of the important steel products are nominally unchanged, so far as the large mills are concerned, but these prices now involve nothing but delivery far ahead. For early deliveries larger premiums are being paid, but, as a rule, buyers cannot afford to pay premiums, and thus there is little being done in prompt or early-delivery material.

The scarcity in billets and sheet bars, which seemed to have reached the possible limit several weeks ago, has grown still more acute. Prices are nominally about 50c. higher than a week ago, but practically there is no general market, as there are only occasional offerings. While the Eastern mills are occasionally selling steel for far forward delivery, the Pittsburgh and Valley mills are quoting no billets or sheet bars for next year, although there is urgent inquiry.

Pig-iron sales have been heavy, though not quite up to the October mark. There is a tendency to place larger contracts, and prices on such orders are advancing steadily.

Baltimore

Nov. 18—Exports for the week included 40,000 lb. of scrap to Leith, Scotland; 2,163,880 lb. of steel billets and 950,320 lb. sheet bars to Liverpool. Imports included 9451 slabs spelter, 3995 tons ferromanganese and 60 tons ferrosilicon from Middlesboro, England; 6600 tons manganese ore from Bombay, India, and 6000 tons from Batum, Russia; 6543 tons pyrites from Huelva, Spain; 12,150 tons iron ore from Cuba.

Birmingham

Nov. 18—Sales of pig iron for delivery during the second quarter of 1913 have been made by Southern iron manufacturers on a basis of $15 per ton, No. 2 foundry. There is a steady inquiry and the indications point to the aggregate business transacted by the end of the year caring for a large proportion of the probable make in that period. The furnaces in operation in the South, with one or two exceptions, are in good shape and promise to keep up the output that was set during October. By the end of the year, if there is no interruption in the steady trade, the yard stocks of iron will be at the minimum for the past four years. No further advance in pig-iron quotations is now being mentioned and $15 appears to be the maximum. There is a healthy home consumption, and a better demand from foundries throughout the South.

Steel prices are stronger and advances are anticipated before long in some of the shapes. Rails are being sold largely. There is also a healthy demand for fabricated steel, in steel-wire goods and in other shapes.

Cast-iron pipe prices have strengthened lately, manufacturers keeping apace with the iron quotation. Much pipe continues moving to the West.

As to sales of pig iron the Tennessee Coal, Iron & R.R. Co., the Sloss-Sheffield Steel & Iron Co. and the Woodward Iron Co. in particular are reported as having booked some splendid business for delivery during the first half.

Chicago

Nov. 19—The local iron market is unmarked by any great change; the demand for iron and steel products of all kinds continues large, with difficulty in supplying it. Pig iron continues in steady demand, with $14 the minimum on Southern No. 2 at Birmingham, which means $18.35 Chicago, and a good percentage of the sales running 50c. higher. Northern No. 2 brings $17.50@18 at the furnace, which means $18@18.50 delivered.

In general the furnaces are well sold up to the end of the first quarter and their representatives are not worried about future business. It is coming and will come, they say, without the need of their cutting prices unnecessarily or running after melters. Indeed it seems to be coming, gradually and surely; while the average melter is buying small lots often, he is looking more anxiously to the needs of the second quarter and later than the seller.

Beyond the first half there is yet no demand, through inquiries continue. Tariff talk undoubtedly influences some users of pig iron; others are cautious from force of habit incalculated by the experience of the last few months. They see ahead of their business requirements large needs of material, at the worst outlook; they show, in general, no apprehension of anything that will injure business.

Iron and steel products continue to be in large demand, the only falling off being in structural materials, naturally in less demand at this season. Railroad supplies are much sought, with trouble only about deliveries. Bar business continues large and prices are firm; for plates, sheets and minor lines the demand is steady and manufacturers are pressed for deliveries. All signs in the general conditions of business point to large and continued use of all forms of iron and steel products.

Cleveland

Nov. 18—Weather has continued good for Lake navigation. Ore shipments from docks are still delayed by shortage of cars.

Pig Iron—The market has been strong, but not especially active. Quotations, Cleveland delivery, are $17.90 for bessemer, $17@17.25 for basic, $17.25@18 for No. 2 foundry and $19.25@19.75 for Lake Superior charcoal.

Finished Material—Deliveries are a little better. New contracts coming in are for longer periods. The heaviest demand just now is for bars and plates.

Philadelphia

Nov. 20—In the pig-iron market inquiries are numerous, chiefly for next year. Sellers are holding prices firmly and no concessions are in sight. Stocks are entirely cleaned out. More furnaces would blow in, if the coke question was not in the way. Quotations are for No. 2X foundry $18.50; No. 2 plain, $18; gray forge is $17.75; basic $18.50 and low phosphorus $24 per ton.

Billets—Openhearth billets are nominally $32, but are hard to get, even at premiums.

Bars—The bar mills are crowded. Iron bars are 1.75c. and steel bars 1.85c. for any sort of seasonable delivery.

Sheets—Pressure for sheets is strong, and premiums are offered for deliveries wanted.

Pipes and Tubes—A good volume of business is being done and there is complaint of slow deliveries.

Plates—The demand is still active and early deliveries cannot be had from the mills.

Structural Material—Demand is off a little, as usual at this season. New orders are for shipyard and bridge work.

Scrap—Prices are firmly held. This week sales have been in small lots, but dealers are not worrying.

Pittsburgh

Nov. 19—The pig-iron market in the Central West is again showing an advancing tendency, with sales of perhaps 100,000 tons of bessemer and basic, a part of the tonnage being at advances of 25c., with prospects that additional sales will be made at further advances. Malleable and foundry grades have also turned very strong. The stiffness in the market is due partly to purchases by large steel companies and partly to the continued strength in coke. While prompt coke is off a trifle, sales being made at $3.90 and $4, Connellsville ovens, for prompt shipment, the inevitable scarcity at holiday time, and sales for December shipment have been made at $4.25 and $4.35. For the new year, sales aggregating 15,000 tons a month or more have been made over first half at $3.50, while at least one contract has been made at $3.25 for the whole year. Such a position in coke naturally prompts furnaces to ask more money for pig iron.

Rivets have been advanced $2 a ton, to 2.10c. for buttonhead structural rivets and 2.20c. for conehead boiler rivets. The total advance in rivets from last spring's low point is $9 per ton. At prices now quoted, deliveries can be made in 30 to 60 days, while out of jobbers' stocks sales are made at still higher prices for prompt shipment.

Pig Iron—The Jones & Laughlin Steel Co. has purchased 12,000 tons of bessemer iron at $17, Valley, for early delivery, and 30,000 tons at $17.25, Valley, for first-quarter delivery. It is understood that other transactions have been practically closed for bessemer at $17.25, Valley, and that furnaces will offer no more at less than $17.50. The Jones & Laughlin Steel Co.'s recent purchase of 10.000 tons of basic pig was incorrectly reported at $16, the price actually paid being on the basis of $16.25, Valley. Additional sales have been made at this price, and $16.50 has since been paid. At the moment it is doubtful whether $17.25 on bessemer or $16.25 on basic can be done again. Foundry iron has proved very stiff, some buyers having been forced to pay as high as $17.50, Valley, for brands desired, and malleable has also advanced. We quote: Bessemer, $17.25@17.50; basic, $16.25@16.50; No. 2 foundry and malleable, $17@17.50; forge, $16.50@17, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The scarcity of ferromanganese is growing more and more acute, nearly all consumers being short, while only occasional lots of prompt can be secured. Contract material is quoted at $61, Baltimore, but it is difficult to put contracts through. Prompt material is quotable nominally at $71@75, Baltimore, with $1.95 freight to Pittsburgh, but is not always obtainable within this range.

Steel—Sales of either billets or sheet bars are very rare and the market is quotable only approximately, although it is certainly 50c. higher than a week or ten days ago. The large mills are entirely out of the market, having absolutely nothing to offer for any early delivery, while they are so crowded that they state they cannot even see their way clear to sell for first-quarter delivery. Occasionally they promise a favorite customer that they will sell a limited tonnage for first-quarter if they can develop later that they will be able to spare it. Brokers have some steel, but they are very reserved about naming prices. There is much inquiry, but usually negotiations do not go as far as the quoting stage. We quote as approximately representing the minimum of the market: Bessemer billets, $27; sheet bars, $27.50; openhearth billets, $28; sheet bars, $28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are $30, mill.

Sheets—Specifications continue to crowd upon the sheet mills, these being largely upon old contracts made at much below present prices. Much of this business will involve delivery next year, and the average price of shipments is thus much below the present market. On the other hand, many sales for prompt delivery, which means any time this year, are being made at $2 above the regular minimum for black sheets, and $2 to $4 above for galvanized sheets. The mills which have been free sellers are fully sold up for first-quarter and fairly well for second quarter. Frequently sales are made even for next year at premiums over the regular market. Regular prices, upon which the premiums mentioned are figured, are: Black sheets, 28 gage, 2.25c.; galvanized, 28 gage, 3.40c.; blue annealed, 10 gage, 1.65c.; painted corrugated, 2.45c.; galvanized corrugated, 3.45c. per pound.

Nov. 20 (By Telegraph)—Additional sales are reported today of bessemer pig at $17.25, Valley, and basic at $16.50, Valley, which is now the market.

Lake Superior ore selling began today, with sales totaling 4,000,000 tons. Prices are $4.40 for Old Range and $4.15 for Mesabi bessemers; $3.60 for Old Range and $3.40 for Mesabi nonbessemers. These prices are 65c. higher than this season for bessemers and 55c. on nonbessemers; but are 10c. below 1911 prices.

St. Louis

Nov. 18—The pig-iron market is still active, though the volume of business is decreasing, more because most producers are sold up than for lack of buyers. Prices remain unchanged at $14@14.50, Birmingham, or $17.75@18.25, St. Louis, for No. 2 foundry. Northern iron is in good demand and is quoted at $18.50@19, St. Louis.

The demand for steel cars and railroad supplies as well as steel specialties of all kinds continues to gain strength.

Coke is getting scarcer as the season advances. This is due to car and labor shortage, and also to the large amounts of coke being used for domestic purposes this year on account of the anthracite shortage. Connellsville foundry is quoted at $6.50 and byproduct coke at $5.50@6, St. Louis.

Iron Ore Trade

Of the shipments of 7,010,219 tons of Lake Superior iron ore in October, a total of 5,913,493 tons, or 84.4%, was delivered to Lake Erie ports.

Foreign Iron Trades

British Foreign Trade—Exports and imports of iron and steel and of machinery in Great Britain, nine months ended Sept. 30, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel	£34,549,271	£9,232,320	Ex. £25,316,951
Machinery . .	24,056,385	4,995,829	Ex. 19,060,556
Hardw're, etc.	9,130,207	5,956,963	Ex. 3,173,244
New ships. . . .	4,433,042	. . . .	Ex. 4,433,042
Total.	£72,168,905	£20,185,112	Ex. £51,983,793
Total, 1911. .	65,703,649	17,377,974	Ex. 48,325,675

Increase in exports, £6,465,256; increase in imports, £2,807,138. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports	3,277,330	3,537,835	I. 260,505
Imports	1,297,988	1,432,757	I. 134,769

Exports of tinplates to the United States decreased from 12,780 tons in 1911 to 1430 tons this year.

British Pig Iron Prices—Recent quotations for pig iron in England are: Middlesboro pig, $16.11; Scotch pig, $17.55; West Coast hematite (bessemer), $19.50 per ton.

METAL MARKETS

New York, Nov. 13—The metal markets have been generally steady, with some tendency to advance.

In our table of prices last week the quotation for spelter in New York on Nov. 11, 12 and 13 was given as 7.40@7.50c., through a clerical error. It should have been 7.40@7.45c. on each day.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Sept. 1912. .	$ 568,302	$ 4,200,682	Imp. $3,632,380
" 1911. .	2,352,861	4,704,096	Imp. 2,351,235
Year 1912	43,728,274	38,789,793	Exp. 4,938,481
" 1911. .	18,263,310	45,177,106	Imp. 26,913,796
Silver			
Sept. 1912 .	6,011,221	3,648,883	Exp. 2,362,338
" 1911	4,940,391	4,161,706	Exp. 778,685
Year 1912. .	52,347,946	36,301,752	Exp. 16,046,194
" 1911. .	49,527,961	33,696,430	Exp. 15,831,531

Exports from the port of New York, week ended Nov. 16: Gold, $100; silver, $1,210,623, chiefly to London. Imports: Gold, $180,108, silver, $208,280, from the West Indies, Mexico and South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Supplies arriving went to the Bank of England, with the exception of a small reservation for India.

Iridium—This metal is still quoted at $67@70 per oz., New York.

Palladium—Supplies are still rather scarce, and $72 per oz. is quoted.

Platinum—The market seems to be improving, but prices are unchanged. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes, under date of Nov. 8, that the market and prices are generally unchanged. The demand, especially from abroad, has become better. The starateli begin to reduce work, as the frosts have set in. The offer of platinum by the starateli will diminish from now on and this will make the market steadier. The quotations are: in St. Petersburg, 37.500@37.700 rubles per pood; at Ekaterinburg, 9.80 rubles per zolotnik, for crude metal, 83% platinum—equal to $36.85 per oz. in both cases.

Silver—The market continues steady. Every decline below 29d. is followed by an advance to the even figure, so that any large demand upon the market would put price up to the figures prevailing some weeks ago.

SILVER AND STERLING EXCHANGE

Nov.	14	15	16	18	19	20
New York. . . .	62¾	62½	62¼	62⅞	62⅝	62¾
London . . .	29	28⅞	29	$29\frac{1}{16}$	$28\frac{15}{16}$	29
Sterling Ex.	4.8500	4.8495	4.8505	4.8510	4.8495	4.8455

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of gold from London to British India 10 months ended Oct. 31 were £7,998,817 in 1911, and £10,947,463 in 1912; an increase of £2,948,646 this year.

Copper, Tin, Lead and Zinc

NEW YORK

Nov.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
14	17⅝ @17¾	17.30 @17.40	50⅜	4.60 @4.65	4.45 @4.50	7.40 @7.45	7.25 @7.30
15	17⅝ @17¾	17.35 @17.45	50¼	4.60 @4.65	4.45 @4.50	7.40 @7.45	7.25 @7.30
16	17⅝ @17¾	17.45 @17.50	50¼	4.60 @4.65	4.45 @4.50	7.40 @7.45	7.25 @7.30
18	17⅝ @17¾	17.45 @17.50	50	4.57½ 4.62½	4.42½ @4.47½	7.40 @7.45	7.25 @7.30
19	17⅝ @17¾	17.45 @17.50	49⅞	4.57½ 4.62½	4.42½ @4.47½	7.40 @7.45	7.25 @7.30
20	17⅝ @17¾	17.45 @17.50	49⅞	4.57½ 4.62½	4.42½ @4.47½	7.40 @7.45	7.25 @7.30

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Nov.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
14	78	78¾	84	229¾	229¾	18¼	26⅞
15	78¼	79	84	229¾	229¾	18	26⅞
16	. . . .	. . . .	. .	. . . .	. . . . .	. . .	. . . .
18	78½	79¼	84¼	228¼	228½	18⅛	26½
19	$77\frac{15}{16}$	78⅜	83¾	227¼	227½	18⅛	26½
20	78	78¼	83¼	226½	226½	18⅛	26½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 ± 21¾c.

Copper—Beginning on Nov. 21 there was an improvement in the demand for copper and transactions were effected upon a rising scale of prices, but there has been no snap to the market. The situation appears to be that buyers have been starved into paying the price asked by the principal producers, but do so grudgingly and for no greater quantities than absolutely necessary. American consumers have not yet figured in the market to any important extent, but some millions of pounds of electrolytic copper have been sold to Europe at prices rising to 17.45@17.50c., cash, New York, or the equivalent c.i.f. Owing to the increase in ocean freight charges and the present low rate of exchange European sales net relatively less than they did a little while ago. Some small sales of Lake copper were made during the week at 17⅝@17¾c., cash, New York.

The buying by European consumers this week evidently indicates that their stocks are being depleted. The statistics of public stocks for the first half of November show a decrease of 1764 tons. Those for the second half of October had showed a decrease of 2383 tons. The purchases of this week were principally for early shipment. While there has been but little demand on the part of domestic consumers, it is generally supposed that they are not well covered and that they are likely to come into the market at any time. At the close, we quote Lake copper at 17⅝@17¾c., and electrolytic copper in cakes, wirebars and ingots at 17.45@17.50c. Casting copper is quoted nominally at 17.25@17.35c. as an average for the week.

The London market for standard copper has been more active, and transactions were of larger volume. The market advanced from £78 for spot and £78 15s. for three months on Nov. 14 to £78 10s. for spot and £79 5s. for three months on Nov. 18. It closes slightly lower at £78 for spot, and £78 15s. for three months.

Visible stocks of copper in Europe, Nov. 15, are reported as follows: Great Britain, 27,430; France, 6870; Rotterdam, 350; Hamburg, 1930; afloat from Chile, 2130; afloat from Australia, 4850; total, 43,560 long tons, or 97,574,200 lb. This is a decrease of 2780 tons from the Oct. 31 report.

Tin—The market in London developed a weaker tone, which for the want of other argument, was ascribed to the expected increase in statistics. Business continued in a desultory fashion, but in most cases was limited to small transactions. Support from this side seemed to be entirely lacking, the fact being that sellers in this market, rather than replenish their supplies, were anxious to liquidate, and in consequence sold below London limits. Business here continues in a hand-to-mouth fashion. The market closes weak at £226 5s. for spot, and £226 10s. for three months, and at about 49⅝c. for December tin.

Lead—The card price of the A. S. & R. Co. remains 4.75c., New York, but the open market is entirely in the hands of the outsiders, several of whom have steadily lowered their offers in the endeavor to interest buyers. Not only does the supply of lead seem to have increased, the advent of the International company having been a disturbing factor, but also the consumptive demand seems to have relaxed, which, perhaps, is only natural in view of the approach of winter when much out-of-doors work is suspended. At the close lead at St. Louis is quoted at 4.42½@4.47½c., and 4.57½@4.62½c. at New York.

The London market for Spanish lead is unchanged at £18 2s. 6d., and English 2s. 6d. higher.

Spelter—The market has been rather sluggish and transactions have been confined to November-December deliveries, the bulk of the business reported having been at 7.25@7.30c., St. Louis. January spelter has been offered at 7.20c., and less, but nobody has been interested in such contracts. A good deal of uncertainty respecting the market for this metal is manifested. At the close we quote 7.25@7.30c., St. Louis, and 7.40@7.45c., New York.

The foreign market is slightly lower, good ordinaries being quoted at £26 10s., and specials at £26 15s. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

It is reported that the Vieille Montagne company is making such increases in the capacity of some of its smelteries that its annual output hereafter will be about 120,000 metric tons of zinc per annum.

Other Metals

Aluminum—The market has been rather dull and prices are a little easier, current quotations being 26@26½c. for No. 1 ingots, New York. A report comes from abroad that the Aluminum Co. of America is buying up all surplus available for export in France and Germany.

Antimony—Business is quieter and the market is not so active as it has been. Prices are easier, on account of some liquidating sales. Cookson's is quoted at 10.20@10.50c. per lb., and Hallett's 9.60@9.75c. For Chinese, Hungarian and other outside brands 9@9.35c. is asked.

Quicksilver—Business has been steady and there are no changes in prices. New York quotations are $42 per flask of 75 lb., with 60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price is £7 12s. 6d. per flask, with £7 10s. named from second hands.

Zinc and Lead Ore Mareets

Joplin, Mo., Nov. 16—The high price of zinc-sulphide ore is $60, the base range $52@57 per ton of 60% zinc. Zinc silicate sold at $30@33 per ton of 40% zinc. The average price for all grades of zinc is $52.84. Lead sold on a base of $57 per ton of 80% metal, with but two lots assaying over 80%. The average price of all grades of lead is $56.34 per ton.

Weather conditions have been superb all fall for the outputting of ore, and the shipments have been heavy, rounding out the period with a shipment of over 8000 tons this week.

SHIPMENTS WEEK ENDED NOV. 16

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,931,080	.	1,148,210	$195,253
Joplin	3,226,340	...	323,720	99,463
Alba-Neck .	1,011,520	. .	44,300	30,068
Duenweg....	967,700	. .	59,450	29,274
Galena. . .	930,110	...	60,820	27,210
Granby .	231,750	803,480	14,030	20,215
Oronogo....	699,520	...	84,820	17,603
Spurgeon ...	311,410	310,450	27,870	14,155
Miami . .	329,590	. .	87,680	10,410
Cave Springs	305,540	....	4,540	8,687
Carl Junction	232,710		.....	6,748
Jackson	181,280	....	12,200	5,236
Carthage	121,390	.....	.....	3,377
Aurora......	157,440	80,000	.. .	4,216
Lawton .	65,200	.....	......	1,790
Sarcoxie...	63,380	.....	......	1,647
Stott City....	49,590	.....	......	1,240
Totals ...	14,815,550	1,193,930	1,867,640	$475,592
46 weeks....	499,425,480	31,462,750	83,062,570	$16,241,611

Blende val., the week, $402,780; 46 weeks, $13,373,412
Calamine, the week, 20,187; 46 weeks, 498,647
Lead value, the week, 52,625; 46 weeks, 2,369,552

MONTHLY AVERAGE PRICES

Month	ZINC ORE				LEAD ORE	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January.....	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February....	40.21	45.75	39.16	43.31	54.46	52.39
March.......	39.85	51.56	38.45	49.25	54.57	54.64
April........	38.88	52.00	37.47	50.36	56.37	54.18
May..........	38.25	55.30	36.79	53.27	55.21	52.45
June.........	40.50	55.88	38.18	54.38	56.49	55.01
July.........	40.75	58.85	38.36	56.59	58.81	58.83
August......	42.50	55.13	41.28	53.27	60.74	57.04
September ..	42.63	59.75	41.29	57.07	59.33	61.26
October......	42.38	57.00	40.89	55.97	54.72	63.21
November...	45.40	.....	43.25	.....	57.19	.....
December...	44.13	....	40.76	......	62.03	.....
Year......	$41.45	.....	$39.90	......	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Nov. 16—The base price paid this week for 60% zinc ore was $54@55 per ton. The base price for 80% lead ore was $58 per ton.

SHIPMENTS WEEK ENDED NOV. 16

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.........	834,470	.	. .
Platteville	661,780	....	198,000
Benton................	659,640	. ..	955,200
Shullsburg............	314,800	. ..	.
Cuba City............	240,400	. .. ..	81,000
Hazel Green........	240,000	...	.
Galena	232,900	. ...	.....
Linden	52,000	. ....	. .
Total.................	3,235,990	. ....	1,234,200
Year to date..........	176,262,170	7,218,960	33,113,410

Shipped during week to separating plants, 1,688,380 lb. zinc ore.

Other Ore Markets

Manganese Ore—The price for domestic ores as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49% or over in manganese, not over 0.20 phosphorus and 8% silica. Prices range down to 23c. per unit for 40% manganese; with deductions for excess phosphorus and silica.

New Caledonia Ores

Exports of ores from New Caledonia, eight months ended Aug. 31, as reported by the *Bulletin du Commerce,* of Noumea, were 46,555 metric tons of nickel ore and 31,261 tons chrome ore. Exports of metals were 2000 tons of nickel matte.

Chemicals

New York, Nov. 20—General trade continues good and the markets are fairly active.

Arsenic—Supplies are better and business has been quiet. The market is easier, but quotably unchanged, \$5@5.12½ per 100 lb. being asked for spot and \$4.62½ for futures.

Copper Sulphate—Trade is fair and the market is steady. Prices are unchanged at \$5.50 per 100 lb. for carload lots, and \$5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is quiet and buyers are rather holding off. Quotations are 2.60c. per lb. for all positions up to May; 2.57½c. for later deliveries.

Phosphate Rock—Shipments of Florida phosphates, nine months ended Sept. 30, are reported as below, in long tons:

	1911	1912	Changes
Hard rock	342,689	351,726	I 9,037
Pebble	1,017,593	977,035	D 40,558
Total	1,360,282	1,328,761	D 31,521

Exports have been checked to some extent by high ocean freights.

Petroleum

Exports of mineral oils from the United States, nine months ended Sept. 30, were 1,348,222,381 gal. in 1911, and 1,407,544,164 gal. in 1912; an increase of 59,321,783 gal., or 4.4%, this year.

The monthly report of the *Oil City Derrick* shows new wells completed in the month of October as follows: Pennsylvania, New York and West Virginia, 534; Lima-Indiana, 59; Kentucky, 10; Illinois, 146; Kansas-Oklahoma, 739; Texas-Louisiana, 145. In all the divisions 1633 wells were completed, having a new production of 57,857 bbl. This was an increase of 108 in the number of wells and a decrease of 3371 bbl. in new production. Of the new wells 276 were failures, and 167 were gas producers. The number of oil-producing wells was 1190. In September the productive wells numbered 1108, 1272 in August and 1092 in July. At the close of October there were 519 rigs up and 1644 wells drilling, a total of 2163. These figures show a decrease of 60 in rigs, an increase of 180 in wells drilling, and a net increase of 120. The most of the new work is found in the Mid-Continent field.

MINING STOCKS

New York, Nov. 20—On Nov. 14 there was some improvement on the Exchange. On the Curb mining stocks were more active, with heavy sales of Gold Hill and Stewart, and fair dealings in Cobalts. Braden was again prominent among the coppers.

Nov. 15 the market was under pressure and prices rather weak. On the Curb coppers were active and firm and there were fair sales of other mining stocks, including Goldfields and Cobalts. There was a sale of Comstock Tunnel at 10c. per share.

Nov. 1 the Exchange was uneasy and rather irregular. The Curb was fairly active with free sales of Goldfield Midway and some other stocks; also of Braden Copper.

Nov. 18 the Exchange was irregular and confused on a market almost purely professional. On the Curb there was fair trading in all the mining stocks at fractional declines.

Nov. 19 and 20 the Exchange continued irregular, the general tendency being rather weak. Mining stocks on the Curb were still in fair demand, but prices were unsteady, though changes were only small.

The listing committee of the New York Curb Market Association has listed and admitted to quotation the 600,000 shares of common stock, par value \$5, of the Lightning Creek Gold Gravels & Drainage Co., Ltd., as a prospect. Stock outstanding, 600,000,, and in treasury, 200,000 shares.

At auction in New York, Nov. 14, eight shares Quicksilver Mining Co., preferred, \$100 par, brought \$7 per share; 100 shares Nipissing Mines Co., \$5 par, \$7.12½ per share.

Boston, Nov. 19—Aside from a few specialties the mining-share market has lapsed into dullness and with this same weakness. Granby Consolidated continued a conspicuous feature during the week, advancing to a high price of \$77.75, or a \$6.12½ bulge with some reaction. This is Granby's highest price for over two years. La Salle has come to the fore with a \$2 advance during the week to \$6.50. This is due to reports that the Calumet & Hecla management has decided to resume exploratory operations at the La Salle property.

Both Mayflower and Old Colony maintain strength and at times are fairly active. The former is up \$1.75 to \$15.25 and the latter \$1.75 also to \$10.25. These stocks were each selling at \$2 per share a year ago. Calumet & Arizona and North Butte have been among the few active stocks. The first named rose \$2 to \$80 and the latter \$1.50 to \$38. Copper Range and Mohawk are also among the strong spots on increased dividend prospects. Quincy mining shares dis-

COPPER SMELTERS REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	August	Sept.	October
Alaska shipments	1,242,836	1,726,715	1,435,235
Anaconda	25,250,000	24,500,000	25,250,000
Arizona, Ltd.	3,260,000	3,340,000	3,200,000
Copper Queen	8,040,424	9,103,861	8,184,575
Calumet & Ariz. ..	4,514,000	4,462,000	4,1[illegible]1,000
Chino	3,485,278	3,217,369	3,638,500
Detroit... . ..	1,882,289	1,881,668	1,934,828
East Butte. ...	1,410,500	1,250,000	
Mammoth. .. .	1,802,590	1,834,937	
Giroux.	774,844	1,005,208	.
Mason Valley... ..	1,384,000	1,200,000	1,563,700
Nevada Con . .	6,551,030	5,607,578	.
Ohio	620,000	635,000	.
Old Dominion ..	2,597,896	2,204,000	2,523,000
Ray	2,902,715	2,978,404	
Shannon	1,400,000	1,142,000	1,210,000
South Utah	224,855	225,568	
United Verde*	2,500,000	2,750,000	
Utah Copper Co	11,248,992	6,616,887	. .
Lake Superior*. ..	21,000,000	19,250,000	21,500,000
Non-rep. mines*..	8,195,156	8,094,792	8,250,000
Total production	110,211,367	103,025,987	
Imports, bars, etc..	23,561,161	25,149,329	....
Total blister	133,772,528	128,175,316	...
Imp. in ore & matte	8,544,624	7,142,232	....
Total American.	142,307,152	135,317,548	. ....
Miami†	3,048,750	2,949,150	2,577,750
Brit. Col. Cos.:			
British Col. Copper	941,364		1,013,000
Granby	1,970,388	2,083,118	....
Mexican Cos.:			
Boleo†		. .	2,612,400
Cananea .	4,044,000	3,500,000	4,248,000
Moctezuma	3,229,839	771,844	3,045,667
Other Foreign:			
Cape Cop., S. Africa		678,720	757,120
Kyshtim, Russia...	1,400,000	1,750,000	. ..
Spassky, Russia .	902,720	981,120	....
Tilt Cove, Newf'd		. ...	86,785
Exports from			
Chile .	8,512,000	6,048,000	8,512,000
Australia	8,064,000	7,616,000	9,520,000
Arrivals in Europe‡	20,200,320	8,518,720	13,771,520

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
X, 1911.....	118,255,442	64,068,307	60,084,349
XI..........	111,876,601	68,039,776	67,049,279
XII..........	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912..... .	119,337,753	62,343,901	80,167,904
II......... .	116,035,809	56,228,368	63,148,096
III	125,694,601	67,187,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V.........	126,737,836	72,702,277	69,485,945
VI........... .	122,315,240	66,146,229	61,449,650
VII.......	137,161,129	71,094,381	60,121,331
VIII......	145,628,521	78,722,418	70,185,150
IX....	140,089,819	63,160,810	60,264,796
X...............	145,405,453	84,104,734	47,621,342

VISIBLE STOCKS

	United States	Europe	Total
XI, 1911... .	134,997,642	176,825,600	311,823,242
XII....... .	111,785,188	164,281,600	276,066,788
I, 1912..... .	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV.	62,367,557	136,819,200	199,186,757
V..........	65,066,029	134,176,000	199,242,029
VI...... ..	49,615,643	117,801,600	167,417,243
VII.......	44,335,004	108,186,000	152,521,004
VIII...... .	50,280,421	113,299,200	163,579,621
IX.......... .	46,701,374	113,568,000	160,269,374
X..........	63,065,587	107,408,000	170,473,587
XI.......	76,744,964	103,801,600	180,546,564

counted the increase in the quarterly dividend rate to $1.50 by advancing $4 to $90 per share.

Prices on the Curb are about steady with the most pronounced activity in the cents stocks. Butte Central, after a $1.50 drop to $6.25, recovered to $7.75 again.

Assessments

Company	Delinq.	Sale	Amt.
Alpha Con., Nev	Nov. 13	Dec. 4	$0.03
Best & Belcher	Nov. 6	Nov. 25	0.05
Buffalo, Ida	Oct. 28	Nov. 28	0.002½
Consolidated Virginia, Nev.	....	....	0.15
Crown Point, Nev.	Nov. 11	Dec. 4	0.10
Crown Point, Utah	Nov. 15	Dec. 10	0.01
Eastern Star, Ida	Oct. 12	Nov. 12	0.003
Exchequer, Nev	Oct. 30	Nov. 20	0.03
Franklin, Mich	Oct. 18	....	2.00
Laclede, Ida	Nov. 18	Dec. 9	0.003
Holy Terror, Ida	Oct. 18	Nov. 18	0.00¾
Hub, Ida	Nov. 14	Dec. 14	0.001
Hugo, Ida	Nov. 9	Dec. 9	0.001
Indiana, Mich	Oct. 16	....	1.00
Leroy Gold & Copper, Ida	Nov. 28	Dec. 28	0.002
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Melcher, Utah	Nov. 23	Dec. 12	0.02
National Copper, Ida	Nov. 15	Dec. 10	0.01
North Star, Ida	Nov. 30	Dec. 30	0.001
Oneco, Mich	Oct. 10	....	1.00
Ophir, Nev	Nov. 11	Dec. 9	0.15
Rhode Island, Ida	Oct. 31	Nov. 30	0.00½
Sierra Nevada, Nev.	....	....	0.10
Sunshine, Ida	Oct. 30	Nov. 30	0.001
Tar Baby, Utah	Nov. 2	Dec. 2	0.002½
Yellow Jacket, Nev	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	63.471	25.596	24.594	29.299
November	55.635	55.719		25.680	25.649	.
December	54.428	54.905	..	25.160	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.180	17.314	12.370	17.661	55.170	76.389
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634	..	55.973	.

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	[illegible]	43.923	October	41.185	50.077
May	43.115	46.053	November	43.125	
June	[illegible]	45.815	December	44.655	
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.655
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265	5.071	4.139	4.894	15.332	20.630
November	4.298	......	4.181	......	15.821	
December	4.450	....	4.332	......	15.648	
Year	4.420	....	4.286	..	13.970	..

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	......	6.223	...	26.795	......
December	6.301	......	6.151	.....	26.849	.
Year	5.758	....	5.608	......	25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	17.90	13.44	17.18	14.34	17.22
November	14.92	.....	13.30	.....	14.25	.
December	15.15	....	13.10	...	13.90	
Year	$15.72	.....	$13.94	...	$14.49	..

STOCK QUOTATIONS

COLO. SPRINGS Nov. 19

Name of Comp.	Bid.
Acacia	.04
Cripple Cr'k Con.	.01¼
C. K. & N.	.16¼
Doctor Jack Pot.	.06
Elkton Con.	.64¼
El Paso	5.77
Findlay	.04¼
Gold Dollar	.19¼
Gold Sovereign	.02½
Isabella	.21¼
Jack Pot	.05¼
Jennie Sample	.06¾
Lexington	.006
Moon Anchor	.01
Old Gold	.03½
Mary McKinney	.78
Pharmacist	.01½
Portland	1.04
Vindicator	.88
Work	.01

SALT LAKE Nov. 19

Name of Comp.	Bid.
Beck Tunnel	.08
Black Jack	.09
Cedar Talisman	.005
Colorado Mining	.17½
Columbus Con.	.12
Crown Point	.02¼
Daly-Judge	‡6.00
Grand Central	.78
Iron Blossom	1.27½
Little Bell	‡.75
Lower Mammoth	.04
Mason Valley	12.00
May Day	.20
Nevada Hills	1.50
New York	‡.005
Prince Con	1.70
Silver King Coal'n	3.12½
Sioux Con.	.03
Uncle Sam	.14
Yankee	‡.12

TORONTO Nov. 19

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	‡7.50	Foley O'Brien	.25
Hudson Bay	60.00	Hollinger	14.50
Temiskaming	.42	Imperial	.02¼
Wettlaufer-Lor.	.22	Pearl Lake	.23½
Am. Goldfield	‡.40	Porcu. Gold	.16¼
Apex	.01¼	Preston E. D.	.02½
Crown Chartered	.02½	Rea	.35
Doble	‡.25	Standard	.00⅛
Dome	19.50	Swastika	.08¾
Dome Exten	.09½	West Dome	‡.13

SAN FRANCISCO Nov. 19

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	8.70
Belcher	.37	Jim Butler	.71
Best & Belcher	.07	MacNamara	.20
Caledonia	.95	Midway	.40
Challenge Con.	.03	Mont.-Tonopah	2.00
Chollar	.05	North Star	.33
Confidence	.40	West End Con.	1.55
Con. Virginia	.33	Atlanta	.17
Crown Point	.52	Booth	.05
Gould & Curry	.02	C. O. D. Con.	.07
Hale & Norcross	.11	Comb. Frac.	.04
Mexican	1.75	Jumbo Extension	.30
Occidental	.71	Pitts.-Silver Peak	.88
Ophir	.53	Silver Pick	.07
Overman	.50	St. Ives	.30
Potosi	.04	Tramp Con.	.02
Savage	.08	Argonaut	‡2.00
Sierra Nevada	.27	Bunker Hill	‡4.50
Union Con.	.35	Central Eureka	.23
Yellow Jacket	.44	So. Eureka	1.50

N. Y. EXCH. Nov. 19

Name of Comp.	Clg.
Amalgamated	85
Am. Agri. Chem.	56⅝
Am. Sm. & Ref., com.	79⅛
Am. Sm. & Ref., pf.	106¾
Am. Sm. Sec., pf. B	85
Anaconda	43⅝
Batopilas Min.	1⅝
Bethlehem Steel pf.	69
Chino	48½
Federal M. & S., pf.	42¼
Goldfield Con.	2⅜
Great Nor., ore., ctf.	45¼
Guggen. Exp.	55⅛
Homestake	98
Inspiration Con.	19½
Miami Copper	28½
Nat'nal Lead, com.	59¼
National Lead, pf.	110½
Nev. Consol.	22⅝
Phelps Dodge	215½
Pittsburg Coal, pf.	91⅞
Ray Con.	22
Republic I & S, com.	28
Republic I & S, pf.	90
Sloss Sheffi'd, com.	50
Sloss Sheffield, pf.	95½
Tennessee Copper	40⅝
Utah Copper	63⅜
U. S. Steel, com.	74⅝
U. S. Steel, pf.	111⅞
Va. Car. Chem.	46¾

BOSTON EXCH. Nov. 19

Name of Comp.	Clg.
Adventure	6
Ahmeek	‡330
Algomah	3½
Allouez	41
Am. Zinc	30¾
Ariz. Com., ctfs.	4
Bonanza	.30
Boston & Corbin	6
Butte & Balak.	4 9/16
Calumet & Ariz.	78¼
Calumet & Hecla	585
Centennial	19½
Cliff	‡3
Copper Range	56¾
Daly West	3½
East Butte	15
Franklin	10
Granby	75½
Hancock	25
Hedley Gold	25½
Helvetia	.75
Indiana	17½
Island Cr'k, com.	‡55
Island Cr'k, pfd.	86¾
Isle Royale	35½
Keweenaw	2 1/16
Lake	30¾
La Salle	6½
Mass	6¼
Michigan	1¾
Mohawk	64
New Arcadian	‡2½
New Idria Quick.	5½
North Butte	36
North Lake	3
Ojibway	3
Old Dominion	59
Osceola	111
Quincy	89
Shannon	14¾
Shattuck-Ariz.	32¼
Superior	43½
Superior & Bost.	2¾
Tamarack	41
Trinity	5½
Tuolumne	2⅞
U. S. Smelting	45
U. S. Smelt'g, pf.	51¼
Utah Apex	‡1¾
Utah Con.	13½
Victoria	2½
Winona	4
Wolverine	74
Wyandot	1½

N. Y. CURB Nov. 19

Name of Comp.	Clg.
Barnes King	‡.60
Beaver Con.	42
Braden Copper	9
B. C. Copper	4⅝
Buffalo Mines	2½
Caledonia	40
Con. Ariz. Sm.	7/16
Davis-Daly	2⅛
Diam'field-Daisy	6
Ely Con.	18
Florence	74
Giroux	4⅝
Gold Hill Con.	5/16
Greene Cananea	9⅞
Greenwater	05
Internat. S. & R.	‡124
Kerr Lake	2¾
Keystone	2
La Rose	2 9/16
McKinley-Dar-Sa.	2⅛
Min. Co. of A. new	2⅞
Motherlode Gold	60
Nev. Utah M. & S.	05
Nipissing Mines	8¾
Ohio Copper	1 9/16
Pacific Sm. & M.	3/16
Puebla S. & R.	1 13/16
South Live Oak	2
South Utah M. & S.	⅜
Standard Oil (Old)	1110
Stand'd Oil of N. J.	395
Stewart	1 9/16
Tonopah	6½
Tonopah Ex.	2¾
Tonopah Merger	.95
Tri-Bullion	11/16
Tularosa	1 1/16
Union Mines	‡10
United Cop., pfd.	10
Yukon Gold	3 1/16

LONDON Nov. 20

Name of Com.	Clg.
Camp Bird	£1 4s 3d
Dolores	1 10 0
El Oro	0 17 3
Esperanza	2 0 6
Mexico Mines	6 17 6
Oroville	0 5 0
Stratton's Ind.	0 3 1½
Tomboy	1 8 9

BOSTON CURB Nov. 19

Name of Comp.	Last
Alaska Gold M.	8⅜
Bingham Mines	4¾
Boston Ely	1
Boswyocolo	.01
Butte Central	8¼
Cactus	.09
Calaveras	2¼
Chief Cons.	1⅝
Corbin	.26
Cortez	.79
Crown Reserve	3 7/16
First Nat. Cop.	2
Majestic	.43
Mazatan	‡½
Moneta Porc.	03
Nevada-Douglas	3⅜
New Baltic	1½
Oneco	2
Raven Copper	.21
Portsmouth Coal	‡.03
San Antonio	3¼
Smokey Dev.	2 7/16
S. W. Miami	5
South Lake	6
Trethewey	.32
United Verde Ext.	

‡Last quotation.

The Engineering and Mining Journal

Vol. 94 NOVEMBER 30, 1912 No. 22

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 31—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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Problems of the Petroleum Industry in California

The petroleum industry in California is relatively young, but we believe that we are correct in the opinion that it has been developed upon a more scientific basis than in any of the older fields of the United States. The engineering literature of the subject is one evidence of this. Pennsylvania, Ohio, Illinois, Kansas, Oklahoma, etc., have given us but little; California has given us a good deal. The reasons for this difference are to be found, no doubt, in the greater cost of prospecting for oil in California, where the wells are relatively deep, necessitating a large original outlay of capital; and the interest that has been taken in the industry by engineers experienced in gold, silver and copper mining, who have applied to petroleum production the principles that made them successful in their other work. Of course the California petroleum producers, like all others, have had their problems. Some of them that remain unsettled are very serious. But with customary California thoroughness, they are being considered in a scientific way. The latest manifestation of this is a report on the "Fuel Resources of California" by Messrs. M. L. Requa (chairman), F. W. Bradley and Walter Stadler, as a committee of the Commonwealth Club of San Francisco. This report, which is a pamphlet of 36 pp., is a very good treatise on petroleum production.

This committee finds the things especially menacing the petroleum industry of California to be the following, stated in the order of their relative importance: (1) Influx of water into the oil formation; (2) competitive drilling whereby one company offsets the wells of its neighbor; (3) unsatisfactory control of production by the marketing companies, permitting the production of unnecessary quantities of oil, with consequent loss through evaporation and seepage; (4) the undetermined disposition of government land. The committee recommends that the water danger be minimized by the establishments of commissions, supported by a fund of $500,000 raised by a special tax per barrel of oil produced, this fund to be placed in the hands of the State Mining Bureau and to be distributed among the various fields in proportion to their production, boards of commissioners to be elected in each field by the companies operating therein, one vote being given for each acre of land owned, these boards to elect water supervisors to carry out the existing law.

Line drilling is a recognized waste in oil production. In the words of the committee, "Line drilling, frankly, is done to get something belonging to someone else, on the theory that if not done, it will be done by the other company." If a company drills in the corner of four adjoining pieces of land, the other three corners must be drilled or their owners will lose a certain quantity of their oil. The result is four wells, three of them forced by the drilling of the first one. The committee recommends that this practice be abolished and drilling from the center of each piece of property be substituted by agreement among the property owners. The committee points out that it would be to the advantage of a company to drill from the center outward, inasmuch as the cost of operation would be materially decreased by having the wells as near as possible to a central operating plant, while the pipe lines would be of the minimum length and transportation from and to the warehouse would be minimized. The total quantity of oil extracted would ultimately be the same, with the added benefits that owners would cease drilling when the price of oil be low, without fear of having their territory drained. The committee proposes that this be accomplished by agreement, but suggests that possibly legislation can be enacted that would render such a method of drilling obligatory.

No doubt, legislation to control the water in the oil strata and to prevent line drilling would be constitutional under the state's police power. It may be argued that this would be an interference with the rights of property, but the owner of a piece of real estate is not permitted to reach over his fence and steal goods from his neighbor's property. No more should he be permitted to steal his neighbor's oil. In the latter case the difficulty is, of course, in proving the theft. The conditions of oil occurrence being as they are, it would, we think, be within the right of a state to compel owners of property to behave in such a way that they could not steal their neighbor's oil, intentionally or unintentionally.

With respect to the control of production and market conditions, the committee is pessimistic. It says: "So far as the Sherman law is concerned, or so far as any of the recent efforts at trust regulation is concerned, there have been absolutely no benefits derived for the oil producers. On the contrary, conditions have been made worse. Under existing conditions, there is no possibility of getting the marketing companies together to agree upon any uniform policy." The committee thinks that this ought to be permitted, but does not see how it can legally be done.

The withdrawal of the government land is fully approved, there being no present need for its oil. When the oil is required it will no doubt be released, probably by a leasing system. "If such a leasing system is inaugurated," says the committee, "it should be as free and unhampered by government control as possible." With this opinion we concur.

Mining Accidents in Tasmania

Under the rigid system of mine inspection that is practiced in Tasmania, the fatality rate in mining in that state has been steadily diminishing. In the period 1893-97, it was 1.527 per thousand; in 1898-1902 it was 1.411; in 1903-07 it was 1.088; and in 1908-11 it was 0.935. In 1911 alone it was only 0.762, only four men having been killed out of an average of 5247 employed during the year in the mines and smelting works of the state. Of course, the rate for 1912 will be enormously increased by the sad catastrophe that happened last month in the North Mt. Lyell mine.

Notwithstanding that, the record of the mines-inspection department of Tasmania is one to be proud of, and without doubt the accidents, both fatal and nonfatal, in mining "can be restricted and reduced," in the words of the chief inspector, "If those who control and operate the industry—government, owners and workmen alike—will unite in aiming at total prevention." Such a union of effort is certainly necessary.

It may be pointed out that under the enlightened legislation of Tasmania and the sincere and impartial execution of its laws, responsibility is fixed on the miners, as well as on the operators. If a miner disobeys the law of the state he is subject to proceedings inaugurated by his fellow employees, superintendent or any one of the state inspectors, and if found guilty is fined or otherwise punished. This is an important way to reduce accidents in mining, to reduce the number of widows and orphans, to reduce industrial charges, etc., but if this were proposed in the United States, what would the Western Federation of Miners say about it?

The Future of Slime Cyanidation

Irrespective of the recent legal decision about the slime filters, because after all it is not of great consequence to the cyanide operator whether he pay a royalty to one patentee or another (assuming the royalty always to be moderate), the earnestness with which cyanide operators, during recent years, have been seeking to avoid the use of slime filters at all, is noteworthy. In the early days of slime treatment two distinct practices, filtration and decantation, were inaugurated. The system of filtration introduced by Moore and his imitators, and the system later introduced by Merrill, proved economically superior to the decantation process, which soon was abandoned.

Yet there has always been a feeling that the filtration systems, which are of relatively high cost both for installation and operation, do not attain the acme of efficiency, and there has been a lurking suspicion that perhaps the old method of decantation might be capable of improvement. The trend of opinion among cyanide operators seems to be more and more in this direction.

One of the developments toward this end is the attempt to treat slime by the continuous decantation method, by means of which a number of changes of solution is possible. Successive thickenings and dilutions tend toward rapid solution of metals, and the avoidance of filters is hoped for by making each dilution with weaker solution, using a final extremely weak, barren solution, or water.

Where water is not scarce and weak solution can be used, as is the case of some gold ores, the system may be used without the aid of any filter at all, as successive dilutions will reduce the metal and cyanide content so that there is little loss in discarding the necessary amount which must go out as contained moisture. Where water is scarce and stronger solutions must be used, as in beneficiating silver ores, some method of recovering the greater part of the final moisture content must be found. Thickeners can be relied upon to deliver a product containing approximately 50% moisture, sometimes a little less, and some one of the simpler forms of filters, which are really not filters at all, but dewatering machines, will easily reduce the moisture content one-half.

The decantation method, or some variation of it, is being tried in several mills in different localities and some successful evolution is to be expected.

We have received from the U. S. Geological Survey some interesting pamphlets treating statistically and industrially of copper, lead and spelter in 1911. Why the U. S. Geological Survey should go into these matters is "what no fellow can find out," as Lord Dundreary used to say. There might be more excuse for them under the Bureau of Mines, which anyway is manifestly where the Division of Mineral Statistics belongs.

The custom furnaces—that is, those making pig iron for sale in that form—apparently have to face higher costs for next year. Already prices of iron ore have been advanced and other increases are promised. Ore charges will be from 15 to 20% higher than this season both for Lake Superior and Eastern ores; while the supply of foreign ores will be largely cut off by high freight rates. A more important item, however, will be in the cost of coke, which is now bringing $3.75 or $4 per ton, nearly twice as much as a year ago.

By the Way

The Ekaterinoslaff school has been made a superior educational establishment, which, like the St. Petersburg Mining School, will have full rights to confer the degree of mining engineer. Thus in Russia, says a correspondent of the *Mining Journal,* there will be three mining schools—one in St. Petersburg, one in Ekaterinoslaff (Donetz mining district), and one in Ekaterinburg (Ural district).

The last quarterly report of the Utah Copper Co. states that the production was 29,966,920 lb. of copper from 1,581,527 tons of ore, which amounts to a yield of 18.967 lb. of copper per ton of ore, or 0.9484% Cu. The tenor of the ore is given at 1.41%, which indicates a recovery of 67%. Nevada Consolidated recovered 18,405,467 lb. of copper from 797,794 tons of 1.74% ore, a recovery of 68.2%. Chino recovered 10,340,960 lb. of copper from 340,300 tons of 2.33% ore, or an extraction of 65.15%. Chino's report stated that in July the recovery was 74.84%, indicating a recovery in August and September of 61.36%. Ray reported a production for the second quarter of 8,952.074 lb. of copper from 374,609 tons of 1.72% ore, or a recovery of 69.37%, as against 68.85% for the first quarter.

The field work of the International Geological Survey along the 141st meridian—the Alaska-Yukon boundary line—from the Yukon River to the Arctic Ocean, has been practically completed. It was divided between the United States and the Canadian geological surveys. The work was commenced in the spring of 1911, and by the terms of the agreement, the United States and Canadian geologists worked to the north and south respectively of Porcupine River. This work not only gives a geological section at that longitude through the northern half of the Yukon Plateau, the entire Rocky Mountain, and the Arctic Slope physiographic provinces, but should also assist materially in correlating the geology of Alaska with that of Yukon and British Columbia.

The officers of the Hardinge Conical Mill Co. are smiling about a case of its well known and useful mill, designed only for peaceful industrial purposes, being mistaken for an engine of warfare. A recent shipment of one of these mills with its full complement of steel balls was confiscated by *insurrectos* in Mexico upon the supposition that it was some new Yankee implement of war. The mistake was evidently the result of the mill being of unusual shape, and accompanied by two tons of steel balls. The description of the hold-up and the unsuccessful efforts of the rebels to make use of their capture would make a good story if garnished with all its details. The Mexicans were willing to accept the fact that *gringo* ingenuity was responsible for some sort of trouble exterminator, but efforts to make proper use of the capture only resulted in their sidetracking the car and the placing of a guard over the unrecognized device. One thing, however, they were sure of, viz., that the balls resembled certain munitions of war with which they were acquainted. Since the first report of the detention, the *maquina infernal* has been placed and is peacefully pounding out gold, which latter we admit is the "root of all evil."

A new form of mining swindle is reported. In this instance, however, the mining company is swindled, and not the people. The federal authorities recently raided the brokerage offices of Hunter & Crane in various cities. One of the complaints was from a mining company which declared that it had been swindled out of $8500. A Pittsburgh mining company told the federal authorities that it advertised its bonds for sale and received a reply from Hunter & Crane, who suggested that it would be an easy matter to market the bonds if they were guaranteed. Then the company received a communication from a Rochester bonding company which was to guarantee the underwriting of the bonds. The bonding company obtained $5000 for underwriting $500,000 worth of bonds. The next development was the opening of negotiations by a London company for the handling of the bonds, and in order that an engineer sent supposedly by a possible purchaser might be suitably entertained, the Pittsburgh mining company parted with $3500 more. Later the company was informed that the engineer had made an adverse report. In time the company became convinced that it was being swindled and complained to the federal authorities.

Now and then we are let behind the scenes in the theater of great market movements and this always is interesting. One of the oldest and most highly esteemed of the brokerage houses trading in gold and silver in London is Samuel Montagu & Co., a former head of which was raised to the peerage as Lord Swaythling. A member of the firm also sits in Parliament. Recently his right to his seat was questioned because of participation in government contracts. The present Lord Swaythling, speaking in the House of Lords on Nov. 14, replied to the criticisms of the action of the India Office for employing his firm, Messrs, Samuel Montagu & Co., to purchase silver for the Indian Government. He said it was common knowledge that a ring was formed some time ago in India for the purpose of rigging the market in India against the Indian Government. There are only four firms that deal largely in silver in London, and three of those were acting at the time for that ring. His firm was the only exception. In the instructions given to it secrecy was made one of the chief objects in order to avoid the possible or certain rise which would occur in the market. It was informed that after the reasons for secrecy ceased to exist the India Council would probably go back to its own channels of purchase. The firm acted on the instructions of the Finance Committee, who told it sometimes to abstain from and sometimes to resume purchases. No inkling of the purchases crept out until the first shipment of silver had arrived in India. The firm was complimented by the India banks on the way in which the secrets of the India Council had been kept, and received a letter of thanks from the India Council. The House could imagine the surprise and disappointment caused to his firm by the attacks made upon it in the public press, chiefly through lack of information. He could only imagine that some of the attacks which had been made on the firm and on the Government of India had been instigated by speculators in India who, having carried their silver holdings for many months, losing interest thereon, were balked of the huge profits, not confined to the £99,000 mentioned in the House of Commons, but of the far larger sum which they expected to make from the India Council.

A course of instruction in mining has been inaugurated at the Haileybury (Ont.) high school, the first classes being opened Oct. 23. Charles Speerman, a graduate of Queens and Columbia Universities, has been appointed instructor. According to Principal W. A. Wilson, the idea is to offer: (A) Instruction to actual employees of the Cobalt district; (B) instruction to high-school pupils in elementary mining studies for the purpose of interesting them in obtaining higher education at some university; and (C) to give the youth of the district who are unable to attend college an opportunity of acquiring such technical education as will fit them to engage in an intelligent and useful manner in the chief industry of the district. The instruction to employees includes: (1) short courses; (2) night courses; (3) lecture courses; (4) correspondence courses; (5) field courses for prospectors. The principal features will occur in a single year of the high-school course, and will include the subjects of machinery, mining methods, design of mine and mill equipment, surveying, metallurgy, mining geology, petrography, assaying and business methods and administration. This is a rather large order for high-school pupils to masticate; indeed some universities have failed to convey a comprehensive idea of these subjects to their students in four years. If, however, the high-school course stimulates enough interest to induce the pupils of that district to attend a qualified university, it may serve its purpose.

Selling Prices of Lake Iron Ores

Although the settlement of rates on Lake Superior iron ore is not quite as important an event as it was 10 or 15 years ago, owing to the large proportion of ore now mined by steel companies for their own use, it is still of much interest to the smaller independents and the merchant furnaces which buy their ore. Nominally—for reasons easily understood—there is no open agreement, but the prices charged by all sellers are practically the same. This year the rates were adopted and sales of ore began with apparently little previous conference and at an unusually early date. The base for prices is the same as for several years past, 55% iron and under 0.45% phosphorus for bessemer ore; 51.5% iron for non-bessemers. On these bases the prices for 1913 are equivalent to 8c. per unit of iron for Old Range and 7.56c. per unit for Mesabi bessemers; 7c. per unit for Old Range and 6.6c. for Mesabi non-bessemers. The prices given are delivered on Lake Erie docks, and for delivery at furnace freight charges varying from $0.75 up, according to distance, must be added to get the cost at furnace.

SELLING PRICES OF LAKE IRON ORE FOR 24 YEARS

Season	Date buying movement	Season Iron Ore Prices				Iron Prices, Valley	
		Old Range bessemer	Mesabi bessemer	Old Range non-bessemer	Mesabi non-bessemer	Bessemer	Foundry No. 2
1890	Dec. 15, 1889	$5.50	no sale	$5.25	no sale	$22.15	$18.15
1891	June 1, 1891	4.50	no sale	4.25	no sale	15.15	15.00
1892	Jan. 31, 1892	4.50	no sale	4.25	no sale	15.00	13.65
1893	Mar. 15, 1893	3.85	$3.00	3.20	no sale	12.65	12.15
1894	Mar. 1, 1894	2.75	2.35	2.50	no sale	9.65	9.65
1895	Apr. 1, 1895	2.90	2.15	2.25	$1.90	9.40	9.40
1896	May 1, 1896	4.00	3.50	2.70	2.25	12.40	11.15
1897	May 20, 1897	2.60	2.25	2.15	1.90	8.35	8.40
1898	Mar. 20, 1898	2.75	2.25	1.85	1.75	9.55	9.80
1899	Feb. 1, 1899	3.00	2.40	2.15	2.00	10.30	9.75
1900	Dec. 15, 1899	5.50	4.50	4.25	4.00	24.15	22.15
1901	Apr. 15, 1901	4.25	3.25	3.00	2.75	16.15	14.40
1902	Feb. 1, 1902	4.25	3.25	3.25	2.75	15.90	15.90
1903	Mar. 20, 1903	4.50	4.00	3.60	3.20	21.50	21.65
1904	Apr. 15, 1904	3.25	3.00	2.75	2.50	13.35	13.15
1905	Feb. 1, 1905	3.75	3.50	3.20	3.00	15.50	16.00
1906	Dec. 5, 1905	4.25	4.00	3.70	3.50	17.25	17.25
1907	Nov. 10, 1906	5.00	4.75	4.20	4.00	21.50	21.50
1908	June 15, 1908	4.50	4.25	3.70	3.50	16.00	15.00
1909	May 10, 1909	4.50	4.25	3.70	3.50	14.75	14.25
1910	Dec. 24, 1909	5.00	4.75	4.20	4.00	19.00	17.25
1911	Apr. 21, 1911	4.50	4.25	3.70	3.50	15.00	13.75
1912	Mar. 20, 1912	3.75	3.50	3.00	2.85	14.25	13.25
1913	Nov. 19, 1912	4.40	4.15	3.60	3.40	17.25	17.50

We are indebted to the *Iron Trade Review* for the interesting table given herewith, which shows the prices for 24 years, the dates when buying opened and the prices for bessemer pig and No. 2 foundry iron in the Mahoning and Shenango valleys at those dates:

It will be seen that the date of first sales this year was earlier than in any other of the 24 except in 1907. The latest date reported was in 1908, when sales did not begin until June 15 of the same year. In only five out of the 24 years were sales opened before Jan. 1. The total quantity of ore sold up to date is reported at about 6,000,000 tons.

The changes from 1912 for the coming season are increases of 65c. per ton on bessemer ores; of 60c. on Old Range, and 55c. on Mesabi non-bessemers. The rates are nominally 10c. per ton below those of 1911; but there has been a cut of 20c. on rates from the mines to Lake Superior ports and of 5c. on unloading charges, so that there is really a difference of 15c. in favor of the ore sellers this year. To offset this, it is claimed that vessel rates will be higher, as well as wages at the mines; but this remains to be settled later.

Potash in Nebraska

Many shallow lakes, 50 to 500 acres in extent, occupy depressions among the sand hills of western Nebraska. At the ordinary stage of water, most of the lakes have no surface outlets. Some of them are apparently underlaid by impervious measures, which prevent the escape of the water by seepage. As a result they form a shallow evaporating pan in which large quantities of the saline materials of the tributary drainage waters accumulate and become concentrated. One of the largest of these bodies of water, covering about 400 acres, known as Jesse Lake, was visited by Mr. Dole, of the U. S. Geological Survey.

It varies in depth from 30 in. to dryness, according to rainfall and the season. When the lake was examined in May, a strip of the lake shore about 100 ft. wide was exposed and the water in the lake was about a foot deep. The shore is a brownish-black sticky mud devoid of vegetation. The lake is entirely surrounded by typical sand hills and probably it would be necessary to have a rise of four or five feet in the water level to effect surface run-off. Samples of water from the lake go from 2.9 to 3.34 grams of soluble salts per hundred parts of water, carrying 30% of K_2O. A crust from the top of a pit dug on the shore of the lake shows 47.72% of soluble salt, of which 24.97% was K_2O. Experiments are now being conducted on the ground in the expectation of marketing either the crude salt or extracting the potash and other byproducts. The extraction problems that must be solved are similar to those at Searles Lake.

International Map of the World

A world map, recently undertaken by agreement among the leading nations, is being prepared on the scale of 1: 1,000,000, one inch representing about 16 miles of the earth's surface. The map is to consist of about 1500 sheets, covering all the land areas of the world, each sheet representing four degrees of latitude and six degrees of longitude.

The first sheet of the United States portion of the international map has just been issued by the U. S. Geological Survey, and includes Rhode Island and portions of New York, Connecticut, Massachusetts, New Hampshire, Maine and Nova Scotia. This sheet, which is known as the Boston sheet, is printed in six colors and shows all the principal cities and towns, railroads, main wagon roads and other works of man, and the rivers, lakes and other water features. The different depths of the ocean are denoted by contour lines or depth curves and various shades of blue; the relief or altitudes of all parts of the land surfaces are represented by contour lines and color graduations, from pale green to brown, a different tint being used for each 100 m. of altitude. At the present rate of progress the United States portion of the map should be finished within eight or 10 years. The sheets are to be sold at 40c. each, this making a cost of $20.80 for the entire map of the United States.

Vulcan Detinning Wins Suit

The six-year litigation between the Vulcan Detinning Co. and the American Can Co., over the use of a secret process of recovering tin from scrap, has finally been decided in favor of the former by a decision of the Court of Errors and Appeals of New Jersey, the highest state court. Under the decision, the Vulcan company will recover from the American Can Co. about $600,000, representing the profits of its detinning works at which the Vulcan's process was employed. These plants were permanently closed by injunction several years ago and the judgment rendered represents the profits accruing in their four-years' operation prior to the suit. The decree allows the American Can Co. credit for the value of its useless detinning plants, of money for repairs, insurance and taxation expended.

The original suit involved the use of the sodium-hydroxide electrolytic process of treating tin scrap which, it was alleged, was divulged to the American Can Co. by confidential employees of the Vulcan.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Forbestown District, California

I have read with interest the article by Lewis H. Eddy on the Forbestown district, California, which appeared in the Journal of July 27, 1912. I am not prepared to criticize the article as a whole, but Mr. Eddy's notes on the placer deposits give the reader a prejudiced idea of the district which I believe to be unwarranted by the conditions.

In speaking of the placers of New York and Ohio flats, he states: "When the flats had been cleaned to the bedrock, the miners followed the pay toward the quartz croppings and worked up to the Miller, Shakespear and Burlington. The pay dirt of the placers was not gravel of stream origin, as is usual in placer ground, but a formation of red earth, evidently disintegrated from the quartz veins, and was worked by hydraulicking up to, but not above, the ledges." Figures as to the yield of the placers are then given, apparently as evidence of probable value of the veins mentioned.

The following are the conditions as I remember them, after an absence of several years from the district: New York Flat is the name given the stream which drains the southern part of the Forbestown district. This stream flows east of south, emptying into Dry Creek, and the waters eventually find their way into the Yuba River. In the lower reaches it passes over a hard igneous rock, but above this the bedrock is a soft decomposed granitic rock, probably diorite, and the valley widens out into a wide meadow or flat, which gives the stream its name. Ohio Flat is the name applied to the upper part of this meadow.

The first work done in this district was in the small ravines, as they could be easily drained. Some of the larger of these ravines were hydraulicked and the smaller ones were worked by sluicing and rocking. There is no tributary of New York Flat that has not been worked to its head. The larger ravines carried well washed gravel and smooth, rather coarse gold. The smaller streams carried less gravel, which was less worn, and usually carried less gold.

Sufficient grade for hydraulicking the lower part of the flat was obtained by working out the channel through the hard rock. This channel yielded but little, but the soft bedrock above was overlain by a bed of well washed medium gravel, varying in thickness up to about three feet. This gravel, I believe, yielded most of the gold of the district. It was overlain in general by about 5 ft. of blue clay and above this was about 15 or 20 ft. of sandy soil. In many places along the edge of the wash the deposit was much shallower.

After the passing of the Caminnetti act. a dêbris dam was built at the lower end of the flat and the remainder of the deposit was worked by hydraulic elevating.

It was the opinion of many of the men who worked in the flat that the immediate source of much of the gold was an old channel, which flowed practically parallel to and for a part of its course coincident with the present channel, but at a higher elevation. Where the old wash was not coincident with the present channel, it was practically all washed into it, leaving shallow diggings along the edge of the present channel. In some of these bench diggings the gold was found at or near the grass roots in a residual soil, often red from the decomposition of ferromagnesian minerals in the bedrock. The gold was coarse and smooth, some of the larger nuggets much resembling lima beans in size and shape. In some instances it was found associated with well worn quartz boulders ranging around 100 lb. in weight. These boulders, as well as the gold, were evidently the remains of a considerable wash, and while they were probably the result of disintegration of quartz veins, this is certainly not, as Mr. Eddy states, the origin of the red dirt.

Besides the veins mentioned, the drainage of New York Flat is crossed by thousands of small quartz stringers, some of which undoubtedly helped to feed the placers. In fact, I have picked specimens of free gold from one of these stringers not more than an inch wide. Another probable source of the placer gold is pockets in the larger veins of the district, of which there are several, which average of too low grade to attract much interest.

Donald Steel.

Brussels, Belgium, Oct. 2, 1912.

Penobscot Mining Co.

The report of a news correspondent under the heading of Montana, Beaverhead County, Penobscot Mining Co., in the Journal of Oct. 26, 1912, p. 810, was in error.

The name of the company is the Penobscot Mining Co. The company is not a reorganization of the old Elkhorn Copper Mining Co. The Elkhorn mine was not worked by the Elkhorn Copper Mining Co. The new company has been in existence and operating mining property since 1898. The so called new company has not purchased the mining property of the Old Hecla Consolidated Mining Co., which included amongst other claims the "Hecla" mine. It is not the intention to run any tunnel, much less a 3000-ft. tunnel, under the orebodies at a low level, as stated. Ore is at present being taken from the mine continuously. Engineers are not surveying for the tunnel nor are they making any estimates of the quality and quantity of the ore now in sight. There are more than 20 incline shafts on the vein. No arrangement has been made with the Butte Electric & Power Co., on the Big Hole River, to supply power to the mine.

J. Henry Longmaid.

Camden, N. J., Nov. 13, 1912.

The Situation in Mexico

In the Journal of Nov. 2, 1912, is an article entitled, "The Situation in Mexico," signed by L. A. Godfrey. Upon the face of it one cannot take the article as an index of the conditions existing in Mexico generally, as Mr. Godfrey has confined himself to a few statements concerning a particular camp in Chihuahua (name not mentioned), and it is readily seen that his feelings are a result of the fact that it was "his ox that was gored."

It so happens that I have been in Mexico during the greater part of the recent troubles, which began with the Madero revolution of 1910. During that time I have had occasion to travel through the north, south, east and west of this country, in populous and out-of-the-way places, both in *tierra caliente* and *tierra fria*. In consequence, I am not talking from hearsay, but from the result of personal observation, when I say that Mr. Godfrey's statements cannot be justly applied to conditions in Mexico generally. Although there have been instances, unfortunately too numerous, in which businesses, and mines in particular, have been temporarily paralyzed; it is these occurrences which have gained publicity, whereas nothing, naturally, has been said of the vast majority of the businesses which have remained undisturbed. Thus the impression has got abroad among people who have no other source of information than the press reports, that Mexico is in a condition of anarchy, or something akin to it. This is wrong, and as Mr. Godfrey himself states, "The ordinary statements issued both in the United States and Mexico concerning the situation there are absolutely false."

The articles referred to also states that, "the federals make no effort to protect the mines," and that, "they are doing absolutely nothing toward the reëstablishment of order in the country." It states further that, "neither has he" (President Madero) "attempted to do anything."

The foregoing is notably untrue, as at two mines where I happened to be recently, the federal soldiers promptly garrisoned the property when the rebels threatened to attack. I could give further instances where, to my positive knowledge, the federals have furnished complete protection for mining properties which were menaced. Further, the prompt apprehension of Bernardo Reyes, the suppression of the Vasquez Gomez and Orozco revolutions, and finally the speedy crushing of the momentarily feared Diaz revolution in Vera Cruz, are surely adequate proof of what President Madero and the federal soldiers are doing toward the reëstablishment of order in the country.

Now while I do not claim that Mexico is enjoying absolute peace, I do most confidently affirm that, except in a few places, Mexico is a perfectly safe place for anyone who wants to come here and attend to his business. Let us be fair, and not permit sound judgment to be overbalanced by a passing emotion.

If the condition of the country can be at all judged by the condition of its chief industry, the following figures will be of interest, and may surprise some. The production of silver, which is Mexico's chief mineral product, as shown by exportation, during the first 11 months of the fiscal year 1911-12, shows a gain of $10,067,159 over the production of a similar period of the previous year, and the gain in production of copper, as shown by exportation, during the first 11 months of the fiscal year 1911-12 over the production during a like period of the previous year was $7,902,673. Although there was a falling off in the production of some of the other metals (notably gold), the aggregate production of all minerals during the first 11 months of the last fiscal year shows a net gain of $10,770,302 over the production during a like period of the previous year. Also, the value of exports during the last fiscal year show an increase of $12,400,000 over the previous year, and the value of the import duties during the same period, to quote the Minister of Finance, "exceeded those of the previous year, which may be considered as a normal year, in spite of the revolution, by about $2,000,000."

The foregoing statements are facts taken from the latest statistics, and far from indicating that, "Mexico is a disagreeable and dangerous country to live in," it indicates that it is making good progress in mining and nearly all other lines of business, which, of necessity, argues the prevalence of peace rather than danger. It is better for business men to go by the facts than to go by a "hunch," or someone else's distorted opinion.

Can anyone point out one specific instance of good that has resulted from all this "calamity howling?" Emphatically, no. Then let it be stopped, and do not try to scare people away who are anxious to come and cast their lot in this wonderful country which Humboldt so justly characterized as "the treasure house of the world."

ALBERT E. BLAIR.

Naica, Chih., Nov. 13, 1912.

Who Is a Mining Engineer?

Once more we hear the call of the wild, "Who is a mining engineer?" Instead of the old admonition, "Thou shalt not call thyself a mining engineer unless we (Broadway, etc.) give you our gracious permission to do so," we have this: "Take the chart and see just what you are and what your relative position is among your colleagues."

For the last day or so our staff has been a house divided against itself, as to whether Mr. Lamb's article was intended as a serious effort or whether we were merely given something to amuse ourselves during the winter evenings. Whatever was the motive it has afforded us some diversion from the routine of daily work, in establishing the "relative positions" of our friends.

This chart has in the last few days added (on paper) several new geniuses to the mining engineer's Hall of Fame, who otherwise would have been met by the "no admittance" sign, and no doubt several very capable engineers have lost their prestige by the selfsame chart.

As the chart practically disregards experience and ability, evidently money and publicity being considered more of an asset in the makeup of a successful mine manager, then by this means it is possible to create a "topsy turvy" world among members of the mining profession, which condition would be accurately expressed by the words of Smoke Bellew's partner, "Two and two don't make four no more."

While publicity is considered rather an important factor in determining the standing of an engineer, the notoriety given an engineer through the medium of either the technical or daily press owing to his connection with propositions not bearing the stamp of approval would, of course, lower his professional standing, but by the chart he could still maintain his standing. This would truly be a land of honey when the culprits and four-flushers could pat themselves on the back and say, "I am all right; look at the chart and see."

I would suggest that in order to make the chart complete and thoroughly effective, the experience factor be reduced to London, Boston and New York, also that a factor of social requirements and personality be added, so that the candidates who are to be admitted to the holy of holies of the engineering profession can be duly prepared. The scale can be arranged something on the order below.

Does the candidate dance?

Play bridge (poker is for the uncultured)?

Part his hair in the middle?

Wear a monocle?

Can he eat a seven-course dinner without getting excited?

Is he a social lion, etc.?

50% added for general etiquette.

The old chart, which has given good results in the past, ran something like this:

Can he get maximum results and efficiency with a minimum-cost sheet, consistent with good mining.

Missouri, Nov. 21, 1912 S. P. G.

[We incline to the opinion that Mr. Lamb intended to be amusingly ironical and that his spirit was of jest.—EDITOR.]

Scaling of Magnesia Brick

The general opinion on magnesia brick seems to be that expressed in the article "Copper Blast Furnace Settlers," in the JOURNAL of Oct. 12, 1912, that is, that the brick is subject to highly destructive scaling. This can be prevented in great measure by keeping moisture from these bricks; and, by avoiding sudden changes of temperature in the furnace, even when the bricks are laid in the old-fashioned way, in dry, powdered magnesite. In laying bricks dry, be sure that they are dry, and not dampened by a leak in the brick-shed roof. I have seen this cause spoil several expensive furnace bottoms. However, when the bricks are laid, using sodium-silicate solution and magnesite powder, magnesite walls stand up about as well as do the old-fashioned clay brick, so far as spalling goes, and, of course, much better, when fluxing action is considered.

It is also my opinion that many persons get discouraging results from magnesia brick because they do not take the precaution to lay them away from contact with silica. Whenever magnesia courses must be topped with silica brick, a course of chrome brick between them is imperative. I am reminded by this that I once tried powdered silica to lay magnesite bricks in, thinking a fluxing bond would be produced, but the results were not good. This may not have been due to any fault in the theory, however, but to some defect in its application.

J. A. THOMAS.

Pittsburgh, Penn., Nov. 23, 1912.

Righting the Calaveras Dredge

By Lewis H. Eddy

Due to the breaking of rotted planks in the hull, the 5-cu.ft. Calaveras dredge sank and overturned; the bow was left hard on bottom and the stern on the tailing pile, with no support amidships, resulting in severe racking. After lowering the water in the pond and pumping the hold dry, open seams were calked and the dredge floated to level ground where the hull was straightened and other repairs completed.

The 6-cu.ft. gold dredge operated by the Calaveras Gold Dredging Co. on Calaveras River at Jenny Lind, Calaveras County, Calif., resumed digging in March, 1912, after undergoing repairs and partial reconstruction necessitated by sinking and overturning. The history of this dredge is interesting in illustrating the relative life of steel machinery and wooden hulls in gold-dredge operation. Eight years of almost constant digging and two serious mishaps have demonstrated the remarkable strength and durability of the wooden hull and its capability for withstanding extraordinary and unusual strains.

IN OPERATION SINCE 1903

The dredge was designed and constructed especially for this field in 1903; it was operated constantly until 1906 when it was beached by flood; again in commission from 1907 to 1911; was sunk, overturned, and badly racked in 1911; righted and repaired, and in 1912 is again in active digging. Barring further accident the dredge is good for the three or four years that will be required to complete the overturning of the 60 acres that remain of the 200 acres in the original holding of dredgeable land by this company in the Jenny Lind field.

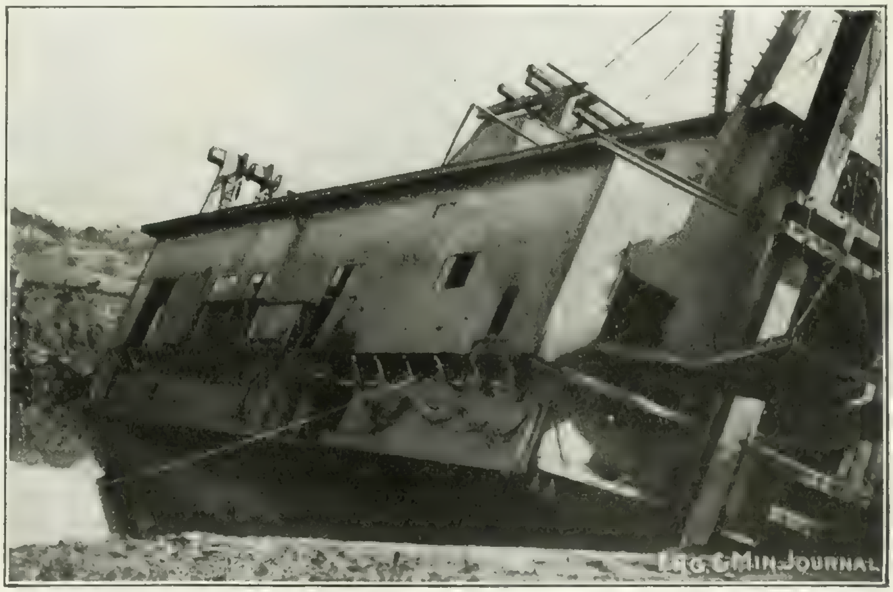
The hull is 96 ft. long, 36 ft. wide, 7 ft. deep. The digging ladder is of the plate-girder type, equipped with 77 5-cu.ft. close-connected Bucyrus buckets, designed to dig 36 ft. below the water line. The stacking ladder is 85 ft. long, carrying a belt conveyor 30 in. wide and 185 ft. long. The spuds are 50 ft. high; one is of wood and one of steel. The machinery was manufactured by the Bucyrus Co.; the dredge was constructed by the Western Engineering & Construction Co. The old style shaking screen and gold-saving tables are still in use. The dredge is electrically driven, being equipped with six Westinghouse motors. A total of 214 hp. is used; electricity is supplied by Western States Gas & Electric Co., of Stockton. The average depth of gravel excavated is 25 ft., and the maximum depth is 30 ft. The gravel is coarse, and a large part is overlain with hydraulic tailings.

BEACHED BY FLOOD IN 1906

On Dec. 10, 1906, the flood water in Calaveras River at the point where the dredge was operating raised 10 ft. and fell 7 ft. within 18 hr. The topography of the dredging land is flat; the river having a high bank on the opposite side, there was a heavy flow of flood water into the flotation pond carrying with it gravel from the tailings pile, filling and destroying the pond, and moving the dredge out of position. The ebb flow left the dredge aground with one side of the hull standing three feet higher than the other. In order to clear the ground and rebuild the flotation pond it was necessary to divert the course of the river. Recurrent floods continued through the early spring of 1907. When the dredge was again floated and ready for digging the electric power was shut off, owing to disturbance of the power plants and pole lines between Jenny Lind and Stockton. These disturbances continued for a month after the boat had resumed digging. In all this racking and twisting of the hull of the dredge, afloat and aground, no costly damage resulted; but constant attention and labor were necessary to save it from greater damage. The unusual strain of withstanding the heavy movement of the water and the grinding on the gravel proved the superior strength of the wooden hull construction. Following these interruptions the dredge operated until October, 1911.

DREDGE OVERTURNED IN OCTOBER, 1911

On Oct. 20, 1911, at 7 a.m., the dredge was sunk in 18 ft. of water, port side down, at an angle athwartship of 27° from the water line, the stern standing 3½ ft. higher out of the water than the bow. The bow was hard on the bottom of the pond, the stern resting against the tailings pile, and the port side was hard against the bank of the pond. The solid support at bow and stern, with no support amidship, caused the decks and side timbers to hog to the center. When the boat was beached and stood on level keel, measurements were made showing that the bow decks stood 3 ft. 5 in. above the water line; the stern deck 2 ft. 2 in. above, and the center 1 ft. 2½ in. above. Thus the center line had sagged 2 ft. 2½ in. in a length of 48 ft. from the bow, and 1 ft. ½ in. in an equal length from the stern. The cause of the sinking was the breaking of rotted planks in the port side of the hull.



STERN VIEW OF CALAVERAS DREDGE AFTER WATER LEVEL IN POND WAS LOWERED

The accompanying halftones illustrate the most interesting positions of the dredge: (1) A stern view after most of the water had been pumped out of the pond, showing the steel spud down; (2) stern view, the steel spud down, the wooden spud partly down, and the lower end of the tailing stacker hanging from the center; (3) bow view after the boat had been floated, showing the bow gantry, the twist in the digging ladder, and the 6-in. pump installed on the forward starboard deck used in keeping the bow end free from water after getting the boat on comparatively even keel.

WATER PUMPED OUT AND SEAMS CALKED

The sinking of the boat toward and against the bank of the pond prevented it from turning completely over broadside, as no doubt would have occurred had the boat gone down in the middle of the pond. The first essential was to lower the water in the pond, which was done with a 5-in. centrifugal pump. When the water had been lowered about 10 ft., all the leaks in sight on the sides and bow and the forward deck were calked.

By means of a 6-in. pump installed on the starboard bow the hold was pumped dry. All seams found open were calked with oakum, and in addition strips of canvas four inches wide were used to cover all seams on the port side, the port bow; the starboard side, which was leaking worse than other parts, was entirely covered with canvas. The stern was also covered with 4-in. strips of canvas, and any leaks found in the bottom of the hull were similarly stopped. A 6-in. sand pump was then installed on the bow on the starboard side.

A 5-in. pump and a 2-in. pump were installed at the middle of the starboard side, and the filling of the pond was begun. Steel guys were made fast one each to the bow gantry, the middle gantry, and the steel spud, and pulled tight with chain blocks. Before the boat was floated both the steel and the wooden spud were pulled with a hand-winch. The water was turned into the pond on Nov. 25, at 2:15 p.m. In the meantime the tailings pile was leveled with team scrapers forming a bench 150 ft. long by 60 ft. wide with the purpose of floating the boat over the bench and beaching it in order to facilitate the work of straightening the hull and adjusting the machinery. It was questionable whether this could be accomplished, owing to the large quantity of sand; it was necessary to place brush on the tailings pile in the path of the horses as the work progressed to keep the teams from miring. By this method the bench was completed and ready for the boat when the water was deep enough to float it.

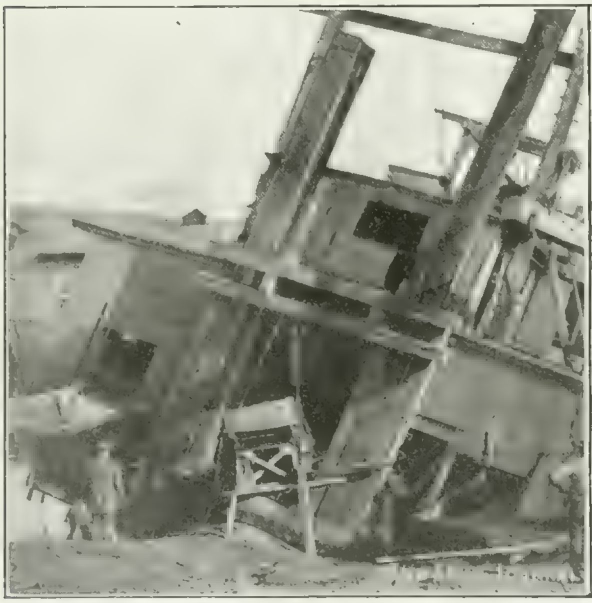
PLACED ON LEVEL GROUND AND STRAIGHTENED

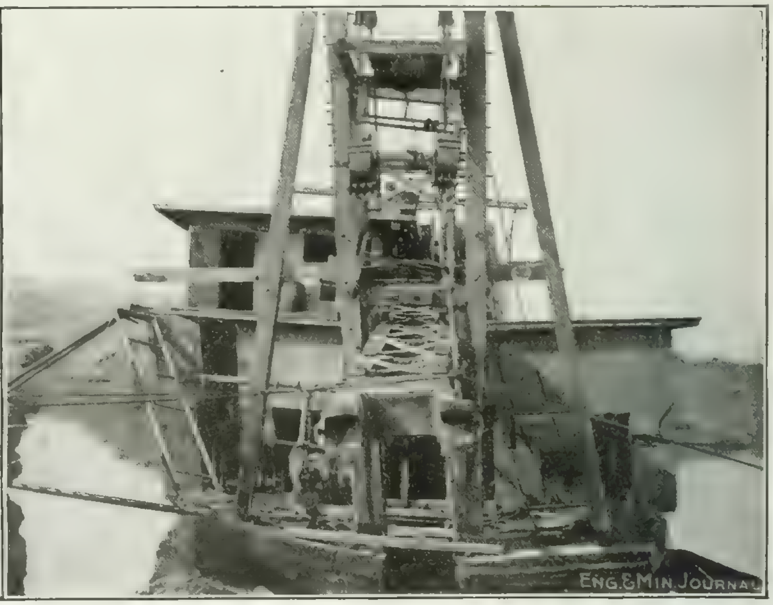
On Nov. 27, at 9.20 p.m., the water was six feet deep over the bench. Then the turning of the dredge was begun; this was done entirely by hand, as electric power could not be conveniently applied. The boat was turned and stood in 7 ft. 4 in. of water over the bench at 1:30 a.m. on Nov. 28. The water was then pumped off the bench and only the water in the original flotation pond remained. This was done with the same 10-in. pump that was used to lower the water in the pond in the beginning of the work of righting the dredge. The dredge was then beached on a level keel in the sand and the bottom kept wet with a pump. In some places it was necessary to dig under in order to do some of the work on the hull.

After getting the dredge on the sand the hog straightened, the bow and the stern settling down and the center returning to place. The hogging of the hull did not break any of the members forming the hull construction, owing directly to the expedition with which the boat was righted from the position in which it went down at sinking. However, the class of material and the workmanship in a large measure must account for the excellent condition of the hull after withstanding of the extraordinary strain on the center of the structure for 39 days. Add to this the eight years of digging strain and the strain of meeting the flow and ebb of the flood of 1906 for two or three months, and the record seems remarkable.

When I visited the dredge in the early part of February there were no evidences of the effects of the hogging; the repairs on the hull were completed, and the entire hull structure was being covered with a second coating of crude oil. Except for the absence of some of the machinery parts which had not yet been put in place, the appearance of various new pieces of plank and timber used in the repair of the boat and the fact that the dredge still stood on the bench instead of being afloat, there was no evidence that it had been racked and out of commission. The port pontoon also straightened after the dredge was beached.

The righting of the starboard pontoon was done by chaining down, and the replacement was an improvement on the former position. The dredge was floated in February, 1912; the replacing of the machinery was completed in the following month.


STERN VIEW SHOWING STEEL SPUD DOWN AND WOODEN SPUD PART OF THE WAY DOWN



BOW VIEW OF THE CALAVERAS DREDGE AFTER BOAT WAS FLOATED

REPAIRS TO HULL NECESSARY

The repairs varied from the renewal of whole parts to the replacing of planks and stubbing the posts. The entire stern was rebuilt, the planking and inner timbers, with the exception of the bottom log, which was sound, being replaced with new. On the port side three new side planks were put in, extending from the stern forward for a length of 80 ft. On the starboard side five new planks replaced the old ones extending from the stern forward for a length of 70 ft. In the well hole on the port side four planks were replaced with new, one for the full length of the well hole, 50 ft., and three for a length of 20 ft. each. On the starboard side of the well hole five planks were replaced with new, one 50 ft. long and four 25 ft. in length. Two bottom planks in the well hole were replaced, one on each side.

The bulkhead back of the well hole was rebuilt. A new bow was built on the starboard pontoon. Some of the vertical posts were rotted at the lower end; these were stubbed at the lower end to provide a nailing surface, and in each repair of this character the stub and the end of the post were given a coat of crude oil; new planks were placed under the posts where they were found to be decayed. The two main posts of the bow gantry were stubbed at the lower end; some of the middle and the stern gantry posts were stubbed, others were found in good condition and required no repair. New decks were laid on the forward pontoons, and a new deck was laid from the tumbler gantry to the stern. The boat was also strengthened by trussing of members that in the building of the dredge were not considered necessary to be trussed. A truss was put in on the forward deck just forward of the deck housing, with two truss rods to hold the two pontoons in place and prevent sagging. A truss was put in the tumbler gantry; the truss rods extend down to the bottom timbers to hold the after-end pontoons in place.

Thorough inspection and overhauling disclosed rotted planks and timbers, chiefly at the joints of plank ends and the abutting of the lower ends of vertical timbers with deck planking or the edges of other timbers. The ends of timbers and planks naturally showed greater decay than edges of timbers and sides of planking, as the moisture is more readily absorbed through and along the course of the arteries, that formerly carried the sap or moisture of the live timber, than across the grain. It was observed that in no case where oil or grease from the machinery had penetrated the joints of connecting wood parts was there evidence of decay. But where there was no oil the timbers or planking were decayed whether directly exposed to dampness or not.

Timbers Treated with Crude Petroleum

In the repair work crude petroleum was used at all joints of vertical timbers with deck planking and at all splices of gantry timbers; and the entire hull inside and out was given two coats of petroleum. The petroleum was applied hot to give it deeper penetration. It is common practice in dredge building to use preparations containing petroleum as preventive of decay of wooden parts. In some of the specifications for dredge construction white lead is required to be applied to all joints. The use of crude petroleum is not unknown, but it has not become popular with dredge builders, probably because it is not a clean material to handle. There is no question as to its value for the purpose; nor as to economy. The cost of the petroleum used on this dredge was about $3; two 100-gal. drums, or about 4½ bbl., were sufficient.

In its reconstructed state, patched with new wood and spotted with black crude oil, and a black hull, the dredge is not now the attractive craft that was put in commission eight years ago; but it has the appearance in all its parts of being fit to withstand all ordinary strains of digging for even a longer period than will be required to finish the present field. At the time this dredge was constructed steel hulls were not considered; and though the wooden hull built for this construction, as shown by its remarkable history, was a model in many features, there has been such advancement in hull building that there seems to be no special or urgent demand for the innovation of the steel hull. Yet both the steel and the wooden hull have their places in the economy of dredge construction, but it is doubtful that the steel hull will supersede the wooden hull in the construction of dredges of 5- to 7-cu.ft. bucket capacity, especially where the field is limited to 10 or 12 years' digging for a single dredge.

The history of this dredge is, perhaps, the best illustration in California of the economy and durability of the wooden hull for this class of dredge. In the construction of dredges of 9- to 15-cu.ft. future practice will in all probability demand all-steel construction; and for shipment to countries where dredging lands are situated apart from timber-growing sections the steel hull may be demanded for all dredges. The head office of the Calaveras Gold Dredging Co. is in the Alaska Commercial Building, San Francisco. S. A. Moss is president; G. H. Sharrer, of Jenny Lind, is superintendent in the field.

Railroad Rates on Dynamite

In complaints filed against the Louisville & Nashville R.R., the Interstate Commerce Commission has decided that the rate charged on dynamite from Knoxville to Copperhill, Tenn., is exorbitant, and that the railroad must not charge more than the ordinary first-class rate on such shipments after Dec. 5 next.

In this case all of the shipments moved from Knoxville to Copperhill over the line of the Louisville & Nashville R.R. and charges were assessed thereon at a rate of 96c. per 100 lb. This charge is the double first-class rate applicable from and to those points. Complainant contended that any charge based on a rate higher than the first class is unreasonable because in official classification territory the maximum rate for the transportation of dynamite in carloads is the first-class rate, except as to some points on the New York, New Haven & Hartford R.R., where commodity rates are published approximately equal to one and a half times the first class; that the same is true in Wisconsin, Minnesota, Kansas, Nebraska, Oklahoma, Colorado and Texas; that from and to many points the rates are less than first class; and that in the Southeastern territory the first-class rate prevails except as to the local rates on the Louisville & Nashville and the Nashville, Chattanooga & St. Louis railroads.

It was further contended that, with the element of danger eliminated, dynamite, in view of its bulk in proportion to weight, easy handling, its loading capacity in the car, and its value, would properly be rated with articles taking the fifth-class rates, or approximately one-half of the first-class rate. If this is the proper classification when dynamite is charged at the first-class rate the charge is one-half for risk or insurance and one-half for transportation service; and when double the first-class rate is assessed the insurance charge becomes 300% of that for transportation.

Early History of the Bessemer Process

Some interesting early history of the Bessemer process is given by F. P. Wellman, in the *Journal* of the Cleveland Engineering Society, November, 1912. The information presented by him was received at the time of a visit he made to Sir Henry Bessemer, in company with Andrew Carnegie. Bessemer explained that the reason he was first induced to think of an experiment with a new process of iron making was the knowledge which came to him that the emperor, Louis Napoleon, was seeking a material to make better artillery than was then in use.

Bessemer's first idea was that he could make an improved wrought iron by blowing air through the liquid iron, instead of stirring it with a rabble to bring it in contact with metallic oxides, as was the practice in the puddling furnaces. To carry out this idea, he constructed a small stationary converter of firebrick. This was about three feet inside diameter, and much more in height. The pipes, or tuyeres, entered at the side not much above the bottom. They were all connected with the blast box, which encircled the converter, a pipe leading from this to the blowing engine.

The converter was covered and the hole in the side, near the top, was left as an outlet for the flames. When it was finished he sent to the iron store for a ton of pig iron—no other specification, anything would do so long as it was pig iron. Here was Bessemer's lucky day

He knew nothing at that time about the chemistry of iron or what composition was necessary in the iron to make good steel, so it was pure chance that it so happened that the iron, "Blaenavon," sent to fill this order was the only brand made in all England at that time that would have made good malleable steel under the conditons by which it was made. It was low in phosphorus and sulphur, high in silicon, and contained a little manganese.

So the first trial was successful in making a metal that when tried in a neighboring iron works rolled and hammered successfully. The bars were treated in many ways, both hot and cold, and proved to be so strong and tough that it created a great deal of interest in all who saw it. Bessemer said that if the steel had been made from any other brand of iron made in Great Britain that the result would surely have been a worthless metal, brittle and rotten at all temperatures, and that he would have abandoned the experiment at once. Certainly, it was a lucky chance that he sent to that particular iron dealer.

Wallaroo & Moonta

The report of the Wallaroo & Moonta Mining & Smelting Co., for the half year ended June 30, 1912, is an unusually important one, in view of the alternatives to be laid before the shareholders at the annual meeting: The abandonment of mining operations at the Moonta mine or the expenditure of about £7000 on development prospecting, says the *Mining Journal.*

In introducing the subject to the consideration of the shareholders, the report states that for many years the underground operations at this mine have been gradually contracting, owing to the working out of the ore ground and the declining value of the ore. The reports submitted to the shareholders of this company in March, 1891, show that even at that time the Moonta lodes, with the exception of Taylor's and Hogg's, were rapidly deteriorating in depth, and since then reference to these yearly reports will show an almost continuous record of gradual impoverishment and of unsuccessful exploration.

The available quantity of payable ore ground now left in the mine, so far as it has been opened up, is estimated to be only about 40,000 tons, of from 2 to 4%, yielding about 1000 tons of fine copper during the next 18 months, provided no serious difficulty occurs in the working of Taylor's remaining arches and a regular output can be maintained. The point has now been reached when, under existing conditions, it must be a matter for serious consideration whether closing the underground operations must not be regarded as an early possibility, contingent always on the price of copper and on any discoveries that may be made in the meantime. As to the latter possibility, there are certain parts of the mine which, although of no very great promise, yet possess a certain speculative value, and the directors have had under consideration for some time whether any of these places should be tested for payable ore ground before underground operations are suspended.

It is pointed out, however, that in the event of the mine being closed down, large quantities of slimes and tailings remain for treatment, from which it is estimated that an annual output of 600 tons of fine copper could be obtained for a period of at least five years by the cementation process, the operation of which has been quickened and improved by the ploughing operations in connection with the slime treatment.

The reports from the Wallaroo mines are that the deeper levels retain their productiveness, and though cementation has not been successful here the unit of flotation plant has been very satisfactory, raising the general recovery of metal to over 90%. At this mine also there are a large amount of tailings heaps, amounting to over 200,000 tons of material, from which it is estimated that 1000 tons of copper should be recoverable per year. The total output for the six months from the Wallaroo and Moonta mines was respectively 2116 and 417 tons of fine copper. It will be seen, therefore, that provided new plant is installed to a sufficient extent, there is no reason to suppose that the output of copper by this company need show any decline in the next few years.

The directors, however, observe: "It is questionable whether, even at the present price of copper, with these reservations from their profits, the directors will be able to undertake any great speculative work at the Moonta mines, and at the same time maintain the present rate of dividend to the shareholders."

New Russian Mining Laws

The Mining Department has decided to introduce a change into the Russian mining statutes in order that the real manager of mining work may possess technico-scientific qualifications insuring safety in working, says the *Mining Journal*, Oct. 26, 1912. It is proposed that all mining operations shall be divided into three categories. Managers of the first, most dangerous, category must be exclusively Russian mining engineers. But the responsible persons in the management of the second and third categories may possess only average or lower-class education. At the same time criminal responsibility will be more stringent for breaking the safety laws on mining operations, including imprisonment for two years, with deprivation of certain special rights and privileges.

Price of Osmiridium

In the report of the Tasmanian Secretary for Mines, for 1911, is given some interesting correspondence concerning the price of osmiridium. Certain of the Tasmanian osmiridium miners complained that the local buyers were only giving them about £7 per oz. for the metal and were selling it in London at about £20 per oz. This led to the following communication (slightly abstracted) from the Agent General in London.

The principal firm in London dealing in osmiridium states that it is utterly impossible for it to give a quotation on the metal without risk of being entirely misleading. There is probably no other mineral which varies more in its composition, even in the highly concentrated state, than osmiridium, and transactions in this mineral are invariably based upon each parcel for itself. Even an analysis affords no reliable basis for negotiations, inasmuch as the physical properties, such as size of grains, enter as a factor into the calculation of value.

From one of the Continental firms he received the following reply: The value of osmiridium depends upon the current demand for its constituent metals. The offer of one of these constituent metals on the market in any quantity lowers its price to an unprofitable degree, and as a result the refiner is left with stock for which it is difficult to find purchasers. Furthermore, this ore can only be valued after analysis of each consignment, as the metals of the platinum series which it contains are present in variable proportions. It cannot find a ready market similar to that for platinum ore, which is purchased according to its richness in platinum, a metal in regular use, in the same way as is done in the case of gold ore.

Osmiridium is of higher value if the shape of the grains is such that they can be used for pen points, although in Europe osmiridium is usually bought in order to extract the metals of the platinum series. As there is hardly any fixed market price for the rarer metals of this group, the price of osmiridium varies greatly.

In February, 1912, the price was between 3½ and 5½ marks per gram. It may be pointed out that this quotation, 3½ to 5½ marks per gram, is not far from the price of £7 per oz., stated to be obtained for the material in Tasmania. Inquiries of two firms of pen makers as to the price they are paying for osmiridium state that in April, 1912, they were paying about £11 per oz. for pen points. This price for special material is not a great advance on the £7 for the raw osmiridium from which it has to be selected.

Details of Practical Mining

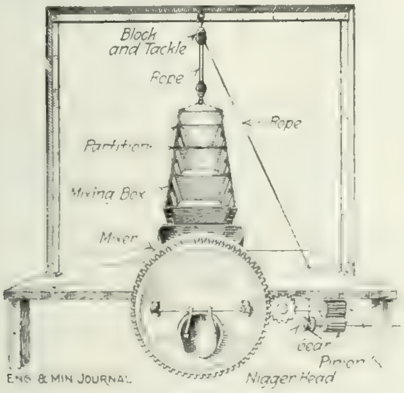
Accounts of Useful Ways of Doing Many Things in the Day's Work

Box for Measuring Concrete Mixtures

By J. R. McFarland

At the Giroux Consolidated Copper Co., Kimberly, Nev., trouble has been experienced in getting an accurate mixture for concrete. The available labor was ignorant and could not be depended upon; even should the men get the right number of wheelbarrow loads the amount would vary according to the energy of the individual.

An arrangement has now been made which assures an accurate mixture. A water-tight box is constructed of boiler plate with gates or partitions provided to slip into slots in the sides and divide the box off into compartments to give the different mixtures, as 1:3:5 or 2:4:6, etc. Each compartment must be filled, and it is easily seen before dumping whether or not the batch is of correct mixture.



Box for Measuring Concrete Mixtures

The box being filled, the partitions are lifted out and the rear of the box tipped up, allowing the batch to run into the mixer. An original idea was designed for tilting the box. A block and tackle is attached to the rear end of the box at the bottom from the framework overhead. The rope runs under the platform and over a couple of rollers to a "nigger head," fitted on an extension of the engine shaft, as seen in the accompanying drawing. The end of the rope is given a couple of turns around the nigger head. When it is wanted to dump the materials from the box to the mixer, the engineer pulls the end of the rope tight enough to give it the friction necessary to lift the rear of the box by the block and tackle. Releasing the friction by releasing the end of the rope allows the rear of the box to drop down on the platform again.

Steel Timbering in an Inclined Shaft

By Frank R. Edwards[*]

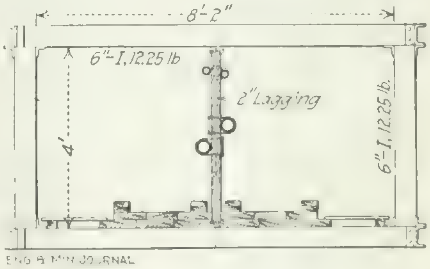
Last spring, steel shaft sets were used for the first time in the Kentucky fluorspar district at the Memphis mines. These mines are situated about 4½ miles northwest of Marion, Ky., and in the past have produced more fluorspar than any other Kentucky mine.

The veins occur in nearly parallel fault zones which have inclinations varying from 60° to 70° from the horizontal. Except in one or two instances, the shafts are sunk vertically till the vein is reached, then continued on the incline. This causes slow hoisting with the present arrangements, and trouble with pipe lines and hoisting cables; so it was decided to start at the point where the solid foot and hanging walls begin and continue to the surface on the slope. Steel sets with oak lagging were chosen as the materials.

It was first necessary to lay out some plans for proper alignment of the sets, and to have this alignment such that the construction on the incline could be done with the minimum of cutting work on the former slope. This was done by means of two wires on the hanging-wall side, properly leveled and aligned with the assistance of spirit level, square and straight-edge.

A sollar to catch all débris was first put in just below the point where the work was to begin. Then 10-in. sawed oak timbers were placed in hitches in the solid walls and at right angles to the proposed slope, as a base for the steel work. The bottom set of steel was placed immediately on this and consists of two wall plates, with holes on the wall side to nail or bolt on the lagging, and two end plates all 6-in. 12.25-lb. I-beams. The inside dimension is 4 ft. by 8 ft. 2 in.; the extra 2-in. length allows for the dividers, which are 2-in. oak plank bolted to 6x3½-in. angles fastened to the wall plates. For spacers, 6-in. 8-lb. channels are used. These are all connected by flanges which come from the manufacturer already fastened to the pieces by riveted bolts.

It was originally intended to have the lagging butt end to end at the steel sets, but this was found to make a weaker structure than lap joints, accordingly 6-ft. lengths of lagging were used to allow plenty of lap for the 5-ft. centers of the sets. These were placed like fore-poling with the butts inside to allow each set to be blocked and wedged at once and to aid in driving the lagging. For the first one or two sets there was enough solid ground to allow moving most of the original timbers and allow the steel and its lagging to be placed. Above that the ground was heavy; trenches were cut through the old timbers for the steel and the remaining wooden timbers meantime braced. Then piece by piece the old lagging was removed and new lagging placed, blocked and wedged tight.



Steel Shaft Set for Inclined Shaft

At one place the old timbers came so far out of line that a big space had to be dug behind the new set. This caused a new departure; spiling was driven in the soft material deep enough to hold the ground while the steel and lagging were being placed, blocked and wedged true to line. It was difficult to make the holes in the steel fit together so drift pins were made especially for the work. At the point where the vertical and incline shaft meet the wet clay overburden became so heavy that the wall plates commenced to spring in, and it was necessary to put in the dividers, which had heretofore been left out to facilitate the work, and to true up the steel a second time. After passing the vertical part of the shaft the excavation had to be done entirely in wet sandy clay which threatened to cave so the men would not continue the work. The old sollar was cleaned off and a new one built near the work. Breast boards were placed ahead of the steel and braced in place to prevent excessive caving. Digging was now commenced at the top at sufficient distance from the vertical shaft to allow for the slope. The ground was cleared away to the vertical shaft and at sufficient width to allow work on the steel when it should reach this point.

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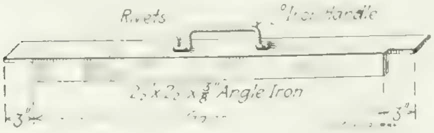
[*] Mining engineer, Marion, Ky.

As the digging continued the dirt started to cave and a sort of coffer-dam was built with long timbers for guides. Two-inch planks were driven ahead like sheet piling, additional guides being placed as braces. This solved the problem and the steel was soon run out to the surface. Heavy hewed-oak timbers were laid as sills to reinforce and hold up the top of the shaft lagging; these also acted as bearers for the head frame. The steel set at the surface was enlarged to support platform.

As sinking was to be continued in the shaft, a skidway was arranged by placing fillers in the I-beams on the foot wall and nailing direct to these. A ladderway was built beside this skidway in both compartments. The pipe lines were fastened to the dividing planks by U-bolts. The idea of this steel shaft originated with A. H. Reed, superintendent, and upon him and H. D. Wolford, foreman, devolved the execution of the work.

Angle Iron Track Gage

A serviceable track gage can be made from a piece of angle iron as shown in the accompanying drawing. One leg of the angle is cut away flush with the face of the other leg and back from the ends 3 in. This gives the proper gage and the projecting 3-in. legs rest on top of the rails. A ½-in. round handle riveted on the upper or longer leg of the gage makes it complete.



ANGLE-IRON TRACK GAGE

With a little use track gages constructed of wood soon become so badly battered that they are practically useless and those made of iron are easily bent, thus giving in both cases a distance shorter than the desired gage of the track being laid.

Breathing can usually be restored after an electric shock within an hour, says *Coal Age.* Keep up artificial breathing for this length of time at least. After breathing starts, begin to restore the circulation by rubbing the limbs briskly in the direction of the heart and under the covers with which the patient has been previously covered.

Canvas Ventilation Pipes

By L. D. Davenport*

In some of the working places along the north shore line of the Chisholm orebody, on the Mesabi Range considerable trouble has been caused by lack of air. In cold weather, with the wind in the right direction, it was sometimes possible for the miners to work two or three consecutive shifts with the aid of carbide lamps. In order to facilitate the work in this part of the mine the company installed a No. 4 Sturtevant belt-driven fan, operated by a 7.5-hp. 220-volt Allis-Chalmers motor.

The fan and motor were placed in a shed at the collar of No. 1 shaft, which is now used as a timber shaft and manway. A 6-in. iron pipe was carried from the fan directly down the east compartment of the shaft to the 99-ft. level. At the 82-ft. level a 3-in. iron pipe runs 60 ft. along the bottom of the drift to a crosscut where it ends in an elbow. A piece of 2½-in. pipe is stuck loosely into this elbow and extends about 30 ft. along the crosscut. Enough air escapes from the elbow to supply the first working place and the balance carried by the 2½-in. pipe is sufficient for the second place.

On the 99-ft. level the 6-in. iron pipe runs along the drift for about 50 ft. and from that point a canvas pipe is used. The canvas pipe is made of 15-oz. duck, 30 in. wide the seam double stitched. The finished pipe is a little more than nine inches in diameter and is given one coat of boiled linseed oil. The pipe is supported every eight or 10 ft. by pieces of fine iron wire thrust through the seam at the top of the pipe. These wires are twisted around nails driven into the drift caps or in some places, driven directly into the ore.

The main pipe line is about 730 ft. long and from it there are four branch lines, 80, 100, 180 and 200 ft. long. The pipe in the 80-ft. branch is 9 in. in diameter and in the other three branches it is 5 in. in diameter. The connections for the branch lines, and for extending the main line, are made of light-weight sheet iron. The canvas pipe is drawn over the connections and tied with cord.

In all parts of the line the canvas pipe is filled out nearly cylindrical in shape. The air is now sufficiently good so that three eight-hour shifts are working regularly. When the slice rooms are worked back, the pipe is cut off in 40- or 50-ft. lengths and saved for use in another place. Plans are being made to use this system in another mine in this district and in this instance canvas pipe will be used from the collar of the shaft.

Reboring a Big Wheel

By Alberto Castañeda*

It often occurs that some heavy machine work has to be done in a mining camp, the necessity for prompt completion of the work making it impossible to ship it to a properly equipped shop. In the absence of machinery and tools, a great deal of ingenuity must be used to get the work satisfactorily done. A case of this kind was in the reboring of the heavy grooved drive wheel of an air compressor at the plant of the Esperanza Mining Co., El Oro, Mexico.

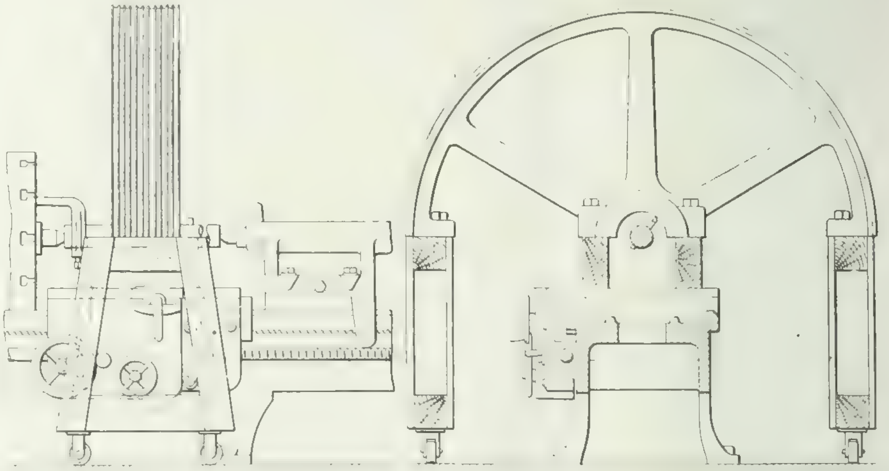


Fig. 1. Arrangement for Reboring a Large Drivewheel

The wheel in question was 13 ft. in diameter with a 26-in. face and weighed nearly 13,000 lb. The original bore was 8 in. and it was decided to increase this to 9½ in. There being no machine which would handle the wheel in the regular way, an original plan was carried out.

Two wooden benches were made and placed one on each side of a lathe, the benches being fitted with rollers. Half of the wheel was placed with the hub on the carriage of the lathe and one end of the face on each of the benches. The half wheel was centered and cut out with a boring bar, the rollers on the benches allowing the whole contrivance to travel with the lathe carriage. The arrangement is shown in Fig. 1.

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*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

*Master mechanic, Esperanza Mining Co., El Oro, Mexico

Half the wheel being bored, the other half was swung over it with chain blocks as shown in Fig. 2, and the two halves bolted together. The proper centers were determined and the cut outlined and marked. This half of the wheel was then placed in the lathe, centered in accordance with the marking, and bored in the same way as the first half. The work was successful and the wheel runs true.

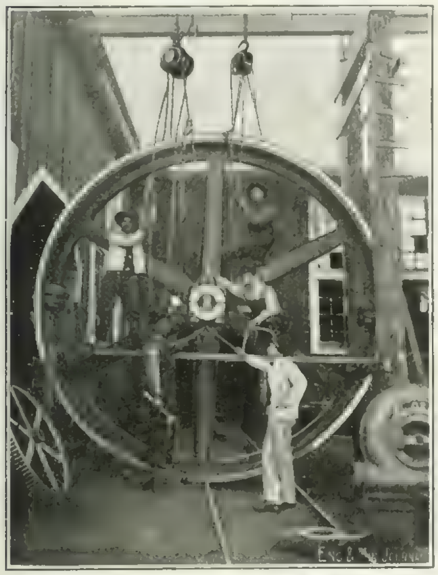


Fig. 2. Heavy Drive Wheel Rebored at Mine

Collecting Mine Samples

For catching the broken rock in mine sampling, the Rand sampler usually takes with him an iron dish into which the pieces of rock fall as they are broken, says G. A. Denny (*South African Min. Journ.*, September, 1912). In place of this iron dish a round pliable basket about eight inches deep and 12 in. in diameter, lined with strong oilcloth has been found preferable. It easily fits into any corner or difficult place and does not allow the pieces of ore to escape by rebound as does the iron pan or box.

It is, however, only in places that preclude the use of canvas on the floor that a receptacle is used for catching the sample. Experience has shown that a better sample is obtained when all the sample broken is caught on a piece of canvas spread so that everything will fall on it. The canvas should be about 10 ft. long by about six feet wide for use in the levels, and it may be 10 ft. square for use in the stopes. The use of a canvas catcher tends to the taking of bigger samples, which alone is a great element in its favor. Rand practice would not, I believe, exceed the cutting of one to 1¼ lb. of ore per foot of sample cut. My present practice is to take not less than five pounds per foot of sample cut, and it often reaches as high as 10 lb. The object of this is to lessen the possibility of salting, as large quantities are less easily salted than small, and also to lessen the danger of over valuation from the inclusion of small specimen pieces of high-grade ore.

In cases where the sample is in excess of 15 lb., it is reduced by breaking down the whole sample in the mine to a gage not exceeding ¾ in., thoroughly mixing and quartering the total bulk in the usual way until a suitable weight, say from five to seven pounds, remains to represent the sample. In the assay office the mine samples are subsequently all reduced to pass ¼-in. mesh before being cut down, then halved in bulk by passing over a sample-dividing device The ¼-in. material is then all reduced to pass a 20-mesh screen, again halved, the remainder reduced to pass a 40-mesh screen and the final sample for assay passed through a 100-mesh screen.

Steam Shovel Removing Overburden at a South Dakota Gold Mine

Drill Holder for Use in Handwork

A labor-saving device which promises to be an aid to prospectors and miners working single handed, has been invented by Thomas Peterson, a Butte miner and prospector. The invention is a hand-power drilling machine by which the work of two men can be done by one. It consists of a light metal drill holder, which can be used either as a tripod or attached to a bar. An ordinary miners' hand drill is inserted in the chuck and the tripod or bar so adjusted that the drill is held rigidly at the point desired. The miner then uses a double-handed hammer in striking the drill, and the force of each blow moves a cam on the chuck, giving the drill the necessary half turn to prevent it from sticking. For back holes or uppers, the bar or column is used in place of the tripod, and as the whole apparatus weighs but 15 lb., it can be easily managed by one man working alone.

Steam Shovel Stripping in the Black Hills

An interesting instance of surface stripping is being practiced by the Wasp No. 2 Mining Co., in the Black Hills mining district of South Dakota.

The orebody is approximately flat and consists of quartzite having a thickness of about 20 ft. The quartzite has been exposed on two sides by erosion. The capping over it consists of surface soil, quartzite and shale. At the lowest point there is only a foot or two of soil, while the covering thickens toward the north and south. The entire portion of ground owned by the company has been prospected by drill holes and it is estimated that there is sufficient ore, which can be recovered by this method, to last about eight years at the present milling rate of 500 tons per day.

The overburden is removed by the use of an Atlantic steam shovel with a 1-cu.yd. bucket. At present the overburden removed is about 10 to 16 ft. thick. The shovel dumps the stripping into wooden, side-dumping cars, which are then trammed to the waste dump by two men.

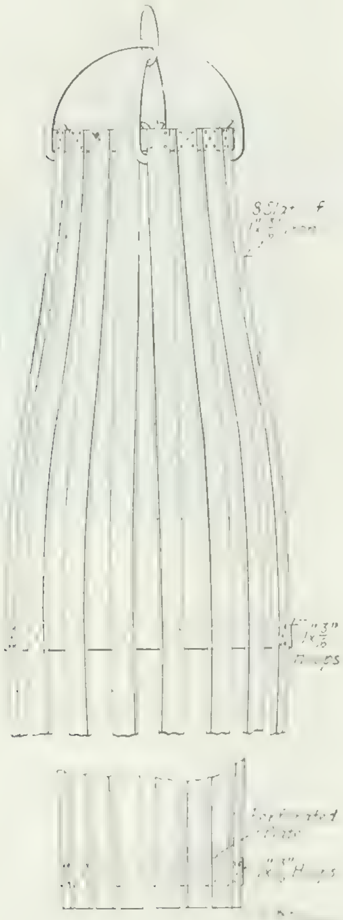
After the overburden is removed and the surface cleaned, holes are drilled to the bottom of the quartzite, chambered with dynamite two or three times and a large charge of black powder, sometimes as much as 50 kegs, put into the hole. This loosens 4000 to 6000 tons of the ore, so that the most of it can be shoveled into the ore cars; the larger boulders are broken up with hand-size air drills of the "Little Jap" type. The ore is either shoveled directly into the skips or into 1-ton mine cars, which are then hauled to a bridge over the skipway and dumped into the skips.

A double-track skipway leads up to the mill bins, the skips being hoisted and dumping automatically into them. The maximum grade of the skipway is 10 ft. in 100, and a 52-hp. double-drum hoist is used for hoisting.

The cost of operation is approximately as follows: Labor, 27.2c. per ton; stripping, 7.8c.; explosives, 3.5c.; power, panying illustration shows the shovel in 1.7c.; total, 40.2c. per ton. The accom- operation.

Charcoal Pot for Ventilating Shafts

During the course of the sinking operations at the No. 6 shaft on the property of the St. Louis Smelting & Refining Co., in the Flat River district of Missouri, a charcoal fire was used to induce ventilation and dissipate rapidly the fumes from blasting. The fire was built in an iron basket such as is illustrated in the accompanying sketch. This basket, filled with burning coals is lowered to the bottom of the shaft immediately after blasting. The heating of the air establishes an upward current over the heater, and a downward current at the opposite side of the shaft from that in which the ventilating pot is hung.



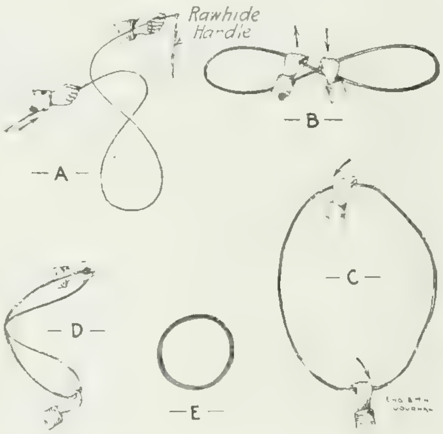
Charcoal Pot for Ventilating Shaft

Coiling Steel Tapes

By J. K. Finch *

The following method of doing up an ordinary steel tape, or band chain, is much more rapid than using a reel and causes less wear on the tape, besides eliminating the necessity of carrying the reel.

The tape is first coiled as follows: Take the end of the tape in the left hand, holding the palm of the hand up, swing the right hand behind the body and, taking hold of the tape at about the 5-ft. mark, pull it forward and lay it over the palm of the left hand as shown in *A* of the accompanying drawing. Do not permit the tape to turn over. Closing on this coil with the left hand the right hand is now swung back for another 5-ft. length and thus the tape is gathered in in 5-ft. lengths, falling in concentric folds which may be crossed at the middle to form a figure 8. A good handle for each end of an ordinary tape is a piece of ½-in. rawhide belt lacing about a foot long. These handles may now be used to tie ends of the tape to the coil.



Method of Coiling Steel Tape

The next step results in forming the tape into a neat coil about a foot in diameter as shown in *E*. This is done as follows: Grasp the tape as shown in *B* one hand on each part of the coil at the center of the figure 8 and the upper part of the coil in the right hand. Now, without permitting the coil to turn in the hands, pull it apart as shown in *C*, keeping a slight pressure on the coil with the left side of the left hand and the right side of the right hand as indicated by the arrows. The tape will first stretch out as shown in *C*, then the right-hand portion will spring over in the form shown in *D* and the two sections may be brought together, forming the coil *E*. The operation of undoing the tape is exactly the reverse of the above described method.

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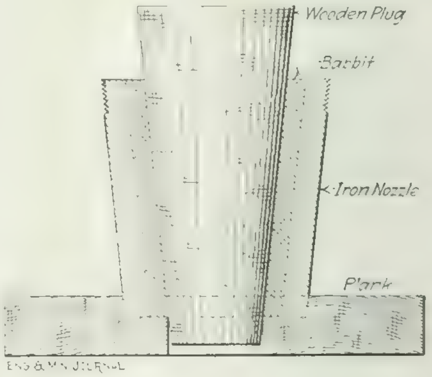
*Instructor in civil engineering, Columbia University, New York.

Altering Size of Pelton Wheel Nozzles

A difference of as little as $\frac{1}{16}$ in. in the size of the nozzle supplying water to a Pelton wheel, according to C. M. Myrick (*Bull.* A. I. M. E., October, 1912), made a material difference in the wheel's speed. The proper size of the nozzle was found by trial, alteration of size being made as follows:

A hole, ¼ in. deep and equal in diameter to that of the iron nozzle to be reduced, is made in a board. The hole is then continued through the board of the same size that it is desired that the nozzle should be. A wooden plug, tapering from a little less than the outlet size of the desired nozzle to about the size of the admission end of the rejected one in a little more than the nozzle's length, is then made. The nozzle is then placed on the board and the wooden plug driven in, as shown in the accompanying illustration, and the space between filled with babbitt.



Mold for Nozzle Liners

When it is again desired to alter the size, the babbitt can be easily melted out. It will be found that for a given pipe line, a point is eventually reached where even if the water supply is adequate, further increase in the size of nozzle does not give increased power. At this stage the loss from increased friction is counterbalancing the increased diameter of outlet. After this point is reached, it pays better to send the water over the spillway. To obtain the maximum efficiency the pulley on the wheel should be lagged so that the circumferential speed of the waterwheel approximates one-half the velocity of discharge, calculated from the available head.

It is clear that the size of the nozzle opening is determined by the size of the hole in the board, not by the size of the plug. One plug will answer for many boards.

Details of Metallurgical Practice

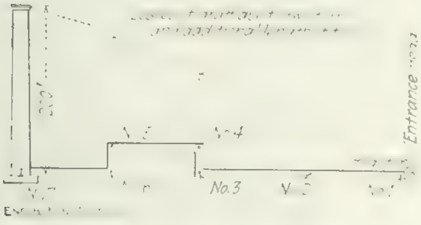
Records of Experience in Ore Dressing, Cyaniding and Smelting

Irregular Draft Reading in Smeltery Flue

By Lindsay Duncan*

In studying draft readings taken along the roaster flue of one of the Colorado lead smelteries I was puzzled to account for the irregularity of certain of the readings. The seven manometer connections were numbered consecutively from the roaster to the base of the stack and the readings may be assumed to have been taken simultaneously. No. 1 (roaster building), draft, 0.10 in. of water; No. 2, 0.20 in.; No. 3, 0.33 in.; No. 4, 0.23 in.; No. 5, 0.33 in.; No. 6, 0.50 in.; No. 7 (base of stack) 0.60 in.

On plotting an elevation of the flue and stack the "paradox" is at once explained. Between No. 3 and No. 6 the flue crosses several railroad tracks. This "siphon" caused the flue to approach what might be termed the "pneumatic gradient" and thus diminish the draft in the elevated portion of the flue. The accompanying illustration representing the draft graphically is self explanatory.



Draft in Smeltery Flue

Detection of Carbon Monoxide

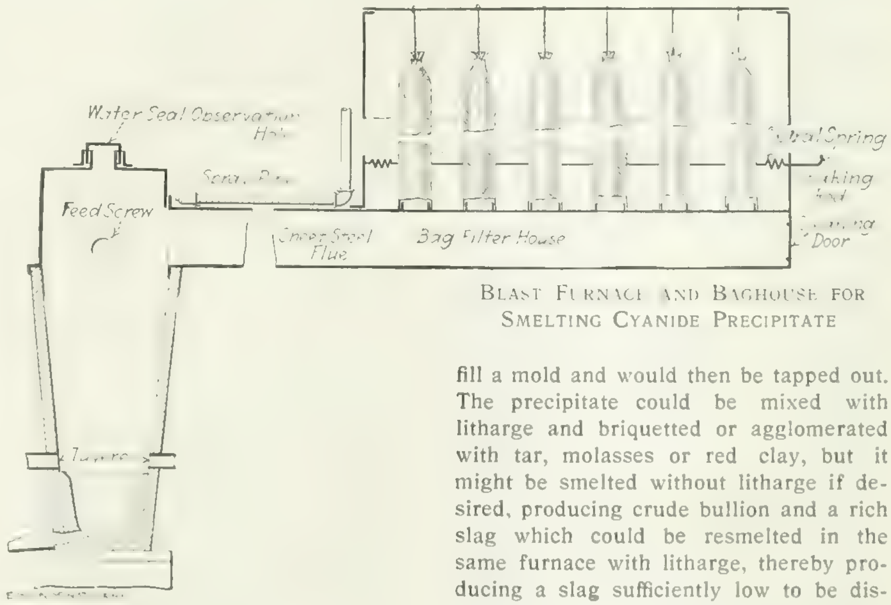
R. Nowiski, chief chemist of the Witkowitz collieries, in Moravia, has devised a compact piece of apparatus for detecting the presence of CO in air by means of palladium-chloride paper. The time taken by the paper to darken depends on the percentage of CO present. Thus, with 0.01% of CO, darkening of the paper perceptibly begins in 11 min., and is complete in 60 min.; 0.1%, 1 and 9 min.; 1%, 16 sec. and 2 min. Anything over 0.1%, says the *Gas World*, is thus detected with reasonable promptitude.

Smelting Cyanide Precipitate

By Hiram W. Hixon*

Referring to the editorial on the treatment of cyanide precipitates in The Engineering and Mining Journal, of Sept. 7, under the heading "A Field for Improvement," I wish to offer as a suggestion the accompanying sketch of a small blast furnace and baghouse for treating these precipitates.

The blast furnace could be of any required dimensions, say, 15 to 18 in. in diameter at the tuyeres and of suitable height, say, 3 to 4 ft. above the tuyeres. The bottom or crucible section should be lined with clay or brasque. The charge would be fed in by a screw or piston feed so as to prevent the exit of gases, the feed to be operated by hand or mechanically. The furnace would be closed at the top except for a water-sealed opening for observation and this opening might also be used for introducing the charge if necessary. The gases on top of the charge should be under sufficient pressure to force them through the flue and baghouse. The baghouse should be at sufficient distance from the furnace so that the gases may be cooled either by radiation of the flue or by spraying the flue on the outside. The bags should be of sufficient number and dimensions to filter the gases from the furnace; they would be shaken from the outside by a connecting rod through the wall of the inclosing baghouse. A cleaning door should be provided at the end of the flue and all the bags placed in one line. The baghouse should be supported by suitable trestle work below. The furnace could be made of cast-iron plates with pipe coils cast in for water circulation and should be made in two sections so that it can be taken apart and cleaned easily. The blast would be supplied by a fan capable of supplying a sufficient volume of blast at a pressure of five or six ounces.



Blast Furnace and Baghouse for Smelting Cyanide Precipitate

The operation of this furnace would be simple and would consist in heating up with sufficient fuel and then introducing the precipitate with the fuel required for its smelting and reduction. The crude bullion would be allowed to accumulate in the crucible until sufficient to fill a mold and would then be tapped out. The precipitate could be mixed with litharge and briquetted or agglomerated with tar, molasses or red clay, but it might be smelted without litharge if desired, producing crude bullion and a rich slag which could be resmelted in the same furnace with litharge, thereby producing a slag sufficiently low to be discarded. If the precipitate is mixed with litharge the bullion would require cupellation in a cupel furnace, the litharge resulting being returned to the blast furnace with more litharge for desilvering. A campaign of smelting precipitate might be followed by one of resmelting slag without blowing out the furnace and still maintain a separation between the two products by introducing sufficient fuel to insure the rich bullion being all reduced and out of the furnace before the lower grade material followed it. Running this small blast furnace in connection with a cupel furnace would allow the same litharge to be used over and over again and insure a clean-up of all byproducts.

The furnace gases must be kept under

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*Superintendent, The Teziutlan Copper Co., Aire Libre, Puebla, Mex.

pressure to avoid the necessity for introducing a fan to force them to the baghouse. This would materially reduce the expense for construction and operation. The size of the furnace and baghouse should be in proportion to the amount of material to be handled. The value of the material to be handled makes it necessary to use a baghouse on the flue gases in order to avoid excessive losses.

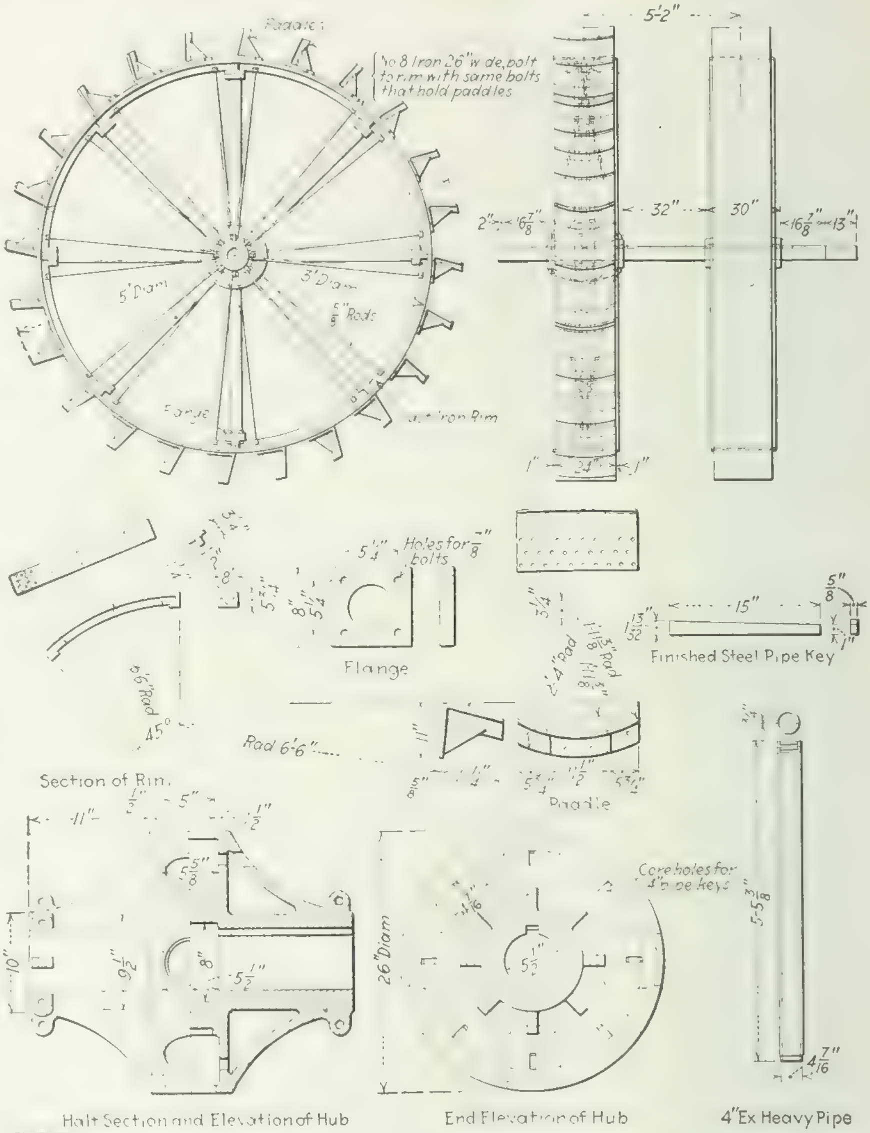
This plan appears to be adapted to localities where electric power for smelting these precipitates is not obtainable and has the advantage over the direct melting of precipitates in a cupel in that all the flue gases would be passed through the baghouse and the losses due to fine material being drawn into the flue would be avoided.

The losses in cupellation of metallic bullion are not excessive while the introduction of fine high-grade material into a furnace of that character inevitably results in high losses and at the same time produces high-grade slags which must be resmelted in a reducing furnace, so that the primary treatment of the precipitates in a blast furnace instead of in a cupel furnace seems to be desirable.

Federal Dewatering Wheel

In the accompanying drawings are shown the details of the construction of the shovel wheels used at the mill of the Federal Lead Co., in southeastern Missouri, for dewatering the tailings before they are fed to the stacking belts. The wheels revolve in a rectangular settling box, about 15 ft. deep, in which the tailings are allowed to build up their own bottom. The water drains from the pulp as it is scraped up the inclined floor formed by the tailings themselves. The height to which the tailings can be scraped depends entirely upon the diameter of the wheel. With a given wheel the limit is the angle of slope at which the tailings will slide freely off the scraper or shovel blades. This is about 35° with the tailings fairly well dewatered, but in practice the limit is about 45°, as with less slope than that the tailings drip off the shovel blades, and fall upon the rim plate that acts as a guard to keep the tailings from dripping back upon the interior of the wheel.

The general design of the wheel is the same as that of the dewatering wheel used at the Doe Run mill, described in the JOURNAL of Oct. 19, 1912, but the details are somewhat different. The Federal hub goes on a separate shaft instead of having the shaft an integral part of the hub. The shovel blades are made wider, and on that account they have two reinforcing ribs. This is much preferable even with narrower blades, as when there is only one rib there is a much greater tendency for the corners of the blades to break; although the fact that there is no false bottom in the settling box, has also aided in making the number of blades that have broken on the Federal wheels much less than at the Doe Run mill. The drawings show the details of the different parts. The rim is made up of eight sections that are held together by bolts at the spoke flanges.



TAILINGS DEWATERING WHEEL USED BY FEDERAL LEAD CO.

Rods that fasten into the hub on the opposite side from that on which they are fastened to the rim hold the wheel together; the pipe spokes are lined up in the proper places, keys driven and the space around the pipe filled with zinc. A deflecting rim is, of course, provided to keep the tailings, which cling to the shovel blades, from dripping back on the spokes and hubs of the wheel.

These tailings wheels are driven in pairs, but with their shovel blades offset with respect to one another, so as to even up the load on the motor as much as possible. The wheels are driven by means of gears from the motor, which is connected to them by means of a rawhide pinion. It has been found that the best speed at which to drive these wheels when they are handling from 1500 to 1800 tons each in 24 hours, is 1½ r.p.m., as then the tailings are as dry as is compatible with handling that tonnage. These tailings, as they fall on the belt, contain from 12 to 15% moisture. It takes about 3 hp. to run the two wheels when they are handling 3200 tons in 24 hours. This is not the capacity of the machines, as by stepping up the speed slightly they could be made to dewater approximately 5000 tons of tailings in 24 hours, leaving only about the same amount of moisture in the tailings as at the present time. From the discharge lip of the dewatering wheels the tailings drop directly upon the troughed belt of the tailings stacker. The overflow fines from the shovel box go to the canvas plant for further treatment. The upkeep on these wheels is practically nothing, and it will be found that they offer a cheap way of dewatering large tonnages of pulp.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Scandium Extraction

Scandium may be separated from the wolframite minerals (double tungstates of iron and manganese) of Zinnwald, and Altenberg, and the copper minerals of Sadisberg, according to *Metaux et Alliages*, October, 1912. The extraction of scandium is by the following methods: The oxides of the wolframite are gotten into hydrochloric-acid solution, which is treated by boiling with hydrofluosilicic acid. The precipitated fluorides are then transformed into sulphates by sulphuric acid and precipitated as hydrates by ammonia and again gotten into hydrochloric-acid solution.

To this solution is then added hydrogen sulphide, after which a treatment with sodium hyposulphite is given. After decomposition of the hydrosulphite by the hydrochloric acid, the whole is precipitated by oxalic acid. In this method all the substances accompanying scandium (lead, copper, iron, manganese, other rare earths, and yttria) are eliminated, with the exception of thorium. To effect this separation advantage is taken of the insolubility of the double carbonates of scandium and sodium, $Sc_2Na_8(CO_3)_7.6H_2O$, in a solution of boiling soda. The separation of thorium and of other rare earths can also be made with success by means of potassium iodate, which throws down thorium iodate in a nitric-acid solution

Alundum Decantation Thimbles

The use of an alundum thimble is recommended by L. W. Bahney, (*Met. and Chem. Eng.*, November, 1912) for removing acids from beakers in which electrolytic deposition has been conducted or for removing the supernatant liquid from a settled precipitate without disturbing it. The apparatus simply consists of a small alundum thimble fitted with a rubber stopper, through which passes a ¼-in. glass tube.

Mr. Bahney states that he began using this thimble to do work which he formerly performed by means of a piece of perforated platinum over the end of a ¼-in. bored glass tube, carrying a filter matte of asbestos, but that on one occasion after his supply of proper length asbestos fiber had become exhausted, he could not get any more that was satisfactory, although he purchased 14 lots from four different dealers. The alundum thimble makes a piece of laboratory apparatus without undesirable contingencies.

In using the alundum thimble for decantation purposes the glass tube emerging from it is simply connected to a suction pump. If this thimble is used in such an assay as the wet determination of copper, in order to draw off the supernatant solution after precipitating the copper on aluminum foil, any of the copper caught up on the thimble can be readily washed off afterwards by means of a little nitric acid. Other uses will also suggest themselves to the chemist.

England Forbids Soft Coal Exports

A development of significance both to the world's coal trade and in the uneasy European political situation is contained in London cable advices, which state that the British Admiralty has issued orders prohibiting the export of steam coal from England, says the *Boston News Bureau*.

This step to conserve the British coal supply for home warships and steamers will, if long continued, impose a severe handicap on rival navies and merchant fleets, which will have to resort to other fuel markets already fully engaged by demands of a world-wide prosperity. England in the nine months to Oct. 1 last, exported 26,765,000 tons of coal; of this, Germany bought 3,030,000 tons; France, 4,055,000; Italy, 4,015,000 tons. Even at that large volume England has had, as a reflection of last year's coal strike and present domestic business activity, less coal than usual to spare, a condition contributing to the present order. For the same nine months of last year, coal exports were 78% greater, at 47,619,000 tons. The price this year, including all grades, has risen to $5.32 average, against $4.81 last year.

The Admiralty itself has lately taken tenders for the coal required by it during 1913. Though details are not likely to be published, the Admiralty requirements usually amount to about 1,125,000 tons per annum.

This situation would normally offer export opportunities for American coal producers, were it not that every ton of domestic output is now in imperative demand. Our exports of soft coal, which for nine months of 1912 were 25,009,000 tons, were confined almost entirely to this continent, Canada taking 18,450,000 tons. If the foreigners come here for bunker coal, they can get little and will have to pay dearly.

Borchers-Pedersen Nickel Process

The recently patented process (U. S. patent 1,043,291) of Wilhelm Borchers and Harald Pedersen consists of the following stages. The ore is first smelted, preferably in an electric furnace, a high-silicate slag being produced. The nickel-copper matte thus obtained is roasted in such a manner that the copper and nickel are, for the most part converted into sulphate, but the iron into oxide. This result is obtained by keeping the roasting temperature about 600° C. The copper and nickel sulphate obtained from the roasting operation are then dissolved by leaching the residue with acidulated water obtained from percolation towers, through which the waste gases from the roasting furnaces flow in a counterstream toward the percolating water, and therefore cause it to contain sulphurous and sulphuric acid.

The residue from this leaching operation, which consists principally of iron oxide, but also contains some imperfectly roasted or over-roasted and therefore insoluble copper and nickel compounds, is added as a flux to the smelting operation. The insoluble copper and nickel are then converted into crude matte, while the iron oxide enters the slag. Fractional precipitation of the sulphate solution is then carried on by either sodium or calcium sulphide. The copper is thrown out in acid solution, and then the nickel is precipitated from the filtered solution by adding more of the alkaline or alkaline-earth sulphide. The nickel sulphide is then separated from the solution by filtration. The sulphides thus obtained are separately smelted to copper and nickel by smelting with a flux of limestone and a carbonaceous reducing agent, preferably in an electric furnace, calcium sulphide being obtained as a slag. Since the use of calcium sulphide as precipitating agent for copper and nickel will carry too much copper sulphate into the copper and nickel sulphide deposits, the calcium sulphide obtained in this operation is converted into sodium sulphide by treating, if necessary, under pressure, with sodium sulphate in aqueous solution. The sodium sulphide thus obtained may be used to better advantage than the calcium sulphide as precipitating agent.

The patentees make the following statement concerning this process: None of the separate stages of which the process is made up, is novel when considered alone. The smelting of the sulphide ores to obtain crude matte, the roasting of the matte to form sulphate, the leaching of the products of roasting, the gradual precipitation of first the copper and then the nickel from the solution, the electric smelting of nickel sulphide with limestone and charcoal to obtain metallic nickel are all processes well known in electro-metallurgy. Similarly, the substitution of calcium sulphide by sodium sulphide in the precipitation to prevent the precipitation of calcium sulphate is not novel in itself.

It was not previously known, however, that from nickel ores poor in copper, both these metals could be extracted practically without loss by smelting the ore to obtain a copper-nickel matte, with the subsequent process as outlined. This result is obtained in spite of all the imperfections of the roasting and leaching processes, by using the roasted and leached matte, which consists chiefly of iron oxide, as a flux in the first stage of smelting the ore to a nickel matte. In the present process only 80 to 90% of the copper and nickel contained in the matte are recovered in the form of sulphate. The remaining 10 to 20% stays in the residue and is recovered on the resmelting.

Efficiency of Bunsen Burners

At a recent meeting of the Scottish Junior Gas Association (Eastern Section), a lecture was delivered by H. O'Connor on the Bunsen burner, in the course of which he said that its requirements must be first known so that it can be specially designed. If it is required merely to produce heat in the form of a flame which will not deposit carbon on cool objects, 2.27 parts of air to each part of ordinary coal gas is required (*Chem. Trade Journ.*, Nov. 2, 1912). The desired quantity varies according to the gas used, because for complete combustion CO requires 2.38 times its volume of air; H, 2.38; CH_4, 9.52; ethylene, 14.28; propylene, 21.42; ethane, 16.66; acetylene, 11.90; benzine, 35.70 times its volume of air.

This refers to the complete combustion, and not to the primary combustion only, as in the case of the 2.27 parts stated above. For a straight coal gas containing H, 53%; CH_4, 33%; CO, 5%; and hydrocarbons, 4% (calculated as for propylene), 1 cu.ft. of gas of this composition requires 5.38 cu.ft. of air. For 1 cu.ft. of carburetted water gas (containing CO, 32%; H, 34%; hydrocarbons, 7%; CH_4, 16%), 4.59 cu.ft. of air are required. It can thus be easily seen that coal gas must be made to draw more air than the carburetted water gas; and if the gas is changed from day to day, sometimes with water gas, and sometimes without, the burner must be adjusted to give the best effect.

Precautions in Handling Acetylene

Owing to some recent accidents with acetylene burners, the French Minister of Commerce has submitted to a commission the question of precautions to be taken with the cylinders containing compressed gases (*Journal du Four Electrique*, Nov. 1, 1912). The following are the rules laid down: The cylinder containing compressed gases for autogenous welding, or for cutting metals, should not be used in workshops where there are floors above containing people. Before being placed in service each bottle should be placed in a ditch of which the sides are protected by battens of wood, and only the neck of the bottle should appear above the surface of the ground. The cylinder should be placed at least 5 m. from any fire. Each cylinder should bear legibly upon it the date of being placed in service, and the pressure to which it was submitted at the last test, and the date of the test. It is forbidden to employ any lubricating greases for greasing the valve, except glycerin or soapy water. It is equally forbidden to employ any heat to make it easier to open the valve, even though this opening proves to be difficult. In using oxyhydrogen gas for soldering there should always be a mixer between the bottles and the flame. There should be a distance of at least 3 m. between the neck of the flask and the neighborhood where the flame is to be used.

Electric Melting of Copper and Brass

In discussing the paper on electric melting of copper and brass, by T. A. Hanson, presented before the Buffalo meeting of the American Institute of Metals, G. H. Clamer states that personally he believes that the future for electric melting in the nonferrous-metal industry will depend not so much upon the saving which may be effected in the course of melting, as in the saving which may be effected in diminishing the loss of metal and in the production of a better product, resulting from the lessened contamination, with oxygen and sulphur adding influences. With the most careful crucible melting in coke-fired furnaces, metal will take up from 0.02 to 0.05% sulphur. Sulphur accumulates each time the metal is melted, and this accounts for the dark skin on remelted castings as compared with that on first-melted metal.

Another field where electric furnaces should be attractive is that for melting finely divided metal, which cannot be successfully accomplished in other types of furnaces, for reasons well known.

Correcting Bad Copper Deposits

In some work on the function of various addition agents used in electrolytic copper analysis, Ellwood B. Spear (*Proc. Int. Cong. App. Chem.*, Vol. XXI, p. 99), was led to believe that a bad deposit might be corrected by adding nitric acid and re-electrolyzing. This proved to be the case. A pulverulent copper deposit was obtained, the electrolyte removed, and a new electrolyte substituted containing 2.5 c.c. of 1.42 sp.gr. HNO_3 in 100 c.c. of water. After a few seconds, the solution turned blue, after which electrolysis was again commenced and a good deposit obtained. It was found necessary to have from 1.5 to 5.0 c.c. of acid per 100 c.c. of water. With less there was no re-solution of the copper, with more the re-solution was too great, and the redeposition too slow or nonexistent.

From his experiments it would appear that the function of sodium chloride, gelatin, tannin, etc., which prove beneficial in commercial refining, is to dissolve small loosely deposited particles of copper, possibly holding them in colloidal solution, allowing them later to be deposited in adherent form. This solvent action would also explain the bad effects noted with too great an addition of these agents.

Sampling of Gold Bullion

Writing of the sampling of gold bullion, Frederic P. Dewey draws the following conclusions (*Bull.* A. I. M. E., Oct., 1912): That there are many cases where either a chip or drill sample will be satisfactory, but that if an assayer is unacquainted with the bullion, he is unsafe in accepting anything but a properly prepared dip sample. In many cases, particularly of cyanide bullion, the composition of the metal interferes with the assaying, and the bullion must be refined before the gold can be determined accurately.

If there is a great difference in drillings from the same bar, simple remelting will not help matters, the material must be refined as well as remelted. In general, it will be found on screening a drilled sample, that the fines will be lower in precious-metal tenor than the coarse.

Losses in Melting Brass Scrap

Some actual losses in melting brass scrap are given by R. A. Wood, in *Metal Industry*, September, 1912. Some leaded brass chips lost 6.147%, including the loss due to volatilization of adherent oil. Yellow brass chips lost 4.982%. (The coke required was 65% of the weight of the chips.) Another lot lost 5.009%, and another lost 7.581%. All these three last were lots weighing 40,000 lb. or over. Two lots of red-metal chips lost 5.595% and 5.362%, and required 66% of fuel to melt them.

Underground Mine Switches

By D. W. Jessup*

Stub and split switches with modifications suitable for heavy underground traffic are described. Special types of switches employed under particular conditions are discussed and various crossovers illustrated.

There are many varieties of underground track switches and nearly every mining camp will possess several of the many kinds. Different conditions demand different switches and one switch may be adaptable under a certain condition where another would not, depending upon the tonnage, the nature of ore hauling, track gage, etc. It is also found that a change of switches could be used to an advantage if sufficient trouble was taken to consider the conditions.

In underground track work, where there is heavy traffic, the switches in general use are the stub and split switches and their modifications. These switches are operated in various ways; usually by means of a stand and lever, a crank and lever, a toggle joint or a target. Where light traffic is concerned, especially a one-car traffic, the switch is operated by the hand or a kick of the foot and gives satisfactory results. In laying track it is important to remember that the frog should be elevated about one quarter-inch above the rails, as this throws the car against the rail opposite the frog and prevents the car wheels from catching the frog.

Stub and Split Switches

Fig. 1 illustrates a typical stub switch with a turnout *BB* from the main track *AA*. The switch points at *CC* are held together by means of a bridle *D* and fit into slots as shown in Fig. 2; with a broader gage more than one bridle is often used. The bridle is moved to and from *AA* to *BB* by various lever methods, principally by those given above, allowing cars to pass over either track. The throw or movement of the switch rails for an 18-in. track gage is about 1½ in. and a ⅛-in. space is left between the switch point ends to allow for easy shifting. Allowance for movement of the switch rails *CC* must be made; these rails are not spiked for a distance of 12 or 15 ft. back from the switch points, and to replace the spikes, clamps *E* are placed about every three feet from the points. Underneath the switch points a long, solid 6x6-in. tie is placed which extends to the switch levers, and facilitates the movement of the rails. To prevent wearing, a strip of sheet iron three or four inches wide is fastened to the tie underneath the points.

The typical railroad split switch is but little used underground in metal mines, except with a track of broad gage, and in mines with a large traffic, as it is expensive to make and lay, and is not adapted to short turns. A modified split switch is used as shown in Fig. 3. Two latches *A A'* are fastened to the rails *B B'*, as shown in Figs. 8 and 9, and are held together by a clamp *D* and a bridle *C*. The latches vary in length from 24 to 36 in. and are drawn to a point at one end, flattening the outside and leaving the inside about normal, or slightly curved inwards, the length of the taper depending upon the length of the turnout. The bridle is operated by one of the different switch levers.

Methods of Operation

The stand-and-lever switch is found in operation in a great many of the mines and affords satisfaction. It has the advantage over the crank and lever in that it offers a latitude in the throw of the switch as is often demanded in the double turnout, or if the rails spread and the switch points are not in line, while the crank and lever offers but one distance of throw.

The stand is spiked to a 6x6-in. tie which extends under the switch points, as shown in Fig. 4, and is placed about 18 in. from the track, allowing sufficient space so that a car running on the track will not strike the lever arm or stand. The latter consists of a double frame *AA* made from ⅜x1½-in. iron spaced ½ in. apart, and is riveted together at *H* and *G*. About two inches of the legs are turned out and fastened to the tie by lag screws as shown. The stand is about 20 in. wide, 12 in. high, and a double strap *B* is riveted across the frame about four inches above the bottom. The lever arm *C* passes between these straps and is fastened to it by a loose bolt or a pin at *D*, about which the lever is pivoted. The length of the lever is from 24 to 36 in. and the lever is bent inward so that a passing car will not strike it; the lever is held in place by a pin passing through the holes *E* in the stand. The lower end of the lever is fastened to the switch rod by a bolt or pin, the rod extending to the bridle. The stand is sometimes made so that the legs are spiked to the sides of the tie instead of the top, but it lacks stability.

The crank and lever-arm method of movement is shown in Fig. 3. An arm or switch lever about 18 in. long is fastened to the bridle at *E*, and the other end is fastened to the crank shaft at *F*. The throw of the crank should be exactly equal to one-half the throw of the switch, so that the distance the latches move is twice as great as the crank, measured from its two axes; that is, if the throw of the switch is 1½ in. then the length of the crank should be ¾ in. The length of the crank shaft is about four inches, and the other end of the shaft is fastened or fitted into the lever arm, the shaft is attached to a block or tie by means of a strap *H*. The length of the lever arm should be such so that when thrown towards the track it will not touch it. The weight on the lever arm is five or 10 lb. and is operated by hand. A piston rod and chuck from an old machine drill will answer the purpose.

Extension Switches

At times it may be convenient to have the lever situated at some distance back from the switch points, and of the several devices an eccentric or a toggle joint is often used. The eccentric is shown in Fig. 5. A switch rod consisting of a double strap *A* about 24 in. long and extending out from the bridle to a piece of timber *B*, passes over a lateral strap *C*, not being fastened to it. The strap *A* is riveted in two places *G*, spaced three inches apart and about 16 in. from the rail, the eccentric of the lever rod *D* passing through the space. A short arm *E* about eight inches long is attached by a pin or bolt to the lever rod *D*, and also to the lateral strap *C*. The eccentric of the lever rod is equal to the throw of the switch, 1½ in. The rod is jointed at *F* and extends to the switch stand. By operating the lever, the eccentric moving between the rivets *G* causes the switch lever to move the track from either point of switch.

The toggle joint, Fig. 6, is of more simple construction than the eccentric switch, and is perhaps more satisfactory. A switch lever *A* connects the bridle to one of the toggles *B*, the toggles consist of a double strap about eight inches long fastened at *C* and to the lever rod *D* by pins or bolts. By operating the lever rod *D* the toggles are pushed in or out, causing the bridle to move at the switch points.

The lever may be of simple construction, Fig. 7, and consists of a lever arm about 30 in. long moving on a pivot *B*, the latter being screwed to a block. The lever rod is fastened to the lower end of the lever and extends to the toggles or eccentric. A guard rail is placed at the top of the lever, being nailed to the tunnel timbers.

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With a track of heavier rails and broader gage, the railroad target switch stand is often used. It is designed for heavier work and is bought in stock, different sizes being manufactured. The stand is operated by means of a hand lever fastened to a head rod at the lower end of which is a crank connected to the bridle by a switch rod.

The following switches are designed mostly for one-car traffic; they give satisfaction, and are of easy manipulation, being adjusted by the hand or foot.

Kick or Latch Switch

This switch is recommended as being one of the most efficient of the lighter switches, due to its short length, its durability, and its easy adjustment by a kick of the foot or a movement of the car, the carman not finding it necessary to advance ahead of his car to adjust the switch unless running towards it. The only disadvantage is that if repairs are needed it may be necessary to remove the whole switch to the blacksmith shop.

The switch, shown in Fig. 8, consists of two short switch points or latches *A* 20 to 24 in. long and fastened to the rails at *B* by means of a looped strap; the points are tapered and turned slightly outwards. A bridle strap 14 to 16 in. long is riveted underneath to the points of the latches, the holes through which the rivets pass being of larger diameter than the rivets to permit the movement of the switch. The outside latch is one or two inches shorter than the inside latch, its length depending on the angle of the turnout. The looped strap fastening the latch to the rail is made of ⅜x1-in. iron and is bolted to both sides of the rail, the loop first passing through the ½x1-in. slot cut in the latch.

The latches may also be fastened as shown in Fig. 12, the strap being bolted to the latch through which a pin is driven into the tie. This method is unsatisfactory as the pin will pull out and cause derailments. Another and better method consists of fastening the latch as shown in Fig. 9, a lug being made on one side of the latch through which a hole is bored and a pin of smaller diameter is driven through the lug and into the tie.

Fixed Switch

The switch shown in Fig. 10 is not movable and has no movable parts that will wear, as all of the rails are spiked to the ties. Sufficient space, about 1½ in., is allowed between the main track and the rails to admit the passage of the car wheels. The direction of the car is controlled by the carman who throws the car to either track by a twist; this is easily done with an empty car but with a loaded car it is troublesome. This switch is used to advantage when the loaded cars are running away from the switch. If the carwheel has a grove or double flange worn on its face, the car may tend to follow in the direction of the turnout.

The railpoint *A′* should be in line with the main track, and as the point *A* may cause derailments, the rail at *C* is made lower than at *A′*, then the weight will cause the car to crowd closer to *C* and not tend to derail. The point at *A* should be slightly higher than the rail at *C*, which will assist the carman in throwing the car in the direction of the turnout. The length of the lead rail is usually from five to seven feet, depending on the angle of the turnout.

A special form of fixed switch is sometimes used, giving an unbroken main line, Fig. 11, requiring the use of two hinged latches *E;* they are about four inches long and are fastened to the turnout rails. When it is desired to run the cars over the turnout, the latches are placed over the main line, a flange on the under side preventing their slipping; and when running on the main line the latches are swung out. This form of switch is not commonly used. It is troublesome, as the latches may slip, take time to adjust, and they may accidentally be left on the main line, causing derailments.

Tongue Switch

The tongue switch, Fig. 12, is used extensively with tracks over which there is light traffic, but it is not recommended for heavy traffic, though it is often used for such. Derailments frequently happen due to an open switch, or the pin pulls out that holds the tongue, or the tongue may turn over on its side causing cars to drop in between the rails. The advantage of this switch lies in its simple construction, has but little repairing and is easily laid by the trackman. The movement of the car will not throw the switch as it will the kick switch, and it is necessary for the carman to advance ahead of the car to move the tongue.

The switch consists of a movable lead rail or tongue *A* varying in length from five to seven feet, depending on the turnout, and it is attached at the frog *B* by a looped strap *C* through which a pin about three inches long and of smaller diameter is driven into the tie. Underneath the hinge a piece of about 3x6-in. sheet iron is nailed to the tie in order to hold the pin. The point of the tongue is tapered and curved slightly outward; at this point a strip of sheet iron is nailed across the tie over which the tongue moves. The tongue may also be fastened as in Fig. 8.

The three-way switch or double-turnout switch is used where two crosscuts are driven on opposite sides from a main drift, and it is desired to run tracks in the crosscuts from the drift. In this case the stub switch will be used to best advantage. It is operated by the stand and lever which allows the latitude of the switch rails demanded by the nature of the switch, as illustrated by Fig. 13. To allow for the shift of the switch rails, they remain unspiked for a distance of 15 ft. or more.

Grade Crossings

Crossings are used where tunnels or drifts intersect at right angles and it is desired to continue the tracks in the one direction without turning on the other tracks. The crossing, shown in Fig. 14, consists of four ordinary 90° crossing frogs *A* and the four inner crossing rails *B* which are a continuation of the tracks; the latter have a length of 15½ in. leaving a space of 1¼ in. between the point of frog and the point of crossing rail. An inner guard rail or square section *C* is often used, affording a more satisfactory track.

If the traffic is much heavier over one of the tracks, and it is desired to have the rails remain unbroken, then the track over which there is lighter traffic is raised 1½ or two inches above the other track, and hinged latches four or five inches long are swung over the main track to connect with the inner crossing rails when the lighter traffic track is to be used. When not using this track the latches are swung back again leaving the main track clear. But there is always the disadvantage of misplaced latches which give trouble.

A double crossover from one track to a parallel track is sometimes demanded. Fig. 15 illustrates the diamond crossover, one of the many kinds in common use. The switch points are fixed, there being no movable parts, and the direction of the car is controlled by the carman throwing his car. If desired, latch or tongue points may be used, operated by hand or by switches, which would probably be necessary if a train was running.

The crossover is somewhat intricate for the average trackman to put down correctly, and at times is also troublesome to use. It may be done away with entirely with a one-car traffic, and a large piece of sheet iron substituted as shown by Fig. 16. The inner rails are cut out leaving only the two outside rails, and if the carman wishes to cross over he throws his car by a twist and passes to the other track. If he wishes to continue on the one track he twists his car towards the outer rail. The inside rails are flattened at the end, curved outwards, and screwed down to the iron sheet. This

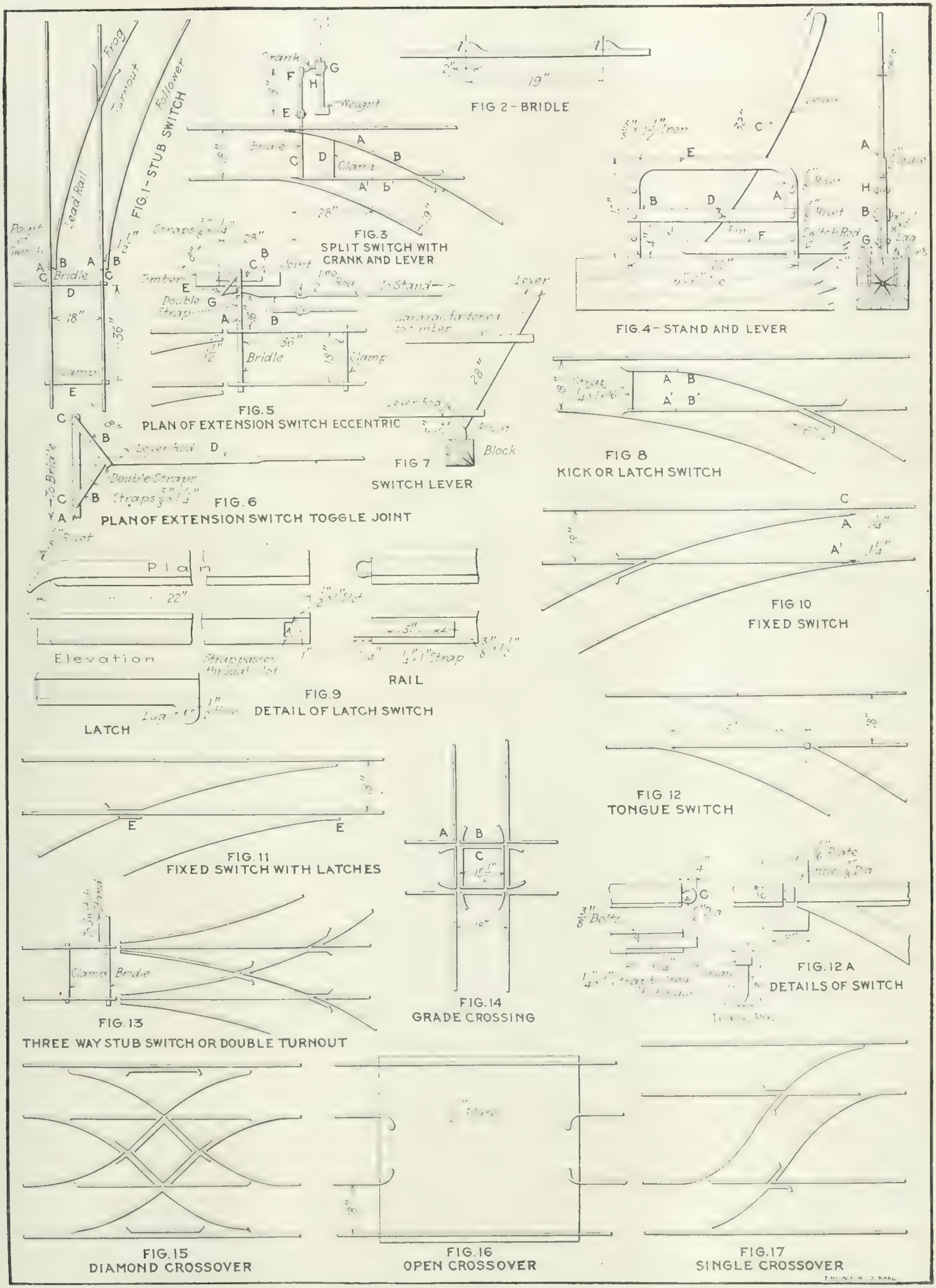

FIG. 1—STUB SWITCH

FIG 2 - BRIDLE

FIG. 3 SPLIT SWITCH WITH CRANK AND LEVER

FIG. 4 - STAND AND LEVER

FIG. 5 PLAN OF EXTENSION SWITCH ECCENTRIC

FIG. 6 PLAN OF EXTENSION SWITCH TOGGLE JOINT

FIG 7 SWITCH LEVER

FIG 8 KICK OR LATCH SWITCH

FIG. 9 DETAIL OF LATCH SWITCH

RAIL

LATCH

FIG 10 FIXED SWITCH

FIG. 11 FIXED SWITCH WITH LATCHES

FIG 12 TONGUE SWITCH

FIG. 12 A DETAILS OF SWITCH

FIG. 13 THREE WAY STUB SWITCH OR DOUBLE TURNOUT

FIG. 14 GRADE CROSSING

FIG. 15 DIAMOND CROSSOVER

FIG. 16 OPEN CROSSOVER

FIG. 17 SINGLE CROSSOVER

SWITCHES AND TRACK EQUIPMENT ADAPTED FOR MINE USE open crossover may be substituted for the three-way switch, doing away with the guard rails and frogs. Fig. 17 shows a single crossover; it has but few parts, is simple, and gives no trouble. The switch points can either be fixed or used as a kick switch.

Quartz Mining in the Klondike District

A report on quartz mining in the Klondike district, by D. D. Cairnes, appears in the "Summary Report of the Canadian Geological Survey for 1911," just issued. The writer examined a number of the most promising quartz properties in the district, mainly in that section situated along and between Indian and Klondike Rivers and their tributaries. Quartz veins are plentiful in the schistose rocks, and although the greater number of these deposits are small and nonpersistent, the aggregate amount of quartz is great. Occasional encouraging assays have been obtained, but with rare exceptions it is not even approximately known what amount of gold the deposits in the different localities contain. The quartz is practically all free milling and but slightly mineralized, the only metallic constituents apparent being pyrite and rarely magnetite, chalcopyrite, galena and native gold.

Small Lenticular Deposits Most Common

A great amount of quartz occurs in the old schistose rocks, extensively developed in the district, the vein frequently exhibiting considerable variety of form, ranging in size from mere threads to masses several hundred feet in length, but in most places less than 10 ft. in thickness; one vein, however, on Yukon River, below the mouth of Caribou Creek, exceeds 30 ft. in thickness. The most common type of vein is lenticular in form, the individual lenticle measuring but a few inches in thickness and less than 50 ft. in length. In places where the veins are wider they are rarely traceable for any considerable distance. The lenses in most places follow in a general way at least, the strike of the schistosity of the containing rocks, but along their dips they frequently cut the wall rocks at various angles. Typical bedded or sheeted veins are also characteristic of some localities, the quartz occurring interleaved with the folia of the schists, the individual quartz bands being generally but a few inches in thickness. In places such deposits occur in zones up to 10 ft. or more in width, consisting entirely of alternate quartz and schist lamellæ, exhibiting a wide range of relative proportions. Typical fissure veins were also noted, which, owing to the decidedly schistose and fractured character of the inclosing rocks, readily pass into the lenticular or sheeted types. All types of veins are liable to bifurcate or branch out, smaller veins frequently uniting to form larger deposits. In places along lines of excessive fracturing, mineralized zones occur in which several of the vein types are represented. Often fair and occasionally even high assays are obtained, and in places the quartz shows native gold, but except in a few instances, it is not known what the gold content averages.

Examinations of the various properties show that the gold that does occur is always either associated with metallic sulphides, or is at or near the contact between the quartz and schists; in the latter case the gold is generally found in both vein and wall rock. It would thus seem possible that some of the fractured zones that have become irregularly impregnated with quartz, may prove of greater value than the more clearly defined massive veins, since the former contain a greater area of contact surfaces in the same volume or weight of material. However, the majority at least, of the mineralized zones examined do not appear to be sufficiently persistent to allow of their containing enough pay ore to make a mine, but it is possible that larger and more richly mineralized zones may be found. It is thought that since the majority of the veins are nonpersistent, the successful exploitation of the quartz will largely depend on finding groups of veins, or mineralized zones sufficiently close to allow of their being worked together. In a number of places several veins or zones have been noted in close proximity.

District Has Not Been Glaciated

The deposits already discovered in the Klondike in all probability represent but a small portion of the quartz actually existing, as bedrock is covered by superficial deposits in most places, except along the summits of the hills and ridges and along the sides of the secondary valleys where occurs the bulk of the quartz that has been found. Future prospecting and development may, therefore, result in the discovery of numerous deposits at present unknown. More development should be done in connection with the quartz deposits already discovered with a view to ascertaining their extent, and more systematic sampling and assaying should be performed to determine the average value of the gold content. It seems probable that at least the upper weathered and decomposed portions of a number of the deposits could be profitably milled. As the district has not been glaciated, a certain surface concentration of gold is to be expected, and is known to occur in some places. The most reliable and satisfactory assay results from free-milling deposits are obtained from mill tests of at least five or 10 tons, and a sampling mill capable of making tests of 10-ton samples of the quartz deposits of the district would greatly facilitate the development of the industry and stimulate prospecting.

Among the promising quartz properties are the Lone Star group, near the head of Victoria Gulch, a tributary of Bonanza Creek; the Violet group, situated along the divide between Eldorado and Ophir Creeks; the Mitchell group on the divide between the heads of Hunker and Goldbottom Creek; the Lloyd group and neighboring claims along the divide between the heads of Green Gulch and Caribou Gulch; and several groups of claims on Bear Creek, near where joined by Ludlow Creek. The only property on which development work, other than the necessary assessment work, was being done was the Lone Star, on which a four-stamp mill had been installed, and two shafts sunk to the depth of 60 and 40 ft. in addition to open cuttings. Electric power had been secured from the power line of the Northern Light & Power Co., on Bonanza Creek, four miles distant. The manager claimed to be able to mine and mill the ore for $3.50 per ton, and tests made indicated that at least the somewhat decomposed superficial portion of one or possibly both of the two main veins should yield pay ore.

In addition to the quartz deposits of the Klondike district, a number of quartz claims have been staked on Dublin Gulch, a tributary of Haggart Creek, which runs into the south fork of the McQuesten River, where a number of discoveries were reported. The ore seen by Mr. Cairnes consisted of quartz carrying varying quantities of mispickel and some typical samples yielded high assays.

Titanium in the United States

No rutile is known to have been produced in the United States in 1911, says the U. S. Geological Survey. The American Rutile Co. did not operate its property or plant, at Roseland, Nelson County, Va., but filled orders from its accumulated stock. Although it is probable that much more consistent results can be obtained by making ferrotitanium from rutile than from ilmenite, owing to the easier control of the percentage of the titanium and iron, ilmenite and titaniferous magnetite are much cheaper than rutile, and it seems that most of the ferrotitanium is made from titaniferous magnetite or from ilmenite. Ilmenite, however, is not suitable for making titanium carbide, used in electrodes for arc lamps and there promises to be some demand for this purpose. A small quantity of rutile was exported to Europe, and ferrotitanium to the amount of 51.17 tons was imported in 1911. It appears that 152,990 long tons of titanium rails were made in 1911, as compared with 256,759 tons in 1910. All other alloy rails amounted to only 999 tons.

Miners' Phthisis on the Rand—I

By Frederick L. Hoffman*

An investigation of miners' phthisis by the government of the Union of South Africa. The disease is not a bacterial infection, but an irritation and hardening of the lung tissue due to inhaled dust particles. Tuberculosis ordinarily supervenes in the last stages of the disease.

On June 2, 1911, the government of the Union of South Africa appointed a commission to inquire into the subject of miners' phthisis and pulmonary tuberculosis in continuation of earlier investigations which were not considered conclusive. The commission was required to make inquiry into and report upon the following matters:

"The extent to which miners' phthisis and pulmonary tuberculosis are prevalent among persons employed upon the mines within the Union specified in Regulation 19, published under Section 4 of the Miners' Phthisis Allowances Act, 1911, and in particular to subject to medical examination persons who are, or have been, so employed."

REPORT OF THE PHTHISIS COMMISSION

The commission consisted of seven persons with the Mines Medical Inspector as the chairman, and Dr. G. D. Maynard as the secretary. The report is dated Feb. 2, 1912, and briefly summarized, with critical observations, as follows: At the outset the commission points out that:

"A certain amount of apprehension was entertained in certain quarters that some of the miners might object to submit themselves to examination; notices were, therefore, prepared and sent to the mine managers, who were requested to post them in prominent positions on the various properties. These notices pointed out the confidential nature of the inquiry. No serious trouble was experienced due to unwillingness on the part of the miners to present themselves for examination; in the instances where some hesitation was shown a personal explanation sufficed to remove any prejudice which existed."

It may be assumed, therefore, that in the event that a similar inquiry were made in the United States an equal degree of willingness to coöperate would be met with on the part of the miners employed in this country.

The report includes a brief but most interesting description of mining methods on the Rand. Only a few extracts, however, can be given in this discussion, and a selection has been made of such as describe the probable relation of mining conditions to health in general, and the occurrence of miners' phthisis in particular. As regards temperature and humidity, it is said in the report that:

"The rock temperature increases with the depth of the mine—in a ratio of 1° F. per 220 ft.—and with this increase of temperature there is corresponding increase in the amount of moisture the air can carry. A hot moist atmosphere has an injurious effect on persons working in it. This question has been investigated by the 'Departmental Committee on Humidity and Ventilation in Cotton Weaving Sheds,' England, 1911; and it was found that injurious physiological effects began to be produced when the wet-bulb temperature rose over 75° F. In an article on 'Work under Pressure and in High Temperature,' appearing in *Science Progress*, January, 1908, Doctor Haldane says: 'It seems clear that for the economical working of a mine the wet-bulb thermometer should not in general be allowed to rise above 80° F., unless, perhaps, where there is a good air current.' The only means of reducing the humidity is by causing a good current of air to pass. In some mines the air is almost completely saturated, the wet- and dry-bulb thermometers showing little difference in temperature. It must be remembered, however, that a fan tends to dry the mine, as it removes an enormous amount of water (as much as 40,000 gal. per day on the Village Deep) as moisture in the air; and, therefore, the stopes and working places must be kept wet by sprays, etc., to prevent the raising of dust."

It would have been an addition of material value to the report, if the commission had included a statement of the ascertained facts regarding temperature and humidity conditions in the mines investigated. Such information would have been most useful for purposes of comparison or contrast with the corresponding conditions observed in the mines of our Western states. Mining operations as such, with special reference to dust as a predisposing cause of injury to health, are described in part as follows:

RAISING THE MOST DUSTY OPERATION

"Development may be described as the isolation by means of drives, winzes, and raises, of blocks of reef varying from 500 to 1000 ft. in length, and from 100 to 500 ft. in depth following the reef. Drives are tunnels, usually about 5 ft. 6 in. high by about 5 ft. broad, running parallel to the strike, or in other words, horizontally east and west on the reef, and roughly at right angles to the shafts. Winzes and raises are at right angles to the drives, running parallel to the dip of the reef and to the shafts, therefore approximately north and south. They connect the drives at intervals. The difference between these is that in a winze the rock is excavated from above downwards, and in a raise from below upwards. Raising is of all operations in mining the one in which the miner is most exposed to dust, because the holes are all 'dry' holes. It is consequently the most dangerous to health, and means must be adopted, such as jets of water under pressure, to prevent the escape of dust into the atmosphere."

The process of driving is described in the following abstract:

"Driving is done by means of rock-drilling machines worked by compressed air. The machine used, for drilling the holes which hold the blasting charge is of the percussive type, the hole being drilled by the abrasion of the rock. The drill which is fitted on to the machine is pounded against the rock by an air pressure of from 60 to 80 lb. The air, after performing the work on the piston, exhausts into the atmosphere, and this exhaust air as a rule constitutes the only ventilation in the vicinity of the dead end, or 'face,' of the drive. Unless suitable precautions are taken a large quantity of coarse and fine dust is formed by the percussion of the drill. Special difficulties in regard to dust prevention arise in the case of the top holes, because they are directed upwards. The introduction of water into these 'dry' or 'top' holes is more difficult than into the 'bottom' or 'wet' holes, which are directed downwards."

In machine stoping three machines are generally used on a stope face, which is usually of an average length of 200 ft. and a width of 72 in. "The most common practice is to drill over a 'bench,' or rectangular face of rock, with four holes. These holes are invariably 'wet' holes; but in cutting out a bench, say at the top of the stope, some dry holes are necessary. The most of the dust which escapes into the air is generated at the starting, or 'collaring,' of the hole. Some miners will not throw water on the rock when collaring, as they say it retards them in the rapid collaring of the hole. These holes are charged with blasting gelatin. There are as a rule six benches in a stope, three of which are drilled each shift. The average amount of explosive used is 33 lb. at each blast.

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The result of the blasting does not pulverize the rock to the same extent as in development work, but the shock of the explosion is directly transmitted to a greater area of ground covered with fine dust, resulting in much dust being thrown into and remaining in suspension in the atmosphere."

Result of Former Investigations

Passing from this brief description of mining methods on the Rand, the report proceeds to the diagnosis and definition of miners' phthisis. The literature of the subject is reviewed, and previous investigations are briefly summarized as follows:

"Two facts of primary importance stand out in these results. First it is apparent that the excessive incidence of lung disease among miners, engaged in a certain class of metalliferous mining, is not a feature peculiar to the mines of the Transvaal, and, although the extent and character of that incidence may vary in detail in different mining communities, the broad fact is well established of the prevalence of fibroid phthisis as a specific occupational disease amongst metalliferous miners working in hard rock. Second, it is of the highest importance to note, that these investigations have everywhere led to the same conclusions as to the nature and causation of the disease, which has come to be commonly known as miners' phthisis; and the evidence they contain, together with the very large local experience of miners' phthisis, has enabled us the more readily to formulate a working definition of the disease we are asked to investigate, and to construct definite clinical standards for its identification and classification."

The foregoing conclusion appears to be quite generally accepted by medical authorities on the subject, but the commission reconsidered the whole question and restated its views regarding the pathology and symptomatology of miners' phthisis in the following statement:

> It is primarily a chronic fibrosis of the lung, a chronic interstitial pneumonia as it is technically described. The irritant properties of the fine dust particles inhaled produce chronic catarrhal processes in the air cells and respiratory passages. From these a certain proportion of the dust particles are taken up and pass into the substance of the lung where they produce a chronic inflammation, which results in the production of fibroid changes around each focus of irritation. These changes become in time distributed in varying degree throughout the whole lung substance, and in the fibrous framework of the lung, and the pleura which invests it. These fibroid areas increase in extent, and ultimately coalesce to form patches of consolidation, obliterating in the process the true lung tissue, and gradually but inevitably, encroaching on the amount of normal lung substance available for respiration. The process at once induces and is extended by the occurrence of recurrent colds, slight attacks of pleurisy, and localized catarrhal inflammations, and is aided, no doubt, by exposure to sudden variations of temperature.
>
> The change is a diffuse one affecting both lungs, but not always equally. It takes a considerable time, commonly a period of several years, to impair the working capacity of those affected. It is not intrinsically an infective process, but is due to mechanical irritation, although its progress may be, and often is, accelerated by inflammatory attacks due to bacterial invasion. This is the primary condition found in all true cases of miners' phthisis—all are primarily cases of silicosis—which is the name given to the fibroid disease of the lung caused by the inhalation of stone dust.
>
> This condition of simple fibrosis may exist and progress for years. But, in the later stages of the disease, the lung so damaged is commonly invaded by the tubercle bacillus. In at least the great majority of cases tuberculous infection becomes toward the end superimposed upon the preëxisting silicosis, and the symptoms and course of the disease become to a greater or less extent altered accordingly.

I have given this conclusion in full, because of its far reaching importance and practical value to medical and other students of miners' phthisis in America. It is in conformity to qualified medical opinion. Any differences in views are explained by variations of occupational conditions, including mechanical properties of the particular dust common to each particular mining center. With regard to this point of view the commission pointed out that such differences "do not affect the unanimity of the general conviction, that the inhalation of rock dust is the primary and immensely the most important cause of miners' phthisis, and that with the absolute elimination of this factor the excessive mortality from lung disease in miners should cease to exist." And they add that "the influence of occupational disease on the health of the miners is not, however, shown solely in the number of deaths returned as due to phthisis. It increases the number of deaths from other respiratory diseases also. Preëxisting silicosis increases the mortality from pneumonia, and the latter disease, when it does not prove fatal, is characteristically slow to clear up if fibrosis of the lung be present. It is apt to assume a chronic form, and may readily become the forerunner of eventual tuberculous infection."

Several Stages of Miners' Phthisis

It would considerably enlarge the present discussion to review the observation of the commission with regard to the different symptoms and several stages of the disease. These are differentiated into: (1) Early fibrosis, with slight shortness of breath, and recurrent bronchial colds. The general health at this stage may not be noticeably affected, but there is a definite impairment of working efficiency. (2) Advanced fibrosis when the shortness of breath becomes more urgent and distressing, the cough more frequent, and the expectoration more copious. It is at this stage that tuberculosis may, and as a rule does supervene as an exterminal phenomenon. When this occurs, the downward progress of the patient is usually rapid and a fatal termination is common. After a further review of medical opinions regarding miners' phthisis, including observations by Sir Thomas Oliver, the commission offers a brief working definition of the disease sufficient to express its essential nature as follows:

"Miners' phthisis is a chronic disease of the lungs, characterized by progressive fibroid changes in the lung tissue and pleura, and accompanied by chronic catarrhal processes in the air cells and respiratory passages. The disease is thus primarily fibrosis of the lung, and the essential factor in producing this condition is the more or less continuous inhalation, over long periods, of fine rock dust. All true cases of miners' phthisis are thus primarily cases of silicosis; silicosis is the feature common to them all.

In the later stages tuberculosis becomes commonly or invariably superimposed upon this condition, and the type of the disease becomes that of a tuberculous infection in a fibroid lung."

The commission points out, however, that: "Pure tuberculosis of the lungs undoubtedly occurs to a certain extent among underground workers, particularly in the earlier years of their mining life. But such cases are not cases of miners' phthisis as defined above—they are cases of ordinary consumption in a miner." In order to enable the commission to estimate correctly the prevalence of miners' phthisis on the Rand, it was found necessary to examine physically a number of miners actually at work. The number of underground miners thus examined with a record of their personal history was 3136, but in addition thereto the commission specially examined all of the employees of two principal mines with exceptional care, including the taking of a radiograph of the chest, and a bacteriological examination of the sputum where chronic expectoration was present. The number of such cases examined was 326 in addition to the 3136 cases previously referred to. The commission also considered the mortality returns of the Transvaal, and a few post mortem records of the Johannesburg Hospital. For the purpose of classification it was considered advisable to group the cases of miners' phthisis into different classes as follows:

Classification of Phthisis

> Class 0. Normal Cases. These include, of course, all men with normal lungs, but they also include a small number of men, in whom no positive evidence of the presence of silicosis or tuberculosis was present, but who presented signs of old or

recent conditions which were not quite normal, e.g., emphysema, bronchitis, or thickened pleura over an area of the lung which has been the seat of a previous pneumonia, and a few other similar cases.

Class I includes cases where the history, symptoms and appearance of the miner pointed to his probably having the disease, but where no definite physical signs of its presence could be found on examining the chest. We have reason to believe that, with ideal conditions for carrying out the physical examination, the number included in this class would be diminished by absorption either into the class "normal" or into Class II. This, indeed, was found to be the case in the results in the special examination held at the Simmer & Jack hospital. That a small number of men do suffer from symptoms of the disease, in whom no clear physical signs of its presence can be found by clinical examination, is, we think, undoubted. This was borne out by the results of the special examination, where undoubted radiographic signs were found in cases in which a careful examination by two or more examiners had failed to show any abnormal physical signs. Nevertheless, the cases returned under this heading are to be regarded as borderland cases, in which the presence of fibrosis has been strongly suspected but not demonstrated.

Class II. In this group were classified all miners who showed undoubted, although frequently slight, physical signs of the disease, but whose working capacity was not impaired. They were men who were capable of undergoing a normal amount of physical exertion with at the most but little discomfort.

Class III. In this group were included more advanced cases, where the disease has progressed to a stage which produced a definite degree of physical incapacity accompanied by the complex of symptoms and physical signs which characterize intermediate fibrosis. The expectation of life of men in this class is seriously diminished.

Class IV represents the terminal condition, with practically absolute incapacity for underground, or, indeed, for any kind of work. In these cases the disease has advanced to such a degree that the sufferer is hardly able to undergo the slightest exertion without suffering from breathlessness. In this stage a secondary tuberculous infection is common.

It is explained further, that: Classes I and II thus coincide with cases of "early fibrosis," while Class III corresponds with those of "intermediate fibrosis," and Class IV with the group "advanced fibrosis."

(To be concluded)

Halloysite near Rome, Ga.

The halloysite mines of the North American Chemical Co., which are situated near Gore, Ga., on the eastern slope of Taylor's Ridge, about 24 miles north of Rome and near the present terminus of the Rome & Northern R.R., are to be exploited. The land on which the mineral is known to occur is on the lower slope of the ridge and covers approximately 1000 acres. The seam varies in thickness from four to six feet, and is estimated to contain 15,000 tons per acre.

A plant is to be erected by the North American Chemical Co., in the vicinity of Rome, for the manufacture of alum from this ore, which is a hydrated silicate of aluminum containing about 37% Al_2O_3. It is said that, although experiments have been made at various times to produce aluminum sulphate from halloysite, the present enterprise marks the first commercial plant actually using this ore as a raw material for aluminum-sulphate making.

Chemistry of the Anaconda Reduction Processes

The chemistry of the reduction processes at Anaconda, Mont., was discussed by Frederick Laist, before the International Congress of Applied Chemistry. The various departments of the reduction works are: Concentrator, roaster, reverberatory, blast furnace and converter. Of these, the concentator has no chemistry, its only function being to wash out the excess of the siliceous gangue of the ore (with a minimum loss of copper, silver and gold) over that required for good smelting.

Roasting-furnace Reactions

All concentrates finer than 5 mm. are called fine, and go to the McDougal roasting furnaces. These concentrates make up 90% of the charge, the other 10% being fine ores and limestone. This last is not decomposed in the roaster. On the first hearth the concentrates are simply dried. On the second the roast commences:

$$7\,FeS_2 = Fe_7S_8 + 6\,S$$
$$6\,S + 12\,O = 6\,SO_2$$

On the following hearths, the temperature gradually increases to a strong red heat and the various constituents are roasted according to the following reactions:

$$FeS + 3\,O = FeO + SO_2$$
$$Cu_2S + 3\,O = Cu_2O + SO_2$$
$$CuS + 3\,O = CuO + SO_2$$
$$Cu_3FeS_3 + 10\,O = 3\,CuO + FeO + 3\,SO_2$$
$$2\,Cu_3AsS_4 + 25\,O = 6\,CuO + As_2O_3 + 8\,SO_2$$

All of the arsenic is, however, not driven out, but a portion unites with the copper oxide to form arsenate and arsenite, which do not decompose until it reaches the reverberatory furnace, where a portion goes into the slag, the remainder into the matte. When too much air is admitted, the calcine becomes red, because of the reaction:

$$2\,FeO + O = Fe_2O_3.$$

The formation of sulphates takes place as follows:

$$FeS + 4\,O = FeSO_4,$$

or, perhaps more accurately

$$FeS + 4\,O = FeO + SO_2 + O = FeO + SO_3 = FeSO_4.$$

When Fe_2O_3 is present, owing to its powers as a catalyzer, it is probable that at least a part of the sulphate is formed in this way. Copper sulphate is formed partly in the same way that iron sulphate is formed, and probably, in part:

$$CuO + FeSO_4 = CuSO_4 + FeO,$$

since ferrous sulphate will decompose much under the temperature at which copper sulphate decomposes.

Reverberatory Reactions

As the atmosphere in the reverberatory is almost neutral, the oxygen must have been added before the materials are placed on the hearth. The limestone decomposes:

$$CaCO_3 = CaO + CO_2,$$

and the iron and calcium oxides unite with the silica to form 86% of the slag. The Anaconda reverberatory slag is $8\,FeO.CaO.9\,SiO_2$ (a bisilicate). To reduce the cutting of the reverberatory bottom to a minimum, a slag should be used which is practically saturated with silica at the prevalent furnace temperature. Of the remaining 14%, about one-half is alumina, and the other half, MgO, MnO, Cu, S, alkalis, carbon, etc.

There has been an immense amount of discussion as to whether alumina is an acid or a base. Mr. Laist believes it to be amphoteric, according to whether bases or acids predominate in the slag. However, both series of aluminum compounds seems to be difficultly fusible and gummy.

The reactions which yield matte are dependent primarily on the power of sulphur, combined with iron, to reduce copper combined as oxide or silicate.

$$4\,FeS + 6\,CuO = 3\,Cu_2S + 4\,FeO + SO_2$$
$$4\,FeS + 4\,CuSiO_3 = 4\,FeSiO_3 + 2\,Cu_2S + 2\,S$$

The simple reaction

$$FeS + CuO = FeO + CuS$$

is impossible, as CuS is unstable at high temperatures, breaking down into $Cu_2S + S$.

While much has been written concerning the harmful effect of Fe_2O_3 produced in roasting, it cannot be very serious, since sulphides would reduce this, thus:

$$3\,Fe_2O_3 + FeS = 7\,FeO + SO_2.$$

Practically all the sulphur not required for these last reactions goes into the matte, so calcination is carried to such a point that there is just enough sulphur left to cause the formation of a 40% matte.

Blast-furnace Reactions

In the upper part of the blast-furnace charge column, a certain amount of roasting goes on and FeS_2 and $CaCO_3$ break down, yielding S and CO_2, respectively. The oxygen of the blast is well utilized, as is shown by the clouds of yellow sulphur which appear when a fresh charge is dropped on a hot top. There is not enough O present to burn the S set free.

Bessemerizing of the sulphides, and oxidation of the coke, as well as union of the metallic oxides and silica, take place mainly in the tuyere zone. The Anaconda blast-furnace slag is mainly a sesquisilicate $7FeO . 9CaO . 12SiO_2$. As the amount of oxygen is limited by the blast, any excess of carbon will prevent oxidation of the iron. Converter slag, $(FeO)_2SiO_2$, probably reacts thus:

$$(FeO)_2SiO_2 + SiO_2 = 2FeSiO_3$$

$$2(FeO)_2SiO_2 + SiO_2 = (FeO)_4 (SiO_2)_3.$$

Copper silicates are reduced as they are in the reverberatory.

Converter Reactions

The charge to the converters carries about 7% less copper than is called for by the formula $Cu_2S . FeS$. The converters are magnesite-lined, and the silica needed to unite with the iron oxide is supplied by adding ore. During the first half of the blow the reactions are:

$$FeS + 3\,O = FeO + SO_2$$

$$2FeO + SiO_2 = (FeO)_2SiO_2.$$

It is important that the slag be poured from the converter as soon as all but about 1½% of the iron has been eliminated, otherwise the charge foams out through the converter mouth. The reason for this is not clear, but is probably due to the formation of copper silicate, which thickens the slag, and prevents free passage of the air.

The slag having been removed, oxidation of the copper sulphide commences as follows:

$$Cu_2S + 4\,O = 2CuO + SO_2$$

$$Cu_2S + 2CuO = 4Cu + SO_2$$

The progress of these reactions is indicated by the color of the converter flame. This is green while the iron is oxidizing, blue just before removing the slag, and red while blowing the Cu_2S to copper.

The matte always contains more or less impurities, the chief ones at Anaconda being lead, zinc and arsenic. Experiment has shown that these are oxidized and eliminated as fume during the slag-forming period of the blow. This elimination is practically complete with zinc and lead, and is nearly so with arsenic. Little arsenic is eliminated during the copper-forming period.

The copper is taken from the converter to the refining furnace in a molten state, and carries about 98.5% Cu, the silver and gold for which it serves as a collector, and small amounts of other impurities. The copper is blown with air to eliminate these base impurities by oxidation, some of the copper also being oxidized. The impurities form a slag on the surface which is collected by means of cinders and skimmed off. The copper is now brought back to pitch by poling, which reduces the Cu_2O. The arsenic elimination in the Anaconda refining furnaces is small, this being almost completed in the converters.

Competition for Miners' Lamps

Under the auspices of the Acetylene Unions of the different countries, a competition for acetylene lamps for mines not containing firedamp is opened from now under the care of the International Committee of Carbide of Calcium, at Geneva (*Min. Journ.*, Oct. 26, 1912). The prize or prizes will be awarded to the lamp or lamps which most completely fulfill the following conditions: Simplicity and regularity; cheapness; strength and lightness; easiness of upkeep; convenience in cleaning and refilling; resistance to upset; ease of handling and capability of being carried in the hand or being hung on the walls; solid material, light, durable and unaffected by dampness or the results of the decomposition of the carbide; strong burner of long duration, and placed or arranged so as to avoid extinction from dripping water or by mine violences; production of gas as constant as possible, rational generation from the point of view of purity of the gas as well as the yield of the carbide; utilization of the present sizes of carbide intensity of 5 to 10 cp. as far as possible; duration of charge as long as possible.

The competition will be divided into two categories: (1) Portable lamps for carrying by hand, duration of charge eight to 12 hours; (2) portable lamps for carrying on the forehead, of extreme lightness, and a duration of at least four to five hours. At the discretion of the jury either one or two prizes may be awarded, of a total of 5000 fr., which may be granted if two prizes are awarded. 3000 fr. for the best portable lamps for the hand, and 2000 fr. for the best portable lamps for the forehead. The models, with description, price of resale, etc., must be forwarded before Mar. 20, 1913, to the International Committee of Carbide of Calcium, 5 Rue des Granges, Geneva. The jury will be composed of competent delegates from the different countries nominated by the respective Acetylene Unions.

Standard for Commercial Platinum

A committee appointed by the National Jewelers' Board of Trade, met, on Sept. 27, 1912, to consider the question of the marking of platinum (*Keystone*, October, 1912). After a long session regarding a definite standard for commercial platinum which would hold in law, the conclusion was reached that commercial platinum must be 950 fine, considering only metals of the platinum group, of which 950 parts, 65% must be platinum. Of the remaining 35% not more than 30% of any one metal of the platinum group must appear. The remaining 5% was allowed for all other metals of the group. [It is unlikely that any loosely drawn specifications of this sort will be adopted by anybody except the jewelers. Platinum ware made according to such specifications as these could not be counted on for any sort of laboratory service.—Editor.]

Hydraulicking Frozen Gravels in Yukon

By Henry Mace Payne*

Large areas of the Yukon goldfield are frozen to a depth which is as yet undetermined and drill holes which have been put down to a depth of over 200 ft. have produced cores of frozen material. This prehistoric frost necessitates thawing the gold-bearing gravel before it is possible to proceed with dredging. The hydraulic operations, however, do not require preliminary thawing, as the great force of the water issuing from the monitors tears the frozen gravel from the bank and washes it into the sluice boxes, over the riffles where the gold is caught, and the gravel passed on down, forming the immense tailing piles. It is found that by allowing water from small monitors, under pressure, to play over the top of the gravel bank, and trickle down the face, more or less thawing takes place on the surface. Advantage is also taken of the heating effect of the sun, during the open season, and the hills are cut away so as to expose the open face to its full rays.

The question of obtaining suitable timber for both thawing and cribbing purposes is rapidly becoming a serious one. The mountain slopes which were once heavily wooded are now denuded and the timber used in all classes of mining operations is rafted from far up the Klondyke and Stewart Rivers. Last summer's forest fires on the Upper Yukon also destroyed valuable timber for over 100 miles along its banks.

Quartz operations are rare in the district. There are a few companies following up promising leads, but no quartz field of any magnitude has as yet come to light. Last summer the Canadian government sent two quartz-mining experts to Dawson, to investigate the possibilities of the Yukon Territory for this type mining. Their report and possibly the erection of a testing mill at Dawson, will determine largely the future development of roads and public utilities under governmental supervision.

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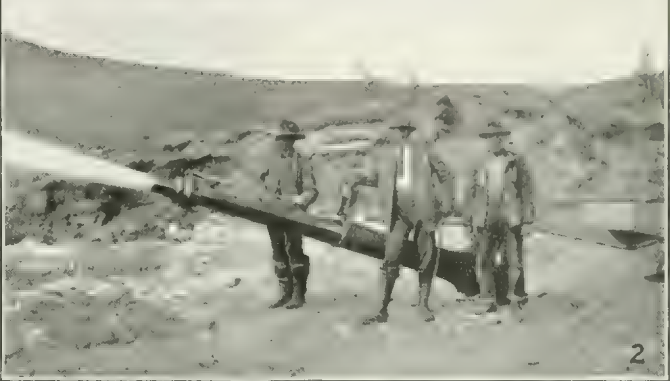
Photographs from the Field

HYDRAULICKING ON BONANZA CREEK, YUKON TERRITORY

1


2

3

4

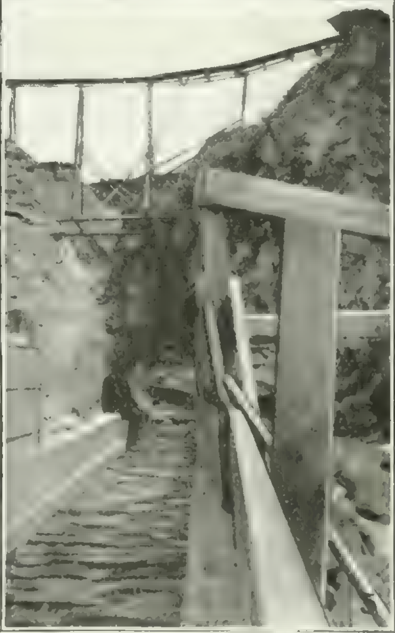
1 and 2. A 4-in. giant with water at 125-lb. pressure attacking frozen gravel forming the mountain side

3. View showing height of gravel bank and trestle carrying pipe line

4. Hydraulicking the frozen gravel with water brought from another watershed through a pipe line 60 miles long

5. Main sluice box, showing riffles of 12-in. cubes of wood, set on end

6 and 7. The creek bottom was first dredged and the wagon road established on dredge tailings; to the right is a nearer view of the extensive cribbing used in protecting the wagon road from the hydraulic tailings; the telephone poles have been reset three times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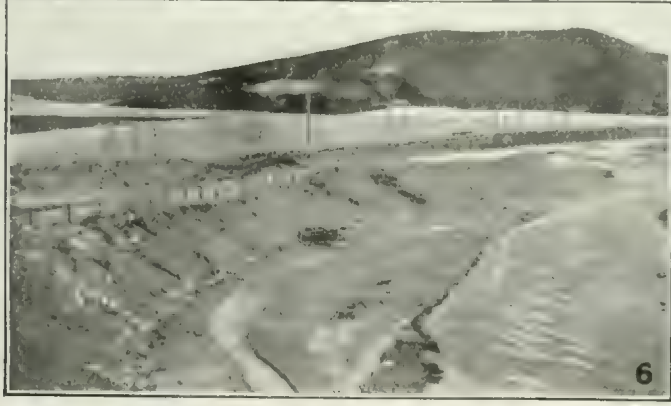
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New Type of Wisconsin Zinc Deposit

By G. H. Cox*

In the early days of the Wisconsin district when galena was the chief ore, the characteristic occurrence was in "crevices" and "openings." At present sphalerite is the principal ore; it is found typically in "flats" and "pitches." Recently a new type of flats-and-pitches deposit was distinguished, called the "single pitch." It differs from the ordinary type in shape, occurrence and direction of pitch.

Orebodies occurring in "openings," "crevices," "flats" and "pitches," and, to some extent, in disseminated deposits have long been recognized as the type deposits of the Wisconsin district. Of these, the occurrence of the ore in crevices or major fractures and cave-like openings was characteristic of the early days of the district when galena was the chief ore and the mining was confined to shallow depths.

Flats and Pitches, Typical Deposit

Today, when the mining is carried on at lower levels, being practically all confined to the lower 50 ft. of the ore-bearing formation (the Galena dolomite), and sphalerite is the chief ore, flats and pitches are recognized as the main type deposit of the district. Deposits of this nature result from ore filling such fractures as would result if a portion of the dolomite, relieved of its support, broke in the form of a natural arch, and slumped. The "core ground" (that portion of the rock which slumped) is generally a number of hundred feet long, from 100 to 200 ft. wide, and surrounded on all sides by an outwardly pitching crevice which arches or "flats" over the top. The fractures and openings developed across the strata and along the bedding planes in this portion of the rock by the slump and later enlarged by solution become, when mineralized, minor flats and pitches.

Openings Were Caused by Slump

Bain[1] was apparently the first to recognize that these openings were caused by slump. He found that their occurrence was limited largely to structural basins and therefore concluded that during the deposition of the oil rock (a thin layer of organic shale at the base of the chief ore-bearing formation) from the sea it accumulated thicker in these basins than elsewhere, and that therefore the slump resulting from the decomposition of this organic matter would be greater at these points; thus accounting for both the formation of the flats and pitches and their occurrence in the structural basins.

However, it has since been suggested[2] that solution by underground water has probably been the most important factor in causing this slump and that the size of the openings themselves is largely due to farther solution along the resulting fractures. Naturally a great many variations in the shape, size, richness, etc. of these deposits occur as would be expected from varying conditions.

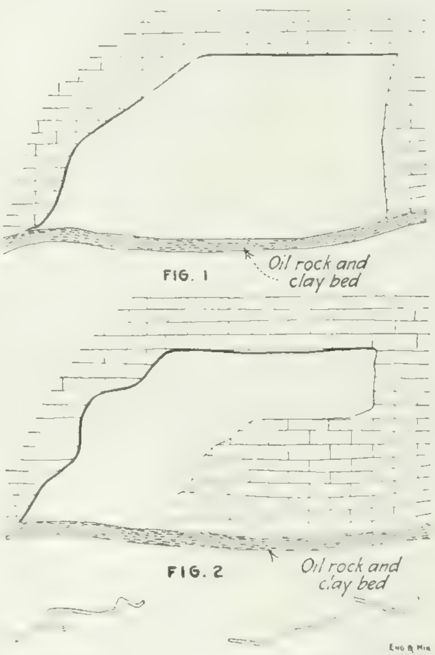

FIG. 1 FIG. 2 FIG. 3 FIG. 4

Sections of New Type of Zinc Deposit in Wisconsin

All horizontal or pitching sheets of ore do not belong to the typical flats and pitches described above. Much confusion has resulted from this fact and money has been uselessly lost in looking for a second pitch where none should have been expected. Bedding planes may be locally enlarged by solution while vertical and pitching crevices or major joints cross the area in various directions and which may occur at any structural position. Many of these are small freak deposits although some may belong to the class now to be described.

Single Pitch Deposit New Type

In the last few years a new type of a flats-and-pitches deposit has been developed. While at first glance it is rather similar to the ordinary type, it is in reality much different and might be more correctly known as the "single-pitch" deposit. Fig. 1 is a cross section of a deposit after the ore was removed; core ground all mineralized. Fig. 2 is another section after the ore was removed in which the core ground was but partly mineralized. These deposits differ from the ordinary type: (1) By having in general but one pitch; (2) by occurring in any structural position, but typically on the sides of the main oil-rock basins; (3) by being narrow, usually 30 to 100 ft., 50 ft. being a fair average; and (4) by their great length, the maximum of which has not yet been determined but which is greater than a mile. The two best examples of this type of deposit are the Empire mine at Platteville and the Klar-Piquette mine about 4½ miles southwest of that point. In neither of these mines has either end of the deposit been fully determined although the Empire orebody (including the Enterprise mine) has been outlined for about 5000 ft. and that of the Klar-Piquette for about 4000 feet.

Such orebodies are limited on one side by a well defined pitch near which the best ore is usually found, and on the other side by a tight vertical crevice, a trace of a pitch, or by a gradual leaning out of the ore. While these deposits are found on the sides of the main oil-rock basins, the longer dimensions of which they tend to parallel, they usually occur in minor basins, or rather troughs, about 100 ft. wide with the oil-rock raising only five to 10 ft. above the bottom of the trough on the side toward the main oil-rock basin.

Throughout the greater portion of their course these deposits seem to be connected with the surface by vertical fractures, which, however, do not appear always to be present. From the standpoint of origin it seems probable that while the presence of a long crevice in the dolomite and a small trough or roll in the oil-rock would aid greatly in the formation of a deposit of this nature, neither is necessary, for if water can flow along a crevice without the presence of a structural trough and continue its course beyond the limit of the fracture, ore deposits can be formed in these positions.

If we consider the ore to have been derived from above[3] and carried by ordinary surface water, the study of the situation of ore deposits here becomes the study of the underground-water circulation. In general this water tends to flow down the slope of the impervious oil-rock bed into the structural basins and then in the directions in which the basins pitch. Water from the surface containing ore in solution after having entered a crevice would tend to follow that crevice until another more open or extending more nearly in the desired direction was encountered. The water may be considered as passing from crevice to crevice, thus forming those sharp elbow-like turns which are so characteristic of these single-pitch deposits.

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[1] H. Foster Bain, "Zinc and Lead Deposits of the Upper Mississippi Valley, Bull. U. S. Geol. Surv. No. 294.

[2] G. H. Cox, Report on the lead and zinc deposits of northwestern Illinois, now in course of publication by the Illinois State Geological Survey.

[3] G. H. Cox, "The Origin of the Lead and Zinc Deposits of the Upper Mississippi Valley District," Economic Geology, August, 1911.

Deposits Distinguished By Shape, Occurrence and Direction of Pitch

It is to be noted that in following down one of these deposits the turn is always towards the main oil-rock basin, the prevailing direction of the deposit changing from oblique to parallel to the strike of the basin as the deposit approaches the bottom of the depression. While most of the water follows the crevice, a small portion is always seeking a more direct route and slowly finds its way along the joints and bedding planes on the drainage side of the crevice or water course. Solution accompanying this slow flow of water finally results in slump, but on this side of the crevice only. When this is accompanied or followed by the deposition of ore, there results a long, narrow, single-pitch deposit marked by sharp elbow-like turns as shown in Figs. 3 and 4. Fig. 3 is a horizontal section of the Klar-Piquette orebody on the scale 4.: 1 mile; Fig. 4 is a similar section of the Empire orebody on the same scale.

It is thus seen that these deposits should not be confused with those of the so called flats and pitches and are to be distinguished from them by their shape and occurrence, but probably most readily by the fact that these pitches tend to pitch in the direction of the main oil-rock slope, while in the other case the pitch is in the opposite direction.

These Deposits Narrow

These deposits are hard to find by drilling because of their extreme narrowness, and great care should be exercised in following such an orebody because of the necessity of determining its probable course so that the desired leases may be obtained, and because lean portions may be encountered which might otherwise be considered as the end of the deposit. The discovery of this class of deposits has greatly increased the attractiveness of the district and has shown that the possibilities of the district are much larger than heretofore supposed.

Lead Poisoning in Factories

Washington Correspondence

The Bureau of Labor has just completed a study of lead poisoning in potteries, tile works and porcelain enameled sanitary ware factories, etc. The investigation covered the conditions in 68 establishments, employing 2100 men and 400 women, and was carried on by Dr. A. Hamilton.

Extent of Lead Poisoning

Among the 1100 men employed in the potteries and tile works investigated, Doctor Hamilton found 87 cases of lead poisoning occurring in 1911, or one for every 12 or 13 employed, and among the 393 women 57 cases, or one for every seven employed. Among the 1012 men engaged in the porcelain enameling of iron sanitary ware 187 cases of lead poisoning were found in 1911, or one for every five employed.

The degree of danger involved in the various processes depends partly on the amount of lead used in the glazes and partly on the use or neglect of methods and devices for protecting the workers. In the 40 white-ware potteries visited, the glazes used contained from 1.75 to 33.3% white lead. In the seven potteries making art and utility ware and in the 11 tile factories the glazes contained from 5 to 60% of white lead. In the 10 porcelain enameled sanitary-ware factories, enamels are in use containing from 2 to 25% of lead.

Prevention of Lead Poisoning

The precautions which should be used in establishments using these lead glazes are indicated by the nature of the danger. Lead is a slowly cumulative poison which enters the human system chiefly through the digestive tract. The mucus membrane of the respiratory tract may absorb lead, and lead has also been found to penetrate the blood vessels of the lungs and so to reach the general circulation. The greater part of the lead which is breathed in as dust is swallowed with the saliva, thus reaching the stomach, and this is the most frequent mode of poisoning by lead. Next in importance comes poisoning by lead which is carried into the mouth with food or chewing tobacco which has been handled with lead-covered fingers, or left exposed in a room where there was lead dust, or carried in the pockets of dusty clothes. Absorption of lead through the unbroken skin is probably a negligible amount.

The prevention of lead poisoning in a factory in which lead glazes are used depends upon measures to prevent dust so that the workmen need not breathe in lead, and measures to provide for personal cleanliness so that he will not convey lead into his mouth from his fingers or carry it home on his body or clothes.

Absence of Protective Measures

Preventive measures of both kinds were conspicuously absent in the factories investigated. Generally speaking, no effort was made to keep down the amount of dust, and no provision was made for carrying it off by exhausts or other mechanical devices. Processes which involve no dust were carried on in the same rooms with dusty ones, exposing workers in the first to a wholly unnecessary danger. The construction of the floors and the methods of cleaning added to the risk. Hot water, an absolute necessity for removing the lead from the hands before eating, was furnished in but a few instances, and soap and towels not at all. Lunch rooms were not provided, and in many instances workers ate wherever they could find a place, regardless of whether or not lead dust was thick about them. No medical care was given the employees except when one of them was taken violently ill while at work in the factory.

Radioactive Waters in the Caucasus

A correspondent of the London *Mining Journal* says that in the summer of the current year the Odessa section of the Imperial Russian Technical Society sent a special expedition to the Caucasus to investigate the radioactive rocks and waters there. The expedition investigated the radioactivity of the sulphur wells in Tiflis, the alkaline carbonic-ferrous wells of Borzhom, and also the waters of Suran. The springs of Abass-Tuman and Maxindzhaur, in the Batoum Province, were also examined. Of all these springs the most radioactive are hot sulphur ones. Judging by the degree of radioactivity of the springs, the presence of radioactive ores along the courses of the waters can hardly be assumed. The expedition did not find any rocks, where it searched, suggesting uranium or thorium ores.

Wedge's Copper-Recovery Method

The extraction in the wet way of copper from oxides, silicates and carbonates is covered by a recent patent of Utley Wedge (U. S. pat. No. 1,043,490). The ores are treated in a Wedge furnace of the muffle type, in a current of sulphur dioxide and air, or of sulphur trioxide. While the process is operative with as little as 3% of SO_2 in the gas, it is preferable to have 14 to 16%. The furnace must be maintained at 800° to 1100° F., but care must be taken not to overheat, and hence decompose, the sulphate after formation. The copper sulphate is then leached out of the sulphatized ore, and the copper precipitated as usual.

Mining and Metallurgical Patents

A Classified List of New Inventions

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by "The Engineering and Mining Journal" upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COPPER

ALLOYS—Method of Producing Alloys or Compounds of Titanium and Copper. Isador Ladoff, Cleveland, Ohio, assignor, by mesne assignments, of thirty one-hundredths to Walter D. Edmonds, Boonville, N. Y. (U. S. No. 1,042,694; Oct. 29, 1912.)

BRASS—Process for Making Brass. Lawrence Addicks, Chrome, N. J. (U. S. No. 1,041,940; Oct. 22, 1912.)

EXTRACTION—Process for the Extraction of Copper and Nickel, Particularly from Low-grade Ores and Products. Wilhelm Borchers, Aachen, Germany, and Harald Pedersen, Trondhjem, Norway. (U. S. No. 1,043,291; Nov. 5, 1912.)

LEACHING—Art of Extracting Metals from Ores. Jose Baxeres de Alzugaray, New York, N. Y., assignor, by mesne assignments, to Midland Ores & Patents Co., New York, N. Y. (U. S. No. 1,041,407; Oct. 15, 1912.)

RECOVERING COPPER from Compounds Containing the Same. Utley Wedge, Ardmore, Penn., assignor to Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,043,490; Nov. 5, 1912.)

GOLD AND SILVER

AMALGAMATING APPARATUS. Alfred Andrew Lockwood, Honor Oak, England, assignor to Turbo Amalgamator & Extraction Co., Ltd., London, England. (U. S. No. 1,043,611; Nov. 5, 1912.)

AMALGAMATOR. Frederick J. Hoyt, Redlands, Calif. (U. S. No. 1,042,229; Oct. 22, 1912.)

AMALGAMATOR. Royer Luckenbach, Colwyn, Penn., assignor to Penn Mining & Reduction Co., Camden, N. J. (U. S. No. 1,042,701; Oct. 29, 1912.)

CLASSIFYING or Grading Apparatus. G. H. Stanley, Johannesburg, Transvaal, assignor to Sands, Ltd., Johannesburg. (U. S. No. 1,039,206; Sept. 24, 1912.)

CRUSHING—Improvements in or Relating to Apparatus for Crushing and, if Required, Amalgamating Gold or Silver Ores. W. W. Wright, Pont Ruabon, Denbigh. (Brit. No. 22,323 of 1911.)

CRUSHING—Improvements in Stamp Guides for Use in Ore Reducing or Stamp Mills. E. W. Massam, Krudersdorp, Transvaal. (Brit. No. 8450 of 1912.)

CYANIDES—Production of Cyanamides and Cyanides of the Alkali Metals. Edgar Arthur Ashcroft, London, England. (U. S. No. 1,041,566; Oct. 15, 1912.)

CYANIDING — Improvements in the Treatment of Ores by the Cyanide Process. H. M. Leslie, Glasgow, Scotland. (Brit. No. 27,879 of 1911.)

CYANIDING—Process of Filtration. James Millar Neil, Toronto, Ont. (U. S. No. 1,043,455; Nov. 5, 1912.)

CYANIDING—Settling and Separating Tank. H. C. Holthoff, Mexico, Mex., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,043,698; Nov. 5, 1912.)

DREDGING—Gold Saving Table. Charles B. King and Jacob W. Fellmeth, Marion, Ohio, assignors to Marion Steam Shovel Co., Marion, Ohio. (U. S. No. 1,041,486; Oct. 15, 1912.)

DRY SEPARATOR. Fritz Oscar Stromborg, Seattle, Wash. (U. S. No. 1,042,836; Oct. 29, 1912.)

FILTERING APPARATUS. Lamartine C. Trent, Los Angeles, Cal. (U. S. No. 1,042,295; Oct. 22, 1912.)

STAMP MILLING—Feeding Apparatus for Stamp Mills. Otto Durstewitz, Parral, Chihuahua, Mexico, assignor of one-half to Frank Reichmann, Chicago, Ill. (U. S. No. 1,038,733; Sept. 17, 1912.)

IRON AND STEEL

ALLOY of Iron and Titanium and Process of Producing the Same. Isador Ladoff, Cleveland, Ohio, assignor, by mesne assignments, of thirty one-hundredths to Walter D. Edmonds, Boonville, N. Y. (U. S. No. 1,040,699; Oct. 8, 1912.)

BLAST FURNACE COOLING DEVICE. Frank D. Carney, Steelton, Penn. (U. S. No. 1,042,767; Oct. 29, 1912.)

COATING—Permeating Protective for Iron and Steel Articles. Herman J. Lohmann, Jersey City, N. J., assignor to The Firm of H. J. Lohmann & Co. (U. S. No. 1,039,978; Oct. 1, 1912.)

FERRO SILICON—New or Improved Method of Producing Ferro Silicon. C. Bingham, London, Eng. (Brit. No. 22,755 of 1911.)

FLUE DUST—Treatment of Flue Dust. John I. Souther, Westmont, Penn. (U. S. No. 1,041,363; Oct. 15, 1912.)

FURNACE — Regenerative Reversing Furnace. Luther L. Knox, Avalon, Penn., assignor to Keystone Furnace Construction Co., Pittsburgh, Penn. (U. S. No. 1,041,814; Oct. 22, 1912.)

FURNACES—Improvements in or Relating to Regenerative Metallurgical Furnaces, particularly the Open Hearth Type. Thomas S. Blair, Kane, Ill. (Brit. No. 15,480 of 1912.)

HARDENING—Process of Hardening Steel Poor in Carbon. Carl Burian, Berlin, Germany, assignor to Offene Handelsgesellschaft Gebruder Schubert, Berlin, Germany. (U. S. No. 1,042,999; Oct. 29, 1912.)

MANUFACTURE of Steel. Paul Girod, Ugines, France. (U. S. No. 1,043,090; Nov. 5, 1912.)

ROASTING—Improvements in or Relating to the Roasting of Iron Ores. Coln Musener Bergwerks A. V., Creuzthal, Westphalia, Germany. (Brit. No. 20,404 of 1911.)

SLAG POCKET for Furnace. William W. Smith, Ensley, Ala. (U. S. No. 1,042,046; Oct. 22, 1912.)

SOAKING PIT. Horace E. Smythe, Pittsburgh, Penn., assignor to The S. B. Smythe Co., Pittsburgh, Penn. (U. S. No. 1,044,093; Nov. 12, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINA—Method of Manufacturing Crystalline Alumina. Frank J. Tone and Thomas B. Allen, Niagara Falls, N. Y., assignors to The Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,044,296; Nov. 12, 1912.)

ALUMINUM—Composition to Facilitate the Tapping of Aluminum or the Like. Hayden A. Kern, Dayton, Ohio. (U. S. No. 1,041,484; Oct. 15, 1912.)

ALUMINUM—Improvements in and Relating to Aluminum Alloys. W. N. Naylor, London, and S. P. Hutton, Beckenham Kent, Eng. (Brit. No. 27,382 of 1911.)

ALUMINUM—Process of Manufacturing Sodic Silico Aluminate and Hydrochloric Acid. Alfred H. Cowles, Lockport, N. Y., assignor to Electric Smelting & Aluminum Company, Lockport, N. Y. (U. S. Nos. 1,041,598 and 1,041,599; Oct. 15, 1912.)

ALUMINUM—Process of Producing Ammonia and Aluminum Compounds. Carl Bosch and Alwin Mittasch, Ludwigshafen on the Rhine, Germany, assignors to Badische Anilin & Soda Fabrik, Ludwigshafen on the Rhine, Germany. (U. S. No. 1,043,798; Nov. 12, 1912.)

ALUMINUM—Tunnel Furnace for Making Hydrochloric Acid. Alfred H. Cowles, Sewaren, N. J., assignor to Electric Smelting & Aluminum Co., Sewaren, N. J. (U. S. No. 1,040,978; Oct. 8, 1912.)

LEAD—Process for the Manufacture of Metallic Lead from Lead Compounds. G. Jansen, Dusseldorf, Germany. (Brit. No. 3728 of 1912.)

NICKEL—Process for the Extraction of Copper and Nickel, particularly from Low-grade Ores and Products. Wilhelm Borchers, Aachen, Germany, and Harald Pedersen, Trondhjen, Norway. (U. S. No. 1,043,291; Nov. 5, 1912.)

NICKEL—Process of Extracting Nickel. Horace L. Wells, New Haven, Conn., assignor of two-thirds to Mary H. King, East Orange, N. J. (U. S. No. 1,044,316; Nov. 12, 1912.)

NICKEL—Process of Making Nickel Salts and Recovering the Acid Used. Horace L. Wells, New Haven, Conn., assignor of two-thirds to Mary H. King, East Orange, N. J. (U. S. No. 1,039,861; Oct. 1, 1912.)

PLATINUM—Clad Metals and Process of Making Same. Byron E. Eldred, Bronxville, N. Y. (U. S. No. 1,043,576; Nov. 5, 1912.)

PLATINUM—Compound Metal Body and Process of Making the Same. Byron E. Eldred, Bronxville, N. Y., assignor to Commercial Research Co., New York, N. Y. (U. S. No. 1,043,578; Nov. 5, 1912.)

PLATINUM—Method of and Apparatus for Producing Compound Metal Objects. Byron E. Eldred, Bronxville, N. Y., assignor to Commercial Research Co., New York, (U. S. No. 1,043,577; Nov. 5, 1912.)

TIN—Process of Making Anhydrous Tetrachlorid of Tin From Dioxide of Tin. Fritz Braunlich, Brunn, Austria-Hungary. (U. S. No. 1,039;356; Sept. 24, 1912.)

TIN—Process of Purifying Alkali Stannates. Gustav Spitz, Brunn, Austria-Hungary, assignor to Goldschmidt Detinning Co., New York, N. Y. (U. S. No. 1,041,895; Oct. 22, 1912.)

ZINC—Improvements in the Production of Zinc and Other Metals of a Similar Nature. Heinrich Specketer, Griesheim-on-the-Main, Germany. (Brit. No. 10,349 of 1912.)

ZINC-LEAD-ORE TREATMENT—Process for the Treatment of Refractory Zinc-Lead Ores. Andrew Gordon French, Nelson, B. C. (U. S. No. 1,041,060; Oct. 15, 1912.)

ZINC RECOVERY from Galvanized-Iron Articles. Eduard Broemme, St. Petersburg, Russia, and Rudolf Steinau, Nuremberg, Germany. (U. S. No. 1,042,315; Oct. 22, 1912.)

ZINC RETORT-FURNACE. Charles A. H. de Saulles, Gas, Kan., assignor to New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,041,977; Oct. 22, 1912.)

NON-METALLIC MINERALS

BARYTES—Process of Making Precipitated Barium Sulphate. John P. Walker, Rolla, Mo. (U. S. No. 1,040,594; Oct. 8, 1912.)

BARYTES—Process of Obtaining Porous and Fairly-Pure Barium Oxide from Barium Carbonate. Karl Bornemann, Aix-la-Chapelle, Germany, assignor to Chemische Fabrik Coswig-Anhalt, G. M. B. H., Coswig-Anhalt, Germany. (U. S. No. 1,041,583; Oct. 15, 1912.)

FELDSPAR—Process of Treating Feldspar for Potash. Harry W. Morse and Ledyard W. Sargent, Cambridge, Mass. (U. S. No. 1,041,327; Oct. 15, 1912.)

PHOSPHATE Fertilizer and Process of Making Same. Spencer B. Newberry and Harvey N. Barrett, Baybridge, Ohio. (U. S. No. 1,042,588; Oct. 29, 1912.)

MINING—GENERAL

ACETYLENE CANDLE. Ralph R. Arnold, Cripple Creek, Colo. (U. S. No. 1,043,039; Oct. 29, 1912.)

BLASTING—Method for the Detonation of Explosives. Heinrich Brunswig, Steglitz, near Berlin, Germany, assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. (U. S. No. 1,042,643; Oct. 29, 1912.)

DRILL. John A. Pease, Gypsum, Kan. (U. S. No. 1,042,597; Oct. 29, 1912.)

DRILL—Diamond Drill. Franz Bade, Peine, Germany. (U. S. No. 1,041,568; Oct. 15, 1912.)

DRILL—Electric Drill. Walter J. Bauroth, Columbus, Ohio, assignor to The

Jeffrey Manufacturing Co. (U. S. No. 1,044,338; Nov. 12, 1912.)

DRILL—Mining-Drill Chuck. John L. Dabadie, Stockton, Cal., assignor of one-half to Columbo Boitano, Stockton, Calif. (U. S. No. 1,044,029; Nov. 12, 1912.)

DRILL—Motive-Fluid-Operated Tool. Daniel Shaw Waugh, Denver, Colo., assignor to Denver Rock Drill & Machinery Co., Denver, Colo. (U. S. No. 1,042,512; Oct. 29, 1912.)

DRILL — Percussion-Tool Machine. Franz Bade, Peine, Germany. (U. S. No. 1,041,569; Oct. 15, 1912.)

DRILL—Rock Drill. Charles A. Hultquist, Los Angeles, Calif. (U. S. No. 1,040,544; Oct. 8, 1912.)

DRILL—Rock Drill. Edwin M. Mackie, Chicago, Ill., and Percival F. Doyle, Franklin, Penn., assignors to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. No. 1,042,359; Oct. 22, 1912.)

DRILL — Rock Drill. Henry Deitz, Denver, Colo. (U. S. No. 1,043,302; Nov. 5, 1912.)

DRILL—Rock Drill. Thomas J. Barbre and James G. Trefz, Denver, Colo., assignors to Western Machinery & Manufacturing Co. (U. S. No. 1,044,337; Nov. 12, 1912.)

DRILL BIT. Robert A. Welch, Dover, N. J. (U. S. No. 1,043,855; Nov. 12, 1912.)

DRILL EXTRACTOR. Benjamin F. Betts, Mazuma, Nev. (U. S. No. 1,042,873; Oct. 29, 1912.)

DRILLING—Improvements in and Relating to Machines and Appliances for Boring Rock, Coal and the Like. S. Buckley and H. Smith, Sheffield, Eng. (Brit. No. 21,433 of 1911.)

DRILLING—Improvements in and Relating to Tools for Boring Earth and Soft Rocks. A. Wolf, Liegnitz, Germany. (Brit. No. 19,462 of 1911.)

DRILLS—Improvements in and Relating to Percussive Rock Drills. John Drunnan, Sheffield, Eng. (Brit. No. 7085 of 1912.)

DRILLS—Improvements in and Relating to Rock Drills. M. A. Knapp, Oakland, Calif. (Brit. No. 21,257 of 1911.)

DRILLS—Improvements in Valve Apparatus for Percussive Rock Drills, Tools and the Like. G. Rayner, Sheffield, Eng. (Brit. No. 5549 of 1912.)

DRILLS—Improvements Relating to Rock Drills. G. Rayner, Sheffield, Eng. (Brit. No. 23,103 of 1911.)

DRILLS—Improvements Relating to Rock Drills and Like Percussive Tools. G. Rayner, Sheffield, Eng. (Brit. No. 13,657 of 1912.)

EXCAVATING—Automatic Electric Excavating Bucket. Walter G. Stephan, Cleveland, and Clement E. Beard, Columbiana, Ohio. (U. S. No. 1,043,640; Nov. 5, 1912.)

EXCAVATING MACHINE. Franklin J. Dearborn, Oakland, Calif. (U. S. No. 1,041,603; Oct. 14, 1912.)

EXCAVATING MACHINE. Leo Albert Krupp, Carey, Ohio, assignor of one half to Peat Industries, Ltd., Montreal, Canada. (U. S. No. 1,043,113; Nov. 5, 1912.)

FLUME—Trough or Open Flume. William Lennon, Manitou, Colo. (U. S. No. 1,042,239; Oct. 22, 1912.)

MINE CAR BRAKE. David W. Anderson and William M. Boyce, Clearfield, and Frederick W. Hollopeter, Glenhope, Penn. (U. S. No. 1,043,498; Nov. 5, 1912.)

MINING METHOD—Method of Getting Clay, Chalk, or the Like, Applicable also to the Working of Mines or Making of Railway Cuttings. Robert Beart Lucas, Hitchin, England. (U. S. No. 1,043,781; Nov. 5, 1912.)

ORE BIN DOOR. Oliver H. Dickerson, Duluth, Minn. (U. S. No. 1,041,444; Oct. 15, 1912.)

RESCUE WORK—Method of Causing Artificial Respiration. Johann Heinrich Draeger, Lubeck, Germany. (U. S. No. 1,044,031; Nov. 12, 1912.)

ROPE WINDING ENGINE. Harry N. Covell, New York, N. Y., assignor to Lidgerwood Manufacturing Co., New York, N. Y. (U. S. No. 1,042,090; Oct. 22, 1912.)

TUNNELING—Shaft Boring and Tunneling Machine. William F. Wittich, Erie, Penn. (U. S. No. 1,043,185; Nov. 5, 1912.)

TUNNELING MACHINE. Lebbeus H. Rogers, New York, N. Y., assignor to Case Tunnel & Engineering Co. (U. S. No. 1,039,809; Oct. 1, 1912.)

WATER MEASUREMENT—Miner's Inch Weir. William F. Englebright, Nevada City, Calif. (U. S. No. 1,042,097; Oct. 22, 1912.)

WIRE ROPE HOOK DEVICE. Nels O. Norell, Vancouver, B. C. (U. S. No. 1,043,064; Nov. 12, 1912.)

ORE-DRESSING—GENERAL

CONCENTRATOR. Arthur R. Wilfley, Denver, Colo. (U. S. No. 1,043,280; Nov. 5, 1912.)

CONCENTRATOR—Ore Concentrator. Clarence I. Glassbrook, Salt Lake City, Utah. (U. S. No. 1,038,871; Sept. 17, 1912.)

CONCENTRATOR—Ore Concentrator. Emil Deister, Fort Wayne, Ind., assignor to the Deister Concentrator Co., Fort Wayne, Ind. (U. S. No. 1,040,288; Oct. 8, 1912, and 1,044,030, Nov. 12, 1912.)

CONCENTRATOR—Ore Concentrator or Slimer. Ira Monell, Boulder, Colo. (U. S. No. 1,041,842; Oct. 22, 1912.)

CLASSIFIER. Lamartine C. Trent, Los Angeles, Calif. (U. S. No. 1,041,909; Oct. 22, 1912.)

CRUSHER and Pulverizer. Frank L. Buchanan, St. Louis, Mo., assignor of one-half to Charles F. Johnson and one-half to George Bridges, St. Louis, Mo. (U. S. No. 1,044,441; Nov. 12, 1912.)

CRUSHER—Rock and Ore Crusher. Theodor Willma, Milwaukee, Wis., assignor of one-eighth to Martin Walski and one-eighth to Stanislaw Kielar, Milwaukee, Wis. (U. S. No. 1,044,325; Nov. 12, 1912.)

CRUSHING—Apparatus for Grinding Ores and Other Materials. Harry W. Hardinge, New York, N. Y., assignor to Hardinge Conical Mill Co., New York, N. Y. (U. S. No. 1,041,783; Oct. 22, 1912.)

CRUSHING—Ball Mill. Heinrich Ostwald, Cologne, Germany. (U. S. No. 1,043,349; Nov. 5, 1912.)

CRUSHING—Improvements in Crushing Machines. J. E. Simons, Milwaukee, Wis. (Brit. No. 599 of 1912.)

CRUSHING—Improvements in Crushing Mills. T. J. Sturtevant, Wellesley, Mass. (Brit. No. 14,832 of 1912.)

CRUSHING—Improvements in or Relating to Breaking and Crushing Apparatus. E. Friedrich, Leipzig-Plagwitz, Germany. (Brit. No. 11,238 of 1912.)

CRUSHING—Improvements in or Relating to Crushing, Pulverizing or Disintegrating Machines. R. Emmott, Burnley. (Brit. No. 22,097 of 1911.)

CRUSHING—Improvements in Pneumatic Stamps for Crushing Ore and the Like. J. M. Holman and J. L. Holman, Camborne, Cornwall, Eng. (Brit. No. 27,273 of 1911.)

CRUSHING—Tube Mill Grinder. William Main, Piermont, N. Y. (U. S. No. 1,043,855; Nov. 12, 1912.)

MAGNETIC SEPARATION—Improved Process for the Magnetic Preparation or Oiling of Ores or the Like and Apparatus Therefor. Murex Magnetic Co., Ltd., and A. A. Lockwood, London, Eng. (Brit. No. 25,469 of 1911.)

ORE SCREEN. Charles O. Michaelsen, Omaha, Neb. (U. S. No. 1,040,251; Oct. 1, 1912.)

PULVERIZER. Frederick R. Cornwall, St. Louis, Mo., assignor to Williams Patent Crusher & Pulverizer Co., St. Louis, Mo. (U. S. No. 1,039,102; Sept. 24, 1912.)

PULVERIZER. William K. Liggett and Walter J. Armstrong, Columbus, Ohio, assignors to Jeffrey Manufacturing Co. (U. S. No. 1,041,495; Oct. 15, 1912.)

SEPARATOR—Ore Separator. William F. Bradbury, Kansas City, Mo.; Emma Bradbury administratrix of said William F. Bradbury, deceased. (U. S. No. 1,042,194; Oct. 22, 1912.)

SIZING—Machine for Sizing and Separating Granular Material. Benjamin A. Hughes, Colorado Springs, Colo. (U. S. No. 1,039,132; Sept. 24, 1912.)

SIZING—Method and Apparatus for Sizing or Volumetric Grading of Materials. Charles L. McKesson and Benjamin F. Rice, Colorado Springs, Colo. (U. S. No. 1,044,067; Nov. 12, 1912.)

SLIME CONCENTRATOR. William F. Deister, Fort Wayne, Ind. (U. S. No. 1,037,212; Sept. 3, 1912.)

METALLURGY—GENERAL

ALLOYS — Production of Alloys. Charles A. Hansen, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,041,072; Oct. 15, 1912.)

CASTING of Metals. Augustin Leon Jean Queneau, Philadelphia, Penn., assignor to Wetherill Finished Castings Co., Philadelphia, Penn. (U. S. No. 1,043,867; Nov. 12, 1912.)

CATALYTIC BODY. Byron E. Eldred, Bronxville, N. Y., assignor to the Commercial Research Co., New York, N. Y. (U. S. No. 1,043,580; Nov. 5, 1912.)

CHANNEL FURNACE. Nils V. Hansell, Bloomfield, N. J., assignor to American Grondal Co., New York, N. Y. (U. S. No. 1,043,695; Nov. 5, 1912.)

CHEMICAL APPARATUS for the Evaporation of Corrosive Liquids. Byron E. Eldred, Bronxville, N. Y., assignor to Commercial Research Co., New York, N. Y. (U. S. No. 1,043,581; Nov. 5, 1912.)

CHEMICAL VESSEL for Withstanding High Temperatures. Byron E. Eldred, Bronxville, N. Y., assignor to Commercial Research Co., New York, N. Y. (U. S. No. 1,043,579; Nov. 5, 1912.)

CONVERTER. Alexander F. Stirling Blackwood, Detroit, Mich. (U. S. No. 1,042,876; Oct. 29, 1912.)

CRUCIBLE FURNACE. Walter S. Rockwell, Jersey City, N. J., assignor to W. S. Rockwell Co., New York, N. Y. (U. S. No. 1,042,825; Oct. 29, 1912.)

ELECTRIC FURNACE. John A. Seede, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,042,613; Oct. 29, 1912.)

ELECTRIC FURNACES — Improvements in Electric Furnaces. A. L. J. Queneau, Philadelphia, Penn. (Brit. No. 19,305 of 1911.)

ELECTROLYTIC APPARATUS. William E. Greenawalt, Denver, Colo. (U. S. No. 1,043,096; Nov. 5, 1912.)

FURNACE LINING—Refractory Material. Frank J. Tone, Niagara Falls, N. Y., assignor to Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,042,844; Oct. 29, 1912.)

AUTOMATIC SAFETY DEVICE FOR ELEVATORS. Peter Hinkel, Ashland, Ky. (U. S. No. 1,043,833; Nov. 12, 1912.)

FURNACE SKIPS—Automatic Safety Device for Furnace Skips or Elevators. Peter Hinkel, Ashland, Ky. (U. S. No. 1,043,834; Nov. 12, 1912.)

GAS PRODUCER. Charles A. Kuenzel, Buena Vista, Colo., assignor to Kuenzel Gas Producer & Smelter Construction Co. (U. S. No. 1,042,566; Oct. 29, 1912.)

KILN—Burner for Rotary Kilns, etc. Povl T. Lindhard, New York, N. Y., assignor to F. L. Smidth & Co., New York, N. Y. (U. S. No. 1,042,576; Oct. 29, 1912.)

KILNS—Heat Regenerator for Cement Kilns. Bruno Bruhn, Charlottenburg, Germany, assignor to The Commercial Research Co., New York, N. Y. (U. S. No. 1,043,901; Nov. 12, 1912.)

LIGHT METALS—Electrolytic Production of Light Metals. George O. Seward, East Orange, N. J., and Franz von Kugelgen and Fritz von Bidder, Holcombs Rock, Va., assignors to Virginia Laboratory Co., New York, N. Y. (U. S. No. 1,043,154; Nov. 5, 1912.)

LIQUID FUEL—Process for Producing Combustible Gas. Charles A. Kuenzel, Buena Vista, Colo., assignor to Kuenzel Gas Producer & Smelter Construction Co. (U. S. No. 1,042,567; Oct. 29. 1912.)

MELTING FURNACE—Electric Melting Furnace. Wayne D. Ludwick, near Tacoma, Wash., assignor of fifty-one one-hundredths to Henry Hewitt, Jr., Tacoma, Wash. (U. S. No. 1,038,614; Sept. 17, 1912.)

ORE TREATMENT—Improvements in or Relating to the Treatment of Ores. N. H. M. Dekker, Paris, France. (Brit. No. 18,488 of 1911.)

POROUS METALS—Method for Producing So-Called Porous Metals. Harald Immanuel Hannover, Copenhagen, Denmark. (U. S. No. 1,042,111; Oct. 22, 1912.)

PURIFICATION—Method of Purifying Metals. Axel Gustaf Sundberg, Helsingborg, Sweden, assignor to Helsingborgs Kopparverks Aktiebolag, Helsingborg, Sweden. (U. S. No. 1,043,371; Nov. 5, 1912.)

PURIFICATION—Process for Purification of Metals. William H. Kelly, Los Angeles, Calif. (U. S. No. 1,041,801; Oct. 22, 1912.)

REGENERATIVE FURNACE. William Frederick Taylor, Tacoma, Wash. (U. S. No. 1,040,459; Oct. 8, 1912.)

ROASTING—Treating Furnace Gases. Utley Wedge, Ardmore, Penn. (U. S. No. 1,039,464; Sept. 24, 1912.)

SCREEN—Rotary Screen. George H. Worrall, Kirkwood, Mo., assignor to National Lead Co., St. Louis, Mo. (U. S. No. 1,041,935; Oct. 22, 1912.)

SMELTER SMOKE—Fume Arrester for Regenerative Matting Furnaces. William Frederick Taylor, Tacoma, Wash. (U. S. No. 1,040,460; Oct. 8, 1912.)

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Applicants are requested to call in person

William T. Soule, superintendent of the Valdez Creek placer mines, Alaska, is in Boston.

D. W. Jessup has been appointed superintendent of the Home Run Copper Co., at Pioche, Nevada.

C. C. Greenwood, superintendent of the Camelia mine, Pachuca, Mex., has been visiting New York.

James A. Ford, of Denver, recently examined some mining property in the Georgetown district in Colorado.

Donald Steel has returned to California after two years spent in the Belgian Congo for the Société International Forestière et Minière du Congo.

L. R. Lemoine, president of the United States Cast Iron Pipe & Foundry Co., New York, has returned from Europe.

W. L. Fleming, of New York, has gone to Porcupine and Cobalt, Ont., to inspect the holdings of C. L. Sherrill and associates.

Effingham B. Morris, chairman of the board of the Cambria Steel Co., has been made a director of the United Gas Improvement Co., of Philadelphia.

Louis Lorent, superintendent of the Santa Eduviges mine, Sonora, Mexico, is in Trenton, N. J., where he will remain awaiting a cessation of hostilities in Mexico.

Arthur W. Prausnitz, associate Pacific Coast manager for the Orenstein-Arthur Koppel Co., is on his way to Europe to make arrangements for enlarging the company's business on the coast.

Rupert Swinnerton has been elected president of the Hibuna Land & Iron Co., Hibbing, Minn. The company, which was recently incorporated, controls nearly 1000 acres of mineral land on the Cuyuna range.

William M. Fink, superintendent of the San Toy Mining Co., near Chihuahua, was being held for $5000 ransom by the rebel bands which captured Santa Eulalia, according to news received by the Department of State on Nov. 22.

President J. A. Farrell and Controller W. J. Filbert, of the United States Steel Corporation, and Eugene P. Thomas, president of the United States Steel Products Co., have returned from a tour of the Porahontas coke plants of the Steel Corporation.

E. W. Oglebay, of Oglebay, Norton & Co., Cleveland, was present at the dedication last week of the Oglebay Hall of Agriculture, Bethany College, Bethany, W. Va., which he had presented to the school. He has made numerous gifts to the college.

Walter Rachals, who has resigned from the office of Julian Kennedy to go with Westinghouse, Church, Kerr & Co., will be succeeded by W. C. Rott, lately resident engineer for Mr. Kennedy at the new plant of the Brier Hill Steel Co., Youngstown, Ohio.

J. M. Fitzgerald, formerly president of the Davis Coal & Coke Co., has been made president of the Western Maryland R.R. At one time he was assistant to the vice-president of the Virginia Iron, Coal & Coke Co. He is a member of the American Institute of Mining Engineers, and of the British Iron & Steel Institute.

R. H. Flaherty, head of the exploratory staff for the Mackenzie & Mann interests, who during the summer had charge of a large party engaged in prospecting the country on the east side of James and Hudson bays, in Ungava, has returned to Ontario. He states that the area examined is rich in minerals, but details of discoveries are withheld for the present.

Robert W. Hunt, of Chicago, widely known as the head of a prominent firm of consulting engineers, has been awarded the John Fritz medal for this year. This medal was founded in 1902 in honor of the veteran iron master whose name it bears "to commemorate notable scientific and industrial progress." Capt. Hunt was one of "John Fritz's boys." When about 20 years old he began work in the iron industry at Pottsville, Penn. Later he studied chemistry and became the chemist of the Cambria Co. He was at various times superintendent of steel works in Wyandotte, Mich., Johnstown, Penn., and Troy, N. Y. In 1888 he founded the firm of R. W. Hunt & Co., consulting engineers, inspectors, etc. He served in the Civil War from 1861 to 1865, rising from private to captain. The previous awards of this medal, besides the initial presentation to Mr. Fritz, have been to Lord Kelvin, George Westinghouse, Alexander Graham Bell, Thomas A. Edison, Charles T. Porter, Alfred Noble and Sir William White.

OBITUARY

Thomas Quirk, for many years prominent as a mining man in Butte, Mont., died at San Antonio, Tex., Nov. 7. He left Butte seven years ago on account of his health and since then had resided in Texas and Mexico. He was born in the Isle of Man, in 1856, and when a young man came to the United States. He was generally credited with the discovery of the Esperanza mine. His fortune was mostly derived from mining and from investments in Mexico. His real estate holdings in the Federal district of Mexico were the basis of a small fortune. He owned mining property in other sections of Mexico. He was prominent in the business and social life of the American colony. Mr. Quirk was one of the active developers of mining claims in Butte in the early days. He was known there as a man of kindness and philanthropy. He leaves a widow and two children.

Societies and Technical Schools

American Institute of Consulting Engineers—A meeting of this society will be held at the Engineers' Club, New York, Dec. 12, for the purpose of discussing the subject of "Professional Relations." The annual meeting of the institute will be held on Jan. 14 next.

National Society for Promotion of Industrial Education—The society has issued a provisional program for its sixth annual convention to be held at the Hotel Walton, Philadelphia, Dec. 5, 6 and 7. At the first day's session there will be discussion upon such subjects as present tendencies in vocational education, debatable issues in extending vocational education in Pennsylvania, and efficiency factors in training teachers. In the evening there will be a banquet at the Hotel Walton and a symposium on Federal aid for vocational education. On Dec. 6 and 7 the speakers will discuss various other phases of the society's work, particularly in the relation to state legislation for vocational education.

American Mining Congress—The preliminary program for the annual meeting at Spokane, Wash., provided for two sessions on Nov. 25, to be devoted to addresses of welcome and other opening proceedings, and to the annual address of the president. In the evening a reception was tendered by the Chamber of Commerce and the Spokane Club. Nov. 26 was devoted chiefly to reports of committees, with addresses on the relations of the Federal Government and the mining industry, by Senators Borah of Idaho, Poindexter of Washington and Smoot of Utah. Addresses were also expected from Dr. J. A. Holmes on the Bureau of Mines, and from Charles S. Thomas, of Denver, on mining-law revision. On Nov. 27 the sessions were to be devoted to discussion of the policy of the government with relation to public lands in the morning sessions, and to Alaska in the evening. Nov. 28 the main subject at the morning sessions was to be workmen's compensation, accidents and legislation relating thereto. The evening was to be devoted to entertainment. On Nov. 29 the morning session was to be given up to committee reports and to a discussion on mine taxation. The closing session in the afternoon was to be taken up by discussion on means for protecting mining investors and for furthering the interests of the mining industry.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Nov. 20—The negotiation which has been pending between the General Petroleum Co., of San Francisco, and the Union Oil Co., of California, is reported in San Francisco to have been closed in New York, the General Petroleum Co. taking over the controlling interest in the Union. It is said that the first payment has been made. It is not publicly known here what amount was paid nor how much of the Union stock is included in the transaction. The General Petroleum Co. was formed three years ago under the name of the Esperanza Oil Co., and about one year ago, after having taken over large holdings in Mexico, the company was reorganized, its capital stock increased from $7,500,000 to $50,000,000, and the present name adopted. There has been insistent report that the Shell Transportation Co. has completed a deal by which it would assume control of the production of the Union and the General Petroleum. The present acquisition by the General Petroleum is not looked upon as being a denial of the report regarding the Shell Transportation Co. It is believed in some circles that the controlling interest back of the General Petroleum is the Standard, but that opinion is not generally conceded. Whether or not this transaction will have any effect upon the situation of the Associated cannot at present be definitely ascertained. Several months ago there was a quite general impression that the Shell Transportation Co., or the Shell-Dutch Co., would acquire the controlling interest of the Associated. It is believed by some that the result of the negotiation between these companies at that time depended upon some possible amalgamation of the Union and the Associated.

Denver

Nov. 21—The city of Denver has now taken the question of building the Moffat railway tunnel through the Front Range from Denver in hand through its several organizations, and in conference with Newman Erb during the last three days the following plan has been discussed and is considered feasible: Mr. Erb proposes to supply one-third of the funds and asks the city to use its credit to provide the other two-thirds. In addition, Mr. Erb proposes to guarantee the interest on the city's money and in time to pay off all the indebtedness incurred by the city on account of the undertaking. He further expects the railroad to own the tunnel at some future time. He will permit it to be used by any other road desiring that opportunity, which will result not only in greater traffic for the road, but additional commerce for Denver. The probable cost of the 4½-mile tunnel complete will be $4,000,000.

The suit between the Portland Gold Mining Co. and Stratton's Independence, Ltd., for $600,000, for the alleged illegal extraction of ore and infringement of territory, has been settled by a compromise. The terms have not been made public.

E. L. Brown, president of the Denver Rio Grande R.R., announces that within two years the electrification of the entire main line will be completed. The work will give employment to thousands of men and a tremendous impetus to prosperity in Colorado and Utah. Within two weeks work will be commenced to electrify the division between Helper, Utah, and Salt Lake City, a distance of 115 miles. The cost is estimated as between $20,000,000 and $25,000,000. The electrification will be effected by the General Electric Co. Power for the Utah lines will be furnished by the Utah Utilities Co., and for the Colorado lines probably by the Central Colorado Power Co. The expenditures will include $3,000,000 for double-track detour over Soldiers Summit; $3,000,000 for electrifying the Utah unit; $2,500,000 for standardizing the Salida-Montrose line; $2,000,000 for electrifying Tennessee pass; $3,000,000 for increasing the capacity of the Central Colorado Power Co., which is planning to extend its transmission line into Colorado Springs and Pueblo, and $8,000,000 by the Utah power companies, which will electrify the Bingham & Garfield R.R., and all the plants of the Utah Copper Co. A large steam-generating plant will be built in Utah, to be used for emergencies on the Denver & Rio Grande. The question of electrifying Soldiers Summit was taken up by the Denver & Rio Grande last summer. The Telluride Power Co., a Colorado corporation, was expected to furnish the power. That company was unable to make the rates and was in financial difficulties. A few weeks ago its stockholders ordered the company dissolved and joined in a $52,000,000 merger of plants in Colorado, Utah and Idaho. This new company expects to spend millions for development purposes and will be able to furnish power to the railroad at a low cost.

A petition of the Portland Gold Mining Co., filed in the district court in Teller County, asks for a temporary restraining order to prevent the county treasurer, S. C. Paxson, and the board of county commissioners from offering the property of the company at public sale to pay taxes. The Portland property was assessed at $200,819 in 1910 and the taxes were $7549. In 1911 the assessed valuation was $338,610 and the taxes $11,885. The company declares the taxes exorbitant and gives this as a reason why taxes have not been paid. Fifteen of the larger mining companies of the Cripple Creek district are represented in the suit which is instituted under the name of the Acacia Gold Mining Co. and associated companies. In a similar suit last year the mining companies won.

Butte

Nov. 20—Steps have been taken, subject to the approval of stockholders, toward merging the Butte Electric Light & Power Co., the Missouri River Electric & Power Co., the Madison River Power Co. and the Billings & Eastern Montana Power Co., the new corporation to be known as the Montana Power Co. A special meeting of the stockholders of the Butte Electric Light & Power Co. will be held Dec. 12, to consider and vote upon the plan. The directors of the new company will be the same that have in the past directed the policies of the Butte Electric & Power Co., and the Great Falls Power Co., i.e., John D. Ryan, John G. Maroney, C. F. Kelly, Marcus Daly, and Max Hebgen, of Montana; J. & W. Seligman & Co., C. W. Wetmore, C. A. Coffin, C. H. Sabin and S. Z. Mitchell, of New York; Gardner M. Lane, of Boston; J. G. Schmidlapp, of Cincinnati; Fleming & Co., of London; and others, with C. W. Wetmore acting as president, and Max Hebgen as vice-president and general manager. The company will be capitalized for $100,000,000; three-quarters of the amount to be common and the remainder preferred stock. A new hydro-electric plant will be built at Wolf Creek, and work has already been started upon a dam across the Missouri River at this place to form an immense reservoir. Also the initiatory work is in progress for the erection of another large dam at the Great Falls of the Missouri for the development of hydro-electric power, where it is believed a manufacturing center will be created similar to that built up by hydro-electric power development at Niagara. With the immense amount of power developed by the plants of this company, it is proposed to operate the trains of the transcontinental railroads in the Rocky Mountain region, as well as to supply commercial light and power to all of the cities and towns in Montana. The plans also include the reclamation of thousands of acres of dry bench lands by irrigation by pumping water by electric power from the rivers and lakes for distribution.

Salt Lake City

Nov. 21—During October, seven Utah mines distributed $426,979 in dividends. These included the Daly-Judge, $45,000; Daly West, $27,000; Centennial-Eureka, $150,000; Grand Central, $25,000; Iron Blossom, $100,000; Mammoth, $60,000; Opohongo, $19,979.

Bulletin No. 523, treating of the western nitrate deposits, has just been issued by the U. S. Geological Survey. Utah, Idaho and Nevada are given considerable attention.

Nitrates of sodium, and of potassium, are found in Utah, near Marysvale, in Piute County, and from several other places. Niter salts also occur in the southwestern part of Idaho, near the Nevada-Utah line, and in Bannock County, near Soda Springs, as well as near Pocatello, in Blaine County. While all these deposits are not immediately available, the demand for this kind of salts is shown by the fact that during 1911 the United States imported $16,814,268 worth of nitrates.

All the mines of Bingham Cañon are now in operation, but are still hampered by shortage of men.

Negaunee, Mich.

Nov. 21—The big find of the Longyear interests, under the name of the Nevada Land Co., in the Mastodon district at Crystal Falls, has been a triumph of applied geology. The 1912 appraisal of the Michigan tax commission values the find at $565,000, and as yet the property is only in the exploratory stage. Five years ago the land was popularly thought to be worthless in mineral possibilities as previous operations and explorations in the vicinity had been ill-fated. The Longyear Exploration Co. of Minneapolis, prominent in diamond-drill work recently added a geological department to its staff. Geological field work carried on in the Crystal Falls area showed that in spite of previous failures the Mastodon region was a favorable place for ore. Diamond drilling was commenced; 15 or 20 holes were put down with no result, but the work was persisted in because the geological outlook was favorable. Finally one hole struck the edge of a deposit and cut a few feet of ore. Other holes then indicated the strike of an orebody. Upon drilling angle holes across the iron formation a gray slate, dipping like the ore at about 60°, was encountered as a foot wall and the holes were stopped in that. Later, thin sections of the slate were made and studied under the microscope. The drill-holes were then continued through the slate, and struck more ore and more slate interbedded in the iron formation. The best ore was found concentrated on the slates. The ore found at first on what was thought to be slate is only a fraction of what has been found on the slates in the lower horizons. The bottom of the ore formation has not yet been reached.

Seattle

Nov. 18—Col. W. P. Richardson, chief of the Alaska road commission, and Lieut. Glen E. Edgerton arrived in this city, from Valdez, on their way to Washington, D. C. Although road building in Alaska was greatly handicapped by the heavy rainfall during September and October, Colonel Richardson expressed pleasure over the amount of work done this year and stated, that it was his belief, that it would be but a few years until the importance of wagon roads for the development of Alaska would be realized and more national assistance given in their construction. In speaking of the work done this season, he said: "The rebuilding of the road from Nome to Bessie Level, was, no doubt, the most important piece of work done under our direction during the season. This is one of the most important roads in the north, it being a trunk line for several roads which assemble several miles out of Nome. Last year 23,000 tons of freight were hauled over this road. In all something like 25 or 30 miles of road were built this season and a great deal of repair work done on old roads and four new bridges were built." The longest stretch of road built by the Alaska road commission this season was the 15 miles to the Circle City and Birch Creek road, while the season's work included the building of three miles of road connecting Juneau and Sheep Creek the completion of the Seward and Inioke road, the improving of the Fairbanks and Valdez trails; the building of a winter shed-road from Ruby City to Salauta; the building of a trail from Cook Inlet to Willow Creek camp; the building of a winter trail from Seward to Iditarod; the improving of the Fairbanks and Coast roads and the building of bridges across Stewart Creek, Delta River, Jarvis Creek and Pile Driver Creek. Lieutenant Edgerton will purchase bridge material to be used in the construction of two bridges at a cost of $20,000 each over Nazina and Gilkana rivers. Members of the Alaska railway commission, including the following, have just arrived from a thorough investigation of railroad conditions in the North: Major J. J. Morrow, of the U. S. Army Engineers; Dr. Alfred H. Brooks, of the Geological Survey; Lieut. Leonard M. Cox, of the U. S. Navy Engineers; and Colin McCrea Ingersoll, a bridge engineer of New York. The commission has spent several months in Alaska investigating the transportation problem. Upon the recommendation of this commission the entire future policy of the Government may hang.

Porcupine

Nov. 22—The strike situation remains practically unchanged with the exception that after the first disorganization, due to the men going out, more work is being accomplished at the mines. Interest naturally centers around the Dome and Hollinger properties, as they are the two largest in the district, and the smaller companies are sitting tight waiting to see what they will do. The general feeling among the operators is that the strike will not last much longer. The union is short of funds and the majority of the men were not in favor of stopping work, but were intimidated by the more aggressive members. The Dome is working steadily at more than half capacity and as soon as new men come in, which will probably be in about a week, the production will again reach normal. The Hollinger is also working, although under greater difficulties than the Dome, on account of the different methods of mining. Both of these companies are firm in their intention to have nothing to do with the union and will continue work on the old schedule. The McEnaney mine, where the men first went out, is working on the old schedule. and has no intention of giving in. Four small properties, the Pearl Lake, Schumacher, Porcupine Lake and Three Nations have compromised with the union, but all the others will stand firm. In the accompanying table the scale that has been paid by the mines is compared with that demanded by the union.

COMPARISON OF WAGE SCALES

	Union Scale eight hours		Mine Scale nine hours
Machine men	$4.00		$3.50
Machine men, sinking	4.50		4.00
Machine helpers	4.00		3.00
Machine helpers, sinking	4.50		3.50
Muckers	3.75		2.75
Timbermen	4.25		3.50
Timbermen, helpers	3.25		3.00
Compressor, and hoist engineers	4.00		4.25(12 hr.)
Surface hoistman			3.50
Underground hoistman			3.00
Blacksmith	4.25		4.25
Machinists	4.25	50c. per hr. overtime	3.50
Pipefitters	4.00		3.00
Firemen	3.75		3.25 (12 hr.)
Surface labor	3.50		2.50
Cooks	100.00 per mo. and board		
"Cookie"	85.00 per mo. and board		
Chore boy	75.00 per mo. and board		
Board	1.00 per day		0.75

The Mining News

The Current History of Mining

Alaska

Another strike of rich placer gold has been made near Nome, on the Bay State group of claims. It is believed by some that this is the long sought continuation of the third beach line. Much excitement prevails.

Soo—A rich strike has been made on this claim, at the head of Dome Creek; Capt. W. L. Spalding, owner.

Alaska Consolidated Mining & Dredging Co.—Gravel panning from 25c. to $3 per pan has been uncovered on this company's claims, on Boulder Creek. W. L. Cochrane, of Nome, is president.

Threeman—A shipment of ore was recently sent from this mine on Prince William Sound to the Tacoma smeltery. W. A. Dickey, Landlock Bay, is manager. Improvements are being planned.

Alaska-Juneau Gold Mining Co.—F. W. Bradley, of San Francisco, has a contract with this company whereby he is to receive a portion of the company's capital stock as consideration for driving a tunnel, certain development work, and building a mill near tidewater. This contract was entered into in December, 1909, and the work has been progressing continuously since then. The tunnel has been advanced about 4000 ft., but has not yet cut any mineral deposit of value. Mr. Bradley has the option, under his contract, of not building the mill if developments are not entirely satisfactory.

Arizona

Mohave County

Golconda—This mine is shipping about 40 tons of 45% zinc concentrates per day. A crosscut has recently been started to cut the vein at a depth of 250 feet.

Maricopa County

Joe Fuller has been developing a gold claim near the Vulture mine. There is a shaft more than 200 ft. deep on one of the claims, and coarse gold has been taken out recently.

Palo Verde—At this mine, west of Arlington, five men are employed in sinking a shaft, which has reached a depth of 186 feet.

Roosemoore—One shaft at this mine, near Mesa, is 85 ft. deep. Galena rich in silver has recently been found in this shaft. High-grade copper ores have been found in other shafts, and these will be shipped to the smeltery at Hayden, as soon as the railroad completes a siding to the vicinity of the mine.

Rover—A shoot of rich ore has been found on the 240-ft. level of this Phœnix mine. Stoping will be started at once.

Vulture—Concentrates from this mine are being shipped from Wickenburg.

Gilbert—A carload of carbonate ore from this property, in the Blue Tank district, will be shipped to the smeltery from Wickenburg within a few days.

Santa Cruz County

Red Hill—George Januel is now shipping from this mine, near Nogales; the ore contains gold and some silver.

R. R. R.—John D. Wansing is now in charge of this mine, succeeding W. S. Sultan, who has been promoted to other work at Globe for N. L. Amster.

Mineral Hill—Harrington & Ellsworth have made a shipment of ore from this silver-lead vein owned by John Allen and associates. The ore was hauled to Chavis station on the Tucson-Nogales R.R.

Blue Lead—This mine near the Ivanhoe in Temporal cañon, has been sold by James Johnson, of the latter company, to J. M. Kellogg, a Colorado operator of experience.

Austerlitz—This mine at Oro Blanco is still shipping at the rate of one carload per day of $40 gold ore, which is hauled to Amado station for $8 per ton and thence to the Pioneer smeltery, near Tucson. Several neighboring mines, notably the Switzerland, have also struck good ore and the camp has taken on new life. The First National Bank of Nogales is financing the mine, which is under bond from Doctor Noon and associates to Woodworth & Lane.

California

Amador County

Lincoln Consolidated—It is reported that the drift has cut a vein in the Wildman on the 1950-ft. level; W. J. McGee, of Sutter Creek, manager.

Argonaut—The cleanup for October was one of the best in the history of the mine. Dividends are withheld pending the settlement of the suit of the Kennedy Extension, which has been in progress for the last two years.

Calaveras County

Recent rains, and a heavy fall of snow at Silver Lake, indicate a good supply of water in Angels Camp and neighboring districts.

Emerson—This gravel mine, near Mokelumne Hill, has been prospected and preparations are being made for ground sluicing. The ground will be broken with black powder, and carried into sluices with about 200 in. of water. The tailings will be impounded. J. D. Galloway, of Vancouver, is manager; George Emerson, superintendent.

Boire—A recent cleanup at this gravel mine, at Railroad Flat, produced $1000, representing the labor of six men for six days; Boire Bros., owners.

Marshall—This mine, at San Andreas, has been sold by order of the superior court to George D. Clarke, one of the owners of the adjoining Chapman mine.

Kern County

Mammoth Mountain Mining Co.—This is a new company incorporated to operate in the Kern River district, 60 miles northwest of Randsburg. Capital stock, $100,000. The directors are H. M. Russell, L. B. Russell and Charles Donelly, Jr., of Randsburg.

King Solomon—This mine will be equipped with electric hoist as soon as the substation of the Southern Sierras Power Co. is ready to supply the power. About 100 tons of high-grade ore is on the dumps and ready for shipment to the Red Dog mill. Little work has been done above the 250-ft. level, although the ore is exceptionally rich in the upper workings; Edward Shipsey, owner.

Butte—A big oreshoot was recently found on the 100-ft. level, and is being stoped.

Yellow Aster—A new air-lift pump has been installed in the 1700-ft. sump. This pump works under 84 lb. air pressure and lifts 25 gal. per min. 850 ft. The installation was made by W. D. Peter, chief engineer. The pump is the invention of Bryan Obear. The peculiar features of the pump are the small submergence, the absence of moving parts, the increase of efficiency with a falling pressure and decrease with a rising pressure. The pump is an experiment which is reported to be proving successful.

G. B.—About 150 tons of low-grade ore is ready for hauling to the Tip Top mill from this mine in the Stringer district. The ore will be cyanided at this mill, satisfactory tests having been made. C. G. Illingworth and others, of Randsburg, are lessees.

Mariposa County

Oro Rico—It is reported that the extraction and milling of ore at this mine, three miles west of Coulterville, will be resumed. The property is equipped with a 20-stamp mill. The mine has been in litigation for several months.

Clearing House—Operation of this mine, in Merced River Cañon, which was suspended for about one month, owing to lack of water, has been resumed.

Nevada County

Champion—The North Star Mines Co. will build a cyanide plant at this mine, on Deer Creek, which the company is operating under purchase bond.

Brunswick—Harry J. Cornelius, of Grass Valley, and William Nichols, of Soulsbyville, Tuolumne County, are reported to have been killed Nov. 2, by the inhalation of gases in the mine.

Champion—A record for fast drilling is said to have been made in October. A total of 755 ft. was made at three levels, 248 ft. north on the 1000-ft. level, 245 ft. on the 1600-ft. level, 262 ft. on the 2400-ft. level. Leyner air drills were used; one man to each drift, working three eight-hour shifts. The best record for one week was 71 ft. One hundred and seventy rounds were blasted, averaging about 13 tons to the blast; each blast averaged eight holes, and used 31 lb. of powder.

Pennsylvania—The new cyanide plant is in operation and doing satisfactory work. The plant is equipped with Oliver filters. The shaft has reached the 2000-ft. level, and it is reported that the returns from the ore treated more than pay for the development. The cyanide plant is said to have cost $30,000. Frank Vestal, of the Empire mine, is in charge.

Fairview—The sale of 200,000 shares of delinquent stock is advertised. The shareholders are principally residents of Wisconsin, who purchased the shares from C. M. Wilson, Arthur Hoge and others, of Nevada City.

Placer County

Midas—This gravel mine, on the extension of the channel formerly worked by the Hidden Treasure, is being developed; Midas Mining Co., of Stockton, owner.

Beaver Gold Dredging Co.—The dredge is working through the Capt. Hawk ranch and is reported to be taking out good pay.

Barton—Laird & Quinn, of Auburn, have leased this gravel mine, near Loomis.

Tuolumne County

App—The foreclosure sale of this and other properties of the Nevills estate, advertised for Nov. 17, was stopped by an injunction suit brought in San Francisco by the estate of Stanton L. Carter against the Central Land & Trust Co. The sale was to have been made in Fresno County.

Colorado

Clear Creek County

Manhattan-Union—This property is shipping four cars of zinc and lead ore per month. The zinc ore averages 40% zinc and is worth about $27 per ton. The lead ore averages about 40% lead, which together with the gold and silver, nets about $30 per ton. The ore is hand sorted and is shipped crude. The property is under lease to J. A. Force, of Denver.

Homestake—Development will be resumed at this property on Lincoln Mountain. The crosscut tunnel, which is now 540 ft. long, will be advanced to intersect the east extension of the Golden Jack vein.

La Plata—It is reported that a six-inch vein of silver ore has been struck in this property on Democrat Mountain. Lessees have opened the vein for a distance of 60 feet.

Capital—The raise from the tunnel level is now up 475 ft. and the 10-in. drill hole on the Aetna vein has been sunk 600 feet.

Rosebud—The east drift on the upper tunnel level has cut an eight-inch vein of sulphide silver ore; George W. Teagarden, manager.

Josephine—Development will be resumed on this property on Kelso Mountain, West Argentine district. The company contemplates the installation of a compressor plant.

Franklin—A winze is being sunk from the 100-ft. level. Lessees have recently struck a 14-in. vein of rich gold and silver ore.

Lombard—This property in Cumberland Gulch is being systematically developed by Henry I. Seamann. The fourth level is being driven to open the ground already prospected in the upper levels. Raises will be extended to connect with the second and third levels. A large quantity of milling ore is reported to be partially developed.

Hoosac—This mine, operated through a tunnel by E. D. Quigley, of Idaho Springs, for the last 12 years, is said to have an oreshoot 1800 ft. long, with backs of from 400 to 1600 ft., the ore being sulphide carrying gold, silver and copper. The mine is about one mile above Idaho Springs and a quarter of a mile below Fall River, and parallels the Specie Payment and Champion, both large producers. A mill is under construction by Peter McFarland & Co., of Denver.

Lake County—Leadville

Lackawanna Belle—The tunnel of this property on the west side of Lake Creek in Lackawanna Gulch is in 1400 ft. and a contract has been let to Clyde Bockwell to drive it 800 ft. further this winter. It is being driven to develop the Miller group of gold veins.

Fair Play—At this mine in Adelaide Park, 10 men are employed under Manager Covey, and about $16,000 worth of ore has been shipped since spring. Ore is now being shipped from the new drift at the 165-ft. level.

Teller County—Cripple Creek

Mary McKinney—The output for October was 38 carloads, worth about $35,000. The water having receded at the ninth level, a drift will be driven to the 800-ft. shoot of ore proved at the eighth level. Five machines are at work on ore above that level, and the mine is being put in shape for a heavy production.

Jerry Johnson—The October output from this mine, on Iron Clad Hill, made by Lessee Caley and his sub-lessees, was 450 tons.

Free Coinage—A stockholders' meeting at Altman, on Dec. 14, has been called by John B. Neville, president, to elect directors for the next year. The ore production for the year has been satisfactory.

Granite—This company, owned chiefly by the MacNeill-Penrose interests, mailed checks, Nov. 19, for a one-cent dividend, amounting to $16,500. The recession of the water is such that Superintendent B. McCarthy expects to operate on the 1100 level in about two weeks. Meantime the production is steady. Howbert & Price, lessees, are shipping mill ore from the seventh levels of the Dillon shaft.

Gold Sovereign—This mine, controlled by Mr. Hinds, of Le Mars, Iowa, who is president and has been at the head of its affairs for many years, has been through several fights for control and had other difficulties, but is now said to be in good shape, and has a new vein from which it is shipping from 10 to 12 carloads of milling ore per month. It is under lease to the Union Leasing Co.

Dante—From this mine, on Bull Hill, a carload of 27½ tons gave returns of $97 per ton; it came from the 500 level under lease to Armentrout & Cohn.

Colorado City—Robinson & Co., lessees, on this Portland property, are reported to have driven 50 ft. on three feet of ore which assays $35 per ton.

Blue Flag Mill—The quantity of ore treated is now expected to average 125 tons per day of $4 to $6 ore, from shoots recently developed in the mine.

Deerhorn—About six carloads per month is the output of this mine, on Globe Hill, under lease to William Fitts.

Doctor Jack Pot—A body of ore from which grab samples run $30 per ton, is reported to have been struck by the Kelly Exploration Co., lessees, at the bottom level of the Davenport shaft.

Idaho

BONNER COUNTY

Webber—Recent developments have exposed a large body of ore which carries gold and silver.

Golden Scepter—The lower tunnel, which has a length of 1000 ft., shows 6½ ft. of concentrating ore in the face. This shoot has been opened along its length for 150 feet.

Idaho Continental—Preparations are nearly completed for continuous shipments during the rest of the winter. Auto trucks are being used to haul the ore; 150 men are at work completing the road.

IDAHO COUNTY

Mineral Zone—Crosscutting has been begun from the second level. It is estimated that 40 ft. will have to be driven to cut the vein.

Mascot—A bar of bullion valued at several hundred dollars, representing the first cleanup from the new mill was shipped to Spokane recently. The new Wilfley table is installed and working satisfactorily.

Moscow—This property has been bonded to Los Angeles men for $100,000.

Little Butte—A winze is being sunk in the lower tunnel, 400 ft. from the portal. The first 30 ft. of sinking shows good free-milling ore.

American Eagle—The raise has been driven 40 ft. and will soon connect with the upper level. The hoisting plant is already installed and sinking will begin in a few days.

LATAH COUNTY

Mizpah Copper—It is hoped to make shipments to the smelter, but in any event development will be pushed all winter. In the No. 5 tunnel a shoot of ore 110 ft. long and 25 ft. wide has been opened up. The company plans to install a mill later. J. J. Stanford is superintendent.

Michigan

COPPER

Ojibway—No. 1 shaft has reached a depth of 2100 ft. and from the 1900-ft. level a raise is being put up to reach the lode, instead of driving a crosscut, which, owing to the flattening of the lode, would have to be extended a considerable distance. No. 2 shaft is temporarily bottomed at a depth of 1900 ft. Lateral openings in the lower levels are opening ground of average copper contents, but it is irregular and bunchy. A large stockpile has been accumulated during the development of the property and this may be shipped to one of the mills in the district in the near future.

Tamarack—The work of remodeling this company's mill is going on. The plans call for the installation of tube mills, Woodbury jigs, Wilfley tables, etc. So that when the mill is completed it will be along the lines of the Calumet & Hecla mills.

Houghton—Sinking in the winze from the 625-ft. level has been discontinued at a depth of about 200 ft. In sinking this winze three copper-bearing formations were cut. The west lode which is being opened so successfully at the Superior has not proved as rich as the main lode. An exploratory crosscut is being driven from the north drift of the 625-ft. level.

La Salle—The work of moving the surface equipment from shafts No. 5 and 6 to the site of shafts No. 1 and 2 is progressing and this property will soon be in shape to resume operations. No. 1 shaft is bottomed at a depth of 2100 ft. and a large amount of development work has been done, so as soon as the shaft is unwatered and the hoisting equipment installed shipments can be made to one of the Calumet & Hecla mills. Sinking will be resumed at No. 2 shaft, which is now bottomed at a depth of about 1800 feet.

Mohawk—A decided improvement is being noted in the ore in the northern workings. The north drifts from No. 1 shaft toward the Gratiot are showing some good ground equal to the better showing in the southern portion. The new No. 6 shaft tributary to North Ahmeek is developing ground that will be a big factor in the future of the property.

Calumet & Hecla—The foundations for the new electrolytic plant at Hubbell have been completed, but the iron work will not be erected until spring. Sixty-five 40-hp. General Electric motors are to be installed in the mines and smeltery.

IRON

Cascade—A wooden headframe is being erected over the new shaft now being sunk. It will be used until sinking is finished, when a steel headframe will be built.

Corrigan, McKinney & Co.—This company has formerly confined its Menominee range mining operations to the Crystal Falls district, where it is the dominant interest. Recently, however, preparations have been made for extensive mining in the Iron River district. Several orebodies proved by diamond drilling are controlled by the company in the Iron River field, including the Tully, Baker, Blair and Michaels. Active development is in progress at the Tully. The shaft which gave so much trouble before the ore was reached has been pumped out and a complete surface plant is being built. It is planned to sink a second shaft several hundred feet to the east, as the orebodies are scattered; the surface here is also thick and of quicksand nature. The Baker mine, just east of the Tully, which was abandoned two years ago on account of disagreements with the fee owner, may also be reopened and pumped out, as this would reduce the water level at the site of the proposed No. 2 Tully shaft.

Cleveland-Cliffs Iron Co.—This company has taken an option on the lands of the Sheldon estate in Mastodon township, Crystal Falls district, following test-pit exploration of the property recently optioned in Sec. 12, 42-32. Work has been commenced on Sec. 1, just west of the Dunn mine of Corrigan, McKinney & Co. The famous Mastodon find of the Navada Land Co., assessed at $565,000 by the State Tax Commission, is just to the south on Sec. 13.

Anvil—At this mine of the Newport Mining Co., at Bessemer, exceptional progress is being made in sinking the new vertical shaft. "Jackhammer" one-man drills are being used, sometimes as many as six at a time. Short holes, about 4 ft. deep, are drilled. The sinking is now in hard quartzite, but will soon be in slate; there was but a few feet of surface. The shaft will be 18x10 ft. 10 in. inside dimensions, and steel sets will be used, each set being self supporting.

Richmond—This open-cut mine on the Cascade range has been closed for the season after shipping more than 100,000 tons of low-grade siliceous ore. About 30 men were employed by M. A. Hanna & Co., which operates the mine.

Minnesota

MESABI RANGE

Morton—Stockpiling has been started and will be continued throughout the winter; 125 men are employed, but the force will probably be increased as the season advances.

Scranton—This property will be operated on a much larger scale than last winter.

Bennett—A large force of men is clearing the land preparatory to stripping. It is estimated that 10,000,000 yd. of overburden will have to be removed, a contract for 1,000,000 yd. will be let soon. A shaft will be sunk on Sec. 24; boiler houses and pumping plant are being built. The property consists of four "forties" one mile from Keewatin and will be opened by a subsidiary of the Meridan Iron Co. It is expected that shipments may be started in the spring. O. B. Warren is in charge.

Bray—The concrete stack has been completed and the engines are being installed. Stripping will be continued throughout the winter. During last season one shovel was used at the mine and a total of 200,000 tons of ore was shipped, the shipments for some days amounting to 90 cars.

Mahoning—Five shovels were at work on ore and three on stripping at this mine during last season. The last shipment for the year has been made, the season's total amounting to 1,500,000 tons, which is about the average for the property during recent years. Strippings will be continued until the close of the year and if the winter is favorable may be continued.

Section Four Mining Co.—A contract will be let for sinking a shaft. Further development work will be started in January. The property is known as the Wickey farm and adjoins the Fayal and Genoa.

Missouri

FLAT RIVER DISTRICT

St. Joseph Lead Co.—This company, at Bonne Terre, is adding to its power-plant equipment at the Leadwood mines a large 1000-kw. General Electric alternating-current generator. In the power plant of the Bonne Terre mines a new General Electric 1250-kv.a. Curtis turbo-generator is being added.

JOPLIN DISTRICT

Belville is coming to the front as an ore producer, the greatest activity being on the Murphy & Davidson lands where ore is being mined from 70 to 80 ft.; 6000 ft. of drilling will be done by Christmas.

Mining operations have been resumed at Gordon Hollow during the last few months. Ore was formerly mined at shallow depths by small operators, but these have given way to larger companies, among which are the Mattes Bros., C. C. Playter, the Independence, the General Lead & Zinc Co., the Priscilla, and the Geronimo companies.

Chapman & Lennan—These operators have been drilling the Walker land, north of Webb City. A 30-ft. face of lead ore was struck in the fifth hole at a depth of 60 ft. The other four holes also showed ore, the fifth being a bonanza strike.

Federal Lead Co.—This company, operating large lead mines in the southeastern part of the state, is prospecting several leases in the Joplin district. Southwest of Prosperity 12 holes have been sunk and a sheet-ore run proved at a depth of 190 ft. A shaft has been started on this lease. The ore is low grade and will require a mill of large capacity. Drilling is also being conducted on the old Troup farm and sheet ore has been encountered at 230 feet.

Pocahontas Mining Co.—A second shaft is being sunk to 190 ft., 250 ft. north of the mill, the object being to provide ventilation and shorten the underground haulage. An inclined tramway will be built from the new shaft to the mill hopper. A systematic drilling campaign is being conducted and good ore encountered north of the mill.

Montana

BUTTE DISTRICT

Alex Scott—Ore reserves have been considerably increased lately by opening a vein of 4% copper ore, averaging 20 ft. in width, on the 1800-ft. level. This orebody was mined on the 1600- and 1700-ft. levels, and is proving richer and wider as depth is attained. The vein has also been developed to some extent on the 1900-ft. level from the shaft of the adjoining West Colusa mine of the Anaconda company, with good results. On the 200-ft. level a vein was recently opened which averages about 3½% copper, with small bunches of high-grade ore. The company recently paid a dividend of 50c. per share on its 74,000 shares of stock outstanding from earnings, which are in the neighborhood of $25,000 monthly. Preparations are being made to increase the output of the mine.

Butte & Superior—Within a week or so the work of installing the new hoisting engine and headframe, which has been in progress for the last six weeks, will be completed. The engine, which was built by the Nordberg Mfg. Co., has capacity for hoisting from a depth of 3000 ft. A Nordberg air compressor, having a capacity for 5000 cu.ft. of air per min., has also been installed. The compressor will be rope driven by an 800-hp. motor. Ore will be hoisted in skips lifted by a flat steel cable. The work of remodeling parts of the concentrator will also be finished in a short time, and when completed the plant will have capacity for treating more than 2000 tons of ore daily. The changes include the installation of Garfield tables in the place of the coarse jigs, and the addition of a series of Wilfley tables to save lead. The Colonel Sellers shaft is being sunk steadily, and is expected to connect with the crosscut driven from the Blackrock shaft on the 1200-ft. level, in a short time. During the shutdown the mill has been treating between 400 and 500 tons of ore daily from a stockpile.

Rainbow Lode Development Co.—Duluth men have organized this company for the purpose of developing a group of seven claims situated north of the property of the Butte & Superior company. Edward C. Congdon, Thomas F. Cole and others, of Duluth, are organizers of the company, which has a capitalization of 80,000 shares of stock, par value, $10 The claims are the Third Sphinx, Michigander, Morel, Valley Queen, Carnbrea, Wanda and an interest in the Sarah. A shaft will be sunk on the Third Sphinx, and development work, will be done on all of the claims from this shaft.

BROADWATER COUNTY

Within three months the Three Forks & Radersburg railroad will be completed and in operation between Radersburg and Three Forks, where it joins the main line of the Milwaukee & Puget Sound R.R. The grading of the road was completed, with the exception of four miles of the total 25, several months ago, but the work was then suspended by the contractors for financial reasons. Since then the work of financing has been successfully accomplished, with the result that the remainder of the grading, and the laying of steel will be started at once. Mining at Radersburg will be revived with the completion of shipping facilities, and the Keating mine, which has for some time been shipping less than 100 tons of ore daily by wagon will increase its tonnage to about 250 tons, which can easily be accomplished, considering the quantity of ore that has been blocked out in the last few months.

Nevada

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Nov. 16, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,400	154,469
Tonopah Belmont	3,526	114,369
Montana-Tonopah	1,033	47,102
Tonopah Extension	1,070	46,313
West End	975	35,277
Midway		820
MacNamara	470	17,249
North Star	45	356
Mizpah Extension	......	40
Jim Butler	350	4,100
Totals	10,869	420,09
Estimated value	$271,725	

Tonopah-Belmont—The report of the company for October states that 12,100 tons of ore was milled for a net profit of $164,697. Two new veins of good ore have been opened on the 12th level and a new vein of milling ore has been cut on the 11th level.

Tonopah Mining Co.—The report for October states that 15,164 tons of ore, averaging $18 per ton, was milled for a net profit of $135,765.

Tonopah Merger—The mine has commenced shipments to the old Belmont mill and it is expected to maintain these at the rate of 200 tons a week.

Jim Butler—The mine is now shipping 350 tons of ore weekly from development work only, on the 600-ft., where there are six working faces in ore. The company earned net profits of $4216 in October.

Tonopah Extension—The report for September states that gross receipts amounted to $61,135 and operating expenses were $38,188, leaving a net profit of $22,947.

WHITE PINE COUNTY

Nevada Consolidated—The concentrator is now running at about full capacity, but there is a shortage of men both at the mines and the mill.

Veteran—An accident to the skip, resulting in tearing out some of the shaft timbers, caused two days' interruption in shipping; several carloads are now being sent out daily.

Giroux—The drifts are being widened preparatory to using mules for drawing ore cars. An underground ore pocket is being built.

Oklahoma

Ottawa County

Miami Lead & Zinc Co.—This property, which is being operated by Chapman & Lennan, now has under construction a 250-ton mill which is expected to be in operation by the first of January. A two-compartment shaft is being sunk. This lease has been thoroughly prospected.

Miami Royalty Co.—This company has built two 250-ton mills in the southern part of the district. These have been running about a week. The mills are driven by 135-hp. gas engines. Each mine is equipped with an Ingersoll-Rand air compressor driven by 110-hp. gas engines.

Utah

Beaver County

Montreal—Ore showing native copper has been found at this property, near the Old Hickory.

Moscow—Additional teams are being secured, and preparations made to increase shipments.

Majestic—A statement issued from the Boston office shows 177 cars, containing 9127 tons, to have been shipped since May. Of this, 2169 tons brought a profit of $3500. There is stated to be much ore in sight at the Old Hickory, carrying copper and silver, with an excess of iron.

Horn Silver—It is reported that arrangements have been made to use one or two sections of the South Utah mill at Newhouse for the treatment of lead-zinc ore from this mine. There are large dumps of ore of milling grade, that, it is figured, can be worked profitably if handled on a large scale. Eighteen cars were shipped recently to the smelteries in Salt Lake Valley.

Juab County

Tintic shipments for the week ended Nov. 15 amounted to 220 cars, which is one of the heaviest week's production in the history of the camp.

Beck Tunnel—The October output netted $1600.

Eagle & Blue Bell—A visit was recently made to this property by the president and some of the directors. There is a good showing of ore on the 1300, which has also been cut on the 1350-ft. level.

Colorado—Net earnings for October amounted to $5500.

Uncle Sam—Driving is under way toward the Richmond-Anaconda, which property has been acquired by the Uncle Sam. One or two cars of zinc ore are being shipped monthly.

Dragon Consolidated—October shipments brought net returns of $2000.

Yankee—Settlement has been received on two cars of zinc ore, which brought $24 per ton. More ore is in transit.

Iron Blossom—October earnings amounted to $51,000, which is at the rate of $53,000 per quarter, in excess of the dividend requirement.

Middle Swansea—The control of this property, adjoining the Eureka-Swansea Extension, has been secured by the Knights. The company has been reorganized, and new directors elected. Jesse Knight is president.

Gemini—This company recently shipped its first car of zinc ore. The property has produced a large tonnage of silver-lead ore, and has hitherto paid no attention to its zinc ores. It is a close corporation, and $2,130,000, or $426 per share, has been paid in dividends. Zinc ore is being opened in various parts of the mine.

Salt Lake County

Utah Consolidated—A dividend of $1 per share has been declared, payable Dec. 17, bringing the 1912 dividends up to $1.50 per share. Net earnings for the first half of the year are reported in the neighborhood of $300,000, from the shipment of the regular copper ores and from lead ores amounting to 8025 tons.

Bingham Mines—This company is working about 50 men at the Dalton & Lark property. A small force is being worked at the Commercial mine, where operations are being increased.

Utah Metal—There remains about 1300 ft. or less to be driven, before this company's 11,000-ft. tunnel is completed. The work should be finished by spring.

Columbus Consolidated—The pumps have been pulled, and the mill closed for the winter. A tentative agreement has been signed with the Columbus Extension, Superior Alta, and Flagstaff Consolidated to combine the four properties on terms to be agreed upon in the near future. It is planned to have a new company take over these mines and finance them, to provide funds for meeting present indebtedness, with enough left over to drive a drain tunnel to the mines, and erect a new mill.

Toledo—A leasing company, recently formed, has secured a lease on this property at Alta. Work will be started in the No. 1 tunnel.

Alta Consolidated — Shipments are being made from this property.

Summit County

Park City shipments for October amounted to 7443 tons, this being about the average production. In addition to the regular shippers, the Ontario lease, the Grasselli Co., Barry-Coxe, New York Bonanza, and lessees, E. J. Baggs and Charles Moore made shipments.

Daly-West—The quarterly report of this company has been discontinued, the plan being to enter into the usual detailed description of company affairs in the regular annual statements.

Tooele County

Eureka-Ophir—The 400-ft. level is being developed, and a car of ore carrying silver, lead and copper has been mined. These workings are the deepest of any on the Stockton side of the Ophir range, earlier development having been carried on as far as the 400 by old-time operators. D. F. Clinton, representing Pittsburgh men, is working the property, on which he has an option.

Hidden Treasure—Regular shipments are being made. An electric compressor, recently installed, will make it possible to increase the present output of two to three cars monthly. The ore is zinc and lead.

Washington

Ferry County

North Washington Power & Reduction Co.—The capacity of the mill, at Republic, since the installation of new rolls is 135 tons daily; a high extraction is reported.

Trojan—Operations at this mine in the Orient district are to be resumed under the direction of Alexander A. Anderson. The tunnel is now in about 800 feet.

Hidden Treasure—Rich gold ore has been encountered at a depth of 30 ft. on this property, near Orient; improvements are contemplated.

Orient Gold Mining Co.—This company, owner of the White Elephant mine, received first prize for the best individual exhibit of ore from the Orient district at the Spokane Interstate Fair.

Okanogan County

Dividend—Shipments are being made by auto truck to the railway at Oroville, six miles distant, at a cost of $2 per ton. The ore is an auriferous iron sulphide. J. C. Fisher is managing director.

Lakeview—Shipments are being made to Oroville by auto truck. The company is making preparations to increase the force and operate all winter.

Snohomish County

Glacier Peak—The company is considering the advisability of building a wagon road to Darrington with a view to shipping ore in the near future.

Stevens County

Copper King—With the installation of the compressor plant which has been ordered for this property in the Chewelah district, the output of the mine will be doubled.

Black Horse—A 75-ft. shaft for ventilating purposes will be sunk to connect with the 180-ft. tunnel in which high-grade tungsten ore is reported.

First Thought—The Platonic, Slimax and Moonlight, all on First Thought Hill, have been sold to J. C. Argall.

Juno Echo—Chewelah men have organized a company to operate this group. Quarters have already been erected and a small force of men has been put to work in the mine.

Wisconsin

PLATTEVILLE DISTRICT

H. E. Stephens and others have struck good jack by churn drill on the John Pitts land within the city limits of Platteville.

Grant County—This mine has been taken over by the Vinegar Hill Zinc Co. The lease adjoins the Empire mine.

Belmont—Development work has been resumed at this prospect, situated northeast of the Empire. Lansing, Mich., men are in control.

Fever River—The Wisconsin Separating Co. has acquired control of this property and is drilling the tract which lies just east of Elmo.

Southwestern—This mine, at Kendalltown, has been reopened by Thurber Bros. and associates from Mason City, Iowa.

Cleveland—This company has bought the Scrabble Creek lease which adjoins the Cleveland property at Hazel Green.

Wyoming

CARBON COUNTY

A shipment of 287 sacks of ore from the Fram and Klondike properties in the Snowy Range district has been made to the American Smelting & Refining Co plant at Denver. The owners, Class, Stewart and Smelzer are considering plans for a small mill.

Canada

BRITISH COLUMBIA

Carmi—An option on this mine on the west fork of the Kettle River, 60 miles from Midway, has been taken by the Granby company. The shaft has been unwatered and the workings examined, with results that are said to have been satisfactory. More than 1000 tons of high-grade ore is said to have been sacked and shipped from the property up to the present time.

May Blossom—Arrangements for shipping $40,000 worth of lead-silver ore during the winter have been made, according to J. C. DeHaan, secretary of the company. The source of the supply is a shoot that has been driven upon for more than 100 ft. on the tunnel level, or at a depth of 170 ft. The shipping ore has a maximum width of 38 in. A ¾-mile tramway will be built next spring.

British Columbia Copper—It is estimated that $100,000 will have been spent by this company, in its diamond-drill operations on the Voigt mine. F. Weekes, who is in charge of the engineering department, at Princeton, reports that six crews are working day and night.

Marion Group—Nickel and cobalt have been struck by Samuel Spencer, in this group of claims, on Whipsaw Creek. In addition these mines have yielded gold, silver, copper and zinc at another place in the property. Five tests of the ore are said to have shown a value of $46 per ton.

Slocan Star—Machine drillers are at work in the deep drift of this mine, which is owned by Spokane and Vancouver men. The machine men are receiving a bonus for footage gained over the average of the field. Bunches of ore have been encountered in the drift; the face is brighter with mineral than it has been for many weeks.

ONTARIO

Dryden Mining Co.—This company is developing two claims on Contact Bay in the Manitou Lake area. Two shafts are down over 20 ft. and an open cut has shown the vein to be 21 ft. wide.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Nov. 23, and for the year to date, were:

Bailey		21 57
Beaver		363 75
Buffalo		989.50
Casey Cobalt		255.15
City of Cobalt		914.99
Cobalt Lake	33 00	860.88
Cobalt Townsite	25 15	1,666 52
Chamb.-Ferland		427.83
Conagas		1,874 33
Crown Reserve	29 61	417 82
Drummond		383 05
Hudson Bay		631.20
Kerr Lake		712.22
La Rose	84.59	3,197.74
Lost and Found		27 80
McKinley-Darragh		2,307.43
Nipissing		1,735.62
O'Brien		325.43
Penn.-Canadian	34.45	97.90
Provincial		22.22
Right of Way		242.82
Timiskaming		884 56
Trethewey	30.20	504.89
Wettlaufer		406 96
Colonial		63 14
Dominion Reduction Co		56.64
Seneca Superior	114.13	148 53
Totals	351.13	19,540.49

W. F. Campbell, of London, England, has obtained options on a number of claims in Gillies Limit.

Silver Bar—Milling ore has been encountered on this property, which is under lease to the Preston-East Dome.

Beaver—A new vein has been cut on the 460-ft. level. The mine has been opened on the 700-ft. level, which is the deepest working in Cobalt.

McKenzie—Manager J. H. Dixon, of this property in the Elk Lake district, has ordered a boiler and a six-drill compressor.

Mann—At this mine in the Gowganda district, 20 tons of 3000-oz. ore is now sacked, awaiting shipment over the winter roads, and 2000 tons of mill ore, averaging 40 oz., is on the dump.

Chambers-Ferland—The provincial government has discontinued the exaction of a royalty of 25% on the gross output of this mine, beginning Jan. 1, 1913, until such time as the company is able to pay a yearly dividend of 10%.

Casey Cobalt—The new mill is treating 25 tons of ore daily, and there is enough ore on the dump to keep it going at that rate for nearly two years. The ore so far treated has averaged about 40 oz. per ton.

Nipissing—During October, ore was mined of an estimated value of $99,040. Ore estimated to be worth $322,640 was shipped. The production for the month was small on account of it being necessary to shut down No. 73 sorting house, while alterations were being made to have it serve as a terminal for the aërial tram. Development during the month was satisfactory.

ONTARIO-PORCUPINE

Edwards—A good surface discovery has been made on this property.

Maidens—These Deloro properties are being examined for the Hudson Bay Mines, Ltd., Cobalt.

Hollinger Reserve—The main vein has been cut at the 200-ft. level.

Bewick-Moreing—Assessment work on these claims, adjoining the Foley-O'Brien, has opened up a large shoot showing high-grade ore. No announcement has been made as to the plans of the company in regard to development.

McEnaney—Up to the time when work was suspended by the strike the ore blocked out was estimated to be worth $800,000. On the 300-ft. level there is an oreshoot 150 ft. long, and 5 ft. wide.

Ontario Gold Wonder—This company, chartered under the laws of North Dakota, holding five claims in Otto and Boston townships, Swastika mining district, has been petitioned in bankruptcy in Boston by its creditors.

Mexico

BAJA CALIFORNIA

El Promontorio—This sulphur mine, near the head of the Gulf of California, has been optioned to American men and the examination by the engineers has been made.

SONORA

Lucky Tiger-Combination—During October bullion, ore and concentrates worth $157,332 were produced from 6514 tons of ore and 1583 tons of old dump tailings. The estimated profit was $77,840.

Spain

According to recent reports there is a feeling of unrest among the Rio Tinto miners and it is believed that a strike is imminent.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Nov. 27—The coal situation in the West is easing up a little and supplies are more plentiful. The weather has been exceptionally mild almost everywhere. Another week will see the end of the Lake movement, releasing more cars for general traffic.

The seaboard bituminous trade is still suffering from scarcity. This is especially the case in the coastwise trade, where the usual rush is on to supply the shoalwater ports in New England before ice makes. The West Virginia situation is improved and there is a prospect of an end to the strike.

Anthracite shipments are slowly catching up with demand, but the companies are still behind on deliveries. The investigation of anthracite rates in Philadelphia is bringing out a lot of evidence against the companies.

Coal and coke carried over all lines of Pennsylvania R.R. east of Pittsburgh and Erie, 10 months ended Oct. 31, short tons:

	1911	1912	Changes
Anthracite	9,581,057	8,358,717	D. 1,222,340
Bituminous	34,551,595	38,227,609	I. 3,676,014
Coke	8,814,649	10,882,963	I. 2,068,314
Total	52,947,301	57,469,289	I 4,521,988

The total increase this year was 8.5%. The largest proportional gain was in coke.

British Fuel Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, 10 months ended Oct. 31, long tons:

	1911	1912	Changes
Coal	53,257,450	52,550,191	D. 707,259
Coke	837,891	803,011	D. 34,880
Briquettes	1,347,495	1,252,007	D. 95,488
Total exports	55,442,836	54,605,209	D. 837,627
Steamer coal	16,017,616	15,020,522	D. 997,094
Total	71,460,452	69,625,731	D. 1,834,721

Imports of coal for the 10 months were 18,572 tons in 1911, and 187,043 in 1912; increase, 168,471 tons.

IRON TRADE REVIEW

New York, Nov. 27—No diminution is apparent in the general activity of the iron and steel trades, and business continues on a large scale. No price changes of importance are noted on finished material.

Railroad buying has again been on a large scale. It has included equipment, bridge work and rails. The result of the bridge and car orders is seen in a heavy business in plates and shapes. Bars are in strong demand and mills are full of work, including some which had been closed, but are now able to run at a profit. The rail mills are almost full for next year, and orders are still coming in, including several for export. Structural steel is rather quiet, as is to be expected at this season.

Pig iron continues active and orders have been freely placed for foundry and basic grades, while inquiries are numerous. Makers are holding firmly to the higher prices already made, as was to be expected from the advance of about 20% in Lake ore prices and 30% on coke. These mean an increase of at least $1.50 in the cost of raw material for a ton of iron.

There is much complaint of delays in shipping material, owing to short supply of cars. The labor question is also rather a serious one at many points. At the Carnegie Steel Works a strike of the switchmen and yardmen is causing much trouble, the mills being held up by the failure to deliver material to them. This delay is rather serious at the present time.

Steel Corporation Suit—The taking of testimony in the government suit against the Steel Corporation has been adjourned for a month. A great many witnesses have been examined; some of their evidence was interesting, but cannot be said to have added anything important to what was already known.

Baltimore

Nov. 25—Exports for the week included 115,600 lb. steel rails, 55,900 lb. splice-bars, 112,024 lb. wire, 673,640 lb. skelp steel and 947,000 lb. steel billets to Glasgow, Scotland. Imports included 305 tons ferromanganese and 775 tons manganese ore from Liverpool; 20,510 tons iron ore from Cuba.

Birmingham

Nov. 25—Considerable pig iron was sold recently by Southern manufacturers for export. The product is to be shipped as quickly as transportation can be arranged. Other sales of iron are reported and the month's business promises to stack up well. The quotations range from $14.25 to $15 per ton, No. 2, foundry immediate delivery iron brings the first named price while the first quarter of 1913 will see iron moving at $14.50 and after that period $15 will be the quotation. The furnaces in blast continue to produce steadily. The new year promises to come in with a tonnage sold ahead in Southern territory that will require steady delivery for at least six months. Basic iron is in good demand. In addition to local consumption, there is a good demand for basic pig elsewhere.

There is continued activity at steel plants in Southern territory, in fact, all plants, large and small alike, are doing well with plenty of orders in hand. Cast-iron pipe production, sales and delivery are about as good as could be asked for.

There are prospects of an early adjudication of affairs of the Southern Iron & Steel Co. and the Alabama Consolidated Coal & Iron Co., which are in the hands of trustees. The reorganization of the first named company is being handled in New York, while the Alabama Consolidated is being placed on its feet at Baltimore.

While coke prices and coke production are attracting attention here as well as elsewhere, no reports are to be heard that there is any interruption because of a shortage of supply.

Chicago

Nov. 26—Sales of pig iron have somewhat slackened in the last week; the demand for iron and steel products continues large and steady. The buying of pig iron in small lots is attributed chiefly to the fact that many of the chief melters are supplied for the first quarter and some well up to the close of the first half; their buying is for mixtures and for special requirements. Furthermore, there is the feeling that the first of the year is approaching and the buying of pig iron naturally falls off previous to that date.

Prices remain nearly the same; Northern iron has stiffened a little, the minimum for the last week having been $18 at furnace, making the delivered price about $18.50, while $18.25 at furnace is now being asked. Southern remains at $14, Birmingham, or $18.35, Chicago, with some sales at 25@50c. higher. No differences are being made between sales for early delivery and for first-half delivery. Charcoal iron is in light demand and firm at $18.75, Chicago.

In the market for finished products the problem continues to be to assure deliveries in time for needs. Railroad buying is on a large scale; the roads are generally replacing old track and equipment with new and the volume of business promises to be large for several months. Structural material is in lighter but steady demand for a wide range of territory, and the question of deliveries is the most important in the trade. Bars are strong, both iron and steel being in large demand at higher prices than for many months; plates, sheets and wire products are in great demand; minor lines show similar demand and difficulty of supply.

Cleveland

Nov. 25—There has been a lively week in the ore market, as noted elsewhere. Shipments from docks are still delayed by car shortage.

Pig Iron—Business is active and the market is very strong. Basic iron is in short supply. Deliveries from furnaces are slow, owing to short supply of cars. Quotations, Cleveland delivery, are $18.15 for bessemer, $16.50@16.75 for basic, $17.50@18 for No. 2 foundry and $19.50 for Lake Superior charcoal.

Finished Material—Some good contracts for structural steel have been let. Demand for plates and bars is heavy.

Philadelphia

Nov. 27—Urgent inquiries continue to strengthen iron for future delivery, and the sales for the past week have been made at full asking prices. The higher grades of foundry are most urgently wanted for delivery throughout the first half of next year. Southern irons are once more moving quite freely and forge iron is more active than for months. Low-grade foundry for pipe purposes has been purchased for forward delivery in large lots at full prices. The uncertain supply of coke with pending advances is causing much concern in furnace quarters, and at some furnaces the supply of labor is short. The feature of the week has been the contracting for or the inquiring for large supplies of various kinds of pig iron, including special grades of foundry and low-phosphorus iron for delivery extending in a few cases far into next year. Quotations may be fairly given at $18.50 for No. 2 X foundry, $17.75 for gray forge, $18.50 for basic and $24 as a bottom price for low phosphorus.

Steel Billets—Steel billets are quoted as a minimum for openhearth at $32, but more money has been paid this week and inquiries to hand yesterday and today indicate that purchasers are at the mercy of makers. Forging billets are quoted at $35 as an inside price.

Bars—Urgent buyers of bars have paid as high as 2c. at mills for ordinary bars, though the nominal quotation, delivered, is 1.67½c. Prices gravitate between these two extremes. Current figures are making it possible for some idle capacity to resume and this may be attempted early in the year. Steel bars command 1.85@1.95c. The bar mills are now figuring upon some large contracts.

Sheets—The sheet mills have scarcely any capacity to spare and premiums which for weeks past have been paid for only early delivery are now being offered for later delivery.

Plates—The monotonous activity in orders for steel plates is still to be reported. Much of the business is still done on a premium basis.

Structural Material—The heaviest orders come from railroad sources.

Scrap—Scrap is selling as fast as it can be delivered, especially heavy melting steel, railroad scrap, yard scrap and heavy cast scrap.

Pittsburgh

Nov. 26—The announcement of the Lake Superior ore prices for the season of 1913, as noted in last issue, has apparently had no influence upon the general iron- and steel-market situation. An advance over the relatively low basis which prevailed for the season of 1912 was such a foregone conclusion as to have been practically discounted in the pig-iron market. A large part of the pig-iron advance is equalized from the furnace standpoint by the advance in coke, Connellsville coke having sold for the first half of next year at from $2.50 clear up to $3.50, against sales for the current half year at $2.15@3.40, and sales made last November for the first half of this year at $1.55 to $1.65 at ovens.

The position of the finished-steel markets is one of considerably decreased buying, as compared with last week or previous weeks, but of undiminished pressure upon the mills for deliveries of material already sold, this being chiefly relatively low-priced material, at from $3 to $5 a ton below the present general market, above which market premiums of from $2 to $4 a ton are being obtained for fairly prompt deliveries. In some quarters the reduced buying for forward delivery is attributed to fears that tariff revision will eventually depress business, and to the near approach of the end of the year, when business is normally dull, but in other quarters it is represented that heavy buying could not be expected to continue, since nearly all the business for the next seven months is already covered.

The local mills of the United States Steel Corporation are filled up, as to the majority of their products, for fully six months ahead, and in some lines current sales are chiefly for third-quarter delivery. The corporation has followed the policy of being very reserved in taking blanket contracts for steel products, cutting down the buyers' estimates of requirements heavily, but of selling freely against specific jobs, even though the delivery period runs far into the future, and holding to prices of not over 1.45c. on plates and shapes in such cases, although the independents usually, if not invariably, quote 1.50c. as a minimum.

Pig Iron—The pig-iron market has been quiet since the heavy sales of steel-making iron reported a week ago, and which advanced basic to $16.50, Valley, and bessemer to $17.25, Valley. The prediction made several weeks ago is now made afresh that basic is likely to cross bessemer in price, as there is a continuous demand for basic, while bessemer is bought by the large steel works only upon occasion. We quote, at Valley furnaces, 90c. higher, delivered Pittsburgh: Bessemer, $17.25; basic, $16.50; No. 2 foundry, $17@17.50; forge, $16.75@17; malleable, $17@17.25 per ton.

Ferromanganese—While the contract price of $61, Baltimore, is still quoted for deliveries over the second half of next year, there is no first-half material available at this figure, and prices are somewhat uncertain, as very little material is offered. We quote the market approximately as follows: Prompt, $75@80; first quarter, $65@70; second quarter, $62.50@65; last half, $61, f.o.b. Baltimore.

Steel—The advanced prices quoted last week on billets and sheet bars have become almost entirely nominal, but so little has been done that new prices cannot be quoted. It is reported that a limited tonnage of sheet bars has been sold at $30, which is a new high price on this movement by more than $1 a ton. We repeat last week's quotations, though they may be regarded as practically nominal: Bessemer billets, $27; bessemer sheet bars, $27.50; openhearth billets, $28; openhearth sheet bars, $28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Wire rods are quotable at $30, Pittsburgh.

Sheets—The sheet mills are very well filled up and the majority of the independents are not quoting, except at premiums over the regular prices of the American Sheet & Tin Plate Co. This interest is now practically sold up through the first quarter, but is selling for second-quarter delivery to manufacturing consumers, and in special cases probably for somewhat later delivery still, its prices being 2.25c. for black, 3.40c. for galvanized and 1.65c. for blue annealed, for such deliveries as it can make. Sales to jobbers have been made only for first quarter, by either the leading interest or the independents. Occasionally some of the independents are booking contracts at 2.25c. and 3.40c., but as a rule they refuse to sell at all. We quote: Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.60c.; blue annealed, 1.65@1.75c.; painted corrugated, 28 gage, 2.45c.; galvanized corrugated, 3.45c. per pound.

St. Louis

Nov. 25—The market has been a little quiet on pig iron, though prices remain firm. All producers have enough orders booked to run them for six months and consumers, on the other hand, are fairly well protected. There are a number of small inquiries from widely scattered sources. Producers in general are asking $14.50 Birmingham or $18.35 St. Louis for Southern No. 2 foundry, while Northern iron is in fair demand at around $19 St. Louis.

Coke is scarce and $6.50 is being asked for the best Connellsville foundry. By-product coke is being widely used and is bringing around $6 St. Louis.

Iron Ore Trade

As noted by telegraph last week, Lake ore prices for the season of 1913 have been fixed at an unusually early date, and with little preliminary negotiation. This action was immediately followed by the placing of large contracts, the total up to date being over 6,000,000 tons. We repeat the new prices, the 1912 rates being given in parentheses: Old Range bessemer, $4.40 (1912, $3.75); Mesabi bessemer, $4.15 ($3.50); Old Range nonbessemer, $3.60 ($3); Mesabi nonbessemer, $3.40 ($2.85). The base continues the same as to iron contents. The prices are for ore delivered at Lake Erie ports. It must be remembered that there has been a reduction of 20c. in the railroad charges from the mines to the upper lake ports since last season.

United States Foreign Trade

Exports and imports of iron and steel and of machinery in the United States for nine months ended Sept. 30, are valued as below by the Bureau of Foreign and Domestic Commerce of the Department of Commerce and Labor:

	1911	1912	Changes
Exports......	$178,938,598	$213,699,572	I. $34,760,974
Imports......	22,220,521	21,111,860	D. 1,108,661
Excess, exp.	$156,718,077	$192,587,712	I. $35,869,63

Increase in exports this year, 19.4%; decrease in imports, 5%. The leading articles of iron and steel were, in long tons:

	Exports 1911	Exports 1912	Imports 1911	Imports 1912
Pig iron............	95,325	193,979	115,874	89,557
Scrap	62,012	78,721	14,371	13,114
Billets, blooms, etc	181,178	224,446	23,245	13,721
Bars.... ...	109,828	166,035	20,840	11,624
Rails	349,942	353,120	681	2,851
Sheets and plates.	252,281	407,082	1,688	2,631
Structural steel....	158,457	217,345	627	1,874
Wire-rods..........	12,730	48,180	12,129	10,736
Wire...	158,602	187,234	.....	.....
Nails and spikes	53,026	74,534	.....	.....
Tinplates	42,557	66,722	12,869	1,502
Pipe and fittings	153,746	192,316	....	....

Imports of wire not reported in quantities; values were $991,655 in 1911, and $813,543 in 1912. Exports of mining machinery were valued at $5,143,394 in 1911, and $5,571,353 this year.

METAL MARKETS

New York, Nov. 20—The metal markets have been generally active, but without any special incident.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Oct. 1912..	$ 330,270	$ 11,887,492	Imp. $11,557,222
" 1911..	3,983,994	4,102,427	Imp. 118,433
Year 1912..	44,058,544	50,677,285	Imp. 6,618,741
" 1911..	22,247,304	49,279,533	Imp. 27,032,229
Silver			
Oct. 1912..	6,171,820	4,683,784	Exp. 1,488,036
" 1911..	5,087,087	3,404,458	Exp. 1,682,629
Year 1912..	58,519,766	40,985,536	Exp. 17,534,230
" 1911..	54,615,048	37,100,888	Exp. 17,514,160

Exports from the port of New York, week ended Nov. 23: Gold, $25,470; silver, $979,645, principally to London. Imports: Gold, $811,494; silver, $241,957, chiefly from Mexico, the West Indies and South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Of the supplies arriving, $750,000 were taken for export to New York.

Iridium—This metal is still quoted at $67@70 per oz., New York.

Platinum—The market has been rather more active, but prices are unchanged. Dealers here still ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

The Russian government order prohibiting exports of crude platinum after Jan. 1 is much discussed, especially by the refiners in France and Germany. The object, of course, is to compel the establishment of refining works in Russia. It is not yet certain that the order will be enforced on that date.

Silver—The market continues steady; the future price depends on the attitude of the Indian government in regard to purchases for coinage purposes. The situation may develop in December.

SILVER AND STERLING EXCHANGE

Nov.	21	22	23	25	26	27
New York....	62⅞	63	63	63	63	63
London	29 1/16	29 1/16	29	29 1/16	29 1/16	29 1/16
Sterling Ex..	4.8480	4.8490	4.8500	4.8495	4.8475	4.8455

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 14, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£7,722,600	£9,434,500	I. £1,711,900
China	990,300	1,377,000	I. 386,700
Total .	£8,712,900	£10,811,500	I. £2,098,600

Exports of gold to India for the month ended Nov. 14 were £749,000 in all.

Copper, Tin, Lead and Zinc

NEW YORK

	Copper		Tin	Lead		Zinc	
Nov.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
21	17½ @17¾	17.40 @17.45	49½	4.50	4.35	7.35 @7.40	7.20 @7.25
22	17½ @17¾	17.35 @17.40	49⅝	4.47½ @4.50	4.32½ @4.35	7.30 @7.35	7.15 @7.20
23	17½ @17¾	17.35 @17.40	49⅝	4.47 @4.50	4.32 @4.35	7.30 @7.35	7.15 @7.20
25	17½ @17¾	17.35 @17.40	49½	4.47 @4.50	4.32 @4.35	7.30 @7.35	7.15 @7.20
26	17½ @17¾	17.35 @17.40	49¾	4.47½ @4.50	4.32 @4.35	7.27 @7.32½	7.12½ @7.17½
27	17½ @17¾	17.35 @17.40	49⅝	4.47 @4.50	4.32 @4.35	7.25 @7.30	7.10 @7.15

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
Nov.	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
21	77½	78 5/16	83½	226½	227	18	26½
22	77⅜	78 3/16	83¾	226¼	227	18	26½
23							
25	76¾	77½	82¼	225¾	226	18	26½
26	76⅞	77¾	82¼	226¼	226¼	17¾	26
27	76⅛	77⅛	82¼	225¾	225½	17 15/16	26

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Copper—Since Nov. 20 the market has been extraordinarily dull. There has been little or no demand from Europe. Some small lots of electrolytic copper have been placed with consumers in Connecticut at 17.40c., cash, New York, and 17½c., delivered, 30 days, corresponding to about 17.35c., cash, New York. Such business has been done both by first hands and second hands. Electrolytic copper at 17½c., delivered, 30 days, has been freely offered all through the week. However, the larger agencies adhere firmly to their old price of 17¾c., although buyers at present will not pay it. The market for Lake copper during the week has been rather nominal. Some trifling lots of special brands have realized as high as 17¾c., but good Lake copper is obtainable at 17⅝c., or less. Notwithstanding the continued aloofness of the manufacturers and their adoption of a hand-to-mouth policy in buying, it is believed in some well informed quarters that their supplies are low and that the inauguration of an important buying movement will quickly absorb the copper that is now for sale at concessions. At the close Lake copper is quoted at 17½@17¾c.; electrolytic copper, in cakes, ingots and wirebars, is 17.35@17.40c. Casting copper is quoted nominally at 17.20@17.25c. as an average for the week.

The London market for standard copper has been under the influence of the disturbed political conditions in Europe, and in consequence has been quiet and weakish. On Nov. 21, spot was quoted £77 10s. and three months £78 3s. 9d., and it has eased off until at the close on Nov. 27, spot is quoted at £76 7s. 6d. and three months £77 2s. 6d. per ton.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for large quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6278 long tons. Our special correspondent gives the exports from Baltimore at 2979 tons for the week.

Tin—Orders, which at the end of last week were placed from this side in the London market imparted a steadier tone to the latter. Still, the market has lost a good deal of its former buoyancy, and it is argued that the war in southeastern Europe has interfered and will continue to interfere seriously with a considerable consumption of tin in Europe. Buying on this side was satisfactory, most orders being placed at prices below those at which tin can be laid down for shipment from abroad. There is now a plethora of tin in this market, so that spot material is selling lower than futures. The market closes easy at £225 10s. for spot and the same for three months, and about 49⅜c. here for December tin.

The total arrivals of Bolivian tin and concentrates in Europe 10 months ended Oct. 31 were equivalent to 19,294 tons fine tin in 1911, and 17,359 in 1912; a decrease of 1935 tons this year.

Lead—On Nov. 21, the American Smelting & Refining Co. recognized the previous decline in the market by cutting its price to 4.50c., New York. Underselling by competitors was promptly resumed and the metal has been freely offered. There has been slightly more business at the lower level, but in the aggregate the tonnage has not amounted to much. This is the time of the year when purchases of lead are about to be curtailed.

The foreign market is slightly lower, Spanish lead being quoted £17 18s. 9d., and English lead 2s. 6d. higher.

Spelter—The quoted price of £26 in London corresponds to about 5.62c., or about 7.20@7.25c. for European spelter landed in New York, duty paid, or about 7.32½@7.37½c., delivered in Pittsburgh; consequently the importation of foreign spelter was impending, which caused American sellers to weaken and take the small business offered at receding prices. Consumption is good, both in the galvanizing and brass trades, but buyers appear to have covered their immediate wants. At the close St. Louis is quoted 7.10@7.15c.; New York, 7.25@7.30 cents.

The London market for spelter held at £26 10s. until Nov. 26, when it fell to £26, at which figure it closes on Nov. 27. This is for good ordinaries, specials being quoted £26 5s. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7⅝@7¾c. per lb., New York.

Other Metals

Aluminum—There is still a scarcity of aluminum for prompt delivery, for which premiums have to be paid, but contract-tonnages are freely offered at somewhat lower prices. There seem to be some cross-currents in this market. We may generalize the status by the quotation of 25½@26c. per lb., New York.

Antimony—After a brief spell of dullness the market has improved a little, though prices here are slightly below the present cost of import. Current quotations are 10.20@10.50c. per lb. for Cookson's; 9.60@10c. for Hallett's; 8.87½@9.37½c. for Chinese, Hungarian and other outside brands.

Quicksilver—Business has been steady and there are no changes in price. New York quotations are $42 per flask of 75 lb., with 60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price is £7 12s. 6d. per flask, with £7 10s. named from second hands.

Cadmium—The latest quotation from Germany is 725@750 marks per 100 kg., f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

Nickel—Shot, blocks and plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 23—The base price paid this week for 60% zinc ore was $55@56.50. The base price paid for 80% lead ore dropped to $52@54 per ton.

SHIPMENTS WEEK ENDED NOV. 23

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	809,020	....	288,000
Mineral Point	793,400	.	....
Benton	748,000	144,400	882,600
Highland	316,800	.. ..	....
Hazel Green	320,000	....	....
Shullsburg	230,000	.. ....	....
Galena	146,500	....	....
Linden	121,660	......	80,700
Harker	86,250	....	....
Rewey	84,000	.....	....
Cuba City	77,000	66,400	....
Montfort	70,000	......	....
Total	3,796,630	210,800	1,251,300
Year to date	180,058,800	7,429,760	34,664,710

Shipped during week to separating plants, 2,654,510 lb. zinc ore.

Joplin, Mo., Nov. 23—The high price of zinc sulphide ore is $61, the base range per ton of 60% zinc is $55@58. Zinc silicate brought $30@36 per ton of 40% zinc. The average of all grades of zinc is $54.14. Lead sold on a base of $56 per ton of 80% metal content, and the

SHIPMENTS WEEK ENDED NOV. 23

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,579,700	......	659,940	$148,998
Joplin	3,229,320	......	365,100	102,258
Galena	1,110,750	......	120,300	34,468
Miami	976,100	......	326,680	32,571
Duenweg	951,080	......	46,000	27,918
Alba-Neck	848,220	......	25,750	25,319
Oronogo	624,730	.....	......	15,568
Carl Junction	476,090	......	7,930	14,028
Spurgeon	117,310	582,020	22,960	13,080
Cave Springs	326,230	......	......	9,134
Jackson	300,380	......	8,410	8,311
Granby	......	254,670	48,880	5,320
Aurora	134,160	111,280	......	5,245
Carthage	149,770	......	......	4,043
Wentworth	141,590	......	......	3,539
Quapaw	131,200	......	......	3,280
Lawton	125,400	......	......	3,151
Stott City	60,830	......	......	1,520
Totals	14,282,860	947,970	1,631,950	$457,761
47 weeks	513,708,340	32,410,720	84,694,520	$16,699,362

Blende val., the week, $396,949; 47 weeks, $13,770,361
Calamine, the week, 13,423; 47 weeks, 514,070
Lead value, the week, 45,379; 47 weeks, 2,414,931

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41 85	$44 90	$40 55	$43.54	$55 68	$58.92
February	40 21	45 75	39 16	43 31	54 46	52.39
March	39 85	51.56	38.45	49.25	54 57	54.64
April	38 88	52 00	37 47	50 36	56 37	54 18
May	38 25	55.30	36 79	53.27	55 21	52.45
June	40 50	55 88	38.18	54 38	56 49	55.01
July	40 75	58 85	38 36	56 59	58 81	58 83
August	42 50	55 13	41 28	53 27	60 74	57 04
September	42 63	59 75	41 29	57 07	59 33	61 26
October	42 38	57 00	40 89	55.97	54.72	63 22
November	45 40	......	43.25	......	57 19	.
December	44.13	......	40.76	......	62 03	.. .
Year	$41.45	......	$39.90	......	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

average price of all grades is $55.62 per ton.

Other Ore Markets

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60½ of tungsten trioxide. For scheelite ore, 50c@$1.50 per unit less. These prices are delivered.

Manganese Ore—Late quotations for manganese ore in Great Britain are, for ores c.i.f. United Kingdom ports; Indian and Brazilian, 50%, 24@25c. per unit; 45%, 22½@23c. Caucasian, 50% manganese, 21@21½c.; 48%, 20½@21c. per unit.

New Caledonia Ores

Exports of ores from New Caledonia, nine months ended Sept. 30, as reported by the *Bulletin du Commerce*, of Noumea, were 51,756 tons nickel ore and 40,987 tons chrome ore. Exports of metals were 3626 metric tons of nickel matte.

Chemicals

New York, Nov. 27—The market is active generally, and the chemical trade is heavy.

Arsenic—Supplies are a little better. Prices are a shade easier, at $5 per 100 lb. for spot and $4.75 for futures.

Copper Sulphate—Trade is good and the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is fair and prices are unchanged. Quotations are 2.60c. for spot and for futures up to June next.

Sulphur—The Union Sulphur Works in Brooklyn, N. Y., were destroyed by fire Nov. 25. About 5000 tons of sulphur were burned.

Imports and Exports—Imports and exports of chemicals and fertilizers, including raw materials for chemical manufacture, in the United States for the nine months ended Sept. 30, were as follows:

	Imports	Exports		Excess
Copper sulph. lb.	....	5,712,696	E.	5,712,696
Copper sul., '11	....	6,363,886	E.	6,363,886
Bleach, lb	55,074,235	400	I.	55,073,835
Bleach, 1911...	73,370,500	17,368	I.	73,353,132
Potash salts, lb..	469,342,269	2,648,210	I.	466,694,059
Potash salts,'11	496,657,379	2,603,881	I.	494,053,498
Soda salts, lb....	9,053,189	368,270	I.	8,684,919
Soda salts, 1911	18,468,414	406,913	I.	18,061,501
Acetate lime, lb.	....	58,661,375	E.	58,661,375
Acetate, 1911. .	... .	59,283,457	E.	59,283,457
Nit. of soda, tons	347,694	6,560	I	341,134
Nitrate, 1911...	427,211	4,379	I.	422,832
Phosphates, tons	.....	927,922	E.	927,922
Phosphates, '11	....	968,634	E.	968,634
Sulphur, tons....	22,056	41,123	E.	19,067
Sulphur, 1911..	16,919	23,793	E.	6,874
Pyrites, tons.. .	690,338	. . ....	I	690,338
Pyrites, 1911...	772,416	....	I.	772,416
Magnesite, lb....	160,129,446	1,928,013	I.	158,201,433
Magnesite, 1911	197,616,774	1,707,775	I.	195,908,999
Sul. ammonia, lb.	67,236,038	357,600	I.	66,878,438
Sul. am'nia, '11	132,443,260	....	I.	132,443,260
Arsenic, lb.......	4,199,361	650	I.	4,198,713
Arsenic, 1911...	3,642,697	3,684	I.	3,639,011

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total quantity of sulphur imported this year was 298,190 tons.

Petroleum

The General Petroleum Co., of California, has arranged to buy the stocks of the Union Provident Co. and the United Petroleum Co., which control the Union Oil Co. The sale is said to be on the basis of $130 per share.

MINING STOCKS

New York, Nov. 27—On Nov. 21 and 22 the Exchange was irregular and depressed, largely under the influence of the foreign markets. On the Curb mining stocks were rather active, with advances in copper shares, but not much change in other stocks.

Nov. 23 the Exchange was rather quiet and disposed to be cautious. The Curb was more active but irregular, some mining stocks showing gains and others losses.

Nov. 24 the Exchange was rather weak, under pressure of uncertain European markets and high rates for call money. The Curb was generally weaker, but there were fair sales of mining stocks, especially coppers, at steady prices.

Nov. 26 and 27 the Exchange continued rather narrow and irregular, under the same influences. The Curb was a little more active, mining stocks being in fair demand. Sales of coppers increased, but prices were variable and irregular.

In New York, Nov. 21, at auction, 92 shares La Dicha Mining & Smelting Co. brought $50 for the lot.

Boston, Nov. 26—The market for mining shares has dwindled to comparatively small proportions and there is a lack of public interest, which, in most cases, has resulted in a lower range of prices. The money disturbance has been partially responsible for this condition of affairs, although rates in Boston have not reached the altitude that they attained in New York, 7% having been the maximum rate so far in Boston. In periods of tight money copper shares are not always considered the best kind of collateral.

Mayflower and Old Colony shares continue well in the fore as market leaders, although they have both lost some of their earlier buoyancy. The former rose $4 to $18, and the latter rose $2.12½ to $11.37½. St. Mary's Mineral Land took on some activity and rose $3 to $53, on the declaration of the third $1 dividend so far this year. This company has declared a total of $21 per share in dividends since 1903.

Butte & Superior, on extra-heavy selling, has fallen $3.75 to $44.25. No explanation followed this decline. The declaration of an extra 50c. dividend by the Nevada Consolidated had no effect on either this or Utah Copper stock. The report of the Shannon Copper Co. for the

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	August	Sept.	October
Alaska shipments.	1,242,836	1,726,715	1,435,235
Anaconda	25,250,000	24,500,000	25,250,000
Arizona, Ltd.	3,260,000	3,340,000	3,200,000
Copper Queen......	8,040,424	9,103,861	8,184,575
Calumet & Ariz....	4,514,000	4,462,000	4,404,000
Chino.	3,485,278	3,217,369	3,638,500
Detroit...	1,882,289	1,881,668	1,934,828
East Butte..........	1,410,500	1,250,000	... .. .
Mammoth.	1,802,590	1,834,937	... ..
Giroux.	774,844	1,005,208	.
Mason Valley......	1,384,000	1,200,000	1,563,700
Nevada Con..	6,551,030	5,607,578	850,741
Ohio	620,000	635,000	..
Old Dominion......	2,597,896	2,204,000	2,523,000
Ray	2,902,715	2,978,404	. .
Shannon	1,400,000	1,142,000	1,210,000
South Utah	224,855	225,568	. ...
United Verde*	2,500,000	2,750,000	2,750,000
Utah Copper Co	11,248,992	6,616,887	2,022,352
Lake Superior* ..	21,000,000	19,250,000	21,500,000
Non-rep. mines*..	8,195,156	8,094,792	8,250,000
Total production	110,211,367	103,025,987	
Imports, bars, etc..	23,561,161	25,149,329	
Total blister.....	133,772,528	128,175,316	
Imp. in ore & matte	8,544,624	7,142,232	....
Total American.	142,307,152	135,317,548	
Miami† . .	3,048,760	2,949,150	2,577,750
Brit. Col. Cos.			
British Col. Copper	941,364	....	1,013,000
Granby	1,970,388	2,083,118	
Mexican Cos.:			
Boleo† ..	..	....	2,612,400
Cananea ..	4,044,000	3,500,000	4,248,000
Moctezuma .	3,229,839	771,844	3,045,667
Other Foreign .			
Cape Cop., S. Africa	...	678,720	757,120
Kyshtim, Russia...	1,400,000	1,750,000	
Spassky, Russia....	902,720	981,120	....
Tilt Cove, Newf'd..		.	86,785
Exports from:			
Chile...............	8,512,000	6,048,000	8,512,000
Australia	8,064,000	7,616,000	9,520,000
Arrivals in Europe‡	20,200,320	8,518,720	13,771,520

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U. S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
X, 1911.........	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII .	122,896,697	65,988,474	79,238,716
Year .	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III .	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,946
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII..........	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796
X	145,405,453	84,104,734	47,621,342

VISIBLE STOCKS

	United States	Europe	Total
XI, 1911.......	134,997,642	176,825,600	311,823,242
XII............	112,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II....... . .	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV .	62,367,557	136,819,200	199,186,757
V..............	65,066,029	134,176,000	199,242,029
VI	49,615,613	117,801,600	167,417,213
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX ..	46,701,374	113,568,000	160,269,374
X..............	63,065,587	107,408,000	170,473,587
XI	76,744,964	103,801,600	180,546,564

year ended Aug. 31 was a favorable document.

On the Curb, Butte Central rose to $9.37½ on heavy trading. An initial dividend of 12½c. by the Nevada-Douglas Copper Co., which is thought to be quarterly, brought the price up to $3.87½ per share.

Assessments

Company	Delinq	Sale	Amt.
Alpha Con., Nev.	Nov. 13	Dec. 4	$0 03
Best & Belcher	Nov. 6	Nov. 25	0 05
Buffalo, Ida.	Oct 28	Nov. 28	0 002½
Consolidated Virginia, Nev.	....	....	0 15
Crown Point, Nev.	Nov. 11	Dec. 4	0.10
Crown Point, Utah	Nov. 15	Dec. 10	0 01
Echo, Ida.	Dec. 11	Jan. 8	0.001
Franklin, Mich.	Oct. 18	....	2 00
Laclede, Ida.	Nov. 18	Dec. 9	0.003
Hub, Ida.	Nov. 14	Dec. 14	0.001
Hugo, Ida.	Nov. 9	Dec. 9	0.001
Indiana, Mich	Oct. 16	....	1 00
Jack Waite, Ida.	Nov. 30	Dec. 21	0.01
Leroy Gold & Copper, Ida	Nov. 28	Dec. 28	0.002
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Melcher, Utah	Nov. 23	Dec. 12	0 02
Moon Creek, Ida.	Dec. 4	Jan. 4	0 002
National Copper, Ida.	Nov. 15	Dec. 10	0 01
North Star, Ida.	Nov. 30	Dec. 30	0.001
Oneco, Mich.	Oct. 10	....	1 00
Ophir, Nev.	Nov. 11	Dec. 9	0.15
Rhode Island, Ida.	Oct. 31	Nov. 30	0.00½
Sierra Nevada, Nev.	....	....	0.10
Sunshine, Ida.	Oct. 30	Nov. 30	0.001
Tar Baby, Utah	Nov. 2	Dec. 2	0.002½
Yellow Jacket, Nev.	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59 043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24 483	24.595	27.284
May	53.870	53.308	60 880	24.797	24.583	28 038
June	53.462	53.043	61.290	24.651	24.486	28 215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24 082	28.375
September	53 295	52.440	63 078	24.567	24.209	29 088
October	55.490	53.340	63.471	25.596	24.594	29 299
November	55 635	55.719	.....	25.680	25.649	.....
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12 295	14 094	12.680	14.337	55.600	62.760
February	12 256	14 084	12.611	14.329	54.974	62 893
March	12 139	14.698	12 447	14.868	54 704	65.884
April	12 019	15 741	12.275	15.930	54 034	70.294
May	11.989	16.031	12.214	16 245	54.313	72.352
June	12.385	17 234	12 611	17 443	56 365	78.259
July	12.463	17.190	12.720	17 353	56 673	76.636
August	12 405	17.498	12.634	17.644	56.266	78 670
September	12.201	17 508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	76.389
November	12.616	......	12 769	....	57 253	......
December	13.552	......	13.768	......	62.068	......
Year	12.376	......	12.634	......	55.973	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	44 519
February	41 614	42 962	August	43 319	45 857
March	40 157	42.577	September	39 755	49.135
April	42 185	43 923	October	41 185	50.077
May	43.115	46 053	November	43 125	......
June	44 606	45 815	December	44 655	......
			Av. Year	42.281	......

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4 435	4 334	4.327	13 009	15 597
February	4 440	4.026	4 266	3 946	13 043	15 738
March	4.394	4.073	4 238	4.046	13 122	15.997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4.373	4 194	4.223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13.260	17 588
July	4.499	4 720	4.397	4 603	13 530	18 544
August	4 500	4 569	4 400	4 452	14 260	19 655
September	4 485	5 048	4 356	4.924	14 744	22.292
October	4 265	5.071	4.139	4.894	15 332	20 630
November	4.298	.....	4.181	......	15.821	....
December	4.450	......	4.332	....	15.648	.....
Year	4.420	......	4 286	......	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23.887	26.642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5.563	6.626	5.413	6.476	23 016	26.048
April	5 399	6.633	5.249	6 483	23 743	25 644
May	5.348	6.679	5.198	6 529	24.375	25.790
June	5 520	6.877	5 370	6 727	24 612	25.763
July	5 695	7.116	5 545	6 966	25.006	26 174
August	5 953	7.028	5 803	6.878	26 801	26 443
September	5 869	7.454	5 719	7 313	27 750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	.....	6.223	.....	26.795	......
December	6.301	......	6.151	......	26.849	......
Year	5.758	......	5.608	......	25.281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15 90	$15.12	$14.40	$13.32	$14 75	$14.00
February	15 90	15.03	14 50	13 28	14 81	14.01
March	15.90	14 95	14 65	13 66	14 96	14.10
April	15 90	15 13	14 65	13 90	15 00	14 15
May	15 90	15.14	14 30	13.90	14 72	14.12
June	15 90	15 15	14 06	14.11	14.56	14.22
July	15 90	15 15	14 03	14.38	14 53	14 38
August	15 90	15 43	14 00	14 90	14 47	14 85
September	15 90	16.86	13 57	16.03	14 40	15.63
October	15 43	17 90	13.44	17.18	14.34	17 22
November	14.92	......	13.30	......	14 25	......
December	15.15	......	13.10	......	13.90	.....
Year	$15 72	......	$13.94	......	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Nov. 26

Name of Comp.	Bid.
Acacia	.04⅜
Cripple Cr'k Con.	.01½
C K & N	16¼
Doctor Jack Pot	.06¼
Elkton Con	.65¼
El Paso	6.05
Findlay	04½
Gold Dollar	.18
Gold Sovereign	.02¼
Isabella	.20¼
Jack Pot	.05
Jennie Sample	.06
Lexington	006
Moon Anchor	.01
Old Gold	.03½
Mary McKinney	.74¼
Pharmacist	01¼
Portland	1.05½
Vindicator	88
Work	.01½

SALT LAKE Nov. 26

Name of Comp.	Bid.
Beck Tunnel	.08½
Black Jack	10½
Cedar Talisman	00½
Colorado Mining	.18
Columbus Con	11
Crown Point	04
Daly-Judge	6.15
Grand Central	82
Iron Blossom	1 30
Little Bell	25
Lower Mammoth	04½
Mason Valley	11.50
May Day	20
Nevada Hills	1.30
New York	005
Prince Con	1 65
Silver King Coal'n	3.15
Sioux Con	.02¼
Uncle Sam	.10
Yankee	.10

TORONTO Nov. 26

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 75	Foley O'Brien	‡.25
Hudson Bay	60 00	Hollinger	14 95
Temiskaming	43½	Imperial	.03¼
Wettlaufer-Lor.	25½	Pearl Lake	.24
Am Goldfield	‡ 40	Porcu. Gold	.18
Apex	01½	Preston E. D.	04½
Crown Chartered	02⅝	Rea	34
Doble	† 25	Standard	‡ 00½
Dome	20 25	Swastika	08½
Dome Exten	.09½	West Dome	‡ 13

SAN FRANCISCO Nov. 26

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	8.42½
Belcher	.34	Jim Butler	.62
Best & Belcher	.05	MacNamara	.18
Caledonia	.90	Midway	.30
Challenge Con	.02	Mont.-Tonopah	1 95
Chollar	.03	North Star	.28
Confidence	.40	West End Con	1.32½
Con. Virginia	.36	Atlanta	.12
Crown Point	.45	Booth	.05
Gould & Curry	01	C.O.D. Con	.05
Hale & Norcross	.10	Comb. Frac	.07
Mexican	1 65	Jumbo Extension	.28
Occidental	70	Pitts.-Silver Peak	.80
Ophir	.41	Silver Pick	.06
Overman	.40	St. Ives	.30
Potosi	.04	Tramp Con	.02
Savage	08	Argonaut	‡2.00
Sierra Nevada	.20	Bunker Hill	‡4 50
Union Con	.27	Central Eureka	.15
Yellow Jacket	.30	So. Eureka	1 50

N. Y. EXCH. Nov. 26

Name of Comp.	Clg.
Amalgamated	84¾
Am. Agri. Chem	56
Am.Sm.&Ref.,com	79¾
Am. Sm. & Ref., pf.	106
Am. Sm. Sec., pf. B	85½
Anaconda	43
Batopilas Min	1⅝
BethlehemSteelpf	69
Chino	47
Federal M. & S., pf.	44⅝
Goldfield Con	2
GreatNor.,ore.,ctf.	45½
Guggen. Exp	55¼
Homestake	99
Inspiration Con	20
Miami Copper	27
Nat'nalLead,com.	61¼
National Lead, pf.	108½
Nev. Consol	23
Phelps Dodge	215½
Pittsburg Coal, pf.	91¾
Ray Con	22⅛
RepublicI&S,com.	27⅝
Republic I & S. pf.	89¾
SlossSheffi'd,com.	50
Sloss Sheffield, pf.	94
Tennessee Copper	40¼
Utah Copper	63⅛
U. S. Steel, com	74¾
U. S. Steel, pf.	111⅝
Va. Car. Chem	46⅝

BOSTON EXCH. Nov. 26

Name of Comp.	Clg.
Adventure	6
Ahmeek	325
Algomah	3¼
Allouez	41¾
Am. Zinc	30½
Ariz. Com., ctfs.	4
Bonanza	.30
Boston & Corbin	5½
Butte & Balak	4
Calumet & Ariz	78
Calumet & Hecla	570
Centennial	19½
Cliff	3
Copper Range	56
Daly West	3¾
East Butte	15
Franklin	9¼
Granby	72½
Hancock	25
Hedley Gold	25½
Helvetia	¾
Indiana	16
Island Cr'k, com.	57
Island Cr'k, pfd.	87
Isle Royale	35¾
Keweenaw	2
Lake	29¾
La Salle	5½
Mass	6
Michigan	1¾
Mohawk	64
New Arcadian	2½
New Idria Quick.	‡5½
North Butte	35¼
North Lake	3½
Ojibway	3
Old Dominion	57½
Osceola	108
Quincy	86
Shannon	14
Shattuck-Ariz	32¼
Superior	43
Superior & Bost.	2½
Tamarack	41
Trinity	4⅞
Tuolumne	2$\frac{13}{16}$
U. S. Smelting	45
U. S. Smelt'g, pf.	50½
Utah Apex	1$\frac{13}{16}$
Utah Con	11½
Victoria	2½
Winona	4
Wolverine	72
Wyandot	1¼

N. Y. CURB Nov. 26

Name of Comp.	Clg.
Barnes King	60
Beaver Con	.42
Braden Copper	9
B. C. Copper	4½
Buffalo Mines	2$\frac{7}{16}$
Caledonia	40
Con. Ariz. Sm	$\frac{7}{16}$
Davis-Daly	2⅛
Diam'field-Daisy	5
Ely Con	.16
Florence	69
Giroux	4⅜
Gold Hill Con	$\frac{5}{16}$
Greene Cananea	9½
Greenwater	04
Internat S. & R.	‡124
Kerr Lake	2$\frac{13}{16}$
Keystone	2
La Rose	2½
McKinley-Dar-Sa.	2¼
Min. Co. of A. new	2⅞
Motherlode Gold.	‡.60
Nev. Utah M. & S.	05
Nipissing Mines	8⅝
Ohio Copper	1⅜
Pacific Sm. & M	$\frac{3}{16}$
Puebla S. & R.	2
South Live Oak	2
South Utah M. & S.	⅜
Standard Oil (Old)	1110
Stand'd Oil of N.J.	390
Stewart	1$\frac{13}{16}$
Tonopah	6$\frac{7}{16}$
Tonopah Ex	2⅜
Tonopah Merger	.81
Tri-Bullion	⅝
Tularosa	1⅛
Union Mines	$\frac{3}{16}$
United Cop., pfd.	10
Yukon Gold	3

LONDON Nov. 27

Name of Com	Clg
Camp Bird	£1 3s 9d
Dolores	1 10 0
El Oro	0 17 0
Esperanza	2 0 0
Mexico Mines	7 5 0
Oroville	0 5 0
Stratton'sInd.	0 3 1½
Tomboy	1 8 9

BOSTON CURB Nov. 26

Name of Comp.	Last
Alaska Gold M	8⅝
Bingham Mines	4½
Boston Ely	1
Boswyocolo	.01
Butte Central	9
Cactus	.08
Calaveras	2¼
Chief Cons	1$\frac{7}{16}$
Corbin	¼
Cortez	75
Crown Reserve	3⅝
First Nat. Cop.	1¼
Majestic	40
Mazatan	‡½
Moneta Porc	03
Nevada-Douglas	3$\frac{13}{16}$
New Baltic	1½
Oneco	2
Raven Copper	.22
Portsmouth Coal	06
San Antonio	‡3½
Smokey Dev	2$\frac{1}{16}$
S. W. Miami	5¼
South Lake	6½
Trethewey	.30
United Verde Ext.	‡½

‡Last quotation.

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Rob't McKean, Secy
505 Pearl St., New York.

Monadnock Bldg., Chicago
6 Bouverie Street, London, E. C.
Unter den Linden 31—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation

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The Engineering and Mining Journal

Vol. 94 DECEMBER 7, 1912 No. 23

The Impending Tariff Changes

Business is undoubtedly uneasy in fear of coming tariff legislation. Recognizing that reductions are going to be made, we fancy that the adverse effect upon any particular industry is going to be much less than is dreaded. In the manufacturing industries the owners of modern plants have but little to fear. The laggards will be inspired to improve their processes and equipment; and by increased efficiency maintain their place in competition. The producers of raw material will be least able to do this, and it is from them that most opposition to tariff reduction will probably come, although economically a tariff on raw material is the most indefensible.

"The reaction against protection, if it should come," says Professor Taussig, in "Principles of Economics," "ought to proceed by gradual and tentative steps. This sort of consideration, however, need not be shown with regard to many raw materials, in producing which no considerable plant is needed."

Yet we expect that it will be with respect to raw materials that the most serious opposition to tariff reduction will be experienced, because therein will vested interests be most irremediably hurt. The manufacturer may modernize his mills. The producer of lumber and lead may not alter the adverse conditions of geography or the lean bounty of nature. If it were only the original exploiters of such resources that were affected, the case would be more simple. It might be said to them, "You have been assisted long enough. Be content." But their property has been capitalized under artificial terms, and upon such bases has been to a more or less extent transferred to investors; and to detract summarily from the earning power of their principal is not a matter for careless legislation.

In the mining industry the subjects of most concern are zinc, lead, iron and their respective ores. In none of these cases, however, do we think that realization will be so bad as the forebodings. The average prices for spelter at St. Louis and London during the 10 years ending with 1911 were about 5.35c. and 5c., respectively; for the 20 years ending with 1911 they were about 4.73c. and 4.51c., respectively. To Pittsburgh, the great spelter consuming center, the freight from St. Louis and from Atlantic ports is about the same, and foreign spelter must, moreover, stand the ocean carriage. Manifestly an abolition of the duty on spelter would make no great difference in the long run. It would, however, certainly tend to equalize market conditions and prevent such extravagances as have been experienced in the domestic market in 1911-12.

In lead the respective 10-year averages have been about 4.56c. and 2.91c.; the 20-year, 4.17c. and 2.77c. Here we have much greater differences than in the case of spelter. An abolition of the tariff on lead would unquestionably reduce the American price, but certainly not to the previous European level, because the latter would be raised by American buying. The world's supply of lead and the demand for it are too nearly in balance to permit any deluge from any source if the tariff barrier were removed.

The present tariff on iron ore is 15c. per ton, which corresponds to the railway freight for about 30 miles. It is inconceivable that the removal of this low tariff would have a disastrous effect upon our iron mining. As to the tariff on steel products, Mr. Carnegie has expressed himself with clearness and emphasis.

There is not the slightest probability that the duties on lead and spelter will be entirely removed. The chances are that the reductions will be but moderate. Important readjustments in commercial operations will, no doubt, become necessary, and the uncertainty about these will naturally create nervousness, but in the end we fancy that no one will find himself hurt so badly as he now thinks.

The copper producers of the United States exploit lower grades of ore than anywhere else, in places remote from the markets for copper consumption, pay the highest rates of wages, export nearly 50% of their product, command the world's market and do all of this without the enjoyment of any tariff.

The Nipissing High Grade Mill

Elsewhere in this issue, R. B. Watson, general manager of the Nipissing mines, describes the remarkable metallurgical process invented by Messrs. Butters, Clevenger and Johnson and introduced by the Nipissing company for the treatment of its high-grade silver ore.

This process has been heretofore referred to casually or briefly in the pages of the technical press, but Mr. Watson's is the first full and authoritative account of it. The process is no longer of experimental character, many thousands of tons of ore yielding many millions of ounces of silver, having been worked by it.

The process comprises amalgamation and cyanidation, applied in a novel combination. The chief operation is tube-mill amalgamation, a tube mill of special design being charged with 20-mesh ore, 5% cyanide solution, a large proportion of mercury and pebbles. In nine hours of running at relatively high speed, about 97% of the silver is amalgamated. The amalgam is separated and sent to the retorting department while the pulp of the ore passes to the cyaniding department where a further quota of its silver contents in extracted.

The total extraction of silver is phenomenally high, just how high may not be said unfortunately, because there are good reasons why that figure should not be disclosed. Apart from its high extraction of silver the process is further remarkable in that no loss of mercury is experienced, bullion of high fineness is turned out in a few hours of operation, disputes with smelters and loss of interest on the value pending settlement being avoided, and finally the first cost of the plant was remarkably low. In view of these advantages a high cost of operation may be borne and still leave a large profit as compared with the old method of dealing with this ore.

In the handling of the large quantity of amalgam resulting from this process the metallurgists were obliged to dismiss all precedents and devise new apparatus suitable to their conditions. The Nipissing refinery is one of the most important and interesting parts of the plant, and the description of it may be studied with profit by many. Whether the Nipissing process of barrel amalgamation and cyanidation is capable of application elsewhere, or is limited to the peculiar conditions for which it was designed, it must anyway be recognized as a remarkable triumph of metallurgical skill.

Respecting Processes

There are many metallurgical processes brought out each year and heralded by the semi-technical press as marking a new epoch in the history of certain metals. How few of them finally take a place in the books of metallurgical experience! Some of these advertised processes may possess merit, but it is, alas! too often that they are made the basis of stock-selling operations before their merit is determined. The purchase of shares is recommended by irresponsible promoters to the public as an unusual opportunity for conservative investment, before the process has been tried on a working scale. The average layman is unable to pick his way through the mazes of the semi-scientific fol-de-rol, or even the logical scientific statements, that are offered, but when he reads that the cost of treating a ton of ore by the new process is to be only $1, where in the past it has been from $2.50 to $8, he immediately concludes that here is a great commercial opportunity.

Let us examine for a moment the basis upon which rest the low-cost claims of most of these new processes. Were the layman to ask engineers for assistance, he would find that they are able to help him but little, for the reason that those in charge of new processes of the type we have in mind usually fail to put forward adequate data upon which the process may be judged. Consequently about the only basis of judging these new processes is the past successes and character of the inventor, and of his backers.

If a proposed process gives promise of success, it can usually obtain a trial at the works of some successful operating company. Or it may be taken up by some successful operator who spends his own money developing the process on a working scale, before it is offered to the general public either as a share investment or as an opportunity to participate in the benefits to be derived directly in the use of the process.

Why do not the promoters of these new processes present a series of technical data, giving full information regarding the test runs, such as the amount of supplies required, the cost of power and labor, the capacity and cost of an operating unit, the time required for a cycle of operations, and the recovery or efficiency of the process? As a rule they fail utterly in giving satisfactory data that would enable engineers to judge of the process, even while they are asking the public to subscribe money for shares. The reason why they do not give such data is, of course, that they do not possess it. Experimentation and data cost money, and that is what the process-promoter wants the public to supply, not himself. There is just about as much chicanery in stock-jobbing in wild-cat metallurgical processes as there is in wild-cat mines.

Tuberculosis in Mines

The valuable paper by Frederick L. Hoffman, which is concluded in this issue, draws attention to the importance of a study of the extent to which American miners are subject to silicosis and kindred ailments that are the precursors of tuberculosis. This is a matter that we earnestly commend to the Bureau of Mines.

The micro-organisms of disease are normally held in check by the destructive effect of fresh air and sunlight. In mines there is no sunlight and the air is never so fresh as on the surface. We have heard the dictum pronounced that no victim of tuberculosis should be permitted to go underground. There is much in favor of this to be said.

The reports of labor scarcity in all quarters multiply. The exodus of Greeks and Slavs has intensified the shortage in several districts. Those people are patriotic and in large numbers went home to fight in the Balkans. A train-load of them went from Bisbee alone.

By the Way

The first account of the occurrence of native copper in the Lake Superior district was published in Paris in 1636, says A. H. Meuche, in a publication of the Michigan Geological Survey. The author said: "There are mines of copper which might be made profitable, if there were inhabitants and workmen who would labor faithfully. That would be done if colonies were established."

The following first-aid-to-the-anxious is from a local newspaper, says the *Canadian Mining Journal,* and calls for no comment:

ALUMINUM

Chemist—Aluminum is chiefly manufactured from aluminum ore. It contains 11 minerals and three silicates. The minerals are: Cryolite, corundum, bauxite, diaspore, gibbsite, alunogen, aluminite, turquoise, wavellite and lazulite. The silicates: Kaolin, feldspar and mica.

Important deposits of iron are found in the basin of the Yonne. The principal deposit, according to the London *Mining Journal,* is still unexploited, and is situated between Troyes and Clamecy. In the district of Ioigny the ore is only 10 in. below the surface. The Yonne possesses also important heaps of iron slags called locally *ferriers,* the remains from the smelting operations of the Romans. As the extraction of iron from its ores was at that time very defective, these slags sometimes contain as much as 45% of that metal, mixed with some manganese and silica. These scoriæ form little hills, which have been acquired by German firms, and are transported in long trains to the blast furnaces of Lorraine.

The U. S. Civil Service Commission announces an examination for assistant chemist in radioactivity at a salary of $1800 to $2160 per year. "An educational training equivalent to that required for a Ph. D. degree from a college or university of recognized standing is required, and some practical experience in radioactivity and the rare metals." It is fortunate that "some" is an elastic term. We imagine Professor Soddy, or Lord Rayleigh will not take the examination, as the salary is too large for their needs. Madame Curie is unfortunately ineligible —the examination is for men only. What does "some" mean? Will it be sufficient to have once seen a willemite screen under radio-bombardment? Will the real experts be attracted by an assistancy?

The recent account with reference to the finding of ore on the Sherwood iron property in Michigan, brings to mind the oft-related case of J. R. Thompson, who was formerly manager of the Newport mine of Ferdinand Schlesinger, at Ironwood. The orebody was exhausted, and things looked "very dark." In an effort to find more ore, Mr. Thompson was sinking the shaft into the foot-wall material, contrary to all good practice of the district. At last, the owner got discouraged at finding nothing, and telegraphed to Mr. Thompson to stop the work. Mr. Thompson didn't stop, but drilled and blasted one more round. The result can be guessed from the fact that there a story to relate. The mine now ships a million tons a year, and the valuation of its known ore reserves last year was $8,535,000, making it the most valuable iron mine in the state. It is needless to say that the practice in the district relative to foot-wall material has materially changed.

Probably every reader of the history of chemistry and metallurgy is familiar with the name of Basil Valentine, supposed to have been a Benedictine monk, living in Saxony in the latter half of the fifteenth century. In the supposed works of Basil Valentine are mentioned the metals zinc and bismuth, referred to as "bastards of the metals"; reference is made to the action of oil of vitriol on iron; the doctrine of three elements, mercury, sulphur and salt, advanced; the use of preparations of mercury, antimony, etc., in medicine, advocated; and a remarkably clear treatment of the preparation and properties of many compounds of antimony given. In short, his writings either were apparently drawn from a common unknown source with, or were themselves the source of, the writings of Paracelsus (1493-1541). Doubts on the existence of Basil Valentine have existed almost since the first appearance of his reputed writings. After a thorough examination of all the evidence on the subject, J. M. Stillman, of Stanford University (*Pop. Sci. Monthly,* December, 1912) believes that Basil Valentine was the invention of Johann Thölde, a chemist, owner of the salt works at Franckenhausen, Thuringia, and member of the Chamber of Councillors, which means that a higher place must be assigned Paracelsus, as the advanced chemist of his time.

In probating the will of the New York manager of a well-known trust and bonding company, it was discovered that he hoped to leave a big estate "because he didn't gamble." This estate has been appraised in the surrogate's court of New York at $18,052. The will is quoted as follows: "I owe no bills, but pay cash for all my purchases, and I neither speculate nor gamble, even in the smallest way. It is therefore, more than possible that, unless some unforseen misfortune overtakes me, I shall leave a little something when I die." Ideas as to what is gambling differ. *Life* recently printed a picture of a mother chiding her son for staying up until half past eight at night to play solitaire, remarking that she did not see where he got his taste for gambling. Nearly everyone gambles, and to an extent which he is generally unable to realize. This trust-company official was certainly unable to realize it, for among the securities listed by the appraiser of his estate are 1000 shares of Hawthorne Silver & Iron Mines, Ltd. Paraphrasing an old song: "If that ain't gamblin', then I don' know." As a matter of fact, one can hardly throw a stone into New England without hitting a man who has gambled in mining stock—and usually in a most foolish manner—but if one broaches the matter of interesting them in a legitimate mining operation, they throw up their hands in holy horror and say, "Oh, I don't believe in mining! I never buy mining stock . . . Well, I did once when . . . . . but never again"—unless it is "guaranteed" to give a return of 600% in 90 days.

According to Agricola (Hoover trans.) the duties of a mine foreman were no less arduous, nor his qualifications less stringent, among the early Germans than in the Pennsylvania anthracite fields, for example: "It is he who distributes the work among the laborers, and sees diligently that each faithfully and usefully performs his duties. He also discharges workmen on account of incompetence, or negligence, and supplies others in their places if the two jurors and manager give their consent. He must be skillful in working wood, that he may timber shafts, place posts, and make underground structures capable of supporting an undermined mountain, lest the rocks from the hanging wall of the veins, not being supported, become detached from the mass of the mountain and overwhelm the workmen with destruction. He must be able to make and lay out the drains in the tunnels, into which the water from the veins, stringers, and seams in the rocks may collect, that it may be properly guided and can flow away. Further, he must be able to recognize veins and stringers, so as to sink shafts to the best advantage, and must be able to discern one kind of material which is mined from another, or to train his subordinates that they may separate the materials correctly. He must also be well acquainted with all methods of washing, so as to teach the washers how the metalliferous earth or sand is washed. He supplies the miners with iron tools when they are about to start to work in the mines, and apportions a certain weight of oil for their lamps, and trains them to dig to the best advantage, and sees that they work faithfully. When their shift is finished, he takes back the oil which has been left. On account of his numerous and important duties and labors, only one mine is entrusted to one foreman, nay, rather sometimes two or three foremen are set over one mine." Timber boss, shift boss, mineralogist, mill boss, supply clerk all in one. We wonder what wages they used to pay these paragons.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Cyaniding at the Dome Mill

I read with interest the article by Mr. Megraw in the JOURNAL of Nov. 23, 1912, describing the milling practice of the Dome Mines Co., at Porcupine, Ont. I notice that the writer seems to consider the ratio between the width and height (8:40) of the Pachuca agitators unusual, but in an all-sliming process such as followed at the above mentioned property it is doubtful if efficient agitation could be obtained with a more shallow, wider tank. F. C. Brown, in giving specifications for Pachuca tanks (*Min. and Sci. Press*, Sept. 26, 1908), placed the ratio between the width and height of standard tanks at 1:4½ or 5, hence that observed at the Dome plant does not appear to be excessive.

In Pachuca construction there seems to be a general tendency to build a lower, wider tank, either from motives of economy in construction, or from the fact that in many cases the tanks are simply remodeled agitators of some other type. While a tank of this kind will give fair results when working on a pure slime, in all-sliming practice where a large percentage of material consists of fine angular grains of sand, trouble is bound to be experienced in the close packing of these particles. In fact, I believe that the greater part of the difficulty encountered in this system of agitation is due to the reason that the proper ratio of width to height has been neglected in the construction of the tanks.

With respect to the Dome plant, and taking into consideration the all-sliming method in use there, I do not see how any other system would handle successfully such a heavy pulp, containing, as it certainly must, a large percentage of angular, fast-settling particles. Mechanical agitation under the above conditions would entail an extremely high repair cost, resulting from the strain on the machinery. The only alternative to the present treatment, it seems to me, would be to divide the mill product into sand and slime, and treat each separately. Considering the matter from this viewpoint, and from the fact that the time spent in leaching would be offset by a lower power cost, I do not see why the older method would not be successful.

As regards amalgamation, I am quite in accord with Mr. Megraw; it appears to me unnecessary.

J. A. REID.

Kingston, Ont. Dec. 1, 1912.

Is Mining Languishing?

In the JOURNAL of Nov. 23, 1912, G. L. Sheldon takes up under this heading, the discussion of an editorial on this subject, on which there has recently developed a tendency to sound study of the underlying causes.

WHERE THE BLAME IS USUALLY PLACED

There seems, however, to be a tendency to lay the difficulty of prospecting and lack of interest in this, one of the most important stages of the development of our mining industry, at the doors of the General Land Office. I have heretofore referred to this phase of the subject, and will at this time only say that the constant repetition of these charges and insinuations is beginning to tell on the prospector, and only this week, an old and tried prospector came to me with a clipping from one of the local papers, in which reference was made to the Tintic case in Utah, stating but a small part of the subject matter in that case, and using such of the facts as bore out the desired construction to enable it to jump on the department. I pointed out a few of the inconsistencies in the item and quoted matter used, satisfying him of the attempted construction. He had taken the statements at their face value with the result that he had been led to believe that he was "up against it."

Laying aside these features, what is of especial interest in Mr. Sheldon's article is the lack of interest in mining and prospecting. On the last he lays the blame on the Department. But does this account for the lack of interest in hundreds, yes thousands, of *bona fide* prospects, well established, and beyond the influence of some over-zealous ranger, or entirely outside the forest reserves, which are lying idle and in which it is impossible to interest capital? The Department can in no wise be blamed for the conditions that exist with reference to these, wherein then lies the cause?

With such conditions existing and operating against the man with a well established prospect, can the reader guess why prospectors do not go into the hills? Is the Department entirely to blame?

There are many features entering into the cause and producing the effect, and it is a subject well worth discussing. I will ask a few questions that may set some of us thinking.

Can this matter be threshed out in the technical press? Can the mining papers reach the small investor, who stands the best chance with the prospect? Can the effect of the "Course in Muck Raking," which has been given by such papers as *Collier's* and the secular press for purpose of warning the small investor against the wildcat mine and the market gambling, which has, indirectly, severely hit legitimate investment in mining, be overcome except through an educational course in the same papers?

WHY PROSPECTS DO NOT EXCITE INTEREST

What is the effect of the examination of prospects by a certain class of experts, who base their views entirely on the financial features of a mining proposition, who have been brought up in the financial atmosphere of the mining business, and who have never had the practical experience of watching the development of the face of a stope from day to day and learned to know what to expect back of that face; on the development of prospects and the interesting of capital therein?

What is the net result of the employment of this class of men by the larger brokerage houses on their investments? What will be the ultimate outcome of mining and the production of our important metals if this process of ignoring prospects is to continue indefinitely?

I have been repeatedly asked for developed, paying properties, in the past 18 months, and for these there seems to be a real demand. Is this surprising? For gold properties of this description I have referred the inquirers to the Alaska-Treadwell, or the Homestake as meeting their requirements, and this comes about meeting what they demand. Who, with a "developed, paying mine," is looking for financial assistance? Have our mining men become so effete that they cannot consider a "speculative investment," on the advice of competent engineers who are familiar with the district, geology and mineralogy of the prospects?

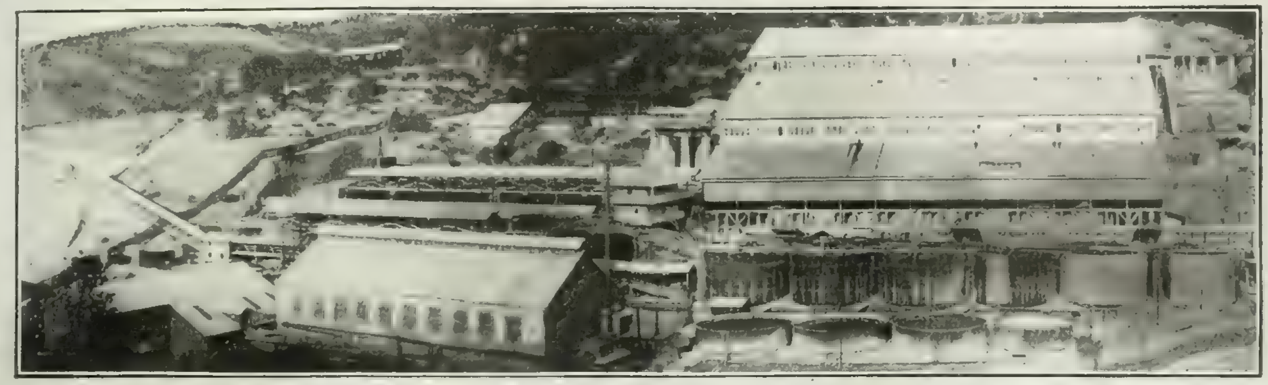
Is the engineer who makes his headquarters in some city office building, at the elbow of the broker and financier, making an excursion, now to Mexico, now to British Columbia, then to Nevada and on to Montana, fleeting trips gaining but a sketchy knowledge of the conditions that enable an expert to give an opinion on a prospect, the kind of "expert" who is going to develop our mineral resources and fill the coffers of his clients?

L. S. ROPES.

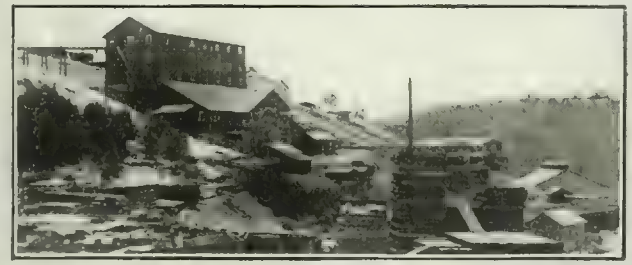
Helena, Mont., Nov. 27, 1912.

Photographs from the Field

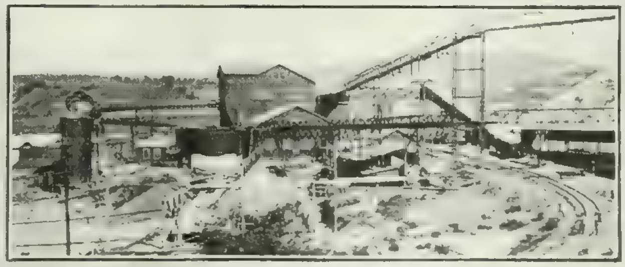
CYANIDE MILLS IN EL ORO DISTRICT, MEXICO



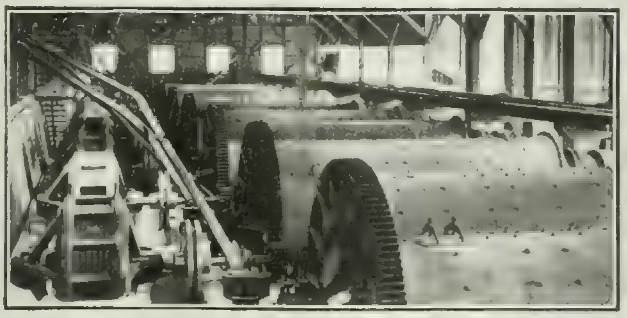
El Cedro Mill of Las Dos Estrellas Mining Co.



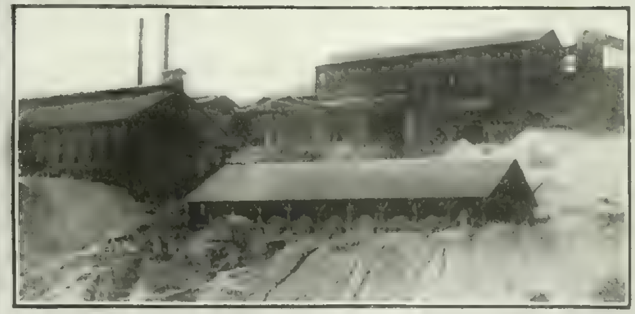
Mill of Mexico Mines of El Oro



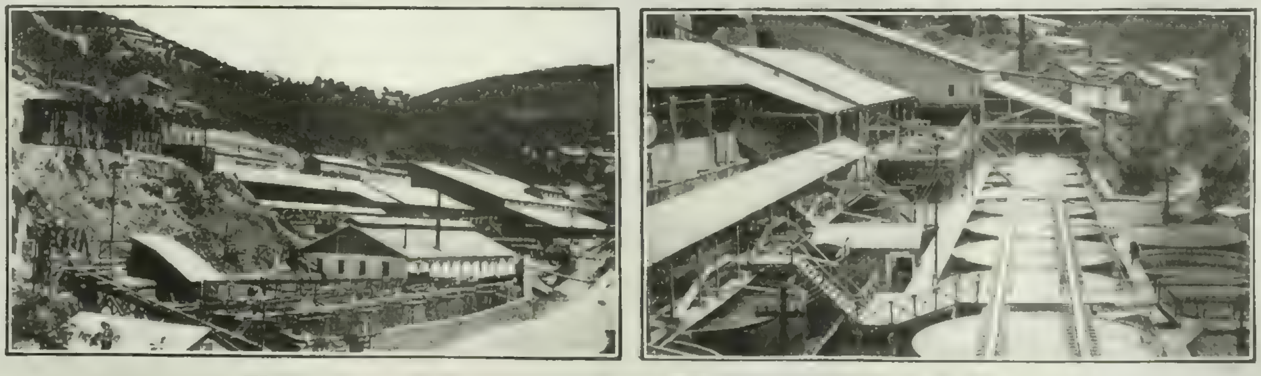
New Mill of the Esperanza Mining Co.



Tube Mills at Esperanza Mill



Mill of El Oro Mining & Railway Co.



Two Views of Mill No. 1 of Las Dos Estrellas Mining Co.

Eng & Min. Journal

Chronology of Mining for November, 1912

Nov. 1—First shipment of ore over Georgetown branch of Butte, Anaconda & Pacific R.R. made from Southern Cross mine.—Increase announced in pay of employees at Utah Copper mills, and of engineers, firemen and switchmen on Bingham & Garfield Railroad.

Nov. 5—Striking miners at Cobalt-Townsite mine return to work under old conditions.

Nov. 8—One man killed and five injured by explosion of gas in Simpson-Brooks colliery at Lafayette, Colo.

Nov. 9—Fire entirely destroyed plant of Vulcan Detinning Co., at Sewaren, N. J.

Nov. 10—A mine captain and a miner overcome by gas in a winze in the Casey-Cobalt mine in Cobalt district, Ont., fell into four feet of water and drowned.—Fire broke out in old workings between the Corra and Badger State mines at Butte, Mont.

Nov. 11—Concentrator of Nevada Consolidated Copper Co., at McGill, Nev., running at full capacity for first time since strike, begun in October.—Ten stamps put in commission in new low-grade mill, of Nipissing Mining Co., in Cobalt district, Ontario.

Nov. 12—Two men killed in strike riots at Waihi gold mine in New Zealand.

Nov. 13—Announcement made that the firm of M. Guggenheim's Sons had joined A. C. Burrage in the exploitation of Chuquicamata copper mines, in Chile.

Nov. 14—Smeltery of American Zinc, Lead & Smelting Co., at Hillsboro, Ill., put in commission.

Nov. 15—Miners at Porcupine, Ont., went out on strike in resistance to proposed reduction of wages.—Accident in Horn Silver mine, Frisco, Utah, entombed 12 persons, including four visitors, all of whom were rescued the next day.

Nov. 18—Albert Freeman, Josiah Quincy, and Julian Hawthorne brought to trial for alleged use of the mails to defraud in promoting Hawthorne Silver & Iron Mines Co., Ltd., and other companies.

Nov. 19—First production of sulphur at Bryan Heights, Texas, by Freeport Sulphur Co.

Nov. 24—Twenty-four men killed by explosion of gas in colliery near Alais, in the Department of Gard, France.

Nov. 25—Fifteenth annual meeting of American Mining Congress begun at Spokane, Wash.—Fifty men caught in a cave-in at Barnum mine, Pittston, Penn.; no fatalities, but about a dozen miners seriously injured.—Explosion and fire at Brooklyn Eastern District Terminal, in Williamsburg district of New York, in which 132 tons of Union Sulphur Co. sulphur was stored; several men severely burned.

Nov. 26—Fuel shortage, caused by strike of engineers and firemen on railway controlled by U. S. Steel Corporation, forced 10,000 iron workers out of work in Pittsburgh region.

November Mining Dividends

Mining dividends paid by United States mining companies in November amount to $1,574,596; by metallurgical, coal, iron, and holding companies to $11,421,944; and by Mexican and Canadian companies to $1,343,718.

There were no special changes in dividends paid by the United States companies, but in the Canadian field, Hollinger made a welcome appearance as the first of the Porcupines to pay dividends, with one on Nov. 2 and another on Nov. 30, while it is understood that one will be paid every four weeks hereafter. Canadian Goldfields also paid in this month. Five Mexican companies reported $578,768 dividends, in spite of the "revolution."

United States Mining Companies	Situation	Per Share	Total
Alaska Mexican, g	Alas.	0.30	$ 54,000
Alaska Treadwell, g	Alas.	1.00	200,000
Alaska United, g	Alas	0.50	90,100
Bunker Hill Con., g......	Calif.	0.05	10,000
Bunker Hill & Sull., l.s....	Ida.	0.20	65,400
Butte-Alex Scott, c	Mont.	0.50	50,000
Champion, c	Mich.	1.00	100,000
Cliff, g	Alas	0.05	5,000
Colo. Gold Dredging, g...	Colo.	0.25	25,000
Ellston, g...............	Colo.	0.02	37,500
Fremont, g.....	Calif.	0.02	4,000
Frontier, z...	Wis.	2.00	2,500
Granite, g....	Colo.	0.01	16,500
Golden Cycle, g	Colo.	0.02	30,000
Hecla, l s	Ida	0.02	20,000
Homestake, g	S.D.	0.50	109,200
Miami, c	Ariz.	0.50	332,470
Parrot, s c	Mont.	0.15	34,477
Stratton's Independence, g	Colo	0.06	60,750
Tom Reed, g	Ariz	0.07	63,669
United, c.	Wash.	0.01	10,000
United Verde, c	Ariz.	0.75	225,000
Wasp No. 2, g	S.D.	0.02	10,000
Yellow Pine, z l s	Nev	0.02	19,000

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
Amalgamated, c	Mont.	1.50	2,308,319
Cambria Steel,	U.S.	0.62½	562,500
Greene-Cananea, c	U.S.	0.25	618,828
Island Creek Coal	U.S.	0.50	75,000
Internat. Nickel, pfd	U.S.	1.50	133,689
International Sm. & Ref....	U.S.	2.00	200,000
Lehigh Coal & Nav	Penn.	1.00	482,936
Nat. Carbon pfd	U.S.	1.75	78,785
New Central Coal.	Md.	0.40	20,000
Penn. Steel pfd	Penn.	3.50	577,500
U. S. Steel pfd		1.75	6,304,919
Warwick I. & S	Penn.	0.40	59,468

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Amparo, g s	Mex	0.03	60,000
Buffalo Mines,	Ont.	0.03	30,000
Canadian Goldfields, g....	Can	0.01½	150,000
Coniagas, s	Ont.	0.45	360,000
Greene Con., c	Mex.	0.40	400,000
Hollinger, g...	Ont.	0.06	175,000
Lucky Tiger, g	Mex.	0.05	35,768
Montezuma Lead, pfd....	Mex	3.50	35,000
Santa Maria de La Paz, l g s t	Mex.	2.50	48,000
Standard Silver Lead, l.s..	B.C.	0.02½	50,000

Mining dividends paid by United States mining companies making public reports amount to $54,744,870 for the first 11 months of the year, and for American mining, metallurgical and allied companies, to $161,846,126.

The Closing of Pipe in Steel Ingots

By Henry M. Howe*

Three new methods of preventing the formation of pipe in steel ingots, presented at the September meeting of the Iron and Steel Institute, are of great interest. They are described by Doctor Goldschmidt, Sir Robert Hadfield and Doctor Stead.

In Dr. Hans Goldschmidt's process a charge of thermit is pushed down to the bottom of the molten ingot, early in the process of solidification. The metal immediately froths strongly, and then sinks back several inches. Though Doctor Goldschmidt describes this as purely a mechanical process, it seems to be something more. The thermit charge contains both aluminum and iron oxide. We may reasonably suppose that the frothing is due to the reaction of part of the iron oxide on the carbon of the metal in its immediate neighborhood, yielding carbonic oxide, and partly to the mechanical disturbance, such as would be produced by thrusting any rod with or without thermit into the mass.

The sinking down we may suppose to be due to the absorption of part of the aluminum by the metal, because it is to metal which has not been treated with silicon or otherwise to free it from gas that this process is applied.

One readily understands why this process should free the metal from blowholes, just as any other addition of aluminum or silicon should. Such elimination of blowholes, if excessive, leads to the formation of a pipe. From Doctor Goldschmidt's words infer that the ingots which he uses are not piped. If that is the case, one can only infer that he uses a quantity of aluminum so moderate as to lead to an incomplete suppression of blowholes, and thus to leave enough to prevent the formation of a pipe. It is not clear wherein this process would differ in its effect from any other addition of aluminum or of silicon, combined with a stirring of the metal in the mold.

The method of preventing the pipe, described by Sir Robert A. Hadfield, and that of Mr. Talbot, described by Doctor Stead, are characteristically simple and ingenious. Sir Robert is right in implying that the common method of preventing the pipe, puffing up the metal by allowing a moderate number of blowholes to form, so that the metal puffed up is just about enough to fill the pipe, is evidently a makeshift, though certainly a useful one. In fact, it replaces a greater evil, the pipe, with a less evil, the blowholes, and their resultant segregation. Any cheap method of closing the pipe in a blowholeless steel is certainly to be welcomed.

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*Professor of metallurgy, Columbia University, New York

I do not overlook the fact that in making a piping steel it is desirable to free it from suspended solid matter, or as Mr. Hibbard calls it, "sonims," by allowing it to evolve gas freely, and adding silicon, aluminum, or other agent for preventing blowholes, and thereby forming the pipe only after opportunity for the escape of gas has been given. This, of course, complicates the procedure.

The method of filling the pipe by retarding the cooling of the top of the ingot has been long and successfully used. The dozzle of Sheffield, the preheated sand sinking head of the steel founder, the gas flame of Riemer, the pouring on of masses of a molten slag, all have been successful. The objection to the common ways of heating the top of the ingot artificially by means of a flame or by coke or charcoal, is that any such operation is likely to carburize or to decarburize the top of the ingot, according to whether the carbon of the fuel used or the air used to burn it has the better chance to work on the metal. Sir Robert's plan of putting a slag buffer between the heating agent and the ingot itself is certainly ingenious and ought to be effective.

Mr. Talbot's method works along the lines of the various compression methods, which close the pipe by squeezing the molten or plastic metal into it as solidification progresses. But Mr. Talbot's method has the advantage over all other compression methods that it applies the cheapest and most effective of our methods of compression, the rolling mill. In particular, Mr. Talbot allows the ingot to solidify part way and then passes it through the rolls in such a way that the still plastic interior of the lower part of the ingot is forced up into the pipe. He thus drives this metal up into the pipe by a passage through the rolls instead of by the longitudinal compression of Whitworth, or the transverse compression of Harmet, Williams, and others.

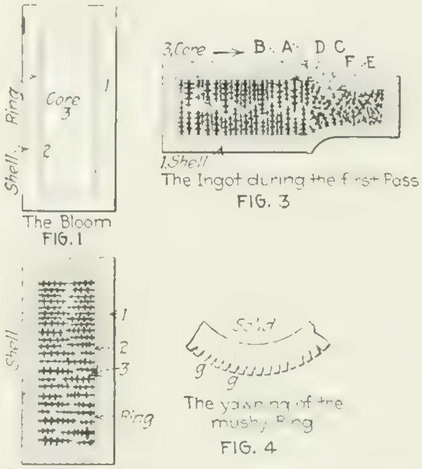
Some words of Doctor Stead's give the impression that Mr. Talbot's method produces some special distribution of the carbon different from the distribution produced by the other methods of compression. It is not clear why this result should follow and an explanation of this point would seem to be desirable.

Sir Robert Hadfield traces the course of solidification in a series of steel ingots by pouring into them at a series of pre-determined stages a small quantity of copper. On sawing the resultant ingot open and etching it, the parts which were molten at the time when the copper was poured in are recognized by the different color there caused by the etching.

It would appear that the same result could be reached by a small addition of pyrites or of an iron alloy rich in sulphur. This addition would in the same way be confined to the part of the ingot molten at the time of introducing it. Then on sawing the ingot open and etching it by the sulphur printing method of Heyn or Baumann, we could easily see what parts were still liquid at the particular moment at which the sulphur was introduced.

In the case of plain ingots, this information might be had more cheaply by sounding with an iron rod, a method which was used by the late John Coffin.

In case of steel castings, Sir Robert's method would appear to offer considerable promise. We sometimes wish to trace the course of solidification, in order to throw light on the problem of feeding and chilling the casting, so as to bring the porous region of final solidification into a harmless position. It might be practicable to throw a good deal of light on these often difficult questions by Sir Robert's method.



The Bloom
FIG. 1

The Ingot during the first Pass
FIG. 3

The Ingot just before rolling
FIG. 2

The yawning of the mushy Ring
FIG. 4

EFFECTS OF ROLLING

As between the Hadfield and the Talbot anti-piping methods here put forward, the former would appear to find its natural field in the case of very large ingots, which are not suited for closing up by Mr. Talbot's simple process. For ingots of moderate size and of regular shape, Mr. Talbot's method would appear to have a great advantage in its extreme simplicity. To arrange heating apparatus for heating the top of each of a large number of small ingots severally would appear to present serious administrative difficulties and at the best to be pretty expensive, whereas the pipe of small ingots, and indeed of all but very large ones, could be closed up easily by Mr. Talbot's method.

Since the above paragraphs were written Mr. Talbot's visit and the discussions to which it has given rise enable us to work out a theory of the special distribution of the three segregating elements, carbon, phosphorus, and sulphur, which Mr. Talbot finds. Briefly, the process is applied to ingots which have been well quieted by an addition of aluminum or its equivalent, and hence would not segregate materially if uncompressed. As a result of the compression, while the outer shell of the ingot has about the normal or ladle composition, there lies within it a ring much enriched in the segregating elements, and within that the core of the ingot is correspondingly impoverished.

Evidently the impurities have been transferred from the central core to the intermediate ring. How has this occurred?

At the time of the rolling the outer crust is distinctly solid, but the core has thus far solidified only slightly, so that it is a wholly incoherent mass of pine tree trunks and branches, with the space between filled with still molten metal. The ring which is finally found enriched in the segregating elements is at this moment in that mushy stage in which the degree of cohesion through it is appreciable, decidedly greater than that of the wholly incoherent core, is yet too little to enable the metal to elongate along with the solid outer walls during the rolling. As a consequence this slightly coherent ring cracks open in numberless minute cracks.

At the same time the solid walls and the ring are pressed down by the rolls upon the incoherent core. Of this core the pine tree trunks and branches are the purer metal, and the still molten ground mass between them is relatively impure, as a necessary consequence of the normal course of solidification. Under these conditions, the opening of the crevices in the ring converts that ring into something like a mass of blotting paper, ready to soak up from the core the still molten impure parts of that core. Thus comes the transfer of the impure material from the core to the ring, pass after pass.

The remarks of Messrs. Kenney and Stoughton have shown the essential conditions, and I have done little more than to supply some missing links and put the whole into coherent form. Having done this, I believe that this explanation is that which Doctor Stead has conceived, though I was unable to follow his remarks in the form in which they reached me.

Wells' Nickel Extraction Process

A recent patent of Horace L. Wells, of New Haven, Conn. (U. S. pat. 1,044,316), provides for the extraction of nickel from nickel-copper matte by means of hydrochloric acid. The matte is pulverized to 60 mesh, or finer, and treated with 18 to 25% hydrochloric acid at a temperature between 110 and 212° F. The first solution is then decanted or filtered off, and the residue is again treated with further amounts of acid. This is done because one treatment will not extract all the nickel, no matter how long continued or how strong the acid. The acid used in the second treatment is not exhausted and is available for use as the first leach in treating a succeeding batch of nickel matte. The matte is agitated during this treatment. The solution of nickel chloride thus obtained is treated for nickel or for nickel salt, as provided for in the various other patents of Tom Cobb King and H. L. Wells.

Metal Tariff Probabilities

WASHINGTON CORRESPONDENCE

Chairman Underwood, of the Ways and Means Committee, has made it plain that he intends to reintroduce and report to the House of Representatives the original Underwood steel and metals tariff bill in very much the same form in which it was expressed last winter. Mr. Underwood has determined to hold hearings in January and it is stated that full opportunity will be given to everyone who has anything to say. But it is also evident that there is a feeling among Democrats that whatever may be said will be largely superfluous and rather intended to placate public opinion and prevent the statement from being made that final action was taken without notice or information, than it will be for the purpose of getting actual new data for use in reframing the measure.

Of course, this does not mean that there are to be no changes in the steel and metals bill; on the contrary, a good many Democrats were quite thoroughly convinced that a number of the rates in the bill had been erroneous. A few amendments made in the Senate were accepted when the bill came back to the House last summer, and more would have been, but the debate in the Senate had not produced any very strong feeling in favor of drastic revision of the terms of the legislation. There are some rates in the bill that are generally considered both by Democrats and progressive Republicans to be too high. Included among these are the rates on all of the heavy iron and steel products and those on lead and zinc as well as on other metals. Some others are considered too low, notably those on certain types of machinery. So it is quite probable that there will be rather extensive changes but none, it would seem, that will be likely to make a real alteration in the general level fixed by the bill of last year. Indeed it seems probable that whatever change in that level is allowed to take place will be in a downward direction.

Lead and zinc interests not affiliated with the American Smelting & Refining Co. have already indicated a determination to take an active part in the work of Congress this winter and to demand free trade in these articles. They point particularly to the present smelting-in-bond provisions as being indefensible and consequently deserving of abolition or if a duty is retained, of serious modification. They have filed briefs with the Ways and Means Committee and expect to bestir themselves actively. The same has been done by those who now profit from the duties on lead and zinc, and a combination of Missouri, Colorado, Idaho and other interests has apparently been effected. The Ways and Means Committee will have to meet this opposition in the Democratic party along with much other antagonism to the bill.

It is already evident, however, that if extensive changes are to be made in the metals bill they will have to be made in the Senate and very largely with the consent of the new President. There is no difficulty in recognizing that the House Democrats cannot well afford to put themselves in the position they would occupy if they were to alter the metals bill drastically in the direction of protection. Whether in consultation with members of the Senate they will consent to a readjustment that will permit the latter body to raise rates all around or not, is a question that is now the subject of very interested discussion. Undoubtedly there is a strong group of senators, including some from the old-line Democratic group, some Progressives, and, of course, a number of old-line Republicans who will do their utmost to raise the rates when the bill goes to the Upper Chamber. Nothing has as yet been decided by the Democrats in the House as to whether they will or will not permit the appointment of a joint committee in conference representing the two Houses which shall reshape the tariff bills this winter and thereby assure sympathetic committee treatment for the House bill when it goes to the Senate. The chances, however, are against any such outcome.

General Petroleum Co.

The General Petroleum Co. is increasing its activities both in California and Mexico. In California, it has 26 drilling outfits at work and besides the building of a 185-mi. pipeline, and the proposed acquisition of the Union Oil Co., mentioned in the JOURNAL of Nov. 30, it is now completing the details of the absorbtion of the Continental Petroleum Co. of America, by exchange of bonds and stock for the U. S. and Mexican properties of the latter company.

The General Petroleum Co. owns 18,000 acres of oil land in Mexico and 13,000 acres in California. Through the General Pipeline Co., of which the General Petroleum owns 75% of the capital stock, an 8⅝-in. pipeline, 185 miles long, is being built at an expense of $4,000,000 for the line, tankage, pumping stations, terminals, etc. The pipeline will have a deep-water terminal at San Pedro and will serve various fields, extending as far north as the Lost Hills district. The line is to be completed in March, 1913, and is expected to have a capacity of 25,000 bbl. per day.

The General Petroleum Co. owns a half interest in a new system of refining and plans are being made to erect a refinery at the pipeline terminal, where a storage capacity of 2,000,000 gal. will be provided. Waterfront property has been acquired near Tampico, Mex., and it is the intention eventually to duplicate in Mexico what is now being done in California.

David White

David White, who was in November appointed chief geologist of the U. S. Geological Survey to succeed Waldemar Lindgren, has been connected with the Survey for 26 years, having joined its force just before he graduated from Cornell University. His chief work for a number of years was in the paleontological division, in which his studies and reports gained for him a high reputation. More recently his familiarity with the coal-bearing formation of the Eastern coal fields, gained in the study of the fossils, and technical knowledge of coal, gathered in the course of investigations of their microscopic composition, and of the problems concerning the origin of coal, led to his choice as section chief, charged with the economic work of the survey in the Eastern coal, oil and gas fields. Mr. White is a member of several scientific societies, including the National Academy of Sciences, and is president of the Paleontological Society and vice-president of the Geological Society of America.

DAVID WHITE

Trunk Channels as Ore Localizers

By Charles R. Keyes *

Trunk channels of the vadose zone are lines of ore removal rather than of ore deposition. Principal ore localization in the profound region is near the bottom of main channels through which vapors and heated waters are expelled from magmatic masses.

Although ore deposits so often occur along the restricted lines of freely flowing groundwaters, it does not necessarily follow, as lately we have been so commonly led to believe, that the presence of orebodies in such situations is solely due to the long continuance of unusually great volumes of passing waters. Ore localization is almost invariably determined by other and entirely unrelated factors. As recently and conclusively shown, only under special geologic conditions do any parts of trunk channels become commercially valuable ore repositories. As general *loci* of ore deposition, altogether too much importance appears to have been attached to these subterranean streams. The conception is largely a purely theoretical one, and has its foundation in certain analogies drawn from the field of general rock metamorphism, rather than from actual observations in mines.

DESCENDING METEORIC WATERS NOT ORE DEPOSITING IN DEPTH

Practical consideration of the relations existing between ore deposition and groundwater circulation indicates that ascending and descending movements are not the features to be particularly contrasted. Only, in a limited sense is the distinction of any real service. The fundamental comparison to be made is between the trunk channels of the vadose zone and those of the profound region. Soon after passing below groundwater level, descending meteoric waters do not appear to be notably ore depositing. Only in exceptional cases are ore materials probably precipitated from such waters after they have attained considerable depths and have begun to travel upward. Artesian waters derived from the general groundwater circulation seem also to be remarkably free from metallic constituents On the other hand, metalliferous ascending waters appear to be invariably associated with certain phases of volcanism and orogenic movement. De Launay, especially, has lately emphasized the idea of a close genetic relationship between orogeny, petrology and metallogenesis.

The common notion that the main channels of groundwater circulation are vertically disposed and that in some places the water currents are ascending but in others descending, seems true only under certain restricted conditions. On the whole, the trunk channels of the profound zone that are ore depositing are probably vertical or nearly so, yet relatively few of them are productive of workable orebodies. It is another problem whether such ascending waters carrying depositable ore materials have been expelled from deep-seated magmas, which are cooling, or whether they are really meteoric waters which have been heated in the course of their subterranean travels. The recent exhaustive arguments of Brun and of Stutzer for the anhydrous character of magmatic emanations appear to afford no adequate explanation of the presence of water in many silicate minerals of plutonic rocks, nor of the peculiar relations existing between such rocks as massive granites, pegmatitic dikes and quartz veins. My own opinion leans towards the idea that orebodies deposited by ascending waters are derived largely, if not entirely, from juvenile waters; rarely, if ever, from heated meteoric waters. Nowhere, so far as the profound zone is concerned, have I ever been able to find satisfactory evidences of the lateral secretion of ore deposits, even in the broadest sense of the term.

The chief diversion of vadose waters in a horizontal direction is productive of two noteworthy results: A large gathering ground for diffused ore materials in decomposing rocks is drawn upon; and these ore materials are soon directed along restricted paths and, without great losses, are often carried great distances.

VADOSE ORE FORMATION COMPARABLE TO WILFLEY TABLE CONCENTRATION

Assuming as fact, as Posepny has so well urged, that the groundwater level is generally an inclined plane, vadose waters are in consequence continually moving down this slope, sometimes fast through open crevices in the rocks, sometimes slow through almost impermeable masses. In its larger aspects, vadose ore formation is comparable in a way to the concentration of finely crushed ores on the Wilfley table, the uprising of mountains tilting both the former slight incline of the groundwater table and the strata, so that all meteoric waters falling upon the area are directed along certain definite lines or narrow troughs. Whenever geologic structures assume the character of cross folds, faults or other obstructions to the free movement of subterranean circulation, impounding conditions occur and the metallic loads in solution are at once precipitated as ores. The tectonic crossbars are thus the analogues of the riffles of the Wilfley. In comparison with the precipitation of metallic minerals through impoundment of groundwaters, all other methods of vadose ore deposition appear insignificant.

In some regions, as the Ozarks for instance, it has been shown that trunk channels are lines of rapid ore solution and removal rather than of ore deposition. In reality, the Ozark country is a tract which is now being rapidly depleted of its ore materials. Only when the main channels of groundwater flow become clogged in some way or other do orebodies form in them. The fact is well supported by other than mere isolated observations. To this more than anything else is it probably due that ores are not deposited everywhere evenly in the vadose zone. It is likely that it is a fundamental law of groundwater movement that only where the current is interrupted, or stagnation prevails, are ore materials precipitated.

DESCENDING WATERS DEPOSIT MINERAL CONTENT AT GROUNDWATER LEVEL

The necessary consequences of a theoretical consideration of circulatory groundwaters have never been critically compared with the recorded observations on the distribution of ore materials in mines. Of course, part of the waters moving horizontally in the vadose zone often issues at the surface of the ground as springs, and becomes mingled with the surface waters. At groundwater level, or slightly below, the portion passing downward into the profound region at once drops a large proportion of its metallic salts to form the bonanza ore zone. The part carried farther downward must mainly enter into combinations, which are not ore forming. Except at the top of the profound part of such channels, few or no orebodies are deposited. When these downward moving waters begin to ascend again, under ordinary conditions, they are probably entirely free from the common metals in solution; and on account of these very conditions they are not likely to take up other metals on their way up to the surface again. The nonsoluble character imposed during the passage of metallic combinations through the profound region, doubtless remains so under all ordinary increases of temperature which are likely to be met.

ORE-FORMING TENDENCIES IN VADOSE AND PROFOUND REGIONS DIRECTLY OPPOSED

On the other hand, ascending juvenile waters appear to part with all or nearly all of their ore-forming materials long before they reach the groundwater line and the confines of the vadose zone. The *locus* of principal ore deposition appears to be near the bottom of the main channels, through which the vapors and waters find exit from the magmatic mass. Only long afterward, when these orebodies are brought to the surface through the general erosion and lowering of upraised mountain belts, are they made accessible to man.

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*Consulting engineer, Des Moines, Iowa.

Since, in the one case, there is notable rock solution, and in the other rock cementation, it follows that the ore-forming tendencies of the trunk channels of the vadose zone and those of the profound region are directly opposed. In the light of the most recent tests regarding the *locus* of maximum ore deposition, the theory of trunk-channel localization of ores, as advanced by Van Hise and others, needs to undergo considerable modification before it can be made acceptable. If, under normally wet-climate conditions, the greater part of vadose trunk channels must be considered as lines of ore depletion rather than of ore enrichment, the subject assumes unusual interest, since it is considered that in arid tracts of the globe the vadose zone, as recently shown, attains enormous thickness and acquires such vast importance in mining.

Mining and Metallurgical Industries in Spain

In a volume of statistics regarding the output of Spanish mines, the president of the Official Council of Mining calls attention to the great mineral wealth of Spain and to the large number of mineral deposits which remain unworked, and suggests four methods by which the government could aid the development of this source of national wealth. This document is dealt with in a British diplomatic report, by T. Lyons.

Suggested Aids to Mining

The methods suggested by the president are:

(1) Legislation to prevent speculators without capital impeding the development of rich deposits by obtaining concessions and refusing to part with them, although they themselves are unable to work them.

(2) That the mining industry should be "freed from the innumerable charges and taxes to which it is at present liable under so many headings." According to the report all companies engaged in this industry are directly or indirectly affected by the following taxes: *boca de mina*, a tax of 3% on the value of raw material at the pit's mouth; transport tax, a tax of 5% on freight charges; export tax; shipping tax, a tax per ton on goods at the port of disembarkation; industrial taxes; import duties; property tax, a territorial contribution on real property; a tax of 1 per 1000 on the total capital employed by certain categories of foreign companies in Spain. During the last year no new taxation has been added to this formidable list but an attempt has been made to fix, at a sum greatly in excess of that previously determined, the capital of certain foreign mining companies for the purposes of the 1 per 1000 tax. Capital taxable under this heading is, failing agreement between the mine owner and the government, fixed by an expert appointed by the ministry of finance, and no appeal is allowed against the decision.

(3) That the state should make to mining companies monetary grants to be spent for such purposes as experimental borings in coal-bearing strata, drainage, pumping, etc.

(4) The improvement of transport facilities both by land and sea.

The president of the mining council considers the lack of these facilities to be the chief factor which retards the development of Spain's mineral wealth. He therefore advocates the construction of light railways, the equipment of ports with modern facilities for loading and unloading ships and the addition to the Spanish mercantile marine of vessels of large tonnage capable of competing with foreigners in regard to freight.

Statistics for 1909

Statistics regarding the output of Spanish mines are leisurely compiled and therefore, Mr. Lyons is content to give the 1909 table shown herewith.

STATISTICS OF SPANISH MINES FOR 1909

Substance	Productive Concessions	Hands Employed	Production Tons	Value at Pit's Mouth Pesetas
Coal	592	21,956	3,662,573	47,345,000
Anthracite	13	1,515	198,302	3,004,000
Lignite	58	1,494	265,019	3,269,000
Iron	503	36,804	8,786,000	45,503,000
Iron pyrites	7	842	258,931	1,215,000
Mercury	16	1,373	37,397	5,082,000
Sulphur	8	602	21,749	149,000
Copper	125	25,448	2,955,258	35,407,000
Manganese	6	203	7,826	134,000
Lead	184	14,233	137,049	18,780,000
Argentiferous lead	133	10,138	161,496	30,619,000
Zinc	84	4,864	163,521	7,388,000
Wolfram	3	118	129	64,000
Salt	35	346	23,044	378,000

In the second table is given the production in 1909 of factories engaged in treating minerals raised from Spanish mines.

The tables show a slight decrease in the production of the more important minerals, including iron, coal and copper. There was, however, an increase of 994 shown in the total of 120,872 men and women employed at the mines. The women, all of whom were employed above ground, numbered 2508. More factories were at work, employing 2104 more persons. This output was greater with regard to iron, copper, mercury, coke, patent fuel and portland cement, but the production of lead, zinc and salt showed a decline.

In all classes of mines and metallurgical factories the total number of men and women employed in 1909, was 156,782, of whom 9½% received some form of injury. New mining regulations issued in 1910 included a more rigorous system of inspection. Statistics (for mines only) show that a great improvement has been brought about. Deaths have been reduced from 256 to 180 during 1911, and serious injuries from 282 to 174 in spite of the tendency toward increase of the total number of employees. Two years will elapse, Mr. Lyons says, before statistics appear regarding the output of Spanish mines during 1911.

PRODUCTION OF SPANISH METALLURGICAL WORKS IN 1909

Substance Produced	Factories Working	Hands Employed	Production Tons	Value Pesetas.
Patent fuel	13	562	478,690	6,735,000
Mercury	6	710	1,364	9,407,000
Cement	66	2,140	471,909	10,108,000
Zinc	1	431	9,625	6,313,000
Copper				
Precipitate	..	...	16,547	19,843,000
Blister copper	21	4,262	17,519	28,706,000
Sulphuric acid	..	...	8,640	864,000
Iron—				
Cast iron	..	...	428,622	8,798,000
Malleable iron	..	...	24,187	8,125,000
Steel	16	11,446	161,261	19,529,000
Rolled and partially manufactured steel and iron	..	...	218,409	34,897,000
Coke	18	261	500,909	15,060,000
Silver	4	33	143,403*	12,843,000
Lead	19	1,689	136,441	43,217,000

*Kilograms

Of the nine articles which form the Spanish export tariff, five are concerned with minerals. The duties levied are as follows: Galena and other lead ores, 1.5 pesetas per 100 kg.; argentiferous lead ores, those containing more than 30 grams of silver to every 100 kg. of lead, 1 peseta; iron ore, 2 centimos; copper ore containing more than 2½% of copper, 16 centimos; copper matte, 2 pesetas. The quantity of metals exported in 1911 was as follows: Pig iron, 38,962 tons; copper precipitates, 13,352 tons; copper ingots, 16,896 tons; mercury, 1463 tons; argentiferous lead in pigs, 48,158 tons; ordinary lead in pigs, 124,619 tons; zinc in pigs and sheets, 2563 tons.

Spanish imports of coal have remained almost stationary at slightly over two million tons during the last three years. Out of a total importation in 1910 valued at 64,600,000 pesetas, 62,600,000 pesetas worth was of British origin. Consumption of coal is increasing in Spain, and is almost entirely provided for by the development of new collieries.

Nearly 70,000,000 gallons of mineral water were sold in the United States in 1911, according to the U. S. Geological Survey, the value of which is placed at $7,875,373. New York led all other states in the quantity of water sold (10,245,261 gal.), but the Wisconsin output had the highest value, namely, $955,988, or an average of 17c. per gal. The average value of the domestic water at the springs was 10.7c. per gallon.

Details of Practical Mining

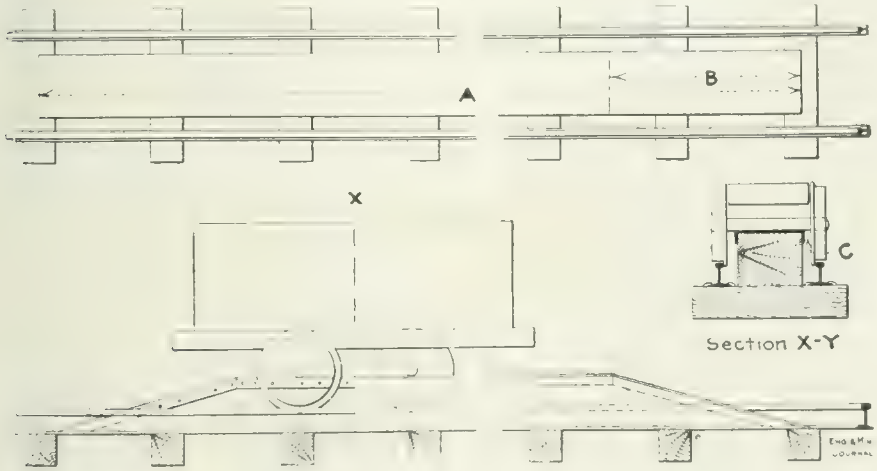
Accounts of Useful Ways of Doing Many Things in the Day's Work

Device for Retarding Speed of Cars

By John T. Fuller*

The accompanying engraving shows the essential details of a simple device for checking or retarding the speed of cars used at the diamond mines in Kimberley, South Africa.

It consists of a platform built of one or more pieces of timber, bolted or spiked to the ties between the rails, with a slope at each end as shown. Over this platform wrought-iron or steel plates ⅛ or ¼ in. thick are spiked, bolted or screwed.



Kimberley Car Check

The height of this platform above the rail is just sufficient to raise the wheels of the car free from the rail when the axles come in contact with the platform. The car travels the length of the platform on its axles, its speed being gently and gradually checked to any degree desired depending on the original speed and the length of the platform.

The width of the platform will depend on the width *C* of the journal boxes. The length of the platform must be determined by experiment for each case; but this is quickly and easily done. The length *B* of the inclined portion of the platform is usually about three feet and I have used at different places platforms with the length *A* from 10 to 25 feet.

When once properly adjusted this car check will be found not only simple and economical but absolutely automatic and indestructible under the roughest usage. This device can, of course, only be used where the car axles are free to revolve. Contrary to expectation, I have never experienced any trouble with bent axles by using this form of check.

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*Consulting engineer, 505 Park St., Honesdale, Penn.

Automatic Belt Tightener

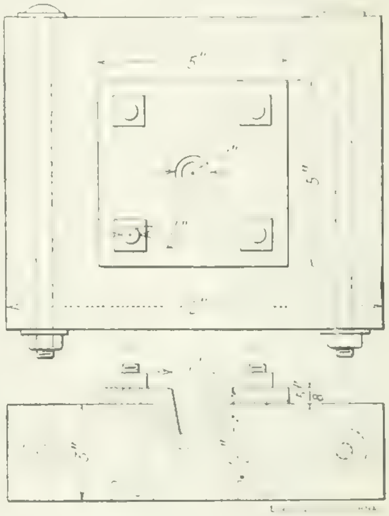
By J. R. McFarland

A unique automatic belt tightener and incidentally a new use for worn out stoping drills has been devised by C. C. Griggs, superintendent of the Uncle Sam Mining Co., at Eureka, Utah. In changing a straight-line steam-driven air compressor to motor-power belt drive, the pulley of the compressor was placed on the shaft between the two narrow-rimmed fly wheels. On account of the proximity of the cylinder, the pulley had to be smaller than good practice would allow.

The necessity of having the belt tight on high pressures was apparent. A wooden frame was erected about midway of the belt. On each of the perpendicular posts a feed cylinder from a worn-out stoper was placed. To the bottom of the feed pistons a shaft bearing an idler was attached with the idler bearing directly on the belt. The tops of the feed pistons were connected with the air line to the receiver. As the air pressure rises in the receiver and the strain becomes greater on the belt with an increased tendency for belt slippage, the air pressure working on the stoper feed pistons holds the idler tightly against the belt and as the air pressure in the receiver drops the tension on the belt is automatically released.

A Steady Tripod Set-up on Loose Rock

In certain classes of mining, especially with some types of underhand stoping, and where the orebody is too wide for a column, a tripod set-up for the drills is frequently necessary. Often it is not possible to place the tripod legs on solid rock and a yielding set-up results which interferes with good drilling. When such a set-up is necessary on a pile of broken ore, several expedients are employed to steady the drill and distribute its weight over a large area. In some Missouri mines the tripod is set on old car wheels; these are heavy to handle and if mixed with the ore might cause serious delays, especially if gyratory crushers were used. In Butte wooden blocks are employed, but unless they are at least five inches thick or shod with iron they are easily split by the sharp ends of the tripod leg.



Shoe for Tripod Leg on Broken Ground

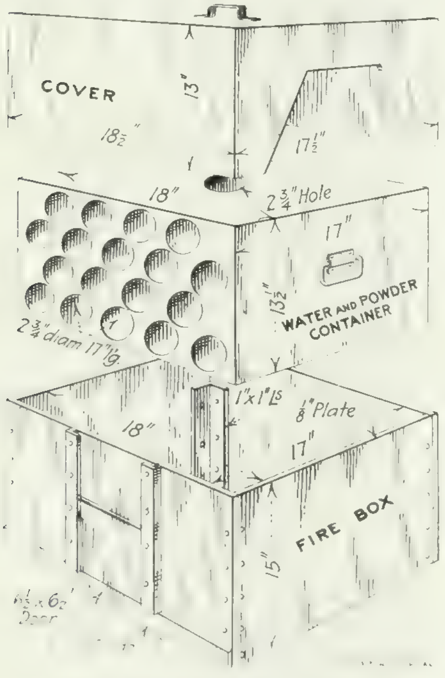
A device used at the Cleveland-Cliffs Iron Mining Co. in Michigan, consists of a 10x12-in. piece of three-inch oak, shod with a five- or six-inch square of ⅜-in. scrap iron. The shoe, which is fastened to the block by four ½-in. carriage bolts, has a depression about one inch in diameter and 1½ in. deep, to receive the tripod leg.

To prevent splitting the block is bound together at each end by a ½-in. bolt, as seen on the accompanying drawing. So good a set-up can be obtained with this device, that the mine captains say the footage drilled depends more on the men at the machines than on whether a column or tripod set-up is used. Other things being equal a man with a tripod can drill only about two-thirds as much as with a column.

The miners often ride the tripod while drilling; much of the jar is eliminated if a plank is put in crossways through the legs, allowing the operator to sit or stand on a spring-board.

Hot Water Powder Heater

The powder heater shown in the accompanying drawings is used throughout the iron mines at Mineville, N. Y. Dupont or Potts powder of from 30 to 45% strength is generally used and, due to the low temperature in the mines even during the summer months, the powder must be thawed. However, some of the mines do use a certain percentage of the non-freezing powder. The heater shown has a capacity of 108 sticks, each flue accommodating six sticks of 1⅛ x 8-in. powder. The fire is first kindled in the firebox, the water container is placed over the firebox, resting on corner angles, and then the cover is slipped over the water container. The latter is 17x18 in. by 15 in. high and made on the principle of a return-tubular boiler. Flues, 18 in number and 2¾ in. in diameter, are fitted in two opposite faces of the container. Water is poured in the top of the container until it is well above the top row of tubes. After the water has been heated to a temperature which the hand will bear, the container and cover are removed to a safe distance from the firebox and the fire completely extinguished. The cover is then removed and the flues are filled with the sticks of powder and the cover replaced. In a short time the powder will be sufficiently soft for use.



Hot Water Powder Heater

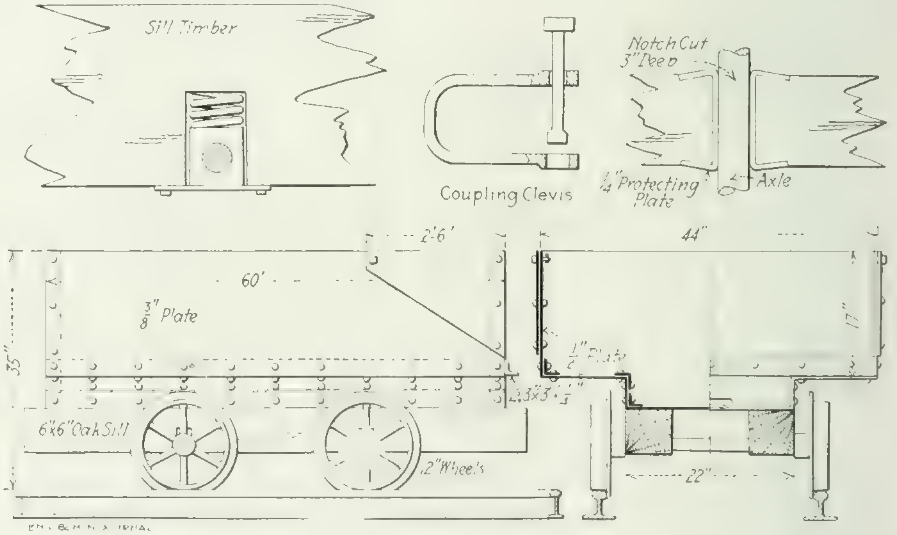
Desloge Mine Car

The mine car used by the Desloge Consolidated Lead Co., in southwestern Missouri, is shown in the accompanying illustration. The car is of the long, low type, which has found favor in the Lake copper and iron districts, due to the ease and rapidity of loading. This is especially true when the ore is to be loaded directly from the floor of the stope.

The Desloge car stands 33 in. above the rail, it is 5 ft. long, 44 in. wide and has a wheel base of 24 in. The body of the car is made up of ⅜-in. plates. It has been found that by using a car composed of several plates, as seen in this design, wrecked cars are more easily repaired than when fewer and larger members are employed. All the plates are cut to the correct size at the mill, being assembled and riveted at the mine, using ⅝-in. rivets, spaced 6 in. center to center, and ¼x3x3-in. angles. The drawbars are formed by bending ⅝x2½-in. iron straps back on themselves and punching them to receive the coupling pin or hook.

The axles, which are 2 in. square, have collars immediately behind the wheels which prevent any side play. An unusual feature of the car is that the axles can move up and down in iron-lined notches cut in the truck timbers, 2 in. wide and 3 in. deep. This enables the wheels to follow any vertical inequalities of the track in much the same manner as do the Joplin bucket trucks. In order to make the car itself ride more easily, coil springs are fitted in the notches between the axles and the truck timbers. The longitudinal timbers project 3 in. at both ends and act as bumpers. The car body being fastened rigidly to the trucks, tipples are used in dumping; the cars have squirrel-cage doors, which permit the use of the spear tipple.

The link-and-two-clevis coupling arrangement is generally used. In order to prevent pins from being lost, the upper hole of the clevis is made smaller than the lower one, the pin is put through the upper hole and upset just enough to prevent it being pulled back, but still is small enough to go through the lower hole easily.



Desloge Mine Car

Sheave Wheel Lining

By G. L. Sheldon*

The rubber lining used to lighten the wear in sheave wheels and to keep wire cable from slipping, frequently cuts out when the wheels are run at short angles. The following method of relining the wheel will be found satisfactory after all of the old pieces of rubber have been removed.

Unwind an old piece of large-size manila rope and wind into the sheave wheel a single strand of the rope, applying a steady tension. As each layer of rope is run on the wheel saturate it with pine tar. Continue the operation until the lining reaches the desired thickness. A liberal allowance of tar should be applied to the last layer of rope and the wheel should be allowed to stand from 12 to 18 hours before using. This lining serves just as well as rubber and is far cheaper. Coal tar or melted pine-pitch gum may be used in place of the pine tar.

Blasting gelatine consists of nitroglycerin in which 10% or more of guncotton has been dissolved and camphor added.

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*Box 135, Ely, Nev.

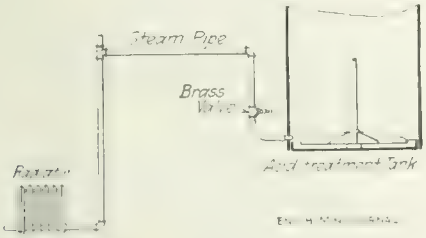
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

A Peculiar Loss of Precipitate

At one of the large mines where the cyanide process is in use, the arrangement of the tanks for acid treatment is essentially as shown in the accompanying drawing. The tank has an agitation arrangement and the method of heating the mixture, in order to expedite treatment, was by taking steam from the heating system and introducing it into the tank near the bottom.

After this arrangement had been in use for some time, a shortage of product was noticed which continued and became more pronounced. As the acid treatment was in charge of one man and the refining and melting in charge of another, there ensued a period of argument, each operator endeavoring to unload the blame on the other, meanwhile the shortage grew. After this had continued for some time the two men commenced an investigation and soon found that the steam-heating device had caused the trouble. The siphoning effect on the acid liquor after the steam had been turned off resulted in eating out the brass valve and the liquor and precipitate worked back through the heating system, the pipes and radiator being found packed full of high-grade gold precipitate.



Arrangement which Caused Loss of Precipitate

After this discovery, the heating was done by a pipe and hose connection, so that after the heating had been carried far enough the hose could be pulled out of the tank and no damage could result.

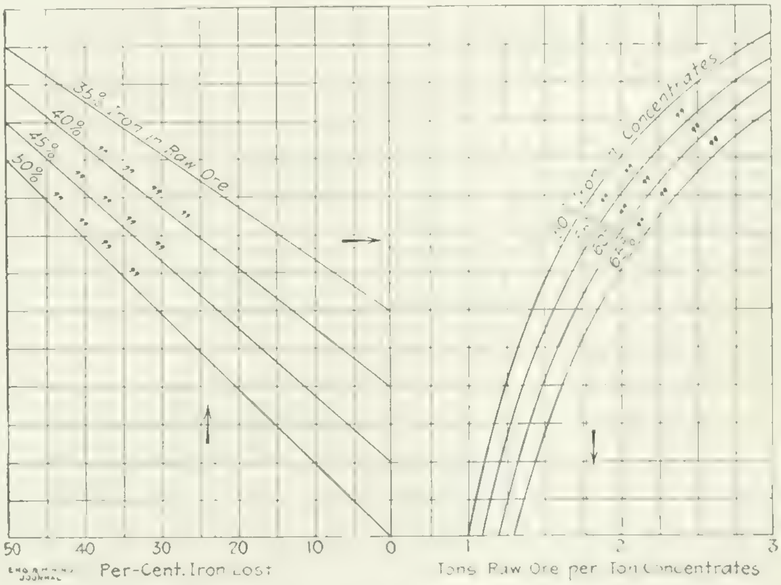
Some time ago, an installation of a Knudsen pyritic-smelting furnace was made at the United Verde copper works at Jerome, Ariz. On account of troubles connected with ground settling, no tests have ever been made; the management expects later to give the furnace a trial.

Iron Ore Washing Calculations

By George C. Olmsted*

The accompanying illustration shows a set of curves which may be used in connection with an iron-ore washing plant. Without calculation they show how many tons of raw ore of given iron content, are needed to produce one ton of concentrates of required iron content when a certain amount of the iron is lost.

For example, a raw ore containing 40% iron is to be washed so as to produce 55% ore; in the process 23% of the iron is lost. How many tons of raw ore are needed per ton concentrates? Follow up the ordinate from the percentage of iron lost, to the line showing percentage of iron in ore, then across along the abscissa to the curve giving the percentage of iron in the concentrate. The length of this abscissa (1.78) is the tons of raw ore required.



Iron Ore Washing Curves

Aids to Launder Efficiency

Flow in launders is aided if the corners are filled with triangular strips of wood, and that portion wetted by the stream of pulp lined with some smooth, abrasion-resisting material such as rubber belting, ("Rand Metallurgical Practice," Vol. I, p. 104). More recent plants on the Rand have put down concrete launders on the solid ground where possible. When the launders are overhead, U-shaped sheet-steel, concrete-lined launders are erected. In each case the wetted surface is finished off with cement to give a smooth surface.

Bends where unavoidable should be wide sweeping and given additional fall, and should not be placed too near in front of a distributing point. Distribution immediately after a change in direction of the pulp is always unsatisfactory, as unequal consistency of pulp in the sub-divisions results.

The Froth Flotation Process

In discussing flotation processes before the Institute of Mines and Metallurgy, H. L. Sulman says that an essential factor in a successful treatment is obtaining a thick substantial or matted froth, necessary to support the coarser mineral product. If, through lack of observance of certain simple conditions, it is allowed to become skinlike, it would obviously not afford the same chance for retaining these. In the last float chamber, where, owing to the growing depletion of the pulp in minerals, the froth necessarily becomes less bulky, the free water flotation surface is therefore often reduced by introducing deflecting or crowding boards. These, by confining the froth within a smaller area, enabled it to retain its normal thickness.

He also remarked upon the simplicity

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*Mechanical engineer, Virginia, Minn.

of the froth-flotation process. By a mere vigorous agitation of ore and water and the addition of a minute proportion of oil, in the case of the Kyloe Copper Co., only two-thirds of a pound of crude eucalyptus oil per ton of dry ore treated, costing only 10¾c., froths were produced which carried over 80% of the total mineral as a concentrate, assaying over 20% copper, and this from an ore carrying only 3½% copper. Such a recovery was by no means exceptional and might be regarded as representing average work on clean chalcopyrite ores. From poorer copper ores they were obtaining recoveries approaching and sometimes exceeding 90% in concentrates carrying 22 or 23% of metal.

The flotation plant was such as could be constructed anywhere by any good mine carpenter, being mainly of wood. The castings required were merely those for bearings and the impellers of the agitator spindles provided for each mixing box. The process is by no means a delicate one and requires no intricate adjustment or highly skilled supervision; but certain conditions are naturally demanded. These are, that the ore pulp sent to the flotation plant should be of fairly uniform consistence, say four or five parts of water to one of ore, and the pulp delivery should be uniform as to flow, and broadly so as to mineral content.

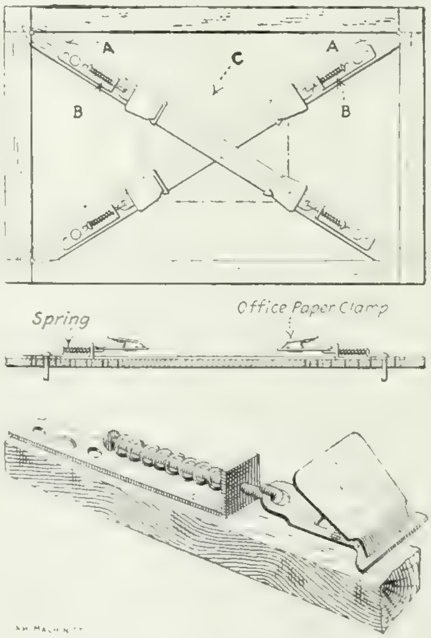
Obviously if either factor was subject to wide variation from time to time, plant adjustment would be required and be varied accordingly. It is also necessary that crushing should be such as would yield the best results for the particular ore under treatment, and that the driving power applied to the agitation spindles should be uniform, these must not be allowed to race at one moment and to drop off the next.

The froth-flotation process is now treating a wide variety of sulphide ores, zinc-lead, copper, silver, molybdenum and others. It has already provided the zinc smelter with materials which have produced over one-quarter of the world's output of zinc, and bids fair to account for the treatment of a considerably larger tonnage of poor copper ores. At one mine alone a plant has been installed to treat 3600 tons per day of low-grade chalcopyrite ore; while the total material the process has already handled annually runs into several million tons. About one-half to three-quarters of a horsepower per box is required for the ordinary froth-flotation plant. The agitation shaft rotates at the speed of about 300 to 350 revolutions. The peripheral speed of the impellers is about 1500 ft. per minute.

A further feature of the froth-flotation plant is its compactness. A modern 300-ton unit, exclusive of the crushing plant, was housed in a building 37x15x12 ft. The cost of a flotation plant is usually given at about 25% under that of a wet concentration plant, but comparing the actual separation items involved in both it would come to far less. Thus the cost of eight-box flotation units for treating 300 tons of ore per day would be about £1000, a low cost in comparison with that demanded by a wet concentration plant of like capacity. A 60-ton plant would cost about £500. The best results in froth flotation are obtained by a two-stage treatment. In the first stage the aim should be the highest attainable recovery. In the second stage, take the concentrate from the first stage and put it through a reconcentration attaining the highest possible percentage of copper. The tailings from the second plant will be high, but can then be sent back to the first box of the first unit, so that there is no loss in this second-stage process.

Stretcher for Tracing Cloth

Draftsmen experience inconvenience owing to the stretch of drawing paper and tracing cloth after it is tacked to the board, and the larger the drawing the greater the difficulty. This is especially so, says H. R. Bowman (*Am. Machinist*, Nov. 21, 1912), when using tracing cloth.



A STRETCHER FOR TRACING CLOTH AND DRAWING PAPER

The device shown is simple, cheap, and gives a uniform stretch. It is composed of a light wooden frame with the diagonal strips *A* and four adjustable clamps *B*, to which the corners of the tracing cloth *C* are fastened with thumb tacks. The clamps may be placed any desired distance apart to suit different sizes of drawings, pulled fairly tight and held in position by inserting pins through the holes in the sheet-metal body and corresponding holes in the diagonal strips.

Friction Loss in Wrought-Iron Pipe

Due to widely varying tables that appear in different handbooks and the necessity of elaborate interpolation to make them usable, a great deal of time is generally wasted in solving problems in which friction of water in pipes is a factor. Ira N. Evans (*Power*, July 9, 1912), has taken six of the best formulas for the friction of water in commercial wrought-iron pipe, together with the results of several tests, and compared them in tabular form.

The following were the principal formulas used by Mr. Evans in obtaining his average:

(1) Williams & Hazen formula:

$$V = c r^{0.63} \left(\frac{h}{l}\right)^{0.54} 0.001^{-0.04}$$

V = Velocity in feet per second;
c = Constant varying with condition of the pipe;
r = Hydraulic radius = $\frac{d}{4}$ in feet;
h = Friction head;
l = Length of pipe in feet.

The constant 120 gave results for most of the sizes higher than the average, while the factor 125 would give results checking closely with the average.

(2) Darcy's formula:

$$h = 0.003732\, l V^2 \frac{D + 1}{D^2}$$

D = Diameter in inches.

This formula gives values higher than the average.

(3) Meier's formula:

$$h = 0.0038\, l \frac{V^{1.86}}{D^{1.25}}$$

D = Diameter in feet.

(4) Harrisons formula:

$$h = 0.00375\, l \frac{V^2}{D}$$

D = Diameter in inches.

The results from this formula are below the average for pipe up to 6 in. in diameter.

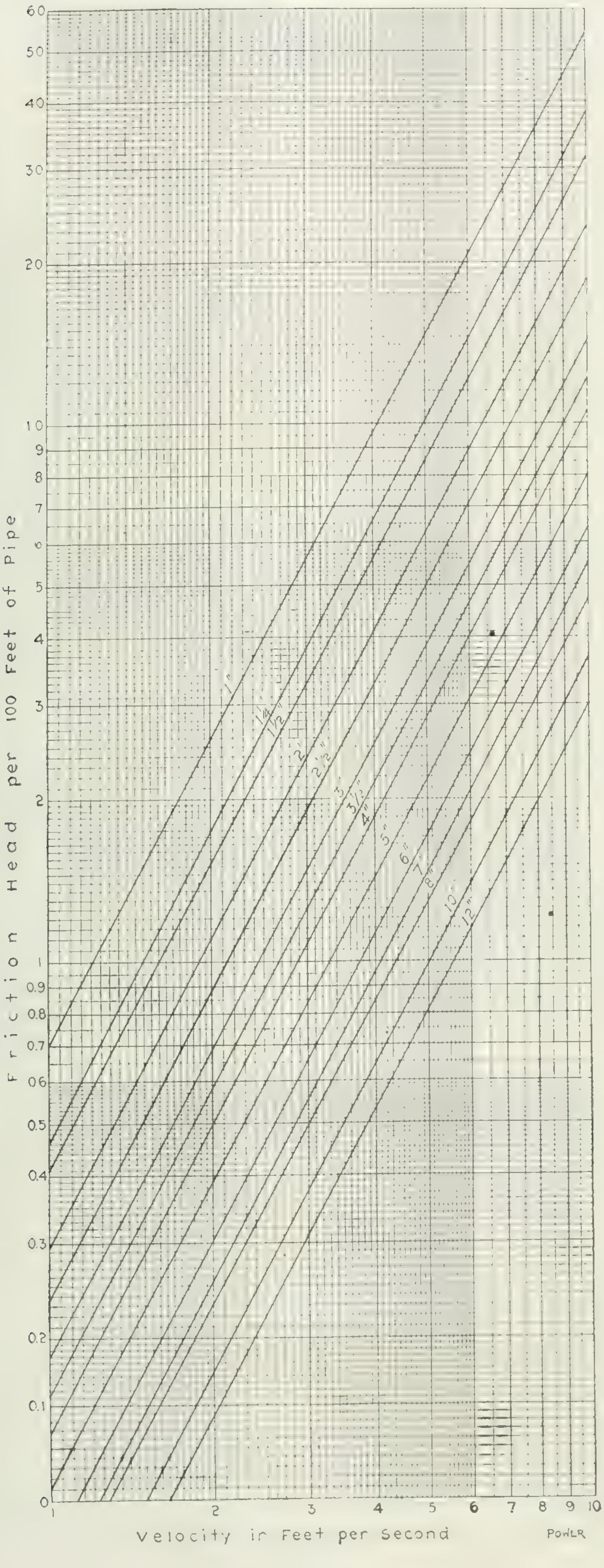
(5) Fanning's formula:

$$h = f \frac{l V^2}{d\, 2 g}$$

The constant f varies for each change in size and velocity. This formula follows the average closely and gives results more consistent than the others except that of Williams & Hazen.

(6) Serginsky's formula, compiled from the latest German authorities, was also used. It gives results above the average for small sizes and below the average for large sizes.

The average values derived by Mr. Evans, mainly by the foregoing formulas, have been plotted by W. L. Durand, on logarithmic paper, as shown in the accompanying curves (*Power*, Oct. 29, 1912). All equations of the general form $y = B x^n$ will plot at straight lines. Several of the formulas are of this form,



FRICTION HEAD IN PIPES 1 TO 12 IN. IN DIAMETER

and those that are not vary from a straight line to only a slight extent. The average values then may safely be represented by a straight line, as the greatest variation will be much less than the difference between any two values that make up the average.

The method of using these curves is self-evident, there being three variables and in any problem containing two of them the third can be found immediately from the chart. If only one variable is known, several values of one of the other two may be assumed and the corresponding values of the third found from the chart. The values that seem to best fit the problem may then be chosen.

The chart is plotted with velocities from 1 to 10 ft. per sec. as abscissas and friction head per 100 ft. from 0.1 ft. to 100 ft. as ordinates. Each curve is for a definite pipe size as indicated, and with a little variation, all the way through for velocities of 1 ft. per sec., the chart shows values practically identical with the averages in Mr. Evans' table.

For example, take a 3-in. pipe with a velocity of flow of 6 ft. per sec., the friction head per 100 ft. of pipe would be 5.45 ft. To produce a drop in head of 2 ft. in 100 ft. of 5-in. pipe would require a velocity of 4.7 ft. per second.

Strength of Commercial Size Timbers

Tables for the designing of wooden beams, based upon an allowable stress of 1000 lb. per sq.in. and showing safe loads and deflections on beams of varying depths and lengths, are familiar to all engineers. Such tables are accurate only for nominal cross-sectional dimensions and not for the real dimensions common in commercial lumber, says R. C. Hardman (*Eng. News*, Oct. 31, 1912). For instance practically 95% of the southern yellow pine on the market is classified and graded under the rules of the Southern Yellow Pine Manufacturers' Association and in actual size is from ¼ to ⅝ in. smaller in dimension than called for by its nominal size. These variations as standarized by the Association, are as shown in Table I, lumber designated "S1S1E" being surfaced on one side and one edge and that designated "S4S" being surfaced on four sides. Full-size stock cannot usually be secured without a special order.

It is obvious that strength formulas applicable to nominal sizes will not give correct results for these smaller commercial sizes. For instance, standard tables show that a 2x4-in. yellow pine beam will carry for a 10-ft. span, with an allowable stress of 1500 lb. per sq.in., a safe load of 534 lb. Commercial 2x4's, S1S1E, are actually 1⅝x3⅝ in., and, S4S, are 1½x3½, which sizes figure safe loads of only 356 and 306 lb., respectively, decreases of 33% and 43% from the safe loads as usually tabulated. These percentages of decrease, which are large in the smaller sizes, shrink to 6% and 12%, respectively, for a 12x12, for instance. In computing deflections the discrepancy is found to be still greater, as the deflection varies inversely as bd^3, while in stresses the variation is as bd^2. Thus for the beam given above, the increased deflections are approximately 40% and 50%, respectively.

In the case of struts, in which the end bearing only is considered, we find that a 4x4, for example, becomes a 3⅝x3⅝, or a 3½x3½, as the case may be, and will carry but 82% and 77%, respectively, of the load based upon the nominal size of a 4x4. If, however, the strut is long enough to be acted upon by combined compression and flexure, the variation becomes greater. For a 4x4-in. column, 10 ft. long, computed by Rankine's formula, it is found that the commercial sizes will carry but 70% and 62%, respectively.

TABLE I. ACTUAL SIZES OF LUMBER IN INCHES.

(Southern Yellow Pine Manufacturers' Association.)

For S1S1E:

Breadth	2-in.	4-in.	6-in.	8-in.	10-in.	12-in.
Depth						
4-in....	1⅝x3⅝	3⅝x3⅝				
6-in	1⅝x5⅝	3⅝x5⅝	5¾x5¾			
8-in..	1⅝x7½	3⅝x7⅝	5¾x7¾	7¾x7¾		
10-in....	1⅝x9½	3⅝x9⅝	5¾x9¾	7¾x9¾	9¾x9¾	
12-in	1⅝x11½	3⅝x11⅝	5¾x11¾	7¾x11¾	9¾x11¾	11¾x11¾

For S4S:

4......	1½x3½	3½x3½				
6......	1½x5½	3½x5½	5½x5½			
8......	1½x7½	3½x7½	5½x7½	7½x7½		
10..........	1½x9½	3½x9½	5½x9½	7½x9½	9½x9½	
12.	1½x11½	3½x11½	5½x11½	7½x11½	9½x11½	11½x11½

To summarize:

Beam, 2x4-in. 10 ft. long:	
Safe load, S1S1E	33% decrease
Safe load, S4S	43% decrease
Deflection, S1S1E..	40% increase
Deflection, S4S..................	50% increase
Strut, 4x4-in:	
Safe load, S1S1E..................	18% decrease
Safe load, S4S	23% decrease
Column, 4x4-in. 10 ft. long:	
Safe load, S1S1E	30% decrease
Safe load, S4S	38% decrease

To care for this error, the accompanying Table II has been prepared for use in designing. It is exact to the extent of a slide-rule check. Table gives the actual sizes of the various nominal sizes of yellow pine lumber as given by the Southern Yellow Pine Manufacturers' Association. Table II gives factors by which the usual tabulated values of safe load should be multiplied to give the true and safe loads for commercial sizes. As an example: In the case of the beam first given—2x4 in. x 10 ft.—the handbook tables show 534 lb. Multiply this value by 0.667 (Table II for S1S1E) which gives 356 lb., the actual value for a 1⅝x3⅝-in. x 10-ft. beam.

Similar tables for other varieties of woods and other commercial sizes can readily be made. In view of the increased and general use of the smaller sizes in concrete forms, etc., and the growing tendency among engineers to design their forms instead of permitting contractors' foremen to "slap them up" in a haphazard manner, it seems that these corrections for commercial sizes of lumber are pertinent, and demanded by the dictates of careful designing.

TABLE II. SHOWING FACTORS BY WHICH TABULATED VALUES OF SAFE LOADS ON BEAMS SHOULD BE MULTIPLIED

For S1S1E

Breadth	2	4	6	8	10	12
Depth						
4 in	0.667	0.744				
6 in	0.714	0.796	0.824			
8 in.	0.714	0.823	0.899	0.909		
10 in.	0.733	0.839	0.911	0.921	0.927	
12 in.	0.746	0.850	0.918	0.929	0.942	0.939

For S4S:

4 in.	0.574	0.670				
6 in.	0.630	0.735	0.770			
8 in.	0.638	0.769	0.806	0.824		
10 in.	0.659	0.790	0.827	0.846	0.857	
12 in	0.674	0.804	0.842	0.861	0.872	0.880

The Murex Process

As is well known, the Murex process consists in agitating ore with magnetite and an oil. The mixture of oil and magnetite coats the mineral particles but not the particles of gangue. The oiled mixture is then passed through a magnetic separating apparatus and the mineral and magnetite removed. In U. S. patents 1,043,850 and 1,043,851, assigned to the Murex Magnetic Co., Ltd., of London, A. A. Lockwood describes improvements in this process. He has discovered that if a silicate of an alkali metal be added to the mixture of magnetite and oil, the coating of the metallic or mineral particles is selective, so that minerals may be separated from each other, as well as from gangue. Again, those ores in which the metallic constituents consist wholly or partially of oxides or carbonates are easily and cheaply oiled or prepared with magnetite to the exclusion of the gangue by adding such a silicate.

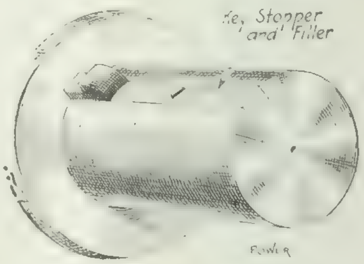
For instance, if a sulphide ore with silicate gangue, assaying 13.7% lead, 16.35% zinc, and 13 oz. of silver per ton, be agitated for 20 min., with silicate of soda equivalent in amount of 20 oz. of a 5% solution; 800 lb. of water; and 20 lb. of a magnetic paint composed of two parts by weight of magnetite to one of residium oil; and this charge then treated in a wet magnetic separator, the result is that the greater portion of the lead and silver is attracted and thus separated from the greater portion of the zinc and the remaining silver.

It has been usual to form the magnetic paint by mixing dry magnetite with oil. In using this silicate process it is not necessary to mix the magnetite with the oil previously, but the magnetite while wet with water may be agitated together with the ore and the oil. It therefore is no longer necessary to go to the expense of drying the magnetite as recovered in the new practice, before using again. Or, it is possible to make up the oil-magnetite paste with wet magnetite, and then agitate with the ore.

The coating of the metallic particles of ores wherein the mineral consists wholly or partially of oxides or carbonates, is also easily and cheaply effected to the exclusion of the gangue, by means of an oily liquid in the presence of water by adding at some stage of the process a small quantity of a carbonate of an alkali metal, either alone or in combination with the silicate of an alkali. Having obtained such a coating by means of the alkali carbonate solution, the Murex process is then said to be applicable to such minerals. It is also stated that wet magnetite can be oiled successfully in the presence of alkaline carbonates.

Safety Stop for Keys

The keys which lock flywheels or pulleys on their shafts may work out at times and cause much annoyance and delay. The accompanying drawing shows a simple and effective device to overcome this difficulty, as described by C. J. Mason (*Power*, Oct. 22, 1912).



SAFETY STOP FOR KEYWAYS

The unused part of the keyseat is filled with a neatly fitted false key. This acts as a stopper and also preserves the symmetry of the shaft end.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Hand Sorting Ore

Probably as good an example of the results of hand sorting as could be used is the one given by J. R. Finlay in his "Cost of Mining," in reference to Cripple Creek ores. "Let us take as a practical example a body of 10,000 tons of ore running 1 oz. of gold per ton. This ore can be shipped without sorting at a handsome profit as follows:

Gross value of ore.	$200,000
Cost of mining 10,000 tons at $3	30,000
Freight and treatment at $8.25	82,500
Total cost	$112,500
Profit	87,500

"But suppose we reject half of this ore by sorting, by so doing we throw away 5000 tons that will average $2.50 per ton or $12,500. The cost of sorting at 50c. per ton (of ore accepted) will be $2500 more. Then our shipment will be as follows:"

5000 tons at $37.50 per ton	$187,500
Cost of mining and sorting $6.50	32,500
Freight and treatment at $11.25	56,250
Total cost	$88,750
Profit	98,750

Here the cost of mining would be twice as great with an additional charge of 50c. per ton for sorting and $3 for freight and treatment with the gross value of the ore lowered $12,500, yet the net profit from sorting is $11,250. This example was taken from actual practice in the Cripple Creek district.

In the Lake Superior copper district the mines follow the practice of crushing and sorting the ore at the mines before shipping to the mills and in some cases a great amount of sorting is done underground as at the Copper Range mines. In 1910, at the Osceola Consolidated, 3.5% of the rock hoisted was discarded by sorting and in 1911 about 2.365%. The Mohawk Mining Co. discarded 11.11% in 1911. The Allouez averaged about 2% in the last two years. At the Copper Range mines; the Baltic, Champion and Trimountain, 8.36%, 6.7% and 11.4% respectively were discarded from ore hoisted in 1911. At the Tamarack, 22.1% was discarded in 1910 against 18% in 1911 and at the Ahmeek 6.8% during 1910 and 3% in 1911. The Wolverine, one of the lowest cost mines in the district, discarded 3.2% of its ore in 1911 at a cost of 4.8c. per ton milled for crushing and sorting, this cost is much lower than at the Mohawk, where the expense was 6.65c. per ton milled, but in this case the percentage of rock thrown away was over three times as great in proportion. Isle Royale discarded 14.6% in 1910; 19% in 1911; Centennial, 3.734% in 1910; 0.00214% in 1911.

At the Buffalo Mines, Ltd., Cobalt, Canada, about 11.5% of the ore was sorted out as waste. In Nevada at the Round Mountain Mining Co., 54% of the tonnage is rejected as waste and it is hoped by installing an underground crushing plant enough can be sorted out to bring the percentage up to at least 66% of the total tonnage.

In South Australia at the Wallaroo & Moonta mines the average ore hoisted has averaged from 3 to 4% copper and by sorting it has been raised to approximately 11% average. In India at the Ooregum Gold Mining Co. and the Nundydroog Mines, Ooregum, South India, the discard in 1911 amounted to 10.7 and 11.3% respectively of the rock hoisted. A record of a zinc mine in southwest Missouri shows that of 305,000 tons mined about 5% was sorted out, ranging from 9% to 2.5% per year.

Of the South African gold mines in 1911, ore was discarded by sorting about as follows:

At the Robinson Gold Mining Co. 16.6%, Meyer & Charlton 5.11%, Cinderella Consolidated 13.6%, West Rand Consolidated 11.01% and at the New Goch mine 28.52% of the tonnage was hoisted. At the Ferreira Deep the discarded ore from sorting has averaged about 16.3% of the tonnage hoisted during the last six years and has ranged from 10.64% to 19.70%. In 1911 when 19.70% was sorted out, the waste had an average gold contents of about 0.7 dwt. per ton, and it is probable that the net saving by sorting amounted to $80,000 or $90,000 for the year. Most of the companies include the cost of sorting in the cost of crushing in their reports and for this reason the actual cost of sorting cannot be given. These figures will serve to show the widespread practice of discarding all waste possible before it reaches the mill or treatment plant. The cost of sorting will vary with the character of the ore and depends largely upon the ease with which the waste can be identified from the ore. In the case of the ores of Goldfield, Nev., though sorting would probably be profitable, even at a high cost per ton, it is impossible to distinguish ore from waste and hence impracticable to do hand sorting.

Mammoth Copper Mining Co.

The following article was written from data furnished by G. W. Metcalfe, general manager of the Mammoth Copper Mining Co., Mammoth, Shasta County, Calif., and represents the average standard of work during 1911. The mines are in a rugged country on the western side of the Sacramento River. The orebodies consist of long flat-lying lenses in a porphyry formation. All work is carried on through tunnels. The horizontal slicing and caving system is employed in mining.

According to the figures furnished, 270,291 tons of ore were mined during the year; 248,786 tons, or 92%, coming from the stopes, and 21,505 tons, or 8%, from development work. In addition to this tonnage, 31,328 tons of waste were removed in development, making a total of 301,619 tons of rock mined. The development work amounted to 8243 linear feet, of which 7028 ft. were drifts and crosscuts, 1199 ft. raises and 16 ft. winzes. The average number of employees was 302, divided as follows: Stoping, 150; development, 47; miscellaneous underground, 40; and surface at mine, 65 men. Of the 150 men engaged in stoping, 53 were breaking ore, 52 shoveling, five tramming ore to chutes and 40 timbering. Practically all the man-tramming is confined to sublevels, as electric locomotives are used in main levels. In development 20 men were engaged in advancing, 19 in mucking and tramming and eight in timbering.

These figures indicate that 895 tons of ore, or 998 tons of ore and waste, are secured per year per man employed underground and on surface at the mines, while per man employed underground the average is 1140 tons of ore, or 1270 tons of ore and waste. In stopes 1655 tons of ore are mined per year per man engaged in breaking, moving ore to chutes and timbering, while the men breaking ore average about 4700 tons per year per man. The stope labor for moving ore to chutes is equal to about one man for every 4360 tons per year, and for timbering about one for every 6200 tons.

In development the ratio of ore secured to waste removed is about 1: 1.45, and footage about one foot of development to 2.6 tons of ore secured. The labor, including men advancing, mucking and timbering, is equal to approximately one man for every 175 linear feet of advance per year. Men engaged in advancing average about 412 ft. per year. The labor for mucking is equal to about one man for every 434 ft. of advance per year, and for timbering one man for every 1030 ft. The miscellaneous underground employees are equal to one man for every 7540 tons of ore and waste handled per year, while the surface employees are equivalent to one for every 4640 tons.

Dynamite consumption amounted to 260,255 lb.; 112,045 lb. or one pound for every 2.22 tons of ore in stopes, and 148,180 lb., or 18 lb. for every linear foot of advance in development. Timber consumption, exclusive of round stulls and posts, which amounted to 20,000 linear feet, was approximately 8.7 bd.ft. per ton of ore produced; timber in stopes was equal to 8.06 bd.ft. per ton of ore from stopes; in development 27.5 bd.ft. per linear foot of advance, and in general repairs and surface 0.53 bd.ft. per ton of ore produced.

Main drifts and stations are lighted by electricity; the average candle consumption was 3.547 candles per man per eight-hour shift. Total machine shifts in stoping amounted to 6557, and in development 5140; this indicates that the average machine shift will break about 38 tons of ore in stopes and make 1.6 linear feet of advance in development. Drill-steel consumption was about one pound for every 6.6 tons of ore produced, including 1500 lb. of hand-drill steel. The average consumption of compressed air for operating 34 piston and five hammer drills was 902,300 cu.ft. per day. In nine hours two men sharpen an average of 476 drills with a drill sharpener, a motor-driven blower being used for air blast to forge and 26 gal. of fuel oil being consumed in the forge. This is equivalent to 26.4 drills per man-hour and one gallon of fuel oil for every 18.3 drills sharpened.

It requires about one hour to set up drills in drift and in eight hours an average of 60 ft. of holes is drilled, usually making two setups. In stopes, using Ingersoll-Sergeant D-24 drills, an average of 45 ft. of holes is drilled in eight hours. One-quarter of a pint of lubricating oil is consumed per piston drill per shift. In tramming fifty 4-ton cars are used for main haulage, drawn by electric locomotives; the oil consumption on these cars is about 1.11 gal. per month.

In driving a 7x9-ft. drift through porphyry and mineralized porphyry, four men, working 56 shifts of eight hours each, advanced 138 ft., using an Ingersoll-Sergeant D-24 drill, drilling approximately six hours per shift and consuming 2850 lb. of dynamite. This is equal to about 4.8 cu.ft. of drift per man-hour, and the dynamite consumption is equivalent to 0.328 lb. per cu.ft. of drift. It required about 20 man-hours to timber. In running a 6x12-ft. raise through the same kind of ground with 2⅓ men per shift, it required 30 eight-hour shifts to advance 58 ft. with two Waugh drills drilling about six hours per shift, and 975 lb. of dynamite were consumed. According to this, 7.46 cu.ft. were advanced per man-hour, and the dynamite consumption was equal to 0.234 lb. per cu.ft. of raise. It required 180 man-hours to do the timbering.

Unit Costs at British Columbia Copper Co.

The Mother Lode group, belonging to the British Columbia Copper Co., Ltd., is situated at Greenwood, B. C., in what is known as the Deadwood camp. The ore occurs in contact deposits between limestone and eruptive dikes. According to data furnished by R. H. Eggleston, secretary, the rock mined at the Mother Lode mine is an altered limestone or limestone replaced by actinolite, garnet, epidote, magnetite and metallic sulphides. During the period from Apr. 1 to Sept. 30, 1912, or 166 working days, 184,644 tons of ore were mined, or an average of 1112 tons per day, all of which was produced from stopes. The average hoisting depth was approximately 375 ft. All stoping is done by the chamber and hollow-pillar system. The labor is of mixed nationalities, but may be said to consist of good Western American laborers. Altogether 109 men worked per day during the period mentioned; of these 57 were employed in the stopes and 17 in miscellaneous underground work, a total of 74 underground, the remaining 35 were employed on surface at the mine. A list giving the various occupations of the men employed was furnished and is given herewith:

Underground	Surface
1 foreman	1 superintendent
23 machine men, piston	1 master-mechanic
13 machine men, hammer	2 skip hoistmen
3 timbermen	2 cage hoistmen
2 blasters	3 compressor engineers
1 powderman	4 blacksmiths
6 motormen	2 machinists
12 chutemen	1 carpenter
1 barman	4 crusher and conveyor
1 nipper	1 railway car loader
1 pipe and track	1 electrician
4 ship loaders	1 watchman
2 cage tenders	1 barn boss
4 shift bosses	1 general surface
	2 office and warehouse
	8 boarding house
74 total	35 total

According to these figures, about 11 tons are secured per working day per man employed, not including employees in boarding house. The rate of production per underground employee is about 15 tons per day. The average daily production per man engaged in breaking ore is about 30.9 tons, and per man stoping 19.5 tons, while apparently 61.5 tons are taken out per day per man engaged in tramming ore. It will be noticed that no labor is needed to move ore to chutes and that only one timberman is employed for every 371 tons of ore mined per day. The ratio of other employees to daily production may be obtained by referring to the list showing the various occupations, the daily production being 1112 tons, as mentioned. During this period 40,250 bd.ft. of timber were used in stopes, or about 0.217 bd.ft. per ton of ore extracted, general repairs and surface work consumed about 0.065 bd.ft. per ton of ore. Dynamite consumption was equal to 0.67 lb. per ton.

All main drifts and stations are lighted by electricity and the candle consumption is at the rate of four or five per man per eight-hour shift. A total of 1560 machine-drill outfits, with 3¼-in. drills, were worked during this period, which indicates about 118 tons per drill-shift. Using a Sullivan 3¼-in., U. F. 2 drill, an average of 31 ft. of holes are drilled per drill-shift. The consumption of lubricating oil on drills is about 0.75 pint per shift.

Tramming is done both by horses and by electric locomotives, it is estimated that one man loading from a chute into a 2.15-ton car and moving the ore 450 ft. will handle from 31 to 32 cars in an eight-hour shift, which is equivalent to about 8.4 tons per man-hour.

Steam Shovel Work

The highest record made so far on the Panama Canal by a 70-ton shovel was made on Sept. 20, when 3910 cu.yd. were removed in eight hours. An article in the *Excavating Engineer,* November, 1912, discussing the Western Maryland R.R. extension to Connellsville gives the cost of moving 37,100 cu.yd. of earth by a 70-ton Bucyrus shovel in 30 days as follows:

Total expense of shovel, including superintendent, walking boss, shovel and dinkey crews and all other labor	$0.0975
Cost of explosives	0.0075
Cost of trestle	0.0050
Cost of coal	0.0075
Cost of oil and waste	0.0015
Cost of water	0.00333
Cost of interest on plant	0.00333
Cost of depreciation	0.0125
Total cost per cu.yd. removed	$0.13816

The work was performed in single 10-hr. shifts. The tracks were maintained by a crew of four men and foreman, and it was possible for the 16-ton dinkey engine to haul twelve 4-cu.yd. cars at a high rate of speed. The entire load was dumped from a trestle on to fill and it required eight men and foreman to keep trestle and dump in shape. During the first half of the period the shovel was working in hard sandstone about 12 ft. thick, which broke into large boulders, this material made up 16,000 cu.yd. of the entire amount handled. The remaining material consisted of a black shale. On an average of one hour was lost per day shifting track on dump. Five 500-ft. moves were made during the period this material was moved.

Nipissing High Grade Mill, Cobalt

By R. B. Watson*

Although the high-grade silver ore is highly complex a remarkable recovery is obtained by a simple but unique process of tube-mill amalgamation. With 2500-oz. ore a typical tube-mill charge is 6500 lb. of 20-mesh ore, 8500 lb. of mercury, 3800 lb. of 5% cyanide solution and six tons of pebbles. About 97% of the total silver is recovered by amalgamation, a further extraction being made by subsequent cyanide treatment.

The high-grade ores of the Cobalt district consist mainly of the arsenides of cobalt and nickel in a calcite gangue with a large quantity of silver in the metallic state. A typical ore carries 10% silver, 9% cobalt, 6% nickel and 39% arsenic; the rest is lime, silica and smaller amounts of antimony, iron, sulphur, tellurium, etc.

ORE IS COMPLEX

The complex nature of the ore and its high content in arsenic make it an undesirable ore for the ordinary custom smelter, who is compelled to charge a high price for its reduction. The general practice is to smelt in a blast furnace where a large part of the silver is recovered at once as base bullion; the resulting speiss is roasted and treated in the wet way for the recovery of the cobalt, nickel and the rest of the silver. This process is slow; the necessary plant costs several hundred thousand dollars, and a large working capital must be available to carry on the business.

Another serious problem in shipping to a smelter was the difficulty in obtaining a fair sample of the ore. This is always a tender point when a mine is marketing ore, but when the ore carries several thousand ounces of silver per ton and the silver occurs in the metallic state, ranging in size from the smallest particles up to nuggets the size of one's hand, the difficulty of sampling is enormously increased.

Great improvement, however, has been made in this part of the marketing, by the building of the Campbell & Deyell custom sampling works at Cobalt, where the ore is crushed in a ball mill fitted with 10- to 20-mesh screens. All metallics coarser than this mesh remain in the mill and are subsequently removed and melted down to bullion. The pulp can then be sampled with a reasonable degree of accuracy.

The marketing expense is made up of smelter deduction, treatment, freight, assaying, representation at smeltery, etc. On 23 carloads of ore averaging 2560 oz. per ton, the marketing expense was 5.57% of the gross value, (with silver at 60 c. per oz.) or $83.55 per ton. In addition to the above direct charge, there is a loss of interest from the date of shipment to the date of payment, which averages 65 days on shipments to Canadian smelters, and all ore is settled for on the commercial assay, which is about 1% lower than the actual assay on this grade of ore.

As the largest producer in the district, the Nipissing Mining Co., Ltd., had been trying for several years to find a simple process by which its high-grade ores could be treated at the mine without going to the large expense of building the usual smeltery. To this end a great many processes had been investigated and one small experimental plant was built; the trouble with most of the processes is the complication of the operations and the consequent tying up of a large amount of money.

A UNIQUE PROCESS USED

It remained to Charles Butters and his assistant, G. H. Clevenger, finally to work out a process which promised to be so simple and effective that the Nipissing company decided to build the necessary plant at once. James Johnston designed and constructed the plant which went into operation February, 1911, and has run successfully ever since.

The high-grade ore from the picking tables is delivered to the sampling plant at the top of the mill where it is put through a 9x15-in. Blake crusher and elevated to a steel receiving bin. From this it is fed automatically into a No. 3 6-ft. Krupp ball mill carrying 1000 lb. of steel balls and fitted with 20-mesh screens. The metallics or silver nuggets which will not pass the screen are removed periodically by taking off a screen, and are melted down in the refinery. From the ball mill the pulp is delivered by a spiral feed to a Vezin sampler and elevated to two 60-ton steel storage tanks, from which it is drawn as needed for treatment in the mill.

AMALGAMATION IN TUBE MILL THE CHIEF OPERATION

The main operation consists of amalgamating the silver in a 5% cyanide solution while the 20-mesh material is being ground in a tube mill. The mill used is a Krupp mill 3 ft. 11 in. in diameter and 19 ft. 8 in. long, fitted with silex liners and run at 37 r.p.m. The weight of ore per charge depends somewhat on the silver content, but with 2500-oz. ore the ordinary tube-mill charge is 6500 lb. of ore; 8500 lb. of mercury; 3800 lb. of cyanide solution, and six tons of pebbles.

The materials are charged through a manhole on the top of the mill, and after the cover has been replaced the mill is revolved for 9½ hr., when 99% of the pulp will pass a 200-mesh screen. This fine grinding is necessary to liberate the fine particles of silver and permit of complete amalgamation. A screen analysis of the final tailing shows that the coarser particles are much richer than the slime; this is also shown by the

TWO VIEWS OF NIPISSING HIGH-GRADE MILL, COBALT, ONT.

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*General manager, Nipissing Mining Co., Ltd., Cobalt, Ont.

accompanying screen tests on ore crushed through a 10-mesh screen.

It was found advantageous to have a certain quantity of silver go into solution in the cyanide, and to this end more air had to be supplied to the charge.

Each gudgeon of the mill is fitted with a stuffing box through which passes a heavy cast-iron pipe, four inches outside diameter, with a 1½-in. hole through the center. The casting is held stationary by bolts to the concrete foundation, and the mill revolves about the pipe. Compressed air under 25 lb. pressure is introduced through one of the hollow castings. At the outlet end there is a right-angle turn in the hollow casting just inside the mill and the upper end reaches to within ½ in. of the lining. The heavy cast-iron elbow, therefore, remains stationary, the inside leg stands vertical, and the upper end remains above the level of the charge at all times, allowing the compressed air to escape while the mill is in motion. The casting is heavy enough to withstand the battering of the pebbles falling against it. This arrangement allows the mill to be filled well above the center with a consequent decrease in the power used, but it is found that the best results are obtained by filling the mill to a point two inches above the center.

GRADING ANALYSIS OF NIPISSING ORE CRUSHED THROUGH 10-MESH

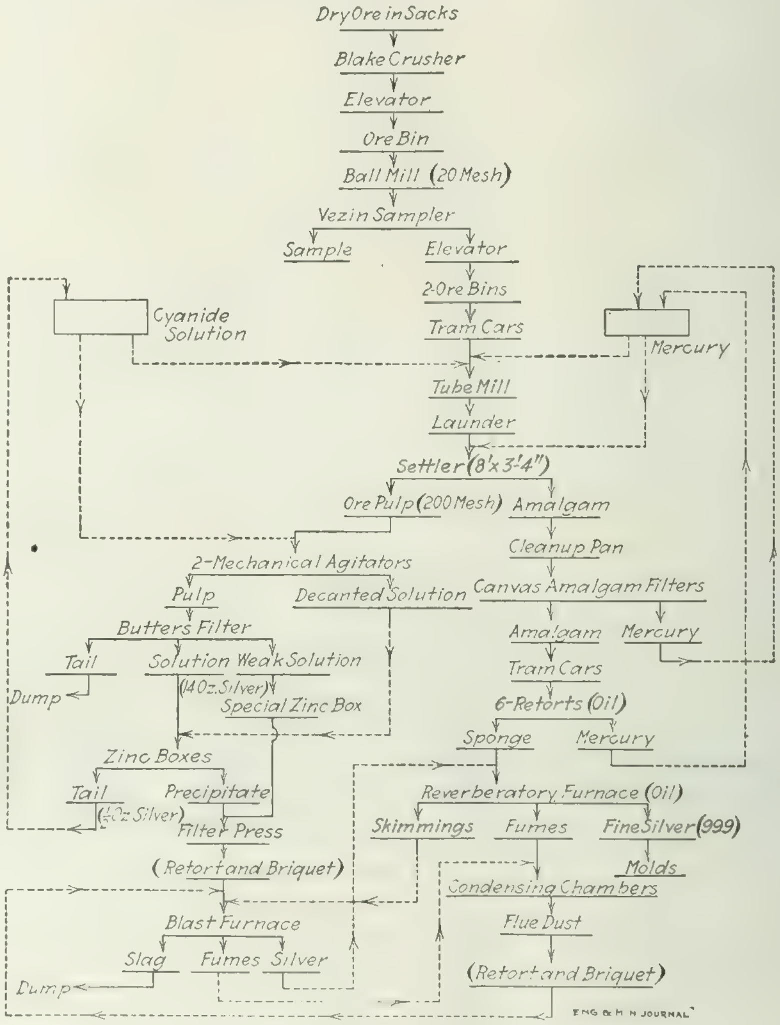
Mesh	Percentage by weight	Silver oz. per ton
+ 20	12.7	6837
+ 40	26.2	3375
+ 60	11.6	2330
+ 80	6.3	1954
+ 100	6.3	1654
+ 120	2.7	1348
+ 150	1.3	1182
+ 200	3.8	1202
— 200	29.1	706

TUBE-MILL PRODUCT WASHED AND SETTLED

At the end of the grinding period the three manhole covers are replaced by coarse screens and the mill is turned over; the charge falls into a sheet-iron hopper which delivers it into an all-iron settler, eight feet in diameter, fitted with wooden shoes. The tube mill is then washed out twice by revolving it with a ton of solution and 1500 lb. of mercury. These washes are added to the charge and the settler filled with solution; the charge is kept in agitation by the muller while the amalgam is drawn off into an iron cleanup pan, and from there into canvas amalgam filters, of which there are 24, each holding 400 lb. of amalgam. The pulp is gradually run out of the settler by drawing the top plug, the balance of the charge being washed twice with solution. When the flow of amalgam has ceased, the mercury, as it drains out of the canvas filters, is pumped back to the settler to wash out any remaining amalgam. The bottom plug is finally drawn and the balance of the pulp discharged. It requires two hours to dump the charge and get the amalgam into the filters.

REMARKABLE RECOVERY BY AMALGAMATION

It was soon found that the amalgam must be kept exceedingly thin, otherwise it would stick in the tube mill and cake under the muller of the settler; hence the mercury used is 15 times the weight of the silver in the ore. After draining in the sacks, the amalgam still carries 78% mercury. The remarkable part about the whole process is that 97% to 98% of the total silver in the ore yields to amalgamation in the tube mill. An ore assaying 2500 oz. per ton is reduced to 50 to 75 oz. per ton when it leaves the settler.



FLOW SHEET OF NIPISSING HIGH-GRADE MILL

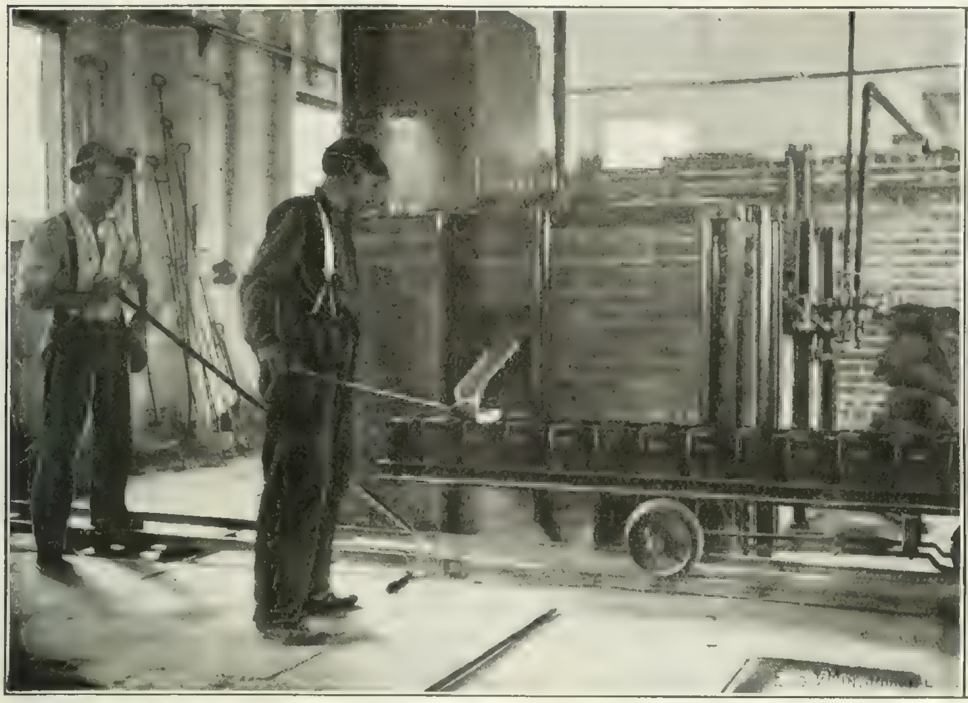
CYANIDATION PLAYS A MINOR ROLE

The cyanide treatment of the pulp which follows is comparatively unimportant as it deals only with six or seven tons of 50-oz. ore daily. There are four 16x7-ft. wooden tanks for the collection and treatment of the pulp, and the necessary tanks for storage of solution and water. A charge for agitation is made up of four tube-mill charges or 13 tons of dry pulp. Five pounds of lime per dry ton of pulp are added and the charge is agitated for 36 hr.; the tanks are fitted with mechanical agitators, and the pulp is circulated through a pump as well. The cyanide strength is 0.75 per cent.

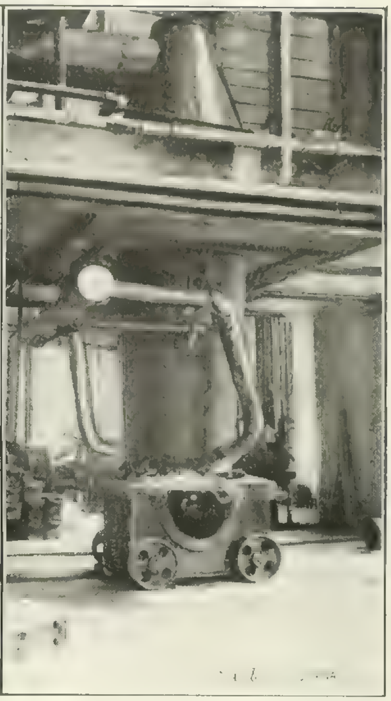
After settling, the solution is decanted, and the pulp, having a specific gravity of 2, is run to a Butters filter of 10 leaves. The specific gravity of the ore is 6, and to avoid the settling of the pulp in the bottom of the filter box while the cake is forming, the charge is kept in circulation by an air lift drawing out of the bottom of the box and delivering at the top. The cake is washed 2½ hr. with weak solution and then discharged. The arsenides of cobalt and nickel go through the process practically unchanged; the residue for the first seven months of this year contained 9% cobalt and 4.5% nickel.

EVIDENCE OF MERCURY IN ORE

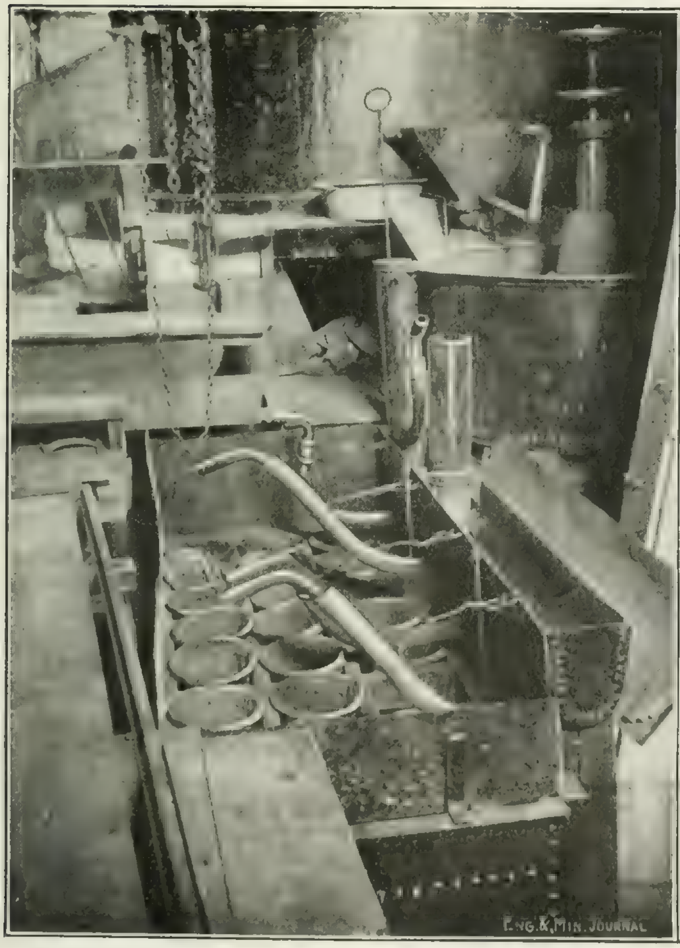
The complex nature of this residue is shown by the following analysis by Johnson & Sons on some of last year's product: Nickel, 9.72%; cobalt, 5.85%;



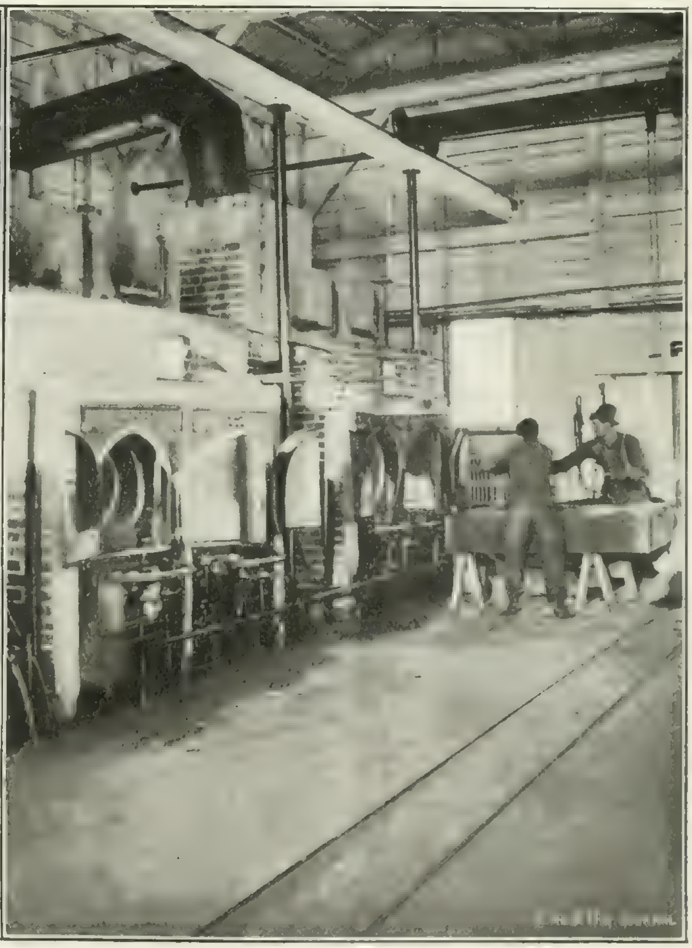
Oil-fired Reverberatory Furnace Used at Nipissing High-grade Mill in Refining Amalgam Sponge and Bullion



Cyanide Precipitate, Flue Dust and Skimmings Are Smelted in A Blast Furnace



Settler, Cleanup Pan and Canvas Amalgam Filters for Treating the Tube-mill Products



Removing Amalgam Sponge from Retorts for Subsequent Treatment in Reverberatory Furnace iron, 2.58%; antimony, 3.80%; bismuth, 0.09%; copper, 0.06%; tellurium, 1.39%; arsenic, 29.50%; sulphur, 1.59%; silica, 11.44%; lime, 8.63%; magnesia, 2.91%; carbonic acid, 13.55%; combined water, 5.74%; mercury, alkali, oxygen, gold and silver, traces of zinc, tin and manganese, 3.15%. Determinations of mercury consumption indicated the presence of mercury in the ore itself. Investigation along this line showed that the ordinary high-grade ore of the district usually carries from two to five pounds of mercury per ton of ore, depending upon the amount of metallics contained. Tests were then made on the metallics alone; 21 samples of metallics taken from various Nipissing veins and from three other mines, showed mercury in every case; the result varied from eight to 95 lb. mercury per ton of metallics and averaged 35 pounds.

The presence of mercury in the metallics was proved on a large scale when the refinery was built; the first charge melted down in the reverberatory when the furnace and flues were clean, was a ton of metallics. A small bottle full of mercury was taken from the condenser and globules of mercury could be plainly seen through the flue dust.

Zinc-Box Precipitation Used

There are two zinc precipitation boxes, one for strong and one for weak solution. The precipitate from both boxes goes to an 18-in. Johnson filter press with 12 frames; the press holds 500 lb. of precipitate which assays 15,000 oz. silver per ton. The product of the cyanide plant amounts to 8000 to 10,000 oz. silver per month.

The solution going to the zinc box carries 14 oz. silver per ton, 0.028% mercury and 0.6% zinc. By passing through the box the mercury in solution is reduced to 0.015%, so it is necessary to retort the precipitate to recover the mercury. As no solution is thrown away, it has become very foul; after passing through the zinc box it runs to a storage tank in the bottom of which a precipitate collects. An analysis of this precipitate follows: Silver, 0.394%; mercury 2.51%; antimony, 3.30%; sulphur, 16.13%; arsenic, 32.64%; silica, 5.362%; zinc, 2.257%; iron, 5.04%; nickel, 9.06%; cobalt, 7.03%; lime, 9.24%; carbon dioxide, 7,259%; manganese, trace.

The sacks of amalgam are hoisted into a car with a cast-iron body, weighed and taken to the refinery which adjoins, but is separate from the mill building. There are six 14x60-in. retorts mounted in batteries of two. They are fired by oil, and the waste gases are conducted through a condenser before discharging them; this is to catch any mercury which might get into the flue on account of a cracked retort.

The retorts are filled three-quarters full of amalgam, fired for nine hours, and allowed to cool for six hours. The resulting sponge and mercury are weighed and compared with the weight of amalgam put in the retort; a cracked retort will sometimes be detected by the loss in weight when it has not been noticed by the man in charge. The sponge is 79% silver; the impurities are mainly arsenic, cobalt, nickel, antimony and bismuth.

The average life of a retort is 34 charges. As soon as the slightest crack appears the retort must be discarded at once. Occasionally a retort will break on the first firing, and retorts have been received which would not hold mercury when cold. Various grades of iron have been tried but the makers have not succeeded in turning out a cast-iron retort which will stand up to the hard and continuous work required. A soft gray iron, low in phosphorus, gives the best results.

Recently a cast-steel retort was installed; it is still in good condition after having been fired 82 times. A specially made wrought-iron retort with sides ⅜ in. thick is now on order; this will be slipped into a cast-iron cylinder which will take the weight of the charge and bear the brunt of the firing.

Melting in Reverberatory Furnace

The sponge from the retorts is melted down in a reverberatory furnace in charges containing 28,000 oz. of refined silver. The hearth is stationary and is made of brick contained in an iron pan, 5 ft. x 5 ft. 6 in., supported on rails. Heat is supplied by two oil burners; the waste gases pass first through a series of dust chambers, then through two iron pipes 3x27 ft. and to a fan which exhausts into the stack. Sprays of water are introduced into the last dust chamber and into the first iron pipe, the object being to cool the gases and condense any mercury that is driven off in melting the sponge, or that comes from a leaky retort.

As soon as the charge in the reverberatory is melted, air under 15 lb. pressure is blown on the surface through two iron pipes introduced at the back of the furnace. The oxides of cobalt, nickel and the other impurities rapidly rise to the surface and are scraped off through the charging door. No flux of any kind is added. The air blown on the surface of the metal has been heated by carrying the pipe through the dust chambers; this materially shortens the operation which usually takes 18 to 20 hr. After the surface of the metal has become mirrorlike it must still be blown several hours to expel the last traces of impurities.

Dip samples are taken and when the bath is 999 fine the air is shut off and the metal is covered with charcoal to absorb the included oxygen and thus avoid sprouting of the bars. The furnace is tapped through the side; the charge fills 25 molds which are run along under the spout on a car.

The first hearth was made of common firebrick; it lasted five months during which time 1,860,000 oz. were refined. The present hearth made of magnesite brick is still in good repair after nine months use and has turned out to date 3,236,000 fine ounces.

Precipitate Smelted in Blast Furnace

For the purpose of working up the skimming from the melting furnace, the flue dust and the zinc precipitate from the cyanide plant, a 20-in. round water-jacketed blast furnace was installed. The jacket is hung from the feed floor to allow removal of the curb. The flue is connected with the dust chambers. Before being charged to the blast furnace the flue dust and precipitate are retorted, then mixed with sugar water, briquetted and dried.

The skimming assays about 15,000 oz. silver per ton, the flue dust 700 oz., and the precipitate 15,000 to 18,000 oz. The charge is calculated according to the material to be put through; some of the mixtures used are as follows: Charge 1: 250 lb. of skimming; 300 lb. of slag; 100 lb. of coke. Charge 2: 100 lb. of skimming; 100 lb. of flue dust; 300 lb. of slag; 40 lb. of iron ore; 100 lb. of coke. Charge 3: 10 lb. of flue dust; 20 lb. of precipitate; 30 lb. of slag; 25 lb. of iron ore; 15 lb. of limestone. These charges gave a slag carrying from five to 11 oz. of silver per ton.

The charge being so rich in silver no lead is necessary. As soon as the crucible is half full of bullion the metal is drawn off into molds. A small amount of speiss is also formed. The bullion runs 800 fine and is melted down in the reverberatory with the sponge. It is only necessary to run the blast furnace one day in every 10, to clean up all the by-products.

The only product marketed is fine silver. It is shipped direct to London and sold at the daily quotation without refining charge. Shipments this year have amounted to 370,000 oz. per month. The bullion carries 0.0043% gold, equal to about $1 per 1200-oz. bar. The total cost of the plant was $67,757, which includes sampler, mill and refinery.

A discovery of tin in the Province of Atacama, Chile, is reported by the *Bulletin* of the Pan American Union.

Miners' Phthisis on the Rand—II

By Frederick L. Hoffman*

No class of mine labor is exempt from miners' phthisis, but machine drillers are most subject to it. Of machine drillers who had worked nine to 10 years underground, 79% had miners' phthisis. The commission classes it as an industrial disease, and subject to compensation as such.

Before considering the results of the investigation it is necessary to take into account certain facts secured regarding the makeup of the mining population on the Rand. The mean age of all miners examined was 33.12 years, while the most common age was 29.51 years. For the purpose of comparison it is stated that the mean age of Cornish miners was 36.16 years; of the South African miners 35% were of South African birth, 51% were born in the British Isles, 4% in other British possessions, and the remaining 10% were distributed among foreign countries. Unfortunately the number and per cent. of American miners on the Rand is not stated. Regarding the previous occupations of miners, it was ascertained that 44% of the miners had no previous occupation, or in other words they had been employed at mining from the start of their working life. The proportion returned as having previously been farmers was 15%, but it is pointed out that in all probability the experience as to actual farming was very limited. As to conjugal condition it was found that 57% of the miners were married with an average family of three persons, that is, a wife and two children. Of this number 84% had their families resident in South Africa. An examination of the original returns exhibited also clearly the shifting nature of the mining population along the Reef. It is said that the average number of mines in which an individual miner works is often large, so that in the course of time the men are probably open to all of the varying conditions, from best to worst. For the purpose of the investigation the following classification of employments was adopted:

(1) Machine drillers; (2) hammermen; (3) trammers; (4) timbermen; (5) surveyors; (6) samplers; (7) others.

It is important, of course, to keep in mind that changes from one underground occupation to another frequently take place, and it is suggested that this fact must not be lost sight of when considering the effect of an occupational grouping in connection with the incidence of miners' phthisis.

Thirty-two Per cent of Miners Affected

The analysis of the returns for 3136 underground miners examined by the commission established the fact that 990, or 32%, were found to have miners' phthisis, in one or another stage of the disease. When this percentage is applied to the estimated number of 11,400 miners on the Rand, the number of men affected with miners' phthisis would be, approximately, 3600. Assuming that there are about 150,000 men employed in the mining of copper, precious metals and lead and zinc in the United States, the number of men affected with miners' phthisis, on the basis of the South African investigation, in the United States would be approximately 48,000. It may be stated, in this connection, that according to a special investigation into the mortality of copper miners at Butte, Mont., the percentage of deaths from tuberculosis at ages 25 to 44 was 28.5 and at ages of 45 to 64 it was 35.0 per cent[1].

Machine Drillers Most Subject to Miners' Phthisis

The commission points out that among the factors influencing the incidence of miners' phthisis are, first, the number of years spent in work underground in hard-rock mines, equivalent, of course, to the period of exposure to siliceous dust; and, second, the nature of the work actually done.

The examination also brought out the fact that the order of greatest risk among the different occupations was: (1) Machine drillers; (2) trammers; (3) hammermen; (4) timbermen; (5) other occupations, excluding surveyors and samplers.

The commission considered the question as to whether the age at which a man commenced work underground affected his liability to contract miners' phthisis but the conclusion arrived at was that this factor was not of importance. Considering the miners affected with miners' phthisis, according to the class of the disease, it was found that about two-thirds were cases of early or moderate fibrosis. In this analysis the average duration of underground work was about eight years, but in a fair proportion of cases the disease was apparent as early as after three years of underground work. In a considerable number of cases the disease was not apparent until after 13 years of underground employment. It would serve no practical purpose on this occasion to go into the question of differential liability to miners' phthisis on the part of miners born on the Rand and those born in other countries, but the conclusion is significant that the average number of years underground among the native class was shorter, which, of course, may be the result of differences in the age distribution.

Considered by subdivisions into occupational groups, the commission points out that rock-drilling miners, or machine drillers, are shown by every investigation to follow the most dangerous occupation underground. Among machine miners, out of a total of 987 men examined, 48% were found to have miners' phthisis, against 32% for the general body of miners, including machine drillers, and 21% for those who have never been employed at machine drilling at all. The average duration of underground work of machine drillers found to have miners' phthisis was only 3½ years. Considering only machine drillers who had been from nine to ten years underground, it was found that 79% had miners' phthisis, as compared with 41% for miners who, though working underground for the same period, had not been employed at machine drilling. There are important differences in the average duration of employment underground before the disease becomes manifest, but for the present purpose a discussion of these variations would not seem to be required. The general conclusion of the inquiry is summed up in the statement that "Miners' phthisis is at once more rapid, more intensive and more regularly progressive among machine drillers than among any other group of underground workers."

No Class of Underground Labor Entirely Exempt

No group of underground workers was found to be free from the serious risk of miners' phthisis and cases of the disease were found in all occupational divisions. Even surveyors and samplers were found to suffer severely from the disease and this was found to be true also of mine managers, mine captains and shift bosses. The fact that the incidence of the disease falls heavily on all classes of underground workers, not excepting the supervisory class, is considered sufficient proof that the habits of the miners, or the neglect of ordinary precautions is not a critical factor in the prevalence of the disease.

The significance and prevalence of tuberculosis as a complicating factor in miners' phthisis was made the subject of a special study in connection with cases presented to the Miners' Phthisis Board for compensation on the ground of employers' liability for miners' phthisis as an industrial disease. While in the general examination only 5% of the miners suffering from miners' phthisis were also found to have tuberculosis, it was ascertained by means of a special examination that the proportion was 10%, whereas in the compensation cases considered by the Miners' Phthisis Board the proportion increased to 30%. The evidence brought together proved conclusively that tuberculosis was not of common occurrence in the early stages of miners' phthisis and the facts seem to indicate that infection in the mine itself was probably not the chief source of the occurrence of tuberculosis superinduced upon existing cases of fibrosis.

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*Statistician, Prudential Insurance Co., Newark, N. J.

[1] See Handbook to the Exhibit on Industrial Hygiene at the XV International Congress on Hygiene and Demography by the Prudential Insurance Co., Newark. N. J., 1912.

Expectation of Life in Miners' Phthsis, Two Years

The expectation of life in cases showing definite evidence of miners' phthisis was approximately placed at two years. The expectation was found to be higher in cases not complicated by tuberculosis. When tuberculosis is present in cases of miners' phthisis the expectation of life is stated to be reduced to only a few months.

The conclusions as drawn from death returns do not appear to have much scientific value. The analysis was not made in sufficient detail to afford an exact method of comparison with corresponding data for certain mining districts of the United States. The average age of those dying from miners' phthisis and tuberculosis was approximately 38 years, whereas the average for deaths from respiratory diseases was 41 years. According to the investigation of deaths of copper miners in the Butte district, the average age of miners dying from tuberculosis was 43.4 years and for metal miners of Utah 45.2 years. The course of the disease in this country would, therefore, appear to be less rapid than in the mining districts of South Africa.

The final conclusions of the commission are in part summarized in the statement "That experience of the last few years has shown that the prevention of the disease is a complex and difficult problem. Although the main principles involved—an adequate supply by efficient general and local ventilation of fresh air to all working places, and the control of dust by means of water—are universally understood and accepted, the detailed application of these principles, in the elaboration of the best practical methods to secure the end in view, has proved to be far from a simple matter." The commission says further in its conclusions that:

> It is to be hoped that by the energetic cooperation of the Mines Department, the mine managements, and the miners, a systematic and uniform policy may be rapidly elaborated, which will effectively and permanently reduce the incidence of chronic lung disases among miners. Much experimental work appears still to be necessary in this direction before the best possible results can be attained. The regulations regarding dust prevention at present in force apply mainly to rock-drill and development work. But the present investigation has abundantly shown that all underground workers are exposed to serious risk of contracting the disease. No doubt this is in part due to the indirect effects of rock-drill work, and the heavier blasting charges used in connection with it, in disseminating finely divided dust throughout the mine; but it is clear that measures for the prevention of dust to be fully effective must be systematically applied, generally, and in all parts of the mine. There appears still to be urgent need for a combined experimental investigation, on the part of the Government and the mine managements, which should aim at the elaboration, introduction and operation of a uniform and systematic standard of the practical methods which should be applied to each form of mining work in detail, both in regard to general and local ventilation, and to dust prevention, in order to combat at every point the conditions which produce miners' phthisis."

On the basis of the statistical data collected by the commission, it is estimated that from 1000 to 1200 claims per annum will be made for compensation on account of miners' phthisis as an industrial disease. It is assumed that the mean expectation of life of the claimants subject to the award of compensation will be from 1½ to two years. It is recognized that this estimate is merely provisional and it is suggested that immediate provision should be made for the collection of reliable morbidity and mortality statistics.

A Distinctly Recognizable Trade Disease

There is an extended discussion of the question as to the provision necessary for insertion in any legislative measure providing for insurance or compensation against miners' phthisis. The conclusive test as to whether miners' phthisis is or is not an occupational disease in individual cases is summed up in the question as to whether the same "is so specific to the employment that the causation of the disease or injury by the employment can be established in individual cases." This "requires the disease or injury to be specific to the employment." It is not enough to show that a certain disease is known to be specially prevalent among the workers in a particular industry. Such a disease may nevertheless not be specific to the trade, since it may frequently, although more seldom, attack persons engaged in other occupations. The disease must be capable of being differentiated from other diseases as specific to the employment."

These are practically the conclusions arrived at by the English Government Departmental Committee on Industrial Diseases of 1906, and the same are accepted by the commission as sufficient for the end in view. They hold, therefore, that: "Miners' phthisis is a definite, and in its intermediate and advanced stages a sufficiently distinguishable trade disease, specific to the employment in the gold mines of the Rand," but they do not concede that a pure tuberculosis, not complicated by miners' phthisis, can be so regarded.

The commission considered the objections urged against the scheduling of fibroid phthisis as an industrial disease and subject to compensation. It goes carefully into the objections, but it adheres to the conclusion that miners' phthisis should be considered an industrial disease for which compensation should be required to be made. In many important respects this conclusion differs from those arrived at by the English Departmental Committee of 1906. The commission makes its final recommendations subject to the following requirements:

Compulsory Medical Examination Recommended

> Compulsory medical examination of workmen prior to their first employment underground in this country. It became apparent in the course of our investigation that a considerable number of men had come to work in the mines, who were physically unfit for underground work on the Rand, by reason of previous disease or defective chest development. No man should undertake, or be accepted for work which is liable to produce fibrosis of the lung, unless his physical condition is good, although such a man might be able to engage in coal mining, or in other mining operations in this country, which are not carried out in hard rock. The same applies more strongly to those who show signs of previous chest disease, and it is evident that any man already affected by pulmonary tuberculosis, or by fibrosis of the lungs, should not, in his own, and in the public interest, be permitted to engage in underground work. Taking into consideration all the circumstances regarding the serious incidence of lung disease among miners on the Rand, we should recommend that any man, applying for the first time to be employed underground in any mine, in work which is liable to produce fibrosis of the lungs, should be the bearer of a medical certificate, signed by a duly qualified medical practitioner, that he is: (1) Of good physique, and capable of undertaking underground work in hard-rock mines, and (2) that he is free from pulmonary tuberculosis and fibrosis of the lung.
>
> It should be an offense thereafter to employ any man who does not hold such a certificate, stamped with the name of his first employer and the date of his first engagement. It should be at the option of the employer to require, that an applicant for work should be examined and certified by a medical practitioner designated by the employer, at the expense of the latter. Further, every workman applying for a "blasting certificate" should be required to produce

such a medical certificate, in the same manner as is prescribed for applicants for a certificate as engine drivers.

The commission considered the need of a suitable classification for degrees of incapacity or disablement, but it may be questioned whether such refinement of methods would really serve a useful purpose in actual experience. This difficulty is recognized by the suggestion for the appointment of a board of medical referees, consisting of members with special previous experience of the disease. The principle, however, is an admirable one, for compensation would be according to the stage of the disease, and the same should take the form of a pension or annuity. Finally, the committee recommended that "No man who has received compensation, owing to his being affected by miners' phthisis in any stage or degree, should be permitted to resume work underground at any time."

Facts More Needed than Mathematical Discussion

Appended to the report is an extended statistical-mathematical discussion and a number of tables and diagrams. It must be considered a matter of sincere regret that the facts regarding miners' phthisis were not presented in more detail, in place of a discussion of mathematical methods and conclusions largely outside of the understanding of the average mine manager, physician or engineer. It is possible, of course, that the commission may subsequently publish the evidence secured in detail and give the actual numbers, together with the percentages, so that the statistical value of the data may be judged by those in a position to use them. By whatever means or methods the problem of miners' phthisis may be solved, it will certainly not be along the lines of mathematical speculation and by refined methods of statistical analysis. A useful appendix to the report is the schedule used for the examination of miners, which should be found suitable for the purpose of a possible future inquiry of this kind in the United States. The report is a most valuable contribution to the literature of the subject and marks a distinct step in advance in the commendable effort to arrive at the facts essential to the adoption of really effective methods to reduce the incidence of miners' phthisis to a minimum.

The value of the gold production of certain districts in Alaska is estimated by the U. S. Geological Survey as follows: Fortymile and Seventymile districts for 1911, $212,000, an increase of $12,000 over 1910; Fairbanks district for 1911, $4,500,000, a decrease of $1,600,000 from 1910; Circle precinct for 1911, $350,000, which exceeds any other year since 1898.

Mining Machinery Exhibit in London

The mining-machinery exhibition to be held at the Royal Agricultural Hall, Islington, N., from May 29 to June 7, 1913, is the fifth of the series organized by Messrs. Montgomery. An association of leading manufacturers in the industry has been formed, and these exhibitions will now be quinquennial, so that after next year's there will not be another exhibition until 1918. This arrangement both prevents an undue tax on the manufacturer through the multiplicity of exhibitions, and enables each to be thoroughly representative. Already three-fourths of the available space has been taken up. A committee has been formed to supervise demonstrations of life-saving apparatus and devices, to organize lectures on subjects of immediate importance to those engaged in mining operations, and to secure the attendance of British, Colonial and foreign representatives of mining institutes.

The committee consists of W. E. Garforth (President of the Institution of Mining Engineers); Sir Ralph Ashton; Prof. J. S. Haldane; Sir Henry Hall; Sir Thomas H. Holland; A. M. Lamb; H. C. Peake, past president, I. M. E.; and H. L. Sulman, past president, I. M. M. Lectures have already been promised bv Sir Henry Cunynghame, Professor Haldane, and other well known authorities. The offices of the exhibition are at 43 Essex St., Strand, London, W. C.

United States Uranium Production

According to the Bureau of Statistics, oxide and salts of uranium to the value of $10,176 were imported in 1910, and to the value of $14,106 in 1911. This is one of the comparatively few mineral products of which the United States ships the raw material abroad to be imported again in manufactured form. Except that incidentally taken out in mining carnotite for vanadium, but little uranium was mined in the United States in 1911. A few hundred pounds of pitchblende were mined by the German Gold & Uranium Mining Co., at Central City, Gilpin County, Colo., but it is understood this material was not sold. but was used by the company in experimental work. The company also owns the Belcher mine, which has produced some pitchblende. There are other mines in the same group which are said to produce pitchblende, of which the Kirk is probably the largest, but figures of production have been refused. In North California a few hundred pounds of pitchblende, part of which is altered to gummite, an oxidation product, has been saved in mining feldspar at Benland.

The uranium in the carnotite ores mined in 1911, amounted to about 25 short tons of U_3O_8, or 21.2 tons of metallic uranium. As nearly as can be ascertained, about half of this quantity was shipped abroad in the form of ore.

The popular interest in uranium is due almost entirely to its connection with radium. Radium extraction has been attempted in the United States by several persons and firms. Some of these have given up their efforts, but others are still at work.

Outside of its uses as a chemical reagent and for yellow glazes on pottery, the chief use of uranium is for making yellow glass. The so called canary glasses are radioactive to a high degree, but they are expensive, as much as 20% U_3O_8 being required to get the color used in incandescent electric-light bulbs, according to the U. S. Geological Survey.

The attempt to use uranium in steel has been given up by some firms which have experimented with it, the claim being made that it imparts apparently much the same properties as does tungsten, and is much more expensive. Other firms, however, appear to be still pursuing such experiments.

Reinforced Platinum Ware

The use of one of the strong metals of the iron group as a backing to reinforce platinum is recommended by Byron D. Eldred, of Bronxville, N. Y. (U. S. pat. 1,043,576). His idea is that the two most useful properties of platinum are its resistance to acids, and its infusibility. The first is given by the platinum surface of the compound metal, while the metals of the iron group are of sufficiently high melting point to retain the property of infusibility.

The method of binding them is to heat the base metal through the platinum sheet with an oxygen or enriched-air flame to surface melting of the base metal, then arresting the heating, as welding will begin at that time. Both metals must be clean, of course.

Another patent (U. S. pat. No. 1,043,579) covers the manufacture of spun ware from compound sheets, double-faced with platinum, made as provided in the previous patent, and then covering the exposed base metal edge by drawing over some of the platinum, or by fusing in a platinum strip.

Another patent contemplates producing these bimetallic plates by casting the ferrous metal, superheated, against the platinum (U. S. pat. No. 1,043,577). Preferably this will be done in a U-shaped mold, casting the metal down through borax or a similar flux, and allowing it to rise in the other leg, against the platinum surfaces. The production of the superheated ferrous metal by reduction of iron oxide by alumina is also covered.

Addicks Method of Making Brass

A new method of making brass has been patented by Lawrence Addicks, of the U. S. Metals Refining Co., Chrome, N. J. He states that the objection to the present method of making brass in crucibles is the high cost of the crucibles in depreciation and breakage, and the high cost of labor, owing to the small-size scale on which operations are conducted. The objection to brass making in reverberatory furnaces is the excessive loss of zinc due to volatilization and the difficulty of maintaining a uniform grade in the brass produced.

His method is to draw copper from the ordinary cathode-melting reverberatory into a ladle, say of two or three tons capacity, and quickly introduce therein the desired quantity of zinc. The two or three tons of brass are then promptly poured off from the ladle and cast into ingots or whatever shape is desired. The molten copper will be delivered to the ladle at no greater cost than to the molds in which copper ingots are cast. Therefore the entire cost of brass making will be simply the cost of materials, plus whatever zinc loss is involved, plus the ladling cost. The quantity which can be handled to advantage at any time will be determined by the loss of zinc that is encountered; a suitable amount seems to be from one to three tons.

Some Properties of Lime

Recent experiments have shown that hydrated lime will not keep any better in air than ground quicklime, says the U. S. Geological Survey, and it has not been proved that hydrated lime may be stored indefinitely without its spoiling. In the crushing- and tensile-strength tests it has been found that magnesian limes were stronger than high-calcium limes. Although this may be of some advantage in structural work, it is known that high-calcium lime possesses the requisite strength for nearly all practical purposes.

The minimum dissociation temperature of calcium carbonate is found to be 880° C. and of magnesium carbonate 750° C. The maximum temperature permissible for burning pure high-calcium limestone is above 1300° C.; for impure high-calcium stone it lies between 1050 and 1150°, and for pure magnesium stone between 1000 and 1050°, and for impure magnesium stone between 900 and 1020°. The more porous a limestone is in its natural condition, the more easily will it burn; that is, the more rapidly and at a lower temperature. Porous stone may be completely burnt at 900° C., whereas a denser stone requires at least 1000° C. for the same length of time. Other things being equal, the lower the temperature at which complete decomposition may be brought about, the better will be the lime. In general it may be said that high-calcium lime will slack faster than dolomite lime, and will also require more water for slacking than do the dolomite limes.

Unskilled Labor

The question of the unskilled laborer has become so pressing a one in railway work that the Roadmasters and Maintenance-of-Way Association had a committee report on the subject at its Buffalo convention, Sept. 10 to 13, 1912 (*Eng. News*, Nov. 21, 1912). Some of the report seems as applicable to mining and metallurgy as to railroading.

Obtaining Laborers

Where it is possible, the laborers should be obtained locally by the foreman. If the required number cannot be secured this way, the company should maintain a labor bureau of its own at some central point where laborers assemble to seek employment. Let it be the policy of these labor bureaus to furnish free employment, free transportation, and, when necessary, send a company representative with the men to their destination and turn them over to the foreman for whom they were engaged, without any first cost to them either legitimate or extortionate. By this means the man so employed will realize that upon his own individual energy will materially depend how long he will be retained in the service.

Obtaining laborers through the regular employment agencies is not always satisfactory, due to the fact that through eagerness to secure a shipment of laborers and earn the fee connected therewith, the labor agent too often makes promises of various kinds that cannot be fulfilled.

The method is discouraged of obtaining laborers through such men as interpreters, book men, commissary men, etc., on promises of appointment as interpreters, subforemen, and timekeepers for the gang, or allowing boarding-house privileges for the purpose of furnishing meals and lodging to the laborers furnished. Usually the interpreter extorts a certain amount of money from each green foreigner for whom he secures work on his assurance of steady employment. He thus practically binds himself to keep these men at work regardless of their fitness or unfitness. The sole interest that the commissary man has in the labor he supplies is to extract every penny possible by charging exorbitant rates for provisions, which the laborers are compelled to purchase from him, and extortionate rents for small and unsanitary sleeping quarters. There is no hope of ever getting any satisfactory results under this system.

Shanties of suitable size with good light and ventilation should be provided, with sleeping rooms separate from the living rooms, particularly if the men do their own cooking. All shanties should be furnished with necessary lamps and a heating or cook stove as required.

The sanitary conditions are most important. Necessary toilets must be maintained. A foreman in charge should closely watch these things and insist that the buildings occupied and used by his men are at all times kept neat and clean, and that the grounds surrounding the building are also kept tidy. A great deal of the local prejudice against foreign labor is due to the filthy habits that on the surface seem to be general among the men.

Handling the Men

It is not an easy task to make good men out of Italians, Japanese, Greeks and Mexicans. It is still more difficult to teach men to speak and write the English language.

The first thing is to obtain the confidence of the men. Avoid abuse. Explain as clearly as possible just what is to be done. Make no promises that cannot be fulfilled. Allow full time for every moment worked. Give liberal allowances of time and proper food when working overtime in emergencies in stormy weather. Keep them always under submission by granting no concessions when a threat to quit accompanies the request. Teach them to become law-abiding citizens. Do not permit them to carry or possess any kind of dangerous weapon. Accustom them to the idea of keeping their home surroundings neat and sanitary.

Explain how best to make purchases of clothing and provisions so that they won't be deceived by men of their own nationality who may have been somewhat shrewder than they and have started small stores for this purpose. Aid them to learn the English language by circulating the names of the various tools and equipment they come in contact with every day.

There is no question but that there is local prejudice against foreign laborers. This can be overcome to a great extent by educating the men to endeavor to live as the average American does. They should be taught by example to be honest and truthful in all their dealings and to observe closely and to pattern after the general run of good American citizens. Give them to understand that this is a free country and that, as long as they conform strictly to its laws as other men do, and as long as they do not become a nuisance to the community in which they live, it is not necessary for them to pay for the privilege of earning an honest living.

Lithium is the lightest known solid element and has a specific gravity of 0.585. It is soft, not tenacious and has no known valuable properties.

Flotation Process at Kyloe, N. S. W.

The oil-flotation process as used at the Kyloe copper mine, near Cooma, N. S. W. Close sizing and feeding are necessary. Too much clay renders the process inoperative. Stage flotation practiced, the flotation surface being successively decreased.

Note—Abstract of a paper by J. W. Ashcroft, in Bull. No. 97, I. M. M., entitled "The Flotation Process as Applied to the Concentration of Copper Ore at the Kyloe Copper Mine, New South Wales."

The ore in the Kyloe mine, 32 miles from Cooma, N. S. W., at the time flotation was adopted, consisted of quartz with chalcopyrite and small amounts of bornite and iron pyrites. A typical sample of clean hand-picked ore gave as follows: Cu, 21.2%; Fe, 24.3; SiO_2, 28.9; S, 25.1%; Bi, Ag, Au, trace.

In places the orebody occurs as small veins in a crushed feldspathic filling. A clay seam, or gouge, varying from 1 in. to over a foot, occurs in the ore channel throughout the workings. This clay, and that derived from the kaolinizing of the feldspathic portion of the granite filling, was the cause of considerable trouble in the flotation treatment. A remedy was subsequently found in the addition of a large proportion of clean quartzose ore.

Original Treatment

Originally the ore was hand-sorted at the shaft bins, waste eliminated and some clean ore taken out for shipment, and the remainder sent through a rock-breaker and crushed to 1½ in. It then went to a picking belt, and after picking over, the remainder, carrying 5 to 5½% copper, goes to the mill bins. A typical analysis is: Fe, 6.5%; Cu, 4.7; S, 5.2; CaO, 3.4; insol., 79.4 per cent.

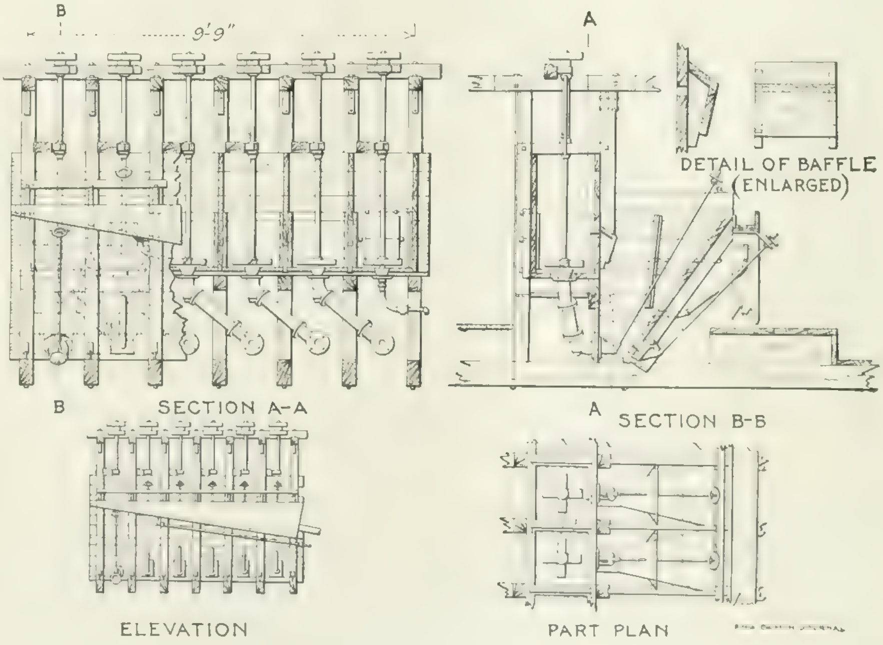
From the mill bin the ore was fed mechanically into an elevator, which discharged into a shaking screen. From this, the oversize was fed, with water, into a set of Cornish rolls, and the undersize went to a May jig. The head product from this jig was dried, bagged and sold to a smelter, the tailings went to waste, and the middlings were reground wet in a ball mill, and after classification, passed over Wilfley and Card tables, the overflow from the classifier being thickened in a pulp thickener, from which a spigot delivered to a Frue vanner, and the overflow went to waste.

For about 18 months the mill recovered 74% of the copper in the mill feed in a concentrate carrying 19 to 20% of copper. The concentrate had formerly been smelted to a 50% matte, but owing to increasing cost of firewood, fluxes, etc., it has been found more profitable to sell the concentrates to a smelter. Freight on these concentrates was $8.50 per ton, therefore it was essential to produce a high-grade product. By lowering the grade of the concentrates, a higher extraction could be obtained, but the extra cost of transport, and the smaller prices paid by the smelter, made it more profitable to ship a concentrate carrying at least 20% of copper.

Flotation Experiments

The old concentrating plant was left untouched, so that work could be begun again at any time, and an experimental mill erected. This was divided into two sections, one for grinding, and one for flotation. The grinding was effected in two 8-ft. classifying-discharge Forwood-Down pans, driven at 30 r.p.m. The flotation machine was the latest type used at Broken Hill on zinc-lead seconds, with six stirring boxes, each 16 in. square.

The first departure from the former method of concentration took place at the jigs. The first hutch product was a clean concentrate as before. The second and third hutch products were dressed on a No. 5 Wilfley table, also as before; the tailings from this Wilfley, together with the No. 4 hutch product and the jig tails, were sent to the grinding pan, and the overflow from the classifier at the head of the jig, together with the overflow from the end of the jig, passed through a pulp thickener of the baffleboard type, the spigot from which discharged into the launder running to the flotation machine, together with the discharge from the grinding pan.



Kyloe Flotation Apparatus

The flotation machine as shown in the accompanying illustration, consists of a series of six square boxes fitted with revolving impellers and each box connected to an outside chamber in which the separation of the mineral from the gangue takes place. From the bottom of the No. 1 flotation chamber, the pulp is drawn by the action of the second impeller into the No. 2 box, and from No. 2 flotation chamber into the No. 3 box, and so on, the pulp from which the mineral has been separated being finally discharged from the bottom of the No. 6 flotation chamber.

The flow from the flotation chambers through the diagonal pipes into the stirring boxes is regulated by a valve on the top of each pipe, and the tailing discharged by a similar valve. In the flotation process as used at Kyloe, no acid is required and the entire operation is conducted at ordinary temperatures. The oil used is crude eucalyptus oil containing a large percentage of phellandrene. This oil is manufactured in the district and costs 17c. per lb., f.o.b. mine.

The pulp thickener was an adaptation of a well known type and calls for special attention, being of cheap and simple construction and working admirably. The details of the apparatus are shown in third illustration.

Defects in the Original Plant

A number of defects soon revealed themselves in both sections of the plant. In the flotation machine the original slicing valves used were not sufficiently sensitive to regulate the flow properly, the correct adjustment of which through the different boxes has an important bearing on the successful working of the process, and the slicing valves were, therefore, replaced by flat valves operated by a rod with threaded end and handwheel, which arrangement proved satisfactory and permitted delicate adjustment.

As soon as work was started, it was found that, owing to the flotation chambers being all of the same width, while the amount of mineral to be floated became less in each one toward the tail end of the machine, the froth became thin and poor after the first two boxes. To remedy this and give the froth a greater density and thickness, the flotation chambers were contracted on top by means of "crowding boards," which reduced their surface to widths varying from 11½ in. on No. 1 to 4½ in. on No. 5. No. 6 chamber was shortened by putting in a water-tight bulkhead in addition to the crowding boards, as in the other chambers. This narrowed the surface to 4 in. and shortened the distance through which the poor froth had to travel by one-half and gave less chance for the mineral to drop away from the froth into the tailings before it was delivered into the discharge launder.

The machine now appeared to work fairly well, but samples taken from the discharge lip of each of the flotation chambers showed that the products from Nos. 4, 5 and 6 chambers were not sufficiently rich to be profitably shipped, so the concentrate launder was divided and arranged so that the products from Nos. 1, 2 and 3 chambers went to the concentrate bin, while those from Nos. 4, 5 and 6 were returned to No. 1 box in the machine and were re-treated.

SAMPLES FROM FLOTATION MACHINES

Chamber	Cu	SiO_2
No. 1 overflow	27.2	21.2
No. 2 overflow	24.1	41.5
No. 3 overflow	22.3	59.6
No. 4 overflow	15.6	61.0
No. 5 overflow	14.3	60.7
No. 6 overflow..............	9.4	68.7

After a short run it was also found necessary to insert iron liners in the stirring boxes as the wooden ones wore away rapidly. The opening into the boxes through which the pulp was drawn by the action of the impellers was made bell-mouthed, which also improved the working considerably. Inspection doors were provided so that the wear could be ascertained without dismantling the boxes. As soon as the machine was working normally after these operations, samples of the feed and tailings were taken regularly, the result of a week's run being as follows: Average feed, 4.4% Cu.; concentrates, 21.6% Cu; tailings, 1.9% Cu; recovery, 61.8 per cent.

This, although an improvement, was not satisfactory, so sizing tests of the feed were made to discover, if possible, in what direction to look for further improvements. The results are shown in the accompanying table.

These figures indicated that the material being fed into the flotation machine was not sufficiently uniform, and that it contained too large a quantity of comparatively coarse particles which could not be held up in the froth and which in falling would carry down some of the finer particles, which would otherwise have remained suspended. Improvements, therefore, lay in the direction of finer grinding and closer sizing. As the sizing test showed that an unduly large percentage of material larger than 40-mesh was contained in the ground pulp, the discharge of the grinding pans was slightly raised and the product again sized, with the result that, while the quantity of slime found was largely increased, the amount of product larger than 40 mesh was but little reduced.

The working of the machine was still unsatisfactory, the recovery in the whole mill being only a little better than with the old system, but as all laboratory tests showed that a much better extraction was possible when conditions were favorable, and as the trouble in this case appears to be purely mechanical, it was decided to rearrange the whole of the flotation plant, so as to remedy the most apparent defects, which were: The excessive amount of oversize in the feeds of the stirring boxes; excessive dilution of the pulp; irregularity of the overflow in the flotation chambers, due to irregularity of the feed, and of the speed of the impellers; the want of proper means to control the supply of oil.

SIZING TESTS ON FLOTATION FEED

	Feed		Concentrates		Tailings	
Mesh	% weight	% Cu	% weight	% Cu	% weight	% Cu
+20	1.52	2.20	0.18	17.5	1.85	2.0
+40	13.17	1.20	0.30	17.0	17.53	1.2
+60	15.10	0.80	0.31	18.5	20.77	0.7
+80	3.55	1.15	0.52	24.7	6.10	0.6
+100	22.50	1.40	7.42	53.6	21.40	0.6
+130....	3.62	3.80	1.55	21.2	4.20	0.5
-130	40.40	5.45	89.60	23.75	28.00	1.2

REARRANGEMENT OF FLOTATION PLANT

In order to remedy the defects mentioned, the old mill was put in commission, while the following alterations were made: The grinding pans were altered from the classifying discharge to the positive feed tank and were arranged to discharge on revolving screens, so as to keep the feed to the flotation machine more even in size. The pulp thickener was moved and placed between the screens and the flotation machine, so as to keep an even feed to the stirring boxes and to regulate its density. The flotation machine was connected to a separate engine with a sensitive governor so as to keep the speed of the stirrers constant. An apparatus was made for adding the oil to the pulp in such a manner as to insure an even flow. On the revolving screens were tried Greening's L. W. C. screening cloth, 600-mesh, with apertures 0.0268 in., and A. K. D. cloth, 900-mesh, with apertures 0.0217 in. The L. W. C. was found to last longer and to give equally good results, and so was finally adopted. The screens last about 10 weeks for each covering.

The method of adding the oil to the pulp, which was finally adopted, consists in placing two drums, one above the other; in working, the top drum is filled with oil, and the flow from this to the lower one is regulated by a floating ball valve, thus insuring a constant head in the lower drum. From the lower drum the oil drops at a constant rate into the launder which carries the pulp from the screens to the flotation machine, at the rate of about one drop per second, amounting to 0.65 lb. of oil per ton of dry ore treated. In the rearrangement of the plant, no concentrating tables were used, but the whole of the product from the jig, excepting that from No. 1 hutch (which was bagged for shipment) was sent to the flotation plant in order to give a larger percentage of mineral there, and so form a thicker froth in the flotation chamber.

Having remedied the defect in the grinding plant, the flotation machine began to do better work, the result of a six days' run being as follows: Feed to stirring boxes, 4.5% Cu.; concentrates, 23.9% Cu; tailings, 1.22% Cu; extraction, 76.3% Cu. The extraction percentage was worked out by the following formula:

$$\frac{\frac{A-B}{C-B} \cdot 100\,C}{A}$$

where A equals percentage of copper in feed; B equals percentage of copper in tailings; C equals percentage of value in concentrates; a convenient formula for approximate estimation when it is impracticable to weigh the product.

CLAYEY FEED GAVE TROUBLE

It was soon found that a certain type of feed gave bad results; that is, where there was a large percentage of oxidized and kaolinized lode matter, and in the week under review the tailings value for the last three days averaged 1.47% Cu from this cause. On one occasion, when there was sufficient of this deleterious material to color the pulp a dirty yellow, practically no flotation took place, the pulp leaving the boxes at approximately the same value as it had when fed in. There was no true froth, only large shiny bubbles and a little coagulated sulphide, which overflowed the flotation chamber. Samples taken from each chamber at this time gave the following results: Feed, 3½% Cu; chamber No. 1, 9.3% Cu; No. 2, 8.2% Cu; No. 3, 6.3% Cu; No. 4, 7.4% Cu; No. 5, 6.5% Cu; No. 6, 8.8% Cu; tailings, 3% Cu. The films forming these large bubbles were slimy and tenacious and no improvement took place while the feed was discolored in this way.

Effect of Slimy Feed

Tests made indicated that the deleterious effect was due to physical rather than to the chemical properties of the material, and to the peculiar nature and excessive quantity of the slime produced by it; in order to determine definitely what effect the large quantity of the slime had upon the working of the process, daily sizing tests were made of the feed to the flotation machine extending over a considerable period, and these showed that when this contained more than 40% of — 130-mesh, the quality of the work began to fall off, while the best results were obtained with from 29 to 30% of this size in the feed.

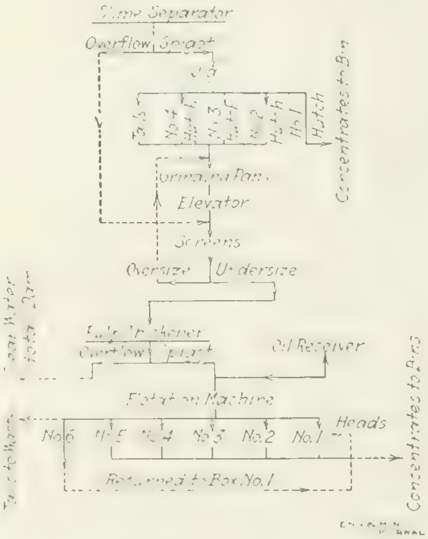
Since the trouble which arose from "dirty" ore, the mill feed has been regulated so as to contain only a small percentage of this in the total feed; and the result has been uniformly good. Only occasionally the separation becomes poorer, and this can now be quickly corrected by the man in charge who can tell by the appearance of the froth what the conditions are. Once running in proper order, the machine is easy to regulate and will sometimes run for 48 hr. without being touched, but at other times, if the character of the feed changes it will require frequent adjustment until the feed is again regular in composition.

A week's run under the new conditions shows as follows: Feed, 3.6% Cu; concentrates, 24.4% Cu; tailings, 0.79% Cu; extraction, 79.6%. These figures show a better recovery than is obtainable by any other known concentrating process on this class of ore, and when it is remembered that, in the case of the Kyloe ore, the mineral contained is nearly pure chalcopyrite, the tailing values are very low.

Drying the Concentrates

The concentrates made are in a fine state of subdivision, and are frothy. Filtration was tried as a means of getting rid of the water, but proved a failure without the aid of presses or vacuum plant. It was found, however, that by running the material into a tank and spraying the surface, the froth was broken up; the introduction of a baffle board at the overflow into the tank caused the mineral to settle and allowed an overflow of clear water. There are two of these tanks in use and concentrates are settled in them alternately. The water is run off as closely as possible, and the wet concentrates then shoveled out onto a drying floor heated from underneath, and from there, when sufficiently dry, are shoveled in the bins ready for bagging. The plant has been in successful operation for six months, at the time of writing this article. The mill recoveries from July 29, 1911, to Jan. 27, 1912, were as follows: Ore treated, 7855 tons; copper content, 411.97 tons; assay, 5.24% Cu. Concentrates made, 1562 tons; copper content, 355.79 tons; assay, 22.65% Cu; extraction, 86.36 per cent.

The recoveries are those for the whole concentration plant, and are worked out from the weights and values of concentrates made and shipped as against the daily assay for the mill feed. The actual recovery in the flotation plant, apart from the jig, is approximately 80% on a 3½% feed, and the assay value of the flotation concentrates is over 25% Cu. It is as well to state here that it has been proved by experiment that the extraction could be increased to 90% or over by lowering the grade of the concentrate; but, as has already been explained, owing to the high transportation charges, there is more profit in making a higher grade product, even though so doing involves a smaller recovery. The actual cost for the 24 weeks, from July 3, 1911, to Dec. 16, 1911, were as follows: Ore milled, 8556 tons; residues treated, 5732 tons.



Kyloe Flow Sheet

The costs shown in the accompanying table include relining the stirring boxes with iron liners instead of the wooden ones originally put in, and include, also, some alterations to the pans, which makes the items "maintenance and renewals," appear high. The cost of oil, which is included under flotation, is 10.5c. per ton of residues treated, or 7c. per ton of ore milled. The total cost of milling for the period, including crushing, belt picking, fine crushing, jigging, regrinding tailings and flotation, together with all maintenance and cost and proportion of general expense, was $1.877 per ton, and the cost of delivering the ore from the mine to the mill bin was 6.7c. per ton. The royalty paid is saved by the Kyloe company in the lesser tolls charged by the smelters due to the higher grade of concentrate shipped. During the first three months of the period shown in the table, a portion of the jig residues was run to waste, as owing to lack of power, the pans could not treat all of them. This has since been remedied, and the total cost per ton of residues treated is now only about 10% over the cost per ton of total ore milled.

The mine is a small one and the tonnage available for treatment is also small, that is, 60 tons per day, and the costs are, therefore, higher than they would be on a large tonnage; but owing to there being no acid required, no heating of solution and to the more favorable conditions existing at Kyloe, the flotation costs are considerably lower than they are at Broken Hill, where the process is worked on zinc-lead tailings. The cost of plant will necessarily vary with local conditions, but owing to the small space occupied and the simplicity of the apparatus employed, it will probably cost 25% less to install than a corresponding wet dressing mill with tables, slime plant, etc.

COST OF FLOTATION PROCESS

Departments	Per Ton of Ore Milled	Per Ton of Residues Treated
Regrinding, screening and flotation	$0.316	$0.470
Power	0.047	0.069
Drying and handling concentrates	0.077	0.115
Maintenance and renewal	0.134	0.198
Assaying, lighting, etc	0.046	0.069
Water supply	0.069	0.103
Superintendence and general expense	0.042	0.066
Total, excluding royalty....	0.731	1.090
Royalty....................	0.121	0.182
Total cost.............	$0.852	$1.272

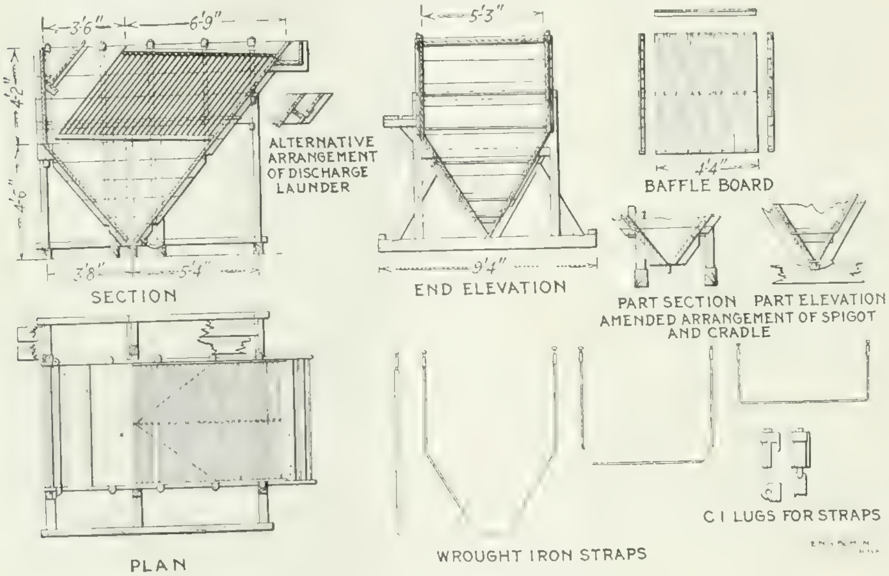
Conditions for Successful Working

So far present experience indicates that any clean sulphide can be treated if the physical conditions are right. These conditions are: That the particles must be clean and free from oxidization; that the gangue must not be of so clayey a nature as to form a fine slime, which coats the surface of the sulphide particles and prevents their attaching themselves to the bubbles formed, or which, in itself, forms too large a proportion of gangue slime which comes up with the froth and destroys its holding power for the sulphide. The material to be treated requires to be ground as evenly as possible. The best size must be determined on each individual ore. The feed and speed of the stirrer must be correctly proportioned and kept as even as possible. The thickness of pulp fed into the machine must be regulated and kept as even as possible.

The minimum amount of floatable material required to be present in the ore has not yet been determined. At Kyloe it amounts to approximately 10% of the weight of the ore, and this gives excellent results. Experiments are now being made to determine, if possible, the minimum amount allowable. Any excess can, of course, generally be removed by jigging or by some other form of concentration before flotation.

In some cases, the addition of clean pyrites may be beneficial, but as the successful float depends largely upon the total quantity of minerals rather than the percentage in the ore, it is, in many cases, possible, by keeping the float back in the flotation chambers, to treat successfully very low-grade material. This, however, must be tested on each ore separately.

The quality of water used has a marked effect on the process and necessitates modification according to its hardness and chemical constituents, but bad water is not necessarily detrimental to the working of the process.



Kyloe Pulp Thickener

The machines as now used are a great improvement on the old type of pointed boxes and will no doubt be further improved as experience suggests modification.

The grinding of the ore to prepare it for flotation may be done in nearly any form of machine, provided it does not make too much slime, although the process can work successfully with a considerable quantity. The best type of machine is one which screens the material as soon as it is crushed and returns the oversize. The ideal to be aimed at is to keep the particles as nearly of a size as is practicable.

In the foregoing the poor success at the starting of the process has been dealt with rather fully, for the reason that the experience gained therefrom may be of use to others when starting a new plant, and following up the various causes of trouble may assist in locating weaknesses in other installations.

Tomboy Gold Mines Co., Ltd.

The report of the Tomboy Gold Mines Co., Ltd., operating mines in the San Juan district of Colorado, for the year ended June 30, 1912, showed that 107,577 tons of ore were milled, at a total profit of $450,941. The bullion yield was at the rate of $8.87 per ton, while the cost was $4.69 per ton. Two dividends, totaling £31,000, were paid during the year.

At the Argentine mine no advance development work was done, for the reason that all efforts were centered on opening the newly acquired Montana mine. The ore reserves in the Argentine mine are estimated at 340,000 tons, of which 230,000 tons are broken ore in stopes.

General Manager D. A. Herron states that a year's operation on the Montana mine has confirmed the estimate that no extra equipment other than the installation of an air-compressor plant would be required. The covered surface tramway connecting the portal of the Ophir tunnel with the portal of the 1760-ft. level of the Argentine mine, and equipped with electric haulage, permits of the housing of Montana miners at the Argentine boarding house, the sharpening of all tools at the Argentine blacksmith shop, and the making of all repairs at the Argentine machine shop. Montana ore is also transported over this tramway into the Argentine mine, hoisted through the Cincinnati shaft, a distance of 90 ft. to the 1650-ft. level, and trammed thence to the 60-stamp mill. It is believed that the Montana mine can be operated with but little additional cost to the expense of operating the Argentine mine alone. Owing to the necessity of doing a large amount of dead work before any advance could be started, only a comparatively small amount of new territory was opened.

The ore occurrence in the Montana mine is analogous to the orebodies of the Argentine, differing only in the fact that the metals are more generally disseminated throughout the vein, varying vertically and longitudinally in a distance of a few feet. In the course of development of the Montana mine, 21,702 tons of ore, averaging $10.50 in gold and silver, were mined and treated at the mill. Inasmuch as this tonnage included quantities of waste, it is expected that the original estimate of the value of the ore is going to be fully maintained, if not exceeded.

Important changes in the milling practice were made during the year, with the view of increasing the capacity and efficiency of the mill. By remodeling the concentrator and the addition of new equipment the number of Wilfley tables working on primary feed was raised from 11 to 22. A grading plant, consisting of three Wilfley tables and one Deister slimer, was erected. This plant receives the mixed concentrates of the primary Wilfley concentrators and the entire concentrated product of the Frue vanners, and turns out a finished product of high-grade lead (over 60%), assaying high in gold; a zinc concentrate containing 24% and higher of zinc, and an iron product which, under the modified smelter schedule, commands a much more favorable price for gold, silver and lead than when, formerly, the iron was included in the zinc concentrate.

A middlings plant was also designed and erected for the retreatment of the higher-grade portion of the tailings discharged from the Wilfley roughing tables and the high-grade tailings from the primary Wilfley tables. The plant consists of two Hardinge conical tube mills for regrinding, eight copper plates for re-amalgamation, classifiers, seven Callow tanks, seven Deister slimers, and eight Wilfley tables for the re-concentration of the re-ground middling products. For the relief of the filter plant this year, four Dorr thickeners are to be installed.

Spellerized Pipe

Spellerized pipe has been on the market for some time, but no explanation has heretofore been offered as to what the process consisted in. The method is now explained by the National Tube Co. as follows: Spellerizing consists in subjecting the heated bloom to the action of rolls having regularly shaped projections on their working surface, then subjecting the bloom while still hot to the action of smooth-faced rolls, and repeating the operation, thereby working the surface of the metal to a uniformly dense texture, adapted to resist corrosion, especially pitting.

This process is, of course, of most service on 4-in. pipe, or smaller, because of the thin walls. The larger sizes, because of their thickness, do not require so much extra work of this character.

Electrostatic Separation of Barite and Sphalerite

Many suggested processes for the separation of sphalerite and barite have failed, the chief cause of failure being the varying physical characteristics of the ore. As the result of a series of experiments performed by C. C. Conover[1] and E. R. Morris[2] at the Missouri School of Mines and Metallurgy for their graduation thesis, the following process was outlined. The essentials are these: Ordinarily sphalerite and barite are nonconductors of electricity; when an ore containing these minerals is leached with dilute copper sulphate solution, the sphalerite becomes a good conductor and can be electrostaticly separated from the barite which is unaffected.

For the experiments a hand-jig concentrate consisting of barite and sphalerite with no pyrite or galena was used. It came from a mine in central Missouri and had not been successfully treated by any process. The apparatus used in these tests was a small one-roller separator made to resemble the Huff roller-type electrostatic separator; electrification was accomplished by an ordinary Holtz electrostatic machine. A small motor was used to drive the apparatus.

Preliminary tests were made to determine the effect of various strengths of copper sulphate solution, time of treatment, sizing of feed, temperature of the bath, washing out the solution after treatment, and the effect of no treatment. The conclusions reached were: The ore must be treated to effect a separation; the ore must be closely sized; the temperature and strength of solution and the time of treatment are not important; copper solution remaining after the wash hinders the separation.

Further tests showed that the deposition of the conductive film upon the sphalerite was rapid, even at room temperature. A lot of ore was treated for one minute with 1% copper sulphate solution at room temperature, immediately washed, dried and separated with entirely satisfactory results.

To determine whether deposition would go on to completion in extremely dilute solution, copper sulphate equal to the amount found to be consumed by five kilograms of ore in a previous experiment was dissolved in 1200 c.c. of water and used in leaching the given quantity of ore. The procedure was made to resemble treatment in ordinary bins by pouring the solution over the surface of the ore and letting it drain off through openings in the bottom as waste water.

After this treatment the ore was dried and screened into four sizes: +20 mesh, +40 mesh, +80 mesh and —80 mesh. The separation of the +20 mesh product gave the following results: Feed, 19.38% zinc; concentrate, 63.75% zinc; middling, 24.64% zinc; tailing, 0.61% zinc; recovery (counting middling lost), 92.8%; recovery (counting middling recoverable), 97.8%. The middling was not separated into tailing and concentrate as it was too small in bulk. Its behavior, however, indicated that it would separate as well as the rest did. Separations of the other sizes gave results equally as good, the dust separating nearly as well as the coarser materials. Analyses of solution used are as follows: Original solution, 0.111% Cu; resulting solution: 0.006% Cu; 0.164% Fe; 0.056% zinc. The copper used in this experiment was at the rate of 2.1 lb. of crystallized copper sulphate per ton of ore. This figures about 10c. per ton for treatment charges above those incurred in the electrostatic separation.

The final conclusions were that sphalerite and barite can be separated by this method, which consists in treating the ordinary concentrate from wet concentration with an extremely dilute solution of copper sulphate, drying, screening and separating by electrostatic means. The effect of abrasion on the conductive film was not studied and may affect the practical application of the process. The film is believed to be cupric sulphide.

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[1] Cuba, Wis.

[2] Hayden, Ariz.

Consolidated Mercur

As explained in last year's report of the president of the Consolidated Mercur Gold Mines Co., operating at Mercur, Utah, operations then were on a precarious basis and a permanent shutdown seemed imminent. However, conditions in the mines improved for a time, and as a result the year ended June 30, 1912, showed an operating profit of $10,797. Of this, $8239, however, had to be written off as depreciation on stores and on stock held in the Manning Leasing Co. While developments during the present year have once or twice given some encouragement, conditions are substantially as they have been for some time. As the company has previously announced, it will continue to operate as long as it can pay expenses and then it will shut down and dismantle the plant, if it can be disposed of. The company has been looking for a new mine, but so far unsuccessfully. The plant and equipment would be, of course, much more valuable if it could be used at some new plant, rather than dismantled and sold as second-hand machinery. Dividend No. 27 of $30,000 was paid during the year, partly from accumulated surplus, and the balance of assets as of June 30, 1912, was $57,760. Dividends to date paid by this company amount to $1,235,000, while including the dividends paid by the old Mercur and De La Mar companies, before consolidation, the total is $3,415,313. During the year, 67,816 tons of base ore, 119,776 tons of oxidized ore and 14,060 tons of old tailings were treated, with an average recovery of $2.45 per ton. The loss in tailings was $0.82 per ton, giving a total average value of all material treated during the year of $3.27. Mining cost, $1.41 per ton of ore mined; treatment of tailings dump, $0.17 per ton of tailing; milling, $1.10 per ton of ore milled or a total of $2.42 per ton of ore treated.

Reclaiming Tin from Old Cans

The high price of tin has again stimulated the desire to reclaim the tin from old tin cans. It is well known that the tin on the cans is pure and the sheet iron or steel upon which it exists carries about 2% (*Brass World*, November, 1912). Therefore, from every 100 lb. of tin cans, 2 lb. of tin could be obtained.

The difficulty encountered in reclaiming the tin from such material is the amount of foreign matter on and in the old cans. Foods, dirt, labels and other foreign material are always present. Many of the cans are lacquered, too, which interferes unless removed. In order to remove the tin by any process it is first necessary to remove the foreign matter. This must be accomplished by the use of alkalies, such as potash or soda, and heating to burn off the organic matter cannot be employed for the reason that it leaves a coating of carbonaceous matter on the cans that is worse than the matter previous to heating.

It has been found that the cost of removing this foreign matter is so great that the profit is taken from the operation of reclaiming the tin. That is, it has been found so by a number of concerns who have attempted to carry out the process. Cans can be obtained and the tin can be removed from them if quite clean, but there is so much foreign material present in and on the cans that it is usually considered that "it does not pay."

Detinning companies work upon new tin scrap that is perfectly clean and the supply is obtained from concerns who make tin-plate goods, such as tin cans, and in some instances by whom they are controlled. It will readily be appreciated that with such a source of clean, tin-plate supply, the obtaining of tin is a different problem from reclaiming it from old tin cans.

To remove enamel from almost any metal, according to *Revue Produits Chimiques*, it is necessary only to heat the enameled object in a furnace or muffle to a red heat and cover the surface with powdered potassium cyanide. After cooling, the enamel will be soluble in water.

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20,735—FOOD SUPPLY of Miners. H. Gray. (Eng. and Min. Journ., Nov. 16, 1912; ⅔ p.) 20c.

20,736—HAULAGE—Margin of Safety Required for Man Haulage at Great Depths. R. B. Greer. (Journ. South African Inst. of Engrs., Sept., 1912; 1¾ pp.) Discussion on paper previously indexed.

20,737—HEALTH CONDITIONS—Mine Sanitation. E. B. Wilson. (Lake Superior Min., Inst., Aug., 1912; 9¼ pp., illus.)

20,738—HEALTH OF MINERS—Sanitation in Camps. R. C. Hardman. (Eng. News, Oct. 17, 1912; 1⅔ pp., illus.) 20c.

20,739—HOISTING—Discussion on the paper "Die Sicherheit der Foerderseile" by Speer, indexed under No. 19,888 in the Eng. and Min. Journ., Sept. 7, 1912. (Glueckauf, Oct. 5, 1912; 10½ pp.)

20,740—HOISTING—Turn Sheave Location and Support at a Michigan Copper Mine. C. R. Forbes. (Eng. and Min. Journ., Nov. 9, 1912; 1 p., illus.) 20c.

20,741—HOISTING ROPES—Le Coefficient de Securite des Cables d'Extraction. Fr. Herbst. (Ann. des Mines de Belgique, Vol. XVII, No. 4, 1912; 27 pp., illus.)

20,742 INDIA General Report of the Geologicla Survey of India for the Year 1911. H. H. Hayden. (Records, Geol. Surv. of India, Vol. XLII, Part 2, 1912; 34 pp.)

20,743—NIGERIA—Mining Law in Nigeria. C. S. Herzig. (Min. Mag., July, 1912; 5 pp., illus.) 40c.

20,744—ORE HANDLING—A New Method of Handling Ore in Incline Shafts of Flat Dip. E. J. Way. (South African Min. Journ., Anniversary Number, Sept., 1912; 4½ pp., illus.)

20,745—PROSPECTING—Eine elektrodynamische Method zur Erforschung des Erdinnern. H. Loewy and G. Leimbach. (Oest. Zeit. f. B. u. H., Nov. 2, 1912; 2 pp.) An electrodynamic method for exploring the interior of the earth; to be continued. 40c.

20,746—REPORT OF OPERATIONS—Knob Hill Report to Stockholders. B. H. Bennetts. (Eng. and Min. Journ., Nov. 9, 1912; ½ p.) 20c.

20,747—REPORTS—Mining Engineers' Reports. J. Bowie Wilson. (Min. and Eng. Rev., Sept. 5, 1912; 2¼ pp.) 40c.

20,748—SERVIA—Der Bergbau in Serbien. (B. u. H. Rundschau, Oct. 5, 1912; 1 p.) 40c

20,749 — SHAFT SINKING — Record Shaft Sinking at the Modderfontein (State) Mining Areas, South Africa. E. M. Weston. Rectangular vs. Circular Shafts. (Min. and Eng. Rev., Sept. 5, 1912; 1½ p.)

20,750—SHAFT SINKING—Tiefkaelteverfahren zum Schachtabteufen. Diancourt. (B. u. H. Rundschau, Sept. 20, 1912; 5¾ pp.) Sinking shafts in wet ground and quicksand by the deep freezing method. 40c.

20,751—SHAFT TIMBERING in Minnesota Iron Mines. L. D. Davenport. (Eng. and Min. Journ., Nov. 2, 1912; 1 p., illus.) 20c.

20,752 — SIGNAL SYSTEM — Electric Shaft Signal System, Argonaut Mine. R. S. Rainsford. (Eng. and Min. Journ., Oct. 26, 1912; 1 p., illus.) 20c.

· 20,753—SOUTH AUSTRALIA—The Yelta and Paramatta Mines. L. Keith Ward and R. Lockhart Jack. (South Aust. Dept. of Mines, Report No. 1, 1912; 24 pp., illus.)

20,754—STOPING—Hints for Hand Stopers in Narrow, Steep Reefs. John V. Muller. (South African Min. Journ., Anniversary Number, Sept., 1912; 1 p.)

20,755—SURVEYING—Devices for Identifying Stations Underground—Method of Correcting Traverse that Fails to Tie. H. G. Henderson. (Mines and Minerals, Oct., 1912; 1½ pp.) 20c.

20,756—SURVEYING—The Value of Surveying. James Higginson. (Eng. and Min. Journ., Nov. 23, 1912; 2 pp., illus.) 20c.

20,757—SWITCHES—Derailing Switches for Slopes. Simon H. Ash. (Mines and Minerals, Nov., 1912; 1 p., illus.) 40c.

20,758—TAXATION—Expose de la Taxation des Mines dans les Divers Pays. Louis Aguillon. (Ann. des Mines, Sept., 1912; 68 pp.)

20,759—TAXATION VALUE OF MINERAL RIGHTS in Michigan. Alfred C. Lane. (Eng. and Min. Journ., Nov. 9, 1912; 2¾ pp., illus.) 20c.

20,760—TIMBER—Tests on Some Species of Nova Scotia Mine Timber. F. H. Sexton and C. A. Hodge. (Can. Min. Journ., Oct. 1, 1912; 2¾ pp., illus.) 20c.

20,761 — TIMBER PRESERVATION — Konservierung von Grubenhoelzern. Max Landau. (Bergbau, Oct. 3, 1912; 1½ pp.) Preservation of mine timber. 20c.

20,762—TIMBERING—Gebirgsdruck auf die Grubenzimmerung. Friz. (B. u. H. Rundschau, Oct. 5, 1912; 4½ pp., illus.) Rock pressure on mine timbers. 40c.

20,763 — TROLLEY WIRES — Hanging Troughs for Protecting Trolley Wires. Claude T. Rice. (Eng. and Min. Journ., Nov. 2, 1912; 1 p., illus.) 20c.

20,764—TROPICS—Pioneering in the Tropics. C. M. Eye. (Min. and Sci. Press, Sept. 21, 1912; 3¼ pp., illus.) 20c.

20,765—TUNNELING—Driving a Double-Track Tunnel in Japan. W. L. Saunders. (Min. and Eng. Wld., Oct. 26, 1912; 1½ p., illus.) 20c.

20,767 UTAH Mines and Prospects of Mount Nebo Mining District. Will C. Higgins. (Salt Lake Min. Rev., Sept. 30, 1912; 4¾ pp., illus.) 20c.

20,768—VALUATION—Mine Valuation and Mine Finance. H. C. Hoover. (Min. Mag., Oct., 1912; 2¾ pp.) 40c.

20,769—VENTILATION of Rand Mines. (South African Min. Journ., Anniversary Number, Sept., 1912; 2 pp., illus.)

20,770 — VENTILATION — Untersuchungen ueber Wetterfuehrung, Arlt. (Zeit. des Vereines Deutsch. Ing., Sept. 18, Oct. 12, 1912; 14¼ pp., illus.) Investigations on mine ventilation.

20,771 — WIRELESS TELEPHONES—Drahtlose Grubentelephonic. O. Dobbelstein. (Glueckauf, Oct. 5, 1912; 5 pp., illus.; abstract translation in Coal Age, Nov. 9, 1912.)

ORE DRESSING—GENERAL

20,772—CENTRIFUGAL MACHINES for Ore Grading and Ore Concentrating. Godfrey T. Camborne. (Bull. A. I. M. E., Oct., 1912; 6¼ pp., illus.) 40c.

20,773 — CLASSIFICATION — Hydraulic Classification. G. A. Robertson. (South African Min. Journ. Anniversary Number, Sept., 1912; 1¾ pp.)

20,774 — CONCENTRATION — Some Problems of Ore Concentration—III. Edward S. Wiard. (Min. Sci., Oct. 10, 1912; 2 pp., illus.) The uses of Wilfley tables and similar types for sizes unsuited for jigging; analysis of the action of the grains; consideration concerning slime treatment. 20c.

20,775—CRUSHING PLANT and Sampling Mill of Reinforced Concrete. (Steptoe Valley Smelting & Mining Co.) K. E. Voorhees. (Eng. Rec., Sept. 14, 1912; ½ p., illus.) 20c.

20,776—FLOTATION—The Wood Flotation Process. Henry E. Wood. (Bull. A. I. M. E., Nov., 1912; 17½ pp., illus.)

20,777—JIG—Recent Jig Design. Roy Reddie. (Mines and Minerals, Oct., 1912; 1¼ pp., illus.) Form of jig containing improvements that give increased efficiency and capacity. 40c.

20,778—SLIME HANDLING—Mammoth Pneumatic Dredgers. B. Schneider. (Internat. Min. Journ., Sept. 1, 1912; 8 pp., illus.)

METALLURGY—GENERAL

20,779—ALLOYS—Etude des Proprietes Magnetiques des Alliages du Fer, du Cobalt, du Nickel et du Manganese avec le Bore. Binet. (Internat. Congress of Applied Chemistry, Sept., 1912; 6 pp.)

20,780—CHIMNEYS—Designing Brick and Steel Chimneys. Everard Brown. (Power, Oct. 8, 1912; 2 pp., illus.) 20c.

20,781—CORROSION—The Deterioration of Metals in Engineering Works. W. H. Maxwell. (Eng. Rev., Sept. 16, 1912; 3 pp.) 40c.

20,782—ELECTRIC SMELTING—Einiges ueber die Erzeugung von Metallen im elektrischen Ofen. Stephan. (Metall u. Erz, Oct. 8, 1912; 5½ pp.) Some notes on the reduction of metals in the electric furnace.

20,783 — PRODUCER GAS POWER, Notes on. H. F. Smith. (Journ. West. Soc. of Engrs., Sept., 1912; 22 pp., illus.)

20,784—PYROMETRY—La Thermometrie et la Pyrometrie Industrielles. Eugene Grandmougin. (Genie Civil, Sept. 14, 1912; 2½ pp., illus.) 40c.

20,785 — SMELTING — Fink Smelting Furnace for Copper, Lead and Zinc. Edward Fink. (Min. and Eng. Wld., Nov. 2, 1912; 4½ pp., illus.) 20c.

MINING AND METALLURGICAL MACHINERY

20,786—ELECTRIC FURNACE—Elektrischer Ofen fuer hohe Temperaturen. (Chem. Ztg., Oct. 29, 1912; ¼ p., illus.) Electric furnace for high temperatures for laboratory use. 40c.

20,787—ELECTRIC POWER for Utah and Idaho Mines. Warren Aikens. (Min. and Eng. Wld., Oct. 12 and 19, 1912; 8 pp., illus.) 40c.

20,788—ELECTRIC POWER—Production et Distribution de l'Energie Electrique aux Mines de Lens. P. Revel. (Bull. Soc. de l'Ind. Min., Sept., 1912; 22 pp., illus.)

20,789 — EXCAVATING — American Earthwork Machinery. No. VII. (Engineer, Oct. 4, 1912; 1¼ pp., illus.) 40c.

20,790 — FOUNDATIONS — Anwendung von Beton zu Maschinenfundamenten. (Zeit. des Vereines Deutsch. Ing., Sept. 21, 1912; 3½ pp., illus.) On the use of cement concrete for engine foundations.

20,791—FOUNDATIONS for Prospecting Machinery. Horace F. Lunt. (Eng. and Min. Journ., Nov. 16, 1912; ¾ p., illus.) 20c.

20,792—GAS-ENGINE POWER STATION—The Largest Suction Gas Engine Power Station in South Africa. (South African Min. Journ., Anniversary Number, Sept., 1912; 1½ pp., illus.) The power house of the Rooiberg Minerals Development Co.

20,793—GAS PRODUCER — Der Heller-Generator. (Oest. Zeit. f. B. u. H., Oct. 26, 1912; 2½ pp., illus.) The Heller gas producer. 40c.

20,794—HOIST—An Electric Hoist With Automatic Control at Auchencruive Colliery, England. Frank C. Perkins. (Min. and Sci. Press, Oct. 15, 1912; 2 pp. illus.) 20c.

20,795—HOISTING—Apparatus for Control of Over-Speeding and Over-Winding in Winding Engines. (Can. Min. Journ., Nov. 1, 1912; 7½ pp., illus.) 20c.

20,796—HOISTING—Safety Catches for Mine Cages. J. A. Vaughan. (South African Min. Journ., Anniversary Number, Sept., 1912; 5 pp.)

20,797—HOISTS—Electric Hoists in Headgears. S. E. Boult. (Journ. South African Inst. of Engrs., Sept., 1912; 3 pp., illus.) 80c.

20,798—LOCOMOTIVES—The "Otto" Petrol Locomotives for Mines. (Min. Eng., Oct., 1912; 1¼ pp.) 20c.

20,799—MOTORS—An Investigation of Explosion-Proof Motors. H. H. Clark. (U. S. Bureau of Mines, Bull. 46, 1912; 44 pp., illus.)

20,800—OIL ENGINES—Use of Crude Tar Oil in Diesel Engines. (Eng. Rev., Sept. 16, 1912; 2¾ pp., illus.) 40c.

20,801—PEAT PRODUCER-GAS POWER PLANT at the Government Fuel-Testing Station, Ottawa, Canada. B. F Haanel. (Journ. Am. Peat Soc., July, 1912; 5½ pp.)

20,802—TURBINE MACHINERY—Construction and Operation of Turbo-Blowers and Compressors. Franz zur Nedden. (Eng. Mag., Oct., 1912; 4½ pp., illus.) Fourth article of series, dealing with the practical operation of turbo blower and compressor plants. 40c.

SAMPLING AND ASSAYING

20,803—ALUMINUM AND BERYLLIUM—On the Detection and Separation of Aluminum and Beryllium by the Action of Amyl Alcohol on the Nitrates. Philip E. Browning and Simon B. Kuzirian. (Eighth International Congress of Applied Chemistry, Sept., 1912; 4 pp.)

20,804—CALCIUM GROUP—A Method for the Qualitative Analysis of the Calcium Group. Richard Edwin Lee and F L. Mickle. (Eighth International Congress of Applied Chemistry, Sept., 1912; 22 pp.)

20,805—CRUCIBLES—Assay of Graphite Crucibles. L. J. Wilmoth. (Mex Min. Journ., Nov., 1912; 1 p.) 20c.

20,806—FLUE GAS ANALYSIS—Determining SO_3 in Flue Gas. F. G. Hawley. (Eng. and Min. Journ., Nov. 23, 1912; 1½ pp.) 20c.

20,807—FUEL ANALYSIS—Dry Fusion with Alkalies and Subsequent Oxidation with Bromine. Irving C. Allen and T. W. Robertson. (Internat. Congress of Applied Chemistry, Sept., 1912; 7 pp.)

20,808—IRON—A Revision of the Atomic Weight of Iron. G. P. Baxter and C. R. Hoover. (Internat. Congress of Applied Chemistry, Sept., 1912; 16 pp., illus.)

20,809—MAGNESIA IN LIMESTONE—The Rapid Determination of Magnesia in Limestone by Means of the Hydrogen Electrode. Joel H. Hildegrand and Herbert S. Harned. (Eighth Internat. Congress of Applied Chemistry, Sept., 1912; 9 pp., illus.)

20,810 — MANGANESE — Determination of Manganese as Sulphate and by the Sodium Bismuthate Method. William Blum. (Journ. Am. Chem. Soc., Oct., 1912; 18½ pp.) 80c.

20,811—QUALITATIVE ANALYSIS—Cadmium Nitrate in Qualitative Analysis. Anton Vorisek. (Internat. Congress of Applied Chemistry, Sept., 1912; 12 pp.)

20,812—TANTALUM ELECTRODES—Tantalelektroden. O. Brunck. (Chem Ztg., Oct. 19, 1912; 1 p.) On the use of tantalum electrodes instead of platinum in laboratories. 40c.

20,813—TEMPERATURE CONTROL—The Control of Temperature in the Operations of Analytical Chemistry. Theodore W. Richards. (Eighth International Congress of Applied Chemistry, Sept., 1912; 6½ pp.)

20,814—TEMPERATURE MEASUREMENT—The Measurement of Temperature in the Operations of Analytical Chemistry. Theodore W. Richards. (Eighth International Congress of Applied Chemistry, Sept., 1912; 9½ pp.)

INDUSTRIAL CHEMISTRY

20,815—ACIDS—Problems in the Manufacture of Chemically Pure Acids. J. T. Baker. (Met. and Chem. Eng., Nov., 1912; 4¼ pp., illus.) 40c.

20,816—ATMOSPHERIC NITROGEN—Fixation of Nitrogen by Alumina and Carbon. S. A. Tucker and Henry L. Reed. (Met. and Chem. Eng., Nov., 1912; 1½ pp., illus.) Paper before Am. Electrochem. Soc., Sept., 1912. 40c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Applicants are requested to call in person.

James McNaughton, general manager of the Calumet & Hecla mines, is visiting New York.

N. H. Emmons has been appointed superintendent of the mines of the North Butte Mining Co., at Butte, Mont.

Thomas F. Cole has been elected president of the North Butte Mining Co., in place of Capt. James Hoatson, who has resigned.

L. B. Pressler has been appointed superintendent of the mines of the Ozark Mining & Smelting Co., at Magdalena, New Mexico.

S. H. Treloar has resigned the management of the Utah Metal Mining Co., of Bingham, Utah, and will engage in personal mining business.

A. F. Flynt has returned to the Zopilote and Purisima mines, in the Territory of Tepic, Mexico, after an extended absence in the United States.

Archibald Johnston, vice-president of the Bethlehem Steel Corporation, has returned from a business trip to Chile and other South American countries.

Robert Linton, who has recently been in Summit County, Colo., on professional work, is now engaged in examining some iron-ore properties in east Texas.

J. B. Tyrrell, of Toronto, Ont., left for a short visit to England, on Nov. 30. His address while there will be 224 Salisbury House, London, E. C., England.

Frederick D. Smith, recently manager of the Seven Devils Copper Co., at Landore, Idaho, has been appointed manager of the Snow Creek mine, at Greenhorn, Oregon.

William F. Carroll has resigned his position with the Compañia Metalurgica Mexicana, at San Luis Potosi, to accept a position with the Blaisdell Coscotitlan Syndicate, at Pachuca, Hidalgo, Mexico.

Howland Bancroft has been in Washington and Philadelphia and is now in New York for a week or 10 days, after which he will go to Boston. He expects to return to Denver about the holidays.

James M. McClave has been appointed consulting engineer for the Sutton, Steele & Steele Manufacturing, Milling & Mining Co. This company is now building a testing plant at Denver, to handle Western business.

Louis W. Groat, a mining engineer and promoter, of New York, has been declared insane by a jury, and has been committed to the Bloomingdale Asylum, at White Plains, N. Y. He was interested in Mexican and British Columbia mines.

B. Magnus, manager of the works of the Electrolytic Refining & Smelting Co., at Port Kembla, New South Wales, has been appointed general manager of the Mount Morgan Gold Mining Co., in Queensland. Mr. Magnus, says the *Australian Mining Standard*, though still a young man, has had a wide experience in the construction of similar works in the United States before coming to Australia under engagement to erect those of the Electrolytic Refining & Smelting Co. Prior to 1907, it had been the custom of the Mount Morgan company to ship its blister copper to the United States for treatment, but in that year it was decided to erect an electrolytic refinery in Australia, the result being the formation of the company, which has since been in operation in Port Kembla. Since then the Mount Morgan copper has gone through Mr. Magnus' hands at Port Kembla, and the work he has done there has given such complete satisfaction that it is not in the least surprising that he has been given full charge of the parent works at Mount Morgan. It is declared that it would have been impossible to have found a man who would give more entire satisfaction.

OBITUARY

William C. Litton died at Butte, Mont., Nov. 20. He was born in Missouri and went to Montana when a young man and engaged in mining work. For a number of years past he had been foreman at the Parrot mine, in Butte.

John Percival Jones died at Los Angeles, Calif., Nov. 27, aged 83 years. He was born in Herefordshire, England, in 1829, and came with his parents to the United States in infancy. He was educated at the public schools of Cleveland, Ohio. He went to California in the early days of the gold excitement, and was always proud of the fact that he was a "forty-niner." He engaged in mining with varying success, in California, and later in Nevada, where he was interested in mines on the Comstock Lode and elsewhere. In Nevada he was prominent in politics and in 1873 he was elected United States senator from that state. He was four times reëlected, holding his seat in the Senate for 30 years continuously. He became prominent in the Senate during the years of the silver excitement, and was one of the leading advocates of the free coinage of silver. On that issue he left the Republican party, to which he had been attached, in 1896. Later he returned to that party, explaining his course by saying that, while still a believer in bimetallism, the conditions had changed and the silver issue was dead. He was a delegate to the Brussels monetary conference during President Harrson's administration, and before that body he spoke for three days, the printed report of his speech containing more than 200,000 words. In 1903 he retired from the Senate and shortly afterward removed to California, where he had since lived, at Los Angeles, or at Santa Monica. Senator Jones saw many vicissitudes during his mining career and it was said of hm that he had made five fortunes and lost four of them, retaining the last.

Societies and Technical Schools

Rocky Mountain Club of New York—This club has moved to new and more spacious quarters, at No. 55 West Forty-fourth St., New York.

University of Pittsburgh—The students of the School of Mines have organized a mining society for the purpose of mutual assistance and discussion. Weekly meetings will be held, at each of which a paper on some mining topic will be read and discussed.

National Association of Cement Users—The ninth annual convention will be held in Pittsburgh, Dec. 10-14, inclusive; the sessions and headquarters of the convention will be held at the Fort Pitt Hotel. A large number of papers will be presented on the uses and applications of cement construction and on the manufacture and testing of cement and concrete. The meeting will be closed by a visit to the United States Government testing laboratories. The U. S. Bureau of Standards will afford the members an opportunity for inspecting the various methods in use for testing structural materials, especially cement and concrete. A reinforced-concrete column 30 in. in diameter and 16 ft. long will be tested to destruction in the recently completed ten-million-pound compression testing machine. The United States Bureau of Mines will give demonstrations in testing of fuels, explosives, mine-rescue work and other interesting matters.

Utah Society of Engineers—The regular monthly meeting was held on the evening of Nov. 15. A number of papers on hydro-electric plants and the undeveloped water power in Utah were presented. Prior to the reading of the papers a short business meeting was held, at which five new and six associate members were elected. The subjects treated were as follows: "Hydro-Electric Power Resources Tributary to Salt Lake City," by H. D. Randall, of the General Electric Co.; "Factors Determining Cost of Hydro-Electric Service," by Markham Cheever, of the Telluride Power Co.; "Continuity of Hydro-Electric Power Service," by Leonard Wilson, consulting engineer; "An Example of Modern Steam Relay Station," by C. A. Cohn, of the Utah Light & Railway Co.; and "An Example of Modern Transmission Practice," by L. J. Riter, of the Utah Light & Railway Co. The meeting was well attended there having been 84 present.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Nov. 27—A petition for temporary injunction has been filed in the superior court of Sacramento County to restrain the principal mines in Amador County from dumping mill tailings into the streams tributary to Dry Creek. The petitioners are Hugo and Martha Loss, owners of 160 acres of land on Dry Creek in the southern part of Sacramento County. The order, if granted, will be sought to be made permanent should sufficient evidence be adduced as to the destruction of the land as alleged. The mines affected by this suit are, in the order to their geographical situation from south to north, Zeila, Argonaut, Kennedy, Oneida, South Eureka, Central Eureka, Lincoln Consolidated, Little Amador, Bunker Hill and Fremont. These mines are on the central belt of the Mother Lode, extending from Jackson to Drytown. They are the most important operating mines on the Mother Lode. The temporary suspension of operation would be costly and disastrous. The permanent closing of the mines would wholly destroy the mining industry in Amador County, so far as present production is concerned, and seriously cripple the developing mines, which are largely dependent on the producing mines for continued development. There is no doubt that the permanent closing of the Mother Lode mines in Amador County would directly affect the mining industry in every district of the Mother Lode region in three other counties, Eldorado, Calaveras and Tuolumne, and extend into Mariposa. It is not improbable that such result would seriously affect the development of mining properties in other parts of California. The last season has been active in the reopening of old mines and the development of new claims in the Mother Lode region, and the outlook for future increased production and permanent operation has not been equaled is a number of years. There has been a good deal of complaint by the farmers on Dry Creek and tributary streams, and the mining companies have paid large sums for damages and endeavored in every way to prevent damage to the lands. The South Eureka and adjoining properties have completed and will have in operation in the beginning of December a ditch and flume construction designed for the special purpose of preventing the overflow of the waters of Dry Creek and its tributaries; but the preparation for this equipment seems not to have satisfied the plaintiffs in the action just undertaken in the superior court. The 160 acres of land which it is alleged to have destroyed by an overflow, is said to be an improved farm. Should the plaintiffs secure even a temporary injunction, other suits will be filed. It it probable, however, that the defendant mining companies will be able to show that the ditch and flume equipment, when in full operation, will be sufficient guarantee against further damage to the lands affected. Unless the mine owners may be protected against the threatened closing of the mines, the equipment for preventing overflow will not be continued in operation. In that case there is reason to expect that the farmers affected by the operation of the Mother Lode mines in Amador County will be in the same position that the farmers affected by the hydraulic mines were placed when hydraulic mining was curtailed by legislative action. The streams still overflow in the flood season, and will continue to overflow until safe and practical engineering plans shall be adopted, whether the mines are in operation or closed permanently.

Denver

Nov. 29—According to the official report just issued the Camp Bird mine at Ouray cannot continue producing much longer unless the work being done uncovers some unexpected ore. General Manager W. J. Cox says in an appendix to his report for the fiscal period ending June 30, 1912 that no ore of importance was disclosed, other than that developed within the area covered by the known oreshoots. The most important shoot of ore is in the stope, between the third level east and the fourth level east No. 2, and which will later be reached from the fifth level east No. 2, to be established 100 ft. deeper. He further states that in no other part of the mine does development work offer any encouragement to further advance the various headings and all work of this nature is confined to the territory tributary to shaft No. 3. The probability of early exhaustion of the Camp Bird has been recognized by the directors for several years, and they have accordingly cast about for other promising properties to develop with the result that the company is now interested in the Messina copper mine in the Transvaal, the Santa Gertrudis silver mine in the Pachuca district in Mexico, and it is now stated that negotiations have been opened for the acquisition of the Campo Morado mine in the state of Guerrero, Mexico.

The Montana mine purchased by the Tomboy company, of Colorado and London from the Revenue company of Ouray appears to have done well during the fiscal year ended June 30, 1912, as it supplied 21,702 tons of ore to the mill of an average grade of $10.50 and according to Manager Herron, the reserve of ore has been increased rather than decreased, since the purchase of the mine in 1911. The Tomboy company owning also the Argentine & Cincinnati made a working profit of $450,941 during the year.

Butte

Nov. 27—A windstorm, the most violent in many years, passed over the city of Great Falls and vicinity on the morning of Nov. 22 and inflicted such damage on the electric power lines that the Butte mines of the Anaconda company, and the concentrator of the Washoe smeltery at Anaconda were forced to suspend operations for several hours. During this time only one power line into Butte was in commission, that from the Big Hole River power plant. Many of the power line towers of the Great Falls plants were destroyed, but by at once placing a large number of men to repairing the damage, only one shift was lost in the Butte mines.

Thomas F. Cole, of Duluth, who was recently elected president of the North Butte Mining Co. stopped at Butte for a few hours Nov. 25, on his way from Utah to Duluth. Mr. Cole is interested in the Rainbow Lode Development Co., recently organized to operate a group of claims situated east of the Butte & Superior holdings. He made arrangements while in Butte to begin the work of sinking the shaft on one of the claims, the Third Sphinx, from which the group will be developed.

Salt Lake City

Nov. 28—The Utah Copper Co. declared its fourth quarterly dividend for the year Nov. 25, amounting to $1,182,412. The last dividend of 75c. per share was paid in October. Including the present dividend, the aggregate paid by this company amounts to $16,428,722. During September, 6,965,144 lb. copper was produced. The October production was 2,128,792 lb., the reduced output in these two months being due to the strike. During the first 10 months of the year, 85,396,607 lb. copper was produced.

If the Moffat road is completed from Colorado into Utah, as at present seems likely, undeveloped portions of the state, which are being held back by lack of railroad transportation, will be opened up. The Uinta Basin district in Wasatch County, in particular, will be benefited. This basin contains large deposits of hydro-carbons, mineral wax, rubber, and gilsonite, beside crude sand- or rock-asphalt. The gilsonite occurs in veins three feet and more in width, and has been opened to a depth of several hundred feet. On the cars at Price it is worth about $33 per ton. Mining cost ranges from $2 to $2.50 per ton. The known quantities of gilsonite at present developed are estimated to be worth about $7,000,000.

Cobalt

Nov. 30—By still further reducing the royalties, the provincial government has taken an important step affecting some of the Cobalt mines. The announcement has been made that arrangements are concluded between the directors of the Chambers-Ferland and the government, whereby the royalty has been canceled. It is provided, however, that in case any rich or valuable bodies of ore are discovered, and the company is able to make such net profit from its operations as will enable it to pay a dividend in excess of 10%, then after making allowance for the payment of this dividend, the government may require the company to pay a royalty not exceeding the royalty payable under the previous agreement. It is also understood that the government is considering the removal of the royalty on the Hargraves mine on the same conditions as those granted the Chambers-Ferland, and alterations are also to be made in the case of the O'Brien. In this last property, the royalty will be 15% instead of 25%. The Chambers-Ferland mine has been paying a royalty of 25% of its net profits to the government, but during the last year, the operations at the mine have not been more than sufficient to cover the operating expenses. The Hargraves and O'Brien are believed to be in a similar position to Chambers-Ferland. Action by the government is expected in these cases also. There are several other mines in Cobalt paying royalties, but it is not likely that they will be affected by the reduction. During 1911, the following mines paid royalties: O'Brien, $61,695; Hudson Bay, $57,962; Chambers-Ferland, $10,000, and Hargraves, $1200. Last year, the government collected a total of $246,529 in royalties, exclusive of those paid to the railway commission, while the total royalties paid to the government up to the end of last year amounted to $1,000,000.

Porcupine

Nov. 30—Little change has taken place place in the strike situation during the last week. The most noticeable improvement has been at the Hollinger, where a large number of the old employees went back to work. Men for the different mines are being recruited at various places and are being sent in on special trains, and on account of the large number of strikers who have left the camp, it will be necessary to recruit a heavy force. There has been some talk and considerable uneasiness over the probability of the Cobalt miners going on strike and still further complicating the situation. These fears, however, were proved to be groundless. When the matter was voted on the men decided not to go out by a vote of 10 to 1. At the Hollinger, over 18 machines are working and at the Dome, development has again been started in some of the workings.

Chihuahua

Nov. 22—During the last three weeks several productive mines in various parts of the state have perfected plans for the resumption of work immediately that security in the safe conduct of operations is assured. A number of important property transfers are also in abeyance for the same reason.

On Nov. 20, a band of 200 so called rebels visited the camp of Santa Eulalia, 15 miles from the city of Chihuahua, and robbed the merchants of several thousand dollars' worth of merchandise and some money, and caused the San Tov Mining Co. to pay several thousand dollars as ransom for A. N. Fink, the superintendent. After spending about 36 hr. in the town and about the mines, the band withdrew before the arrival of federal troops. Some of the engines and rolling stock of the Chihuahua-Potosi Mining Co.'s narrow-gage railroad were badly damaged, as was the track in several places. Now everything is quiet again and work is going on uninterruptedly, although there is some fear of a rebel revisitation. The Rio Tinto, Concheño and other camps lately looted have not been revisited, presumably on account of the stationing of federal or other troops at the properties with strict instructions to shoot to kill

It was anticipated that service over the National Rys. line between Chihuahua and El Paso would be reëstablished during the month, but this was prevented on account of the activities of the rebel bands in the northern part of the state. Several lately rebuilt bridges and trestles were reported destroyed a few days since and the telegraph lines have been out of commission most of the time. The progress of repairing the Mexico Northwestern Ry. from Madera north continues slow on account of the activity of small looting bands. The line between Chihuahua and Madera was also lately troubled by rebels and only irregular service is maintained. The National line south has not been lately interrupted, although marauding bands infest the settlements between Jimenez and Torreon. The Parral and Durango branches of the National are operative.

During the early days of the month it was feared that there might be trouble at Mapimi, Durango, on account of the disloyalty of the volunteers, but this possibility was immediately removed, by sending federal regulars to arrest and replace the Zapatista converts.

The Guanacevi camp was lately visited by rebels who looted the stores and forced the few working mines to temporarily suspend. In the mountain camps and particularly in places removed from railroads, there seems to be a concerted action on the part of robbing bands to respect no one and least of all Americans—from whom it may be possible to secure supplies and money either forcibly or otherwise.

The Chihuahua, Terrazas, Torreon, Asarco and Aguascalientes smelteries continue uninterrupted operations at almost normal capacity. The Chihuahua smeltery in particular has been fortunate in at no time during this year's troubles being obliged to suspend, and just now is operating at larger tonnage than ever.

The Calera Mining Co. is contemplating the renewal of shipping operations and may shortly adopt a new method for more economically handling the complex lead-zinc sulphides. The Cia. Minera de Oro Tres Hermanos in the Batopilas camp is conducting ore tests with a view of building a cyanide plant. It is reported that Paul Ginther and Canadian associates are to build a 200-ton cyanide plant in the Parral camp. They have acquired many properties in that camp during the last two years. The Arizona-Parral Mining Co. is planning on the early reworking of its El Tajo mine at Parral. The Siglo XX and Cerro de la Campaña mines at Naica are under development by Paul Ginther and associates. The activities in the Cusihuiriachic camp continue unabated. The following mines are regular producers: Promontorio, Princesa, San Juan, Durano, Escuadro, Cusi-Mexicana and Reina, while the Gran Potencia, Veta Grande, Chuza and a half dozen others are being actively developed. Several property transfers have lately been recorded and several others are pending.

New York men are making examinations of copper properties along the Orient Ry., east of Chihuahua. Some of these properties have a production record and others are even now small producers. An important gold-ore streak is reported at a depth of about 600 ft. in the Julietta mine, near Jimenez.

The Mining News

The Current History of Mining

Alaska

Cripple City, on Cripple Creek, the new town in the Innoko district, continues to grow. Many Iditarod men and some from Ruby are making their headquarters at Cripple City and will prospect the surrounding country this winter. To date the best discoveries so far made in the new camp are on Fox Creek, where gold was first found, although Cripple Creek also has some good showings.

Supplies are being furnished by the merchants of Fairbanks to the miners of Birch Creek and others of the Circle district who have volunteered to cut a trail from Twenty-Mile Creek, on the present Circle trail, up Birch Creek and over the divide to the Big Chena, thence down to Hot Springs, thus connecting the two routes and shortening the distance from Birch Creek to Fairbanks by 20 miles. An application has also been made for a post office at Chena Springs, and it is hoped that the post-office department will route the Circle City, Eagle and Dawson mails over the Chena road rather than the one now used.

Newsboy—The five-stamp mill for this property has been permanently installed on 11 above on Cleary Creek, and is crushing ore.

Rexall—Horton & Solomon, owners of this group, near Fairbanks, are building a two-stamp mill, and planning other developments.

Kenai-Alaska—The stamp mill at this mine, near Seward, has been closed for the season on account of the breaking of the traction cable of the aërial tramway, and from now on a crew of workmen will be doing development work until spring, when the cable will be replaced and work resumed.

Alaska Treadwell—During October, 77,924 tons of ore milled yielded $191,554 in gold and concentrate or $2.48 per ton at an estimated net profit of $101,050.

Arizona

Maricopa County

Lars Anderson has opened up a quantity of high-grade copper ore on his claims 14 miles west of Arlington; 40 or 50 claims have been located in this vicinity since the discovery of high-grade ore on the claims which belong to Mr. Anderson.

Red Rover—This mine north of Phœnix continues to ship high-grade silver and copper ore. A number of teams are hauling the ore from the mine to the railroad. Active development work has been started.

Max-Delta Mining Co.—At this property south of Phœnix, driving is in progress and sinking will not be resumed until a pump is installed. The shaft at present is 165 ft. in depth. W. S. Jennings, of Phœnix, is superintendent.

Kay Copper Co.—Shipments of ore have been discontinued pending the sinking of the shaft to a lower level. Ore has been encountered on the 300-ft. level and the drift has been driven for 20 or 30 ft. and good ore has been found.

Santa Cruz County

Rainbow—A. B. Richmond, of Tucson, formerly manager of the Mansfield Mining & Smelting Co., has offered to take over on bond this group of claims near Alto, owned by Michalski, Habenicht & Reichert. The ore contains copper and silver, and there are several veins on the claims.

California

Amador County

Keystone—An empty skip that had been lowered from the dumping chute in the headframe, but not securely held by the brake clutch, got away and descended to within about 30 ft. of the bottom of the shaft. The hoist is operated by steam. The engineer thinking the skip secured had gone to attend a boiler. He applied the brake gradually and lessened the speed of the runaway skip, which kept the track until within a few feet of the place at which it was stopped. Some damage was done to timbers, but the men working on the 1500-ft. level, warned by the noise, reached a place of safety in time to escape injury had the skip gone to the bottom.

Butte County

Gold Bank—Recent development has disclosed high-grade milling ore and about 500 tons has been blocked out. This ore is said to be detached from the main vein. This appears to corroborate the opinion that has been expressed by engineers that the orebodies in the Gold Bank are lenticular rather than in the form of detached veins. M. J. Cooney, of Forbestown, is manager.

Brown Bear Mining Co.—This is a new incorporation with $250,000 capital stock formed to operate in Butte County. The incorporators are C. B. Whitmoyer, Marvin Gary, J. W. Charge, James N. Crabb, of Chico and L. A. Snow, of Lovelock.

Calaveras County

Utica—Work is to be resumed after a temporary suspension, which was due in part to the fear that there might be a shortage of water. The recent snow in the higher elevations and rains in the foothill sections have dispelled anxiety regarding water supply. F. J. Martin, of Angels, is superintendent.

If-I-Can—This mine which was recently reopened by the Stanislaus Gravel & Development Co. has been closed down despite recent reports that the directors and other stockholders residing at Portersville in Tulare County had announced that sufficient capital was in hand for extensive development and operation.

Wagerman—A five-inch bore is being put down on the north end of this mine near Angels. The first test hole was sunk 400 ft. but was abandoned on account of caving. H. W. Kuns is manager.

Eldorado County

China Hill—A vein six feet wide has been cut in the tunnel about 200 ft. in from the portal and about 140 ft. below the surface. The mine is in the Placerville district, four miles southwest of El Dorado. China Hill Mining Co. is owner; W. H. Noy, of Alameda, president.

Landecker—The old deep blue channel has been cut in the 700-ft. bedrock tunnel about 2500 ft. east of the old workings. The gravel is in a blue formation and cemented. It is reported that the owners contemplate the installation of a gravel mill. Ideal Mining Co. is owner; S. O. Ames, of Los Angeles, president.

Queen Elizabeth—Sinking has been resumed at this mine, formerly the Nonpareil, near Virner. The shaft will be sunk to 60 ft. and a drift driven to tap the gravel. E. H. Callahan is superintendent.

Inyo County

Skidoo Mines Co.—During October 1152 tons of ore mined and milled yielded $15,551 in gold at a total cost of $5034.

Kern County

Yellow Aster—A new 500-ton ore bin is under construction at the southwest end of the glory hole. Twenty-five miners were added to the crew in November.

making a total of 225 men now employed.

King Solomon—Twenty tons of ore are on the dump at the Wickard-Drennen lease, extracted from the 85-ft. level. Driving to the northwest is in progress. The same vein of high-grade ore found in the Teagle-Lamberson lease has been disclosed in this drift.

Consolidated Mines Co.—A 52-ft. drift has been driven west from the shaft in the Good Hope on the 230-ft. level, disclosing the same quality of ore as found in the east drift. A crosscut is being driven from the main shaft north to the west drift to facilitate handling ore. Driving has been started in the 300-ft. level. Twenty-five tons of ore are on the dump. Twenty-two men are employed on the Good Hope. The Twin Brothers shaft has reached the 65-ft. level, and several tons of ore have been extracted.

MADERA COUNTY

Madera Consolidated—The stamp mill is being repaired, a new concrete collar is being built at the shaft, and unwatering the mine will be undertaken immediately. J. H. Lester, of Grubgulch, is superintendent.

Enterprise—Machinery for a new stamp mill is being delivered at this mine, near Ahwahnee. The mine was formerly a large producer. Lewis Johnson is manager.

NEVADA COUNTY

Prudential—The mine is operated under lease. Six stamps are dropping on good ore extracted from the 900-ft. level. A. P. Wilson, of Grass Valley, is superintendent.

PLACER COUNTY

Eldorado & Placer Gold Dredging Co.—The ground at Poverty bar is being prospected with Keystone drills. A maximum depth of 41 ft. has been drilled. The prospect shows much fine gold. The company is preparing to build a bucket elevator dredge. Alfred Tregidgo, of San Francisco, is manager.

SACRAMENTO COUNTY

Natomas Consolidated—The pit is dug for the laying of the hull of the new steel dredge to take the place of No. 7, a wooden dredge that has gone out of commission. The new boat will be all steel and will be equipped with 9-cu.ft. buckets to dig 58 ft. below water line. It is expected to complete the construction early in 1913. Paul E. Morse is general superintendent of construction for the Yuba Construction Co., the builder.

TRINITY COUNTY

Headlight—The mine has closed down for the winter season. The milling plant will probably be remodeled in the spring, owing to a change in the ore.

Colorado

SAN JUAN DISTRICT

The Smuggler company has 300 men on its payroll, including those at Blue Lake, the Bridal Veil Falls generating station, its mills and mines. An electric motor is being installed at Blue Lake in case water gets low during the winter, when the motor and pumps will raise the water to the pipe line used for generating power at the Bridal Veil station. The Liberty Bell is keeping its mill supplied with 500 tons of ore daily and paying dividends regularly. Work on the Tomboy terminals is going ahead, and it is expected that the tramway will be in operation by the first of the year. Fifteen men will be kept at work all winter on the Bear Creek mill of the Junta Consolidated Gold Mining & Milling Co., which will be finished next spring.

Although most of the high mines are closed in by snow, they are being worked, and when spring and summer comes there will be a big pile of ore ready for shipment. The chief producers will be Sunnyside, Iowa-Tiger, Gold King, Bagley Tunnel and Silver Lake, each employing from 10 to 20 men. Charles Gagner, manager of the Bagley Tunnel, has just finished this new mill and is ready to start the machinery. The Barstow mill, in the Red Mountain district (Ouray County), has closed down, owing to shortness of water, but the mine will be worked all winter under Manager Wilfley. The Highland Mary, near Howardsville, is being worked under the management of D. McLean and is producing rich ore.

Tomboy—During October, $86,000 in bullion and concentrates was recovered from 11,000 tons of ore, the net profit being $28,248.

TELLER COUNTY—CRIPPLE CREEK

The flow from the portal of the deep drainage tunnel is 9060 gal. per min. and the general recession in the deep shafts of the district is from three to five inches per day. Total recession in the Elkton shaft is 220 ft., in the Mary McKinney 217 ft.; the El Paso shaft at 1100 ft. is making 500 gal. per minute.

El Paso—The holdings of James F. Burns, amounting to 83,000 shares, have been bought by President Allen F. Burris, Vice-President Charles M. Heberton and others owning the control of the mine. The stock was bought for the European interests, which last summer began to acquire control of El Paso.

Doctor Jack Pot—The deep drainage tunnel has enabled this company to sink its main shaft another hundred feet, giving it the ninth level and 300 ft. of stoping ground on the several producing veins. Net profits for the first nine months of 1912 are $5850. This would have been larger but for the apex suit being carried on by this company against the Work Mining & Milling Co., which is now in the U. S. Supreme Court. Ten sets of lessees are working and cash in treasury including ore in transit is $23,395.

Idaho

BONNER COUNTY

Idaho Continental—The road work has progressed as far as the river at Port Hill and will be completed within a few days. Machinery for the new mill has begun to arrive.

BOISE COUNTY

Banner—Work has been suspended for the winter.

Idaho City—Both dredges continue to run profitably.

National Development Co.—A successful run has been made in the new mill and the company is considering the installation of a larger plant next spring.

Boston-Idaho Co.—This company recently acquired the Gold Hill & Iowa Mines Co. and has bonded adjoining property. About 30 men are employed in doing development work. The Gold Hill vein has been found on the 500 level and work is progressing in both directions. E. E. Carter is manager.

COEUR D'ALENE DISTRICT

Green Hill-Cleveland Mining Co.—A reader corrects the statement made in these columns in the JOURNAL of Oct. 26, 1912, in which it was said that the Green Hill claim holds a continuation of the Mammoth vein. The Green Hill claim is northwest of the Mammoth and the vein all the way through the Standard and Mammoth claims runs a little south of west on a general easterly and westerly strike.

IDAHO COUNTY

Jumbo—Operations are being concentrated on the No. 4 level on which a large shoot of milling ore is opened. Five more stamps are being put into commission.

NEZ PERCE COUNTY

Having secured a favorable decision from the land office in the contest filed against 140 acres of Quartz Creek placer ground, W. J. Harris, of Spokane, plans to install a $50,000 dredge and operate on an extensive scale.

SHOSHONE COUNTY

Burlington—A second shift has been put to work in the crosscut, which will be driven 80 ft. further to cut the vein.

Empire Milling & Developing Co.—This company has acquired the King, and Wonder groups on Pine Creek. Ore is being shipped from the King.

Yankee Boy—The first shipment of ore from the lower level has been made by Sidney Shonts, lessee.

Carey Copper Co.—A shoot of galena has been found in the lower tunnel.

Michigan

COPPER

Ahmeek—This company is trying mules underground as an experiment in underground haulage.

Old Colony—No. 18 drill hole has been completed at a depth of about 1725 ft., having reached the basal conglomerate. At the place where the Mayflower lode was intercepted the formation was badly broken and the core showed but a small amount of it. This outfit will be moved to the site of No. 20 hole, which will be about 900 ft. to the east of the No. 18.

Hancock—This company's shaft is bottomed at a depth of 4000 ft. and attention is being given to openings preparatory to putting the property on a producing basis. Crosscuts will be run from the 29th, 33d, 36th and 39th levels, and at the bottom a large station will be cut and equipped with an electrical hoisting equipment to work the Pewabic lode at a greater depth. During the opening of the shaft three other formations were revealed, besides the objective Pewabic lode, and each gives promise of becoming profitable. From the Nos. 2 and 3 lodes a large tonnage was sent to the Allouez-Centennial mill, which yielded an average of 18¼ lb. copper per ton. The No. 4 lode, which was cut by the shaft at a depth of about 3100 ft., was about 19 ft. wide and well mineralized. Arrangements have been made so that all future expenditures will be taken care of without the necessity of calling an assessment, so that the company will not be handicapped by lack of funds and the work can go forward without interruption and the property be put on a producing basis. Arrangements have been made to use one of the heads of the Lake Milling, Smelting & Refining Co.'s mill.

IRON

American—Shipments continue to the Canadian Soo, where the American ore is mixed with Canadian ores at the furnaces. The route is by the Duluth, South Shore & Atlantic Ry.

Empire—This mine, of Oglebay, Norton & Co., has been closed for the season. About 35,000 tons were shipped. The mine will be kept pumped out during the winter.

Richmond—This mine, of M. A. Hanna & Co., will be equipped with a new crushing plant, so that by using two gyratory crushers of different size, the ore will be crushed finer.

Peninsula Power Co.—This Menominee Range power company is either supplying electrical power or will, in the near future, to the following mines in the Iron River District: Davidson, Wickwire, Cortland, Bengal and Bates. At Commonwealth, Wis., it will supply power to the Ernst mine, of the Florence Iron Co. The policy of using electrical power for mine air compressors has made possible the sale of several electrically driven compressors; most of these have been sold by the Ingersoll-Rand Co.

Chapin—At this big mine of the Steel Corporation, at Iron Mountain, much trouble has been experienced by excessive flows of water underground, making it necessary to build stone and concrete bulkheads in some drifts. Recently a "vug" was tapped on the 16th level of the Hamilton shaft, and the 15th and 16th levels began to flood. All the men were ordered to surface for 36 hours until the danger had abated.

Oliver Iron Mining Co.—The diamond-drill exploration, west of Republic, on the lands of the Michigan Iron & Land Co., is steadily working westward around Fence Lake and Net Lake. Net Lake is several miles north of Amasa, and the drilling apparatus was shipped by that route.

Imperial—The pumps have been started to unwater this mine at Michigamme. The new steel headframe is partially erected. The change-house has been enlarged to accommodate 200 men. The shaft will be repaired and the coal dock will be lengthened. Everything will probably be in readiness to start mining by January.

Spring Valley Iron Co.—Men of this company, operating the Zimmerman mine at Palatka, have taken an option on 80 acres of the McKenna lands on the Menominee range just east of the village of Quinnesec. Diamond drilling will be started soon. The Quinnesec mine of Corrigan, McKinney & Co., about ½ mile to the east, has shipped 625,000 tons of ore since 1878, most of which was low grade. The McKenna land is in Sec. 2, 39-30. A company will be formed to explore the property.

Missouri

JOPLIN DISTRICT

Much work is being done on both sides of Ben's Branch, between Webb City and Carterville. Most of the land is owned by the Center Creek Mining Co. and has been mined to a large extent. At present the work being done is in the nature of prospecting, small steam and horse hoists being used. Ore is being hoisted from 12 shafts and is cleaned on hand jigs or is sent to custom mills. Little equipment or capital is required and small deposits are worked out that a large company could not handle economically.

Minor Heir-Sunrise—Articles of incorporation have just been filed for this company capitalized for $20,000 in $1 shares. The company is operating the Sunrise mine near Spring City.

Granby—Shaft sinking has been started on Sec. 36, Newton County. The land has just been prospected with churn drills and ore was encountered from 135 to 170 ft. The land is in virgin territory. Two drill rigs are yet in operation.

Mercantile Metal Milling Co.—This company, one of the largest operating in the district, has purchased a 140-acre tract of mineral land west of Sarcoxie for $15,000. The Reo Mining Co., of Carthage, has a lease on 20 acres of the tract and is now erecting a 125-ton mill.

Osceola—This mill, in the north Webb City sheet-ground district, is to be opened by the Mercantile people. The old plant is to be overhauled and the capacity increased.

Chicago-Lehigh—This company's new mill, on the Knight land at Carl Junction, is now in operation. About four

B. L. Van Hoose—This mine recently made its initial shipment. However, it will be some time before the plant will be running full capacity as the mill was erected before any drifts were opened.

Vantage—This mill has been started by the Minor Heir-Vantage Mining Co. on the old Silver-Dick ground, north of Webb City. The operators are cleaning up the ground preparatory to working it with a steam shovel.

Montana

BUTTE DISTRICT

North Butte—President T. F. Cole, during his recent stay in Butte, made an inspection of the Speculator mine. Some excellent orebodies have been opened on the lower levels in the last few months. The Gem vein, which was recently opened on the 2800-ft. level, disclosed a body of 5% copper ore. On the 2600-ft. level the Adirondack vein was cut a short time ago, the ore averaging about 10% copper for a width of four feet. The veins are steadily increasing in width and value as depth is attained below the comparatively barren zone between the 1800- and 2200-ft. levels.

Butte-Duluth Mining Co.—Capt. A. B. Wolvin, president of the Butte & Superior Mining Co., who recently bonded the Brundy group of claims adjoining the Bullwhacker mine on the southeast, has begun active development work on the property. The Butte-Duluth company has been organized to operate the group, which consists of the Macarona, Montgomery, and portions of the Altoona, Colleen Bawn and Amazon claims. On the Montgomery the old shaft has been cleaned out and retimbered to the 80-ft. level. An electrically operated, single-drum, Nordberg 75-hp. hoist, having a capacity for sinking to a depth of 1000 ft., has been installed, as well as a Nordberg air compressor capable of compressing 750 cu.ft. of air per min. As soon as the 100-ft. level is reached a crosscut will be driven east to the center of the vein, which is a continuation of the Bullwhacker, and the ore will be mined through glory-holes as in the Bullwhacker. A large dump has been sampled and found to assay between 1 and 2% copper, which the company is planning to recover by leaching by a process similar in many respects to that shortly to be put in use at the Bullwhacker mine. On the Macarona claim to the east a second fault fissure, paralleling the Bullwhacker-Montgomery enrichment zone, and apparently of the same fault series, has been traced for a distance of several hundred feet across portions of the Macarona, Altoona and Amazon claims by numerous open cuts and tunnels. The ore is of the same general nature as that found in the Montgomery, consisting of impregnations of the crushed and decomposed granite zone. The surface consists of the fractured rock coated with copper in the form of chrysacolla, cuprite and carbonates, assaying from 2 to 5% copper. No definite width of the enriched area has been established, but in many places the overburden has been stripped, exposing a large tonnage of the low-grade material. Excavation is well underway on the Macarona claim for the new leaching plant, which the management hopes to be ready within two or three months.

Deer Lodge County

Southern Cross—About 50 men are now employed at this property of the Anaconda company in the Georgetown district, and it is believed that ore shipments over the newly completed railroad from Anaconda to the mine, will begin some time next February. The work of retimbering and changing the shaft from two to three compartments, has been nearly finished, and soon the work of sinking an additional 200 ft. will be started. A new engine house will be completed in a short time, and an electrically operated hoist will then be installed. Much of the new equipment has arrived, and preparations are being made to build ore bins and a transformer building. A large amount of development work has been done in the mine in the last few months and considerable ore has been blocked out in addition to the reserve of low-grade ore which had been opened previous to the time that the Anaconda company took over the property.

Madison County

Blowout—This property, in the Rochester district, recently acquired by the Corbin Copper Co., is rapidly being prepared for mining operations. The old shaft has been cleaned out to the 100-ft. level, and the work of sinking an additional 200 ft. is progressing. At the 300-ft. level, crosscutting to the veins will be started. R. M. Edwards, president of the company, recently made an inspection of the mine.

Nevada

Clark County

Yellow Pine—The September report shows a net profit of $28,000 more during the month. The fifth dividend for the year, totaling $19,000, was declared Nov. 25, which brings the total dividends for the year above $100,000. Ore reserve for at least one year is blocked out, and recent development work has encountered new orebodies, which as yet have not been explored. A Temple-Ingersoll drill has been purchased by the company for use in development work; 70 men are at work.

Columbia—The new gasoline hoist has arrived and is being installed. Considerable copper carbonate has been encountered in the old shaft, and shipments are to commence at once, one car being now ready. B. F. Hickman is superintendent.

Santa Clara—This property, which adjoins the Anchor on the north, is under lease and bond to Mays & Cornielson, of Goldfield, who will put a force of men at work on development immediately.

Eureka County

The Southern Pacific railroad company is making preliminary surveys with the view of connecting the old Central Pacific line at Palisade with the Southern Pacific line in California. This will reduce the distance between southern California and Eastern markets 500 miles, and the projected line may tap the Eureka mining district. This would solve the transportation problem of the Richmond-Eureka mine which is owned by the United States Smelting, Refining & Mining Co. This line would be broad gage and transport the ores direct from the mine to the smelting plant at Midvale, Utah. There appears to be no other way of getting an outlet for these ores, as the Eureka-Palisade narrow-gage road insists upon rates that make it impossible to ship this low-grade product.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Nov. 23, are as follows:

Mines	Week	Year to Date
Tonopah Mining....	3,050	157,519
Tonopah Belmont....	3,525	117,894
Montana-Tonopah.	1,044	48,146
Tonopah Extension	1,050	47,363
West End	950	36,227
Midway		820
MacNamara	490	17,739
North Star	45	401
Mizpah Extension...		40
Jim Butler	300	4,400
Tonopah Merger	100	100
Totals	10,554	430,649
Estimated value	$263,850	

The purchase of the Little Tonopah company's property of 21 claims for $250,000 in cash has been completed by the Tonopah Mines Corporation, a syndicate composed of John G. Kirchen, Key Pittman, of Tonopah, and Seeley W. Mudd and Frank A. Keith, of Los Angeles. A shaft will be sunk to a depth of 1000 ft., 1200 ft. northwest of the Tonopah Merger shaft.

Tonopah Merger Extension Mining Co.—This company, owning 12 claims adjoining a part of the Tonopah-Merger property, will sink a shaft to a depth of 1000 ft. This property is controlled by Frank Keller, Frank and Clarence Berry, of San Francisco.

Railroad Valley Saline Co.—This company is sinking a string of holes across the south end of the Railroad Valley potash field; one hole in each square mile. Empire drills are used, which give a 6-in. bore. This work is being done to ascertain the best place to sink a deep hole. The district is 75 miles from Ely and 125 miles from Tonopah.

Tonopah-Belmont—This company has declared its usual quarterly dividend of 25c. per share, amounting to $375,000, payable Jan. 1, 1913. This is the ninth consecutive dividend of this amount paid by the company.

Montana-Tonopah—This company has declared a dividend of 10c. per share, payable Dec. 20, on issued capital of 998,115 shares, this being the second dividend of this amount paid this year, the previous one having been distributed in June. The company is now letting contracts for a 300-ton mill on the Commonwealth mine, in Arizona, which it controls.

Tonopah Merger—This company is now making regular shipments of 50 tons of ore every other day to the old Belmont mill. As stopes are opened the output will be increased.

Tonopah Extension—The new shaft, 1200 ft. west of the present working shaft, is now down 775 ft. and cutting stringers of rich ore.

White Pine County

Boston-Ely—A few miners are at work on this property crosscutting on the 1200-ft. level. Some of the ground is very hard.

Veteran—This property is producing at about half capacity.

Giroux—Henry Krumb, consulting engineer for the Inspiration company, is examining the property of the Copper Mines Co., in conjunction with Mr. Sales, the Giroux company's engineer. President T. F. Cole was recently in the district and inspected the Copper Mines property, which, with the water rights in Steptoe Valley that it controls, may be taken over by the Giroux.

Nevada Consolidated—A deep churn-drill hole is being sunk from the next to the lowest bench in Eureka pit to test the primary ore. The smeltery is running at normal capacity.

Oregon

Baker County

All the poles for the power-transmission line from Bourne to the dredge below Sumpter have been set and the wires are now being strung. Power will be furnished by the Eastern Oregon Light & Power Company.

Blue Mountain Mining Co.—C. L. Arzeno, president of the company, reports that the Psyche 20-stamp mill in the Greenhorn district has been purchased and will be moved to the Last Chance mine. The Psyche has been idle for some time.

Molly Gibson Gold Mining & Milling Co.—W. J. Evans, manager, reports he has all supplies that will be needed during winter and that a good force of men is at work.

Gem—This mine, in the Sparta district, is being unwatered. The pumps are lowering water 10 to 15 ft. per day. There is a modern 10-stamp mill and power machinery.

Rainbow—United States Smelting, Refining & Mining Co., which purchased this mine two years ago, has started the mill; 100 miners are at work. There is ore blocked out to keep the mill running for several years. Power is furnished from the Swan Falls electric plant, which is owned by the company.

Texas

Brazoria County

Freeport Sulphur Co.—The first production of sulphur at Bryan Heights was made on Nov. 19. Superheated water was pumped into one well at 9:30 a.m. on Nov. 18; at 8 a.m. the next morning compressed air was turned in and the well produced for 30 min. and then at intervals until Nov. 20. In a total period of 15 hr., an output 200 tons of sulphur was obtained. Production was then discontinued pending the completion of some alterations such as are incident to starting up any new plant, after which operations were to be resumed.

Utah

Juab County

Iron Blosson—Preparations are being made for sinking a winze from the 600-ft. level of the No. 3 workings. This will prospect the northern end of the property at depth, and driving and crosscutting will be done. The annual meeting will be held at Provo Dec. 7.

Dragon Consolidated—Copper ore is being followed on the 700-ft. level of the No. 1 workings. About 125 tons of iron ore is being shipped daily.

Black Jack—The north drift on the 300 level is within 250 ft. of the surface cropping, which is its objective point.

Salt Lake County

New Utah-Bingham—The Utah-Bingham has been reorganized under this name. The property adjoins the Telegraph mine, and consists of 150 acres. Development so far has been by means of an 1100-ft. tunnel, and a 150-ft. shaft, from which driving and crosscutting have been done. Active development is to be undertaken, and the ore-bearing limestone further prospected. Most of the stock is held in Europe.

Alta Consolidated—Good ore is being developed on a level with the bottom of the Brooklyn shaft. This has been driven on for 15 ft., and crosscut for 11 ft., with the work still in ore. The company is making regular shipments.

Summit County

Park City shipments for the week ended Nov. 23 amounted to 3,215,950 lb. The shippers were the Silver King Coalition, Daly-Judge, Daly West, and Silver King Consolidated.

Thompson Quincy—Raising has been done several hundred feet above the 1200 level of the Daly West. There has been considerable difficulty with water. Driving is being done from the 900-ft. level of the Daly West to cut the main raise. This work will do away with water difficulties, and afford better ventilation.

Silver King Consolidated—A shipment of high-grade galena and carbonate ore has been made from new workings below the 1550 level.

Daly West—The new 1000-ft. pipe line connecting the mill with the water supply is finished, and the mill is treating 200 to 300 tons of ore daily.

McKinley & Roosevelt—Work has been resumed at this property, which consists of nine claims, near the Ontario, St. Louis, East Ontario, and American Flag. A shaft is being sunk in hitherto unprospected ground.

Tooele County

Honorine—Lessees are mining and making regular shipments.

Bullion Coalition—Excess water from the Honorine drain tunnel is being used to irrigate farm land owned by this company, at the mouth of the tunnel.

Ben Harrison—Lessees shipped 11 cars of ore of medium grade in October. November shipments thus far amount to four cars. Most of the ore is coming from development work.

Galena King—The Tintic Leasing Co. has sold to the company its leasing rights, which have still another year to run. One car of ore is ready for shipment.

Utah County-Santaquin District

Santaquin Chief—Ore has been followed to the 210-ft. level in the western end of the property.

Union Chief—Sixty tons of ore were shipped recently from the upper workings. During September over 200 tons were shipped. The October shipments were less on account of the roads being blocked with snow.

Santaquin King—A new road is being built to this property. Ore has been followed to a depth of over 130 ft., from which shipments will be made in the near future. This ore carries a large excess of iron, and is a desirable fluxing ore.

Washington

Ferry County

Anaconda Gold—As soon as the 80-hp. oil engine is installed, operations at this property, near Republic, will be increased. A new compressor has been in stalled and is ready for work.

Ben Hur—Operation of this mine has been resumed, and the monthly ore production is running from $20,000 to $24,000. This property is being operated by Doctor Kingston and associates, of Republic.

Stevens County

Bonanza—Some fine ore has been encountered at this mine, near Bossburg, and operations are to be resumed.

Bornite—While working in the main tunnel on this property, in the Newburg district, ore assaying about $6 per ton was uncovered. The work is in charge of Frederick Shilling, and improvements are planned.

United Copper—The fourth consecutive monthly dividend of $10,000 was paid Nov. 20. The net total output for last month was $26,000.

Amazon—The crosscut tunnel has just cut a second vein carrying high-grade milling ore.

Copper Cliff—Work has been resumed on the No. 2 crosscut tunnel under the direction of Thomas Wilson.

Wisconsin

Platteville District

Furnace Drilling Co.—David Gardner, Sr., and associates, have begun drilling on the Straw land, within the city limits of Platteville.

Klar-Piquette—Two Keystone drills, at work on the Hellmer and Heffernan farms, south of Platteville, have struck rich jack ground.

Preston Point—W. N. Tiffany has taken an option on the mine and milling plant at Potosi.

Frontier—This company has struck the range on the Grotkin land, and has taken over the Hoffman lease.

Shamrock—Goldsworthy & Heffren are building a milling plant on the old Peni range, at Mifflin.

Platteville-Linden—Pollard & Harker have secured control of this property and will reopen the mine at Linden.

Murray—A. L. Utt has commenced drilling this lease, just east of the Jarrett mine, near Cuba City.

Wisconsin Separating Co.—This company has obtained a lease on the Lyght mine, south of Platteville; the Hodge and Trego mines, at Platteville, and the Fever River, at Cuba City, have recently been acquired and will be operated to supply separator ore to the roasting plant, at Benton.

Wyoming

It is reported that a seven-year contract, which involves the sale of fuel oil to the extent of more than $5,000,000, has just been closed by the Midwest Oil Co., with the Chicago & Northwestern R.R. From now on the only fuel to be used on this road, west of the Missouri River and on one division east of the river, will be Wyoming oil. The deal was closed during a recent visit to Chicago by Carl Schuyler, general counsel for the Midwest company, and R. D. Brooks, of Denver, general manager. The contract stipulates a sliding scale on the delivery of the oil, by which the railroad company will take from 1500 to 3500 bbl. of oil per day from the Midwest company, at Casper.

Canada

BRITISH COLUMBIA

Society Girl—Fourteen inches of fairly clean galena is reported to have been struck on this mine, near Ymir. Driving has disclosed a vein about two feet wide.

Hedley Gold Mining Co.—A settlement at the rate of $50 per ton is reported to have been received on a carload of ore, shipped by Buffer & Rice, lessees, from the Nickel Plate mine, at Rossland.

Granby Consolidated—During October 112,397 tons of ore was shipped from the mines, the average daily shipment being 3875 tons. In development work, 390 ft. of raising, 668 ft. of driving, 132 ft. of sinking and 1217 ft. of diamond drilling was done. At the smelting 763 tons of ore was received; 112,247 tons of Granby and 1213 tons of foreign ores were smelted.

NOVA SCOTIA

Nova Scotia Steel & Coal Co.—The entire iron-ore tonnage for next year has been sold at a satisfactory price. In addition to supplying their own furnace requirements, the company has been annually selling about 200,000 tons of its Newfoundland ore to the United States and about the same amount to British and German purchasers.

ONTARIO

Ophir—At this mine, in the Lake of the Woods district, a vein 8 ft. wide, situated nearly half a mile from the shaft, has been uncovered for about 50 ft., much of it showing visible gold.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Nov. 22, and for the year to date, were:

Bailey....		21.57
Beaver....		363.75
Buffalo		989.50
Casey Cobalt		255.15
Chamb.-Ferland		427.83
City of Cobalt		914.99
Cobalt Lake		860.88
Cobalt Townsite	62.50	1,729.02
Colonial		63.14
Coniagas		1,874.33
Crown Reserve		417.82
Dominion Reduction Co		56.64
Drummond...........		383.05
Hudson Bay		631.20
Kerr Lake..	30.83	743.05
La Rose..	33.05	3,231.09
Lost & Found	.....	27.80
McKinley-Darragh	43.55	2,350.99
Nipissing		1,735.62
O'Brien..........		325.43
Penn.-Canadian		97.90
Provincial......		22.22
Right of Way	...	242.82
Seneca Superior	47.10	195.63
Timiskaming....	.....	884.56
Trethewey		504.89
Wettlaufer.		406.96
Totals..	217.03	19,757.83

The Trout Lake smeltery, which was originally built for smelting Cobalt ores, has been purchased by men identified with the Island Smelting Co., of Toronto.

Provincial—An effort is being made to have the 10% royalty to the government reduced.

McChesney-Perkins—On these claims in the Wigwam Lake district of the Gowganda camp, the finding of a good vein from four to eight in. wide, showing native silver, is reported.

La Rose—The statement of earnings for October shows a total income of $161,399; expenses, $64,307, and net profit $97,092. In the first ten months of the year 2,272,584 oz. of silver was produced, the income being $1,433.080, the expenses $655,784 and the net profit $777,296. The cash surplus was $1,328,293, which with amounts of outstanding shipments, etc., makes a total surplus of $1,658,881. The company has made another five-year contract for the treatment of low-grade ore at the Northern Customs concentrator, calling for the delivery of 100 tons per day.

ONTARIO—PORCUPINE

Cartwright—This company, in Beattie township, will build a small milling plant. The shaft is down 40 ft. and rich ore is being cut.

Little Pet—Arrangements are being made to have this property reopened.

Crown Chartered—The directors announce the finding of a vein 18 to 24 in. wide, showing abundant free gold, on the North Davidson claims. It has been stripped for 30 feet.

Jupiter—Development on the 300-ft. level has encountered pay ore. More drills will be put to work.

Hudson Bay—This Cobalt company is seeking to acquire properties in Porcupine. Manager A. H. Brown is sampling the Maidens claims in Deloro township, with a view to taking an option.

Mexico

SONORA

Democrata—Delays in the arrival of supplies have caused a postponement of the blowing in of the new smeltery, which has a capacity of 250 tons of ore per day. The new electric hoist at the mine is about ready for use. Underground work consists principally of retimbering some of the main drifts and preparing the mine for steady production. When operating at full capacity between 450 and 550 tons monthly.

Sante Fé—This placer property, in the Altar district, is reported to have been sold to Americans; it was owned by Emilio Gonzales, of Nogales, and associates.

El Pilar—This mine, near Santa Cruz, has 400 tons of ore at the railroad ready for shipment to the Cananea smeltery. A. O. Koppes is in charge.

Mexican Metals Co.—The property of this company is being operated regularly, and the 100-ton mill is turning out rich concentrates. The mill is to be enlarged.

Abundancia—Charles Schandelmier has a lease on this property, also known as the West Cananea. Shipments are being made to the Cananea smeltery; 20 to 26 men are employed.

Superior-Bonanza—At this mine, six miles west of Imuris, the tunnel which will be used to haul ore to the proposed railroad and as a drain for the shafts is nearly completed. During October 266 ft. of tunnel was driven. The total length will be 1400 feet.

Maria—This mine adjoins the Chispas mine of the Minas Pedrazzini company. Work will soon be resumed by R. B. Phillips, manager, after five or six months of inactivity.

Transvaal—A small force of men is at work at this mine, near Cumpas. H. C. Beauchamp is in charge.

Las Animas—The management of this property, at San Xavier, is planning to put the leaching plant in operating condition. The property is producing regularly, shipping high-grade ore and silver bullion to the El Paso smeltery.

Spain

According to a cable dispatch to the New York *Sun*, an alluvial gold field has been discovered in the province of Leon, in the northwest of Spain, and prospecting is being conducted by a syndicate in which Eugene de Sabla and Ernest Wiltsee represent American interests. The syndicate is buying up land in the vicinity of the discovery.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Dec. 4—The situation in the West is improving a little, the close of the Lake trade having released more cars for general work. The Seaboard bituminous trade is also easier, supplies of coal being on a larger scale, especially from West Virginia. Anthracite supplies are also coming out more freely. The collieries have been working steadily and less coal is going West. The continued mild weather has eased up the immediate demand, and there is less pressure for deliveries.

Russian Coal—Coal output in Russia, six months ended June 30, metric tons:

	1911	1912	Changes
Anthracite........	1,277,000	1,617,000	I. 340,000
Bituminous	11,108,000	12,347,000	I. 1,239,000
Lignite.....	64,000	77,000	I. 13,000
Total...........	12,449,000	14,041,000	I. 1,592,000

Coke made this year was 1,829,000 tons; briquettes, 59,000 tons. The figures do not include the Siberian mines.

German Coal Production—Coal production of German Empire, nine months ended Sept. 30, metric tons:

	1911	1912	Changes
Coal	119,791,173	131,301,978	I. 11,510,805
Brown coal .. .	53,352,999	59,712,668	I. 6,359,669
Total mined ..	173,144,172	191,014,646	I. 17,870,474
Coke made ...	18,726,549	21,187,617	I. 2,461,068
Briquettes m'de	16,023,883	17,918,209	I. 1,894,326

Of the briquettes reported this year 13,971,271 tons were made from brown coal or lignite.

Austrian Coal Production—Coal production in Austria, nine months ended Sept. 30, metric tons:

	1911	1912	Changes
Coal	10,775,397	11,656,476	I 881,079
Brown coal .	18,710,953	19,490,252	I. 779,299
Total	29,486,350	31,146,728	I. 1,660,378

Coke made this year was 1,716,143 tons; briquettes made, 296,208 tons, of which 175,353 tons were made from brown coal or lignite.

IRON TRADE REVIEW

New York, Dec. 4—Not much change is to be reported in the general position of the iron and steel trades, and no special advances in quotations are noted.

There has been an increase in inquiry for finished steel products on contract for the second half of the new year, following the lull in interest noted last week. This is now attributed in some quarters to the impending holiday, though why that should be the case is not clear. Despite the reported improvement, it is probably true that forward business in steel products is materially less in volume than it was 30 or 60 days ago. The mills state that they are endeavoring to discourage buyers from contracting so far ahead, but are accepting contracts occasionally for third quarter in certain products, particularly bars, plates and shapes. In other cases they have accepted business for specifications not later than June 30 which will involve delivery in third quarter. The mills are now so far behind in deliveries, having an average of nearly three months of output specified on books, that they do not expect to be caught up by July 1 if demand and general conditions continue good.

The pressure upon mills for deliveries continues heavy, and specifications currently being received, while below the average of 30 or 60 days ago, are up to the average of the past five or six months. This means that they continue to exceed the current shipments.

In the pig-iron market the demand for foundry iron has eased off a little, though there is still much inquiry for future deliveries. Basic is being taken freely and orders for this grade are large. Prices are firmly held and furnaces are not making concessions. Coke is in a little better supply.

Testing Steel Rails—The Rail Committee of the American Railway Engineering Association is utilizing the 800,000-lb. Riehle machine in the Fritz Engineering Laboratory, at Lehigh University, South Bethlehem, Penn., for important tests of rails, as a part of the research work undertaken jointly by the railroads and steel manufacturers. M. H. Wickhorst, of Chicago, engineer of tests of the Rail Committee, is in charge of the work. In the work at South Bethlehem he is being assisted by members of the civil-engineering department of Lehigh University.

Baltimore

Dec. 2—Exports for the week included 4,123,540 lb. steel rails and 371,988 lb. rail fastenings to Puerto Barrios, Guatemala; 136,814 lb. miscellaneous iron and steel and 196,868 lb. tinplates to Havana; 8,196,501 lb. structural and other steel to Panama; 1,893,800 lb. steel billets and 939,640 lb. steel bars to Liverpool. Imports included 7480 tons pyrites from Huelva, Spain; 19,650 tons iron ore from Cuba.

Birmingham

Dec. 2—While the pig-iron trade in Southern territory during the last few weeks has been only fairly active, indications are encouraging. Sales already made for delivery during the first quarter of 1913 call for a large tonnage and inquiries in hand provide for practically the probable make. Some inquiries have been received for pig iron to be delivered during the latter part of the year, but so far very little such business has been booked. The quotations are firm at $14.25 @ 15 per ton, No. 2 foundry.

Basic iron is in strong demand and several furnaces are being kept busy supplying the demand. The steel activity in the South promises to keep up for several months to come, and this warrants a steady operation of furnaces on basic iron. One of the steel mills furnishing rods for concrete work is behind in deliveries and can hardly catch up with the demand. Rails are also in strong demand and the plant of the Tennessee company will be busy through the entire coming year. Cast-iron pipe is still in demand.

Further shipments of pig iron on export orders were made during the past week.

Preparations are being made in the Birmingham district for deep ore mining and to test opinions expressed by geologists as to the existence of much ore under the present seams. Preparations are on for the development of Clinton ore fields on an elaborate scale.

Chicago

Dec. 3—Quiet conditions continue in the pig-iron market; sales of iron and steel products are large. The foundrymen are slackening their buying of pig iron because the inventory season is approaching and their stocks for current needs are ample; until after the new year there is not likely to be any pronounced activity in pig iron. A few sales of more than 300 tons have been made in the last week; most of the purchases are under that figure. First-half sales have been numerous for the last three months; few, if any, have gone into the third quarter.

Under these conditions, prices remain remarkably firm. Southern No. 2 is quoted at $14, Birmingham, as a minimum, which means $18.35, Chicago. Northern No. 2 holds to $18 at furnace, making the delivered price about $18.50. There is no difference between early and late deliveries, so far as the market goes. Charcoal iron remains at $18.75, Chicago, the demand meeting the supply.

In finished products the greatest activity is in railroad supplies. The railroads are now buying very freely and they seem likely to continue doing so. Local producers are not seeking business; they are with difficulty attending to the large amount that comes in. Structural material continues to be in large demand; interest now centers around the possibility of deliveries in the second half of 1913; even these in many cases are difficult of assurance. Sales of bars, both iron and steel, are limited only by the capacity of the mills, at high prices. Plates, sheets and minor lines are active whenever deliveries can be guaranteed; the pressure on the producers is great in every line.

Cleveland

Dec. 2—The Lake season is nearing its end. Dec. 1 is the closing date on all insurance policies.

Pig Iron—The market is rather quiet, but firm, and no concessions are being made. For Cleveland delivery quotations are $18.50 for bessemer, $17 for basic and $17.75@18 for No. 2 foundry.

Finished Material—Some structural and bridge contracts are reported. Plates and bars continue active. There is no letup in the pressure on mills for deliveries.

Philadelphia

Dec. 4—Notwithstanding the far oversold condition of the blast furnaces of this district, contracts for large quantities of all kinds of pig have been made for delivery ranging from the early part of the year to midsummer. Foundry iron is in lighter demand than most other kinds, the purchases being limited largely to specific necessities. Basic and bessemer have been very freely handled and forge has been contracted for on quite a liberal scale. There are still three or four large consumers who are figuring upon supplies to be delivered throughout the first half of the year, but there is some hitch in the deals which has not been explained. Low-grade iron for pipe work continues to strain furnace capacity. The cost of coke, coal and labor remains a threatening factor in the background. Most furnaces have made heavy purchases of ore from both foreign and domestic source. It has been found impossible to make satisfactory arrangements as to coke. No. 2 X foundry is held as high as $18.75, with Virginia a little higher; gray forge, $17.75; basic, $18.50; low-phosphorus, $24 minimum.

Billets—Recent heavy orders have piled up manufacturers as to early deliveries and business is now being done extending in a few cases to the end of the second quarter, as the first quarter is taken up excepting for small lots at premium rates.

Bars—Bars continue very active and car-building requirements are crowding mill capacity to the limit. Prices are moving up fractionally. The greater demand is now for common iron. Quotations: 1.60c. for steel bars, delivered, 1.85c., and early deliveries for iron bars as high as 2c., though quoted in large lots at low as 1.77½ cents.

Sheets—Sheets are active and some business offered a week ago is still under consideration over the question of delivery.

Plates—Sheared plates have brought as high as 1.80c., universal 1.85c., plain 1.75c., with business in large quantities at some shading from these figures.

Structural Material—Most of the business of the past week has had reference to the closing of earlier negotiations. New inquiries have been rather light.

Rails—The Pennsylvania has added 50,000 tons to its order, the Reading has ordered 25,000 tons and about an equal quantity has been ordered by Southern roads, and there is a reported inquiry from New England.

Scrap—Buyers of scrap are not in all cases receiving the supplies promised, and dealers are scouring the country endeavoring to fill their contracts.

Pittsburgh

Dec. 3—Finished steel prices are stationary. There has been no important advance for six or seven weeks, the last increased in a fundamental product being the advance in sheets to 2.25c., about the middle of October.

The Carnegie Steel Co. is making excellent headway in getting its Edgar Thomson and Homestead works back into full operation since the almost complete tie-up at these plants from the strike which started Nov. 22. Ten Edgar Thomson blast furnaces had been operating, and all were banked; eight having now resumed, with the other two expected in by tomorrow. Four of the seven Carrie furnaces were also banked, but two have resumed and the other two are expected to resume in a day or two. A corresponding decrease occurred in operations at the attendant steel mills, which are getting back into full operation this week. The strike was of men operating locomotives in these plants. These men demanded the same wages as are paid on the Union R.R., the company's terminal railroad, and were they granted that basis they would probably have been taken into the union which operates on the Union Railroad. The increase has not been granted.

Pig Iron—The bessemer and basic pig-iron averages, compiled from actual sales, are announced for November at $17.172, Valley, for bessemer, an increase of 17.2c. over October, and at $16.192, Valley, for basic, an increase of 0.8c. over October. The small increase in the basic average is attributed to the fact that some large sales were made at $16, Valley, when the market was quoted at $16.25, and when $16.25 had been obtained even in October. About 100,000 tons figured in the bessemer compilation, chiefly tonnage already mentioned in these reports. In the basic average about 62,000 tons figured. Basic Mahoning Valley, blew out last week for relining, and the company is selling its coke in the market in the interim. sales in the month were larger, but involved some large tonnages sold by a furnace not in the Valleys, and therefore not possible to include. The pig-iron market has been quiet during the past week, but very firm, as the furnaces are well sold up. Struthers furnace, in the Mahoning Valley has gone out of blast. Prompt furnace coke has been a shade easier, at $3.90@4. One of the largest contracts of the season has just been closed, the Wheeling Steel & Iron Co. closing with a Pittsburgh brokerage house, which has had the contract for two years, for its requirements for 1913, about 30,000 tons a month, the price being a shade above $3. Another consumer contracted for about 8000 tons a month over the year at about $3.10. We quote pig iron as follows: Bessemer, $17.25; basic, $16.50; No. 2 foundry, $17.25@17.50; forge, $16.75@17; malleable, $17.25@17.50, f.o.b. Valley furnaces, 90c. higher at Pittsburgh.

Ferromanganese — Several sales of prompt and December ferromanganese are reported at $75, Baltimore. For contracts over second half $61.50, Baltimore, is still quotable, but for second quarter alone $62.50 is named and for first quarter $65, Baltimore.

Steel—Quotations up to almost $30, Pittsburgh, have been made on sheet bars when a considerable tonnage was inquired for. The market is practically unquotable, sales being very limited. We repeat last week's quotations, although they are practically nominal: Bessemer billets, $27; bessemer sheet bars, $27.50; openhearth billets, $28; openhearth sheet bars, $28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are $30, but are growing scarce at that price.

Sheets — The sheet market grows stronger each week as the number of sellers at the base prices decreases. For any early delivery it is now possible to obtain premiums, and even contracts for first quarter are going at premiums in the majority of cases. We quote: Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.50c.; blue annealed, 10 gage, 1.65@1.75c.; painted corrugated, 2.45@2.50c.; galvanized corrugated, 3.45@3.50c. per pound.

St. Louis

Dec. 2—The pig-iron market is in good shape. The demand is fairly active for first-half deliveries; there is any amount of second-half inquiries, but as yet not much business is being done on these. Prices remain about the same, $14@14.50, Birmingham, or $17.75@18.25, St. Louis, for No. 2 Southern foundry. Northern iron is being quoted around $19, St. Louis.

Coke is still on the advance, Connellsville being quoted around $6.50, and by-product $6, St. Louis.

Iron Ore Trade

Sales of Lake ore so far have been chiefly of bessemer ores, the nonbessemers going rather slowly. Ore sellers have decided to eliminate the premiums which have been obtained for a number of years on nonbessemer ores of 53% and above in iron in the natural state. Another important change in the contracts which are now being written provides that furnaces having ore on lower Lake docks at the taxing time in April must pay the taxes. This change results from a controversy of long standing between the ore interests and taxation officials as to how ore on docks should be taxed.

Prices of Port Henry, N. Y., ores to furnaces have been fixed for 1913 at an advance of 50c. per ton over this year.

Imports and exports of iron and manganese ores in the United States, nine months ended Sept. 30, long tons:

	1911	1912	Changes
Iron ore, imp.	1,362,352	1,539,452	I. 177,100
Iron ore, exp.	134,645	181,629	I. 46,984
Manganese, imp.	579,538	893,924	I. 314,386

Imports of iron ore this year included 61,706 tons from Canada; 68,701 from Spain; 100,335 from Newfoundland and Labrador; 280,309 from Sweden; 1,016,343 from Cuba.

Sault Ste. Marie Canal Traffic

The total freight passing through the Sault Ste. Marie canals in October was 10,716,791 tons, the largest tonnage ever reported for one month. The total freight for the season to Nov. 1 was, in short tons:

	1911	1912	Changes
East-bound	32,230,708	48,254,518	I. 16,023,810
West-bound	15,129,031	14,414,981	D. 714,050
Total	47,359,739	62,669,499	I. 15,309,760

The total number of vessel passages this year was 19,998, showing an average cargo of 3150 tons. The mineral freights included in the totals were as follows, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal	13,664,445	12,619,404	D. 1,045,041
Iron ore	28,243,341	42,177,817	I. 13,934,471
Pig and mfd. iron	373,219	542,460	I. 169,241
Copper	104,444	89,988	D. 14,456
Building stone	4,367	2,282	D. 2,085
Salt, bbl.	550,778	566,487	I. 15,709

Iron ore was 67.3%, and coal 20.1% of the total freight this year.

METAL MARKETS

New York, Dec. 4—The metal markets continue fairly active, with only moderate changes in quotations.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Oct. 1912	$ 330,270	$ 11,887,492	Imp. $11,557,222
" 1911	3,983,994	4,102,427	Imp. 118,433
Year 1912	44,058,544	50,677,285	Imp. 6,618,741
" 1911	22,247,304	49,279,533	Imp. 27,032,229
Silver			
Oct. 1912	6,171,820	4,683,784	Exp. 1,488,036
" 1911	5,087,087	3,404,458	Exp. 1,682,629
Year 1912	58,519,766	40,985,536	Exp. 17,534,230
" 1911	54,615,048	37,100,888	Exp. 17,514,160

Exports from the port of New York, week ended Nov. 30: Gold, $41,225, silver, $1,160,673, chiefly to London Imports: Gold, $351,163; silver, $258,914, from Mexico, Cuba and South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. A total of $4,250,000 gold is reported taken in London for export to New York.

Iridium—This metal is still quoted at $67@70 per oz., New York.

Platinum—The market, which has recently been advancing, holds its gain. Small lots (4 or 5 oz.) now command $46 per oz., but large lots can be obtained at about $45. We quote $45@46 per oz. for refined platinum, and $47.50@48.50 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes, under date of Nov. 21, that the market and the prices are steady. The last fortnight considerable quantities of platinum have been sold. The starateli works are reduced and therefore the offer of platinum by them has diminished. The quotations are, St. Petersburg, 37.700 rubles per pood; at Ekaterinburg, 9.80 rubles per zolotnik—equal to $36.95 and $36.85 per oz., respectively, for crude metal, 83% platinum.

Silver—The statement that the Indian government had renewed buying orders, together with the fact that the large silver operators were taking their future contracts as they became due, tended to produce a scarcity of spot silver, covering by the shorts, and an advance in the price to 29 11/16d. in London.

SILVER AND STERLING EXCHANGE

Nov.-Dec.	28	29	30	2	3	4
New York	....	63¼	63½	63⅞	64⅛	63¾
London	29⅛	29 3/16	29⅜	29 9/16	29 11/16	29 7/16
Sterling Ex.	....	4.8465	4.8450	4.8435	4.8445	4.8450

New York quotations, cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

NEW YORK

	Copper		Tin	Lead		Zinc	
Nov.-Dec.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
28					....	....	
29	17½ @17¾	17.35 @17.45	49⅜	4.45 @4.50	4.30 @4.32½	7.25 @7.30	7.10 @7.15
30	17½ @17¾	17.35 @17.40	49⅜	4.45 @4.50	4.30 @4.32½	7.25 @7.30	7.10 @7.15
2	17½ @17¾	17.35 @17.40	50	4.40 @4.45	4.27½ @4.32½	7.20 @7.30	7.05 @7.15
3	17½ @17¾	17.35 @17.40	49¾	4.35	4.20	7.20 @7.30	7.05 @7.15
4	17½ @17¾	17.35 @17.40	49¾	4.35	4.20	7.20 @7.30	7.05 @7.15

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Nov.-Dec.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
28	76⅝	77⅛	82½	226½	226¼	18 3/16	26¼
29	76¼	77	82	226	225½	18 3/16	26¼
30	...						
2	76⅞	77⅝	83	228¼	227½	18⅛	26½
3	76 15/16	77½	83	227¼	226¼	18⅛	26½
4	76⅞	77¼	82¾	225½	224¾	18 3/16	26½

The above table gives the closing quotations on London Metal Exchange All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper—Dullness continued through the last three days of November. European demand was absent. Domestic buyers continued to purchase in a hand-to-mouth way and secured what they needed at 17½@17⅝c., delivered, usual terms. Since Dec. 1 the market has been almost stagnant. Most of the producers maintain their confidence in a return to the pegged price, but one of the larger that has heretofore been holding aloof is reported to have solicited business at the lower level. The sales for Lake copper during the week have been insignificant.

Many of the Lake producers have shipped away all the copper on their wharves in anticipation of the closing of navigation, wherefore the refinery statistics for November ought to show relatively large deliveries of Lake copper. At the close, Lake copper is quoted at 17½@17¾c.; electrolytic in cakes, wirebars or ingots, 17.35@17.40c., while casting copper is quoted nominally at 17.20@17.25c. as an average for the week.

In London, the market for standard copper has fluctuated within narrow limits. It closed on Nov. 28 at £76 12s. 6d. for spot and £77 7s. 6d. for three months. On Monday, Dec. 2, it was 5s. above these prices, but some bear speculation made its appearance, and the market closes somewhat lower, at £76 7s. 6d. for spot and £77 5s. for three months.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for large quantities. Copper wire is 19@19¼c. base.

Copper exports from New York for the week were 6251 long tons. Our special correspondent gives the exports from Baltimore at 2774 tons for the week.

Tin—Both the American and European statistics published the beginning of this month showed clearly the excellent position of this metal. The response of the London market to the favorable figures disclosed by the European statistics was an advance of almost £3 per ton on Dec. 2. This, however, was not maintained. The market became weak and continued its decline both on Dec. 3 and 4. The spectacular advance at the beginning of the week did not attract buyers who seem to be distrustful of it, and this is given as the reason for the market's equally rapid collapse. The close is £225 10s. for spot and £224 15s. three months, and about 49½c. for December tin.

Visible stocks of tin, Dec. 1. are reported as follows: Great Britain, 6181; Holland, 2517; United States, excluding Pacific ports, 3650; total, 12,348 long tons.

Lead—The market is quiet and weakish. When the A. S. & R. Co. reduced its price to 4.50c., New York, it was promptly undersold by the independents and the market quickly fell away from the price named by the largest seller. On Dec. 3 the A. S. & R. Co. made a further cut to 4.35c., New York. Since then the market has been stagnant, both buyers and sellers being at a loss to know what to do. The former are doubtful whether the bottom has yet been reached and the latter are apparently uncertain as to the advisability of making further cuts in order to attract business. The market closes at 4.35c., New York, and at St. Louis at 4.20c. nominally.

The London market is slightly firmer; good Spanish lead is quoted £18 3s. 9d., and English 2s. 6d. higher.

The average price of lead for the week ended Dec. 4 was 4.415c., New York.

Spelter—The conditions outlined in our last report led to some lower offerings, spelter for January delivery being tendered liberally on the basis of 7.10c., St. Louis. However, the few buyers needing spelter for prompt delivery were obliged to pay a premium, especially during the early part of the week. The smelters of Kansas and Oklahoma who may have a December surplus are reluctant to sell too closely so early in the month, in view of the advent of cold weather, which may interfere with their gas supply. During the latter part of the week, however, more spelter seems to have become available for December delivery, reports being current that importations of European spelter are afloat. These will tend to relieve the scarcity for prompt metal that has prevailed for so long a time past. It is fortunate that the European market has been able to spare some metal for shipment to the United States, since otherwise the price of spelter might have risen to an unhealthily high level. At the close St. Louis is quoted at 7.05@7.15c., according to delivery, and New York at 7.20@7.30c. per pound.

At the lower prices for spelter, which were recently established in Europe, there was quite a large demand, which pretty well absorbed the available supplies, and good ordinaries, which, on Nov. 28, closed at £26 5s., on Dec. 2 advanced to £26 10s., at which figure it closes today for good ordinaries, with specials £26 15s. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7½@7⅝c. per lb., New York.

Other Metals

Aluminum—The market for the past week has been rather dull, with more metal for early deliveries. Quotations are practically unchanged, at 25½@26c. for No. 1 ingots, New York.

Antimony—The market has been a little more active and the liquidation in the outside brands seems to be over. Cookson's is unchanged at 10.20@10.50c. per lb.; Hallett's is quoted at 9.75@10c. The other varieties are a little firmer, 9.12½@9.37½c. being asked for Hungarian and Chinese.

Quicksilver—Business is quiet and the quotations, while nominally unchanged, are really a little easier. New York prices may be given at $41@42 per flask of 75 lb., with 58@60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price is £7 12s. 6d. per flask, with £7 10s. named from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 30—The base price paid this week for 60% zinc ore was $56@58. The base price paid for 80% lead ore was $52@54 per ton.

SHIPMENTS WEEK ENDED NOV. 30

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,081,200	.	840,700
Platteville	738,170		198,000
Mineral Point...	701,410		......
Highland	369,400		....
Shullsburg.....	354,400	61,400	. .
Hazel Green	340,000		...
Harker.	224,090		. ...
Galena	223,400	.	.. ...
Cuba City	221,320	.	131,040
Montfort	70,000		....
Total.....	4,323,390	61,400	1,169,740
Year to date	184,382,190	7,491,160	35,834,450

Shipped during week to separating plants, 2,722,950 lb. zinc ore.

Joplin, Mo., Nov. 30—The high price of the week is $61 for zinc sulphide, the base per ton of 60% zinc $55@58.50. Zinc silicate sold at $30@33 per ton of 40% zinc. The average price for all grades of zinc is $55.14. Lead sold at $54 per ton of 80% mineral, and very little ore was sold that assayed higher. The average price, all grades of lead, is $55.80 per ton. Outputting was never

SHIPMENTS WEEK ENDED NOV. 30

	Blende	Calamine	Lead Ore	Value
Webb City Carterville	4,705,250		618,350	$151,413
Joplin	4,054,410		331,930	124,844
Galena.	809,000		142,090	26,630
Duenweg	766,420			21,459
Miami.	551,070		196,370	18,724
Alba-Neck....	578,180		10,470	17,048
Granby	71,500	429,110	18,440	10,365
Carl Junction	338,190			8,455
Springfield...	198,760	.	......	5,963
Spurgeon	63,350	189,800	38,020	5,792
Lawton	189,140			5,296
Oronogo	191,410			5,260
Carthage	135,030			3,645
Jackson	127,140			3,433
Aurora	56,420	71,520	....	2,626
Cave Springs	57,160		8,100	1,822
Wentworth...	64,930			1,752
Quapaw	61,490			1,537
Totals	13,018,850	690,430	1,363,770	$416,064
11 mos......	526,727,190	33,101,150	86,058,290	$17,115,42

Blende val., the week, $365,714; 11 mos., $14,136,073
Calamine, the week 12,256; 11 mos., 526,326
Lead value, the week, 38,097; 11 mos., 2,453 028

MONTHLY AVERAGE PRICES

Month	Zinc Ore Base Price 1911	Zinc Ore Base Price 1912	Zinc Ore All Ores 1911	Zinc Ore All Ores 1912	Lead Ore All Ores 1911	Lead Ore All Ores 1912
January.	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February...	40.21	45.75	39.16	43.31	54.46	52.39
March......	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June........	40.50	55.88	38.18	54.38	56.49	55.01
July........	40.75	58.85	38.36	56.59	58.81	58.83
August.....	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October.....	42.38	57.00	40.89	55.97	54.72	63.22
November..	45.40	55.69	43.25	53.98	57.19	56.55
December..	44.13	..	40.76	..	62.03	
Year.	$41.45	.	$39.90	....	$56.76	...

NOTE: Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

so great as now, and reaches 6500 to 7000 tons per week. There is a strong and continuous demand for all the ore produced.

Chemicals

New York, Dec. 4—The general markets continue active, with a good business forward in most lines.

Arsenic—Supplies are now up to demand and the market is quieter. There is report that the Canadian producers have shut down, but it is not confirmed. Quotations are $4.87½ per 100 lb. for both spot and futures.

Copper Sulphate—Trade is fair and prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Quotations remain at 2.60c. per lb. for spot and futures up to April 30. Futures are a little easier at 2.57½c. for May, 2.55c. for June and 2.52½c. for July and later deliveries.

CURRENT WHOLESALE PRICES

Ammonium sulphate	cwt.	3.15@3.25
Arsenic, white	lb.	0.04¾@0.05¼
Barytes, ground	sh. ton	12.50@14.00
" floated	sh. ton	16.00@17.00
Calcium acetate, gray	cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls	sh. ton	70.00
Carbons, good drill quality	carat	85.00
Cement, Port., Am.	400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburgh	M.	175.00
ore, 50%, ex-ship, N. Y.	lg. ton	14.00@16.00
Copperas, bulk	cwt.	0.55
bbl.	cwt.	0.65@0.85
Copper sulphate	cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburgh	ton	8.00@9.00
Magnesite, crude, 95%	lg. ton	10.00@11.00
calcined, powdered		30.00@35.00
brick, dom., f.o.b. Pittsburgh	M.	160@180
Paints, litharge, Am. powd	lb.	0.06¼@0.07
red lead, American	lb.	0.06¼@0.07
white lead, Am., dry	lb.	0.05¼@0.05¾
zinc white, Am., dry	lb.	0.05⅜@0.06¼
Phosphates, acid:		
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75
Potassium cyanide, 95@96%	lb.	0.24
Pyrite		
Domestic, non-arsenical, furnace size, f.o.b. R.R. per unit		0.12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit		0.13½
Imported, arsenical, furnace size, ex-ship, per unit		0.13@0.13½
Imported, fines, arsenical, ex-ship		0.11½@0.12
Imported, fines, non-arsenical, ex-ship, per unit		0.12½

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton from furnace-size price is made when ore is delivered in large lumps.

Sodium cyanide, 120 to 130% KCN (per 100%)	lb.	0.21
nitrate 95% spot	cwt.	2.60
95% future	cwt.	2.52½@2.60
Sulphur, Louisiana prime, N. Y.	lg. ton	22.00@22.50
roll	cwt.	1.85@2.15
flour	cwt.	2.00@2.40
flowers, sublimed	cwt.	2.20@2.60
pow. com., bags	cwt.	1.50
Sicilian, crude brimstone	lg. ton	22.50
Zinc chloride, granular	lb.	0.04¼@0.04½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S.C.

Note.—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Potash Salts—Exports of potash salts from Germany nine months ended Sept. 30, metric tons:

	Total	To U.S.
Crude Salts	920,171	447,667
Potassium chloride	216,922	146,440
Potassium sulphate	61,040	24,887
Potassium-magnesium sulphate	41,990	7,952
Total	1,240,123	626,946

Exports to the United States were 50.6% of the total. No comparison can be made with 1911, as the German statistical office has introduced a new classification this year.

MINING STOCKS

New York, Dec. 4—Nov. 28 was a holiday. On Nov. 29 the Exchange was dull and irregular, chiefly on account of high rates of interest, and money bringing as much as 20%. Mining stocks on the Curb were rather slow, with small fluctuations.

Nov. 30 the Exchange was still quiet, with small business. The Curb was dull, and mining stocks irregular and generally weaker except Braden Copper.

Dec. 2, the Exchange was unsettled by the decision of the Supreme Court declaring illegal the Union-Southern Pacific merger, but the effect was not great. The Curb was dull and uneven, but copper stocks were firm, especially Braden.

Dec. 3 and 4 there were few changes on the Exchange, and even the Pacific railroad issues rather quiet, notwithstanding the merger decision. The Curb was a little more active, copper stocks being generally firm. In other mining shares, dealings were not heavy and there were only small changes in quotations.

Boston, Dec. 3—Copper shares lack animation and a general heavy tone prevails. Money has been a factor, call rates touching 9% today. A few active spots developed in the mining share list during the week, Pond Creek and Butte & Superior especially, the former a coal mining proposition, and the latter a zinc mine.

Several increases have been made in copper-mining dividends, but with little effect on stock-market prices. The Copper Range Consolidated has increased its rate from 50c. quarterly to 75c., the Calumet & Hecla from $1 quarterly to $1.25 and the Superior & Pittsburg from 30 to 38c. The Old Dominion Co. did not change its quarterly rate from $1.25, as some had expected it would.

Superior & Boston has levied a $1 assessment, payable Jan. 4, which the management claims will be sufficient to put the company on an earning basis and retire outstanding notes. The capitalization of the East Butte has been increased to 410,000 shares through exchange of the Reed interests of 110,000 shares for the purchase of the Pittsmont property made some four years ago.

Trading on the Curb has been in specialties and of fair volume. Mexican

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Sept	October	Sept
Alaska shipments	1,726,715	1,435,245	....
Anaconda	24,500,000	25,250,000	24,250,000
Arizona Ltd.	3,340,000	3,200,000	
Copper Queen	9,103,861	8,184,575	8,807,940
Calumet & Ariz.	4,462,000	4,404,000	4,918,000
Chino	3,217,369	3,638,500	
Detroit	1,881,668	1,934,828	1,968,620
East Butte	1,250,000		
Mammoth	1,834,937		
Giroux	1,005,208		
Mason Valley	1,200,000	1,563,700	
Nevada Con.	5,607,578	850,741	
Ohio	635,000		
Old Dominion	2,204,000	2,523,000	
Ray	2,978,404		
Shannon	1,142,000	1,210,000	
South Utah	225,568		
United Verde*	2,750,000	2,750,000	....
Utah Copper Co.	6,616,887	2,022,352	....
Lake Superior*	19,250,000	21,500,000	...
Non-rep. mines*	8,094,792	8,250,000	....
Total production	103,025,987		
Imports, bars, etc.	25,149,329		
Total blister	128,175,316		
Imp. in ore & matte	7,142,232		
Total American	135,317,548		
Miami†	2,949,150	2,577,750	2,972,000
Brit. Col. Cos.:			
British Col. Copper	.....	1,013,000	
Granby	2,083,118		
Mexican Cos.:			
Boleo†	......	2,612,400	
Cananea	3,500,000	4,248,000	
Moctezuma	771,844	3,045,667	2,112,377
Other Foreign:			
Cape Cop., S. Africa	678,720	757,120	
Kyshtim, Russia	1,750,000		
Spassky, Russia	981,120	974,400	
Tilt Cove, Newf'd	......	86,785	
Exports from:			
Chile	6,048,000	8,512,000	
Australia	7,616,000	9,520,000	
Arrivals in Europe‡	8,518,720	13,771,520	

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
XI, 1911	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796
X	145,405,453	84,104,734	47,621,342
XI		......	......

VISIBLE STOCKS

	United States	Europe	Total
XII, 1911	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	63,065,587	107,408,000	170,473,587
XI	76,744,964	103,801,600	180,546,564
XII		96,947,200	.....

Metal receipts sold up from 55c. to $1.06¼ on news that new blood had entered the management and that developments are favorable. South Lake rose on favorable reports from the property. Butte Central has also continued active and strong.

Assessments

Company	Delinq.	Sale	Amt.
Black Horse, Ida	Oct. 10	Dec. 7	$0.01½
Butte & Anaconda, Mont.	Jan 1	Feb. 1	0 0½
Consolidated Virginia, Nev.	....	....	0 15
Crown Point, Utah	Nov. 15	Dec. 10	0.01
East Hercules Ext., Ida.	Dec. 15	Jan. 3	0 001½
Echo, Ida	Dec. 11	Jan. 8	0.001
Hider Nevada, Utah	Dec. 20	Jan. 11	0.0½
Holy Terror, Ida	Oct. 18	Dec. 9	0.001
Honolulu, Ida	Nov. 20	Dec. 21	0 001½
Hub, Ida	Nov. 14	Dec. 14	0.001
Hugo, Ida	Nov. 9	Dec. 9	0 001
Hypotheek, Ida	Dec. 18	Jan. 10	0 005
Jack Waite, Ida	Nov. 30	Dec. 21	0.01
Laclede, Ida	Nov. 18	Dec. 9	0.003
Leroy Gold & Copper, Ida	Nov. 28	Dec. 28	0.002
Lucky Swede, Ida	Nov. 15	Dec. 15	0 002
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Melcher, Utah	Nov. 23	Dec. 12	0 02
Military, Ida	Oct. 29	Dec. 11	0003½
Moon Creek, Ida	Dec. 4	Jan. 4	0.002
Nabob, Ida	Dec. 2	Dec. 23	0.005
National Copper, Ida.	Nov. 15	Dec. 10	0.01
North Star, Ida.	Nov. 30	Dec. 30	0.001
Ophir, Nev	Nov. 11	Dec. 9	0.15
Seven Troughs Mon., Utah.	Dec. 15	Jan. 6	0.0¼
Sierra Nevada, Nev.	......	....	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52 375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59 043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53 221	53.325	59 207	24 483	24.595	27.284
May	53 870	53.308	60 880	24.797	24.583	28 038
June	53 462	53 043	61 290	24.651	24.486	28 215
July	54 150	52.630	60 654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53 295	52 440	63 078	24 567	24.209	29 088
October	55 490	53 340	63 471	25.596	24.594	29 299
November	55 635	55 719	62 792	25.680	25.649	29 012
December	54 428	54 905	..	25.160	25.349	....
Year	53 486	53.304	..	24.670	24.592	...

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12 295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62 893
March	12 139	14.698	12.447	14.868	54.704	65 884
April	12.019	15 741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16 245	54.313	72 352
June	12 385	17 234	12.611	17 443	56.365	78.259
July	12 463	17.190	12 720	17 353	56 67[illegible]	76.636
August	12 405	17.498	12 634	17 644	56 26[illegible]	78 670
September	12.201	17 508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	76.389
November	12 616	17.326	12.769	17.617	57.253	76 890
December	13 552		13 768		62.068	
Year	12.376		12 634		55 973	...

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 2[illegible]	42 [illegible]	July	42 400	44 519
February	41 [illegible]	42 [illegible]	August	4[illegible] 319	45 857
March	40 [illegible]	42 [illegible]	September	[illegible] 735	49.135
April	4[illegible]	43 923	October	41 185	50 067
May	4[illegible] 117	46 053	November	[illegible]	49 891
June	44 606	45 815	December	44 [illegible]	
			Av. Year	[illegible]	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4.435	4 334	4.327	13 009	15 597
February	4 440	4.026	4 266	3 946	13 043	15 738
March	4 394	4.073	4 238	4.046	13 122	15 997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4.373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13.260	17 588
July	4 499	4 720	4.397	4.603	13 530	18 544
August	4 500	4 569	4 406	4 452	14.260	19 655
September	4 485	5 048	4 356	4.924	14 744	22.292
October	4 265	5.071	4.139	4.894	15.332	20 630
November	4.298	4.615	4.181	4.463	15.821	18 193
December	4.450		4.332	......	15.648	.....
Year	4 420	..	4 286	......	13.970	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5 452	6.442	5 302	6.292	23.887	26.642
February	5 518	6.499	5 368	6.349	23.276	26 661
March	5.563	6.626	5.413	6.476	23 016	26.048
April	5 399	6.633	5.249	6 483	23.743	25 644
May	5 348	6.679	5 198	6 529	24.375	25.790
June	5 520	6.877	5 370	6 727	24 612	25 763
July	5 695	7.116	5 545	6 966	25 006	26 174
August	5 953	7.028	5 803	6.878	26 801	26 443
September	5 869	7.454	5 719	7 313	27 750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	7 371	6.223	7.221	26.795	26.804
December	6.301	......	6.151	......	26.849	......
Year	5.758	......	5.608	......	25.281	....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15 90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15 90	15.03	14 50	13.28	14 81	14.01
March	15.90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13.90	15 00	14 15
May	15 90	15.14	14 30	13.90	14.72	14.12
June	15 90	15 15	14 06	14.11	14.56	14 22
July	15 90	15.15	14 03	14.38	14 53	14 38
August	15 90	15.43	14 00	14 90	14 47	14 85
September	15 90	16.86	13 57	16.03	14 40	15.63
October	15 43	17 90	13.44	17.18	14 34	17 22
November	14.92	18 07	13.30	17 09	14 25	18.00
December	15.15	.....	13.10	....	13.90	......
Year	$15 72	...	$13 94	....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Dec. 3		SALT LAKE Dec. 3	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.04	Beck Tunnel	09¾
Cripple Cr'k Con	01¼	Black Jack	11½
C. K. & N.	16½	Cedar Talisman	00⅝
Doctor Jack Pot	.06½	Colorado Mining	.21½
Elkton Con	.65¾	Columbus Con	12
El Paso	6.10	Crown Point	04
Findlay	.04½	Daly-Judge	6.15
Gold Dollar	18¾	Grand Central	85
Gold Sovereign	.02	Iron Blossom	1 30
Isabella	.19¾	Little Bell	‡ 25
Jack Pot	.05	Lower Mammoth	06
Jennie Sample	06	Mason Valley	12.00
Lexington	0065	May Day	21
Moon Anchor	.01	Nevada Hills	1.40
Old Gold	03¼	New York	00¾
Mary McKinney	.75	Prince Con	1 67½
Pharmacist	.01½	Silver King Coal'n	3.15
Portland	1 05	Sioux Con	03
Vindicator	86	Uncle Sam	.12
Work	.01	Yankee	.15

TORONTO Dec. 3

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 70	Foley O'Brien	20
Hudson Bay	‡60 00	Hollinger	15 15
Temiskaming	43	Imperial	03
Wettlaufer-Lor.	25	Pearl Lake	23
Am. Goldfield	‡ 40	Porcu. Gold	19¼
Apex	01¼	Preston E. D.	04¼
Crown Chartered	03	Rea	25
Dobie	‡ 25	Standard	‡ 00¾
Dome	20 07	Swastika	09
Dome Exten	.09	West Dome	‡ 13

SAN FRANCISCO Dec. 3

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	8.50
Belcher	.24	Jim Butler	57
Best & Belcher	.05	MacNamara	.18
Caledonia	.80	Midway	33
Challenge Con	.07	Mont.-Tonopah	1 97½
Chollar	.02	North Star	24
Confidence	44	West End Con	1.35
Con. Virginia	.37	Atlanta	.14
Crown Point	.40	Booth	.04
Gould & Curry	01	C.O.D. Con	.05
Hale & Norcross	.09	Comb. Frac	.08
Mexican	1 80	Jumbo Extension	.27
Occidental	70	Pitts.-Silver Peak	.75
Ophir	.37	Silver Pick	.05
Overman	.50	St. Ives	.30
Potosi	.03	Tramp Con.	‡ 02
Savage	09	Argonaut	‡2 00
Sierra Nevada	.36	Bunker Hill	‡4.50
Union Con	.29	Central Eureka	22
Yellow Jacket	.30	So. Eureka	‡1.50

N. Y. EXCH. Dec. 3

Name of Comp.	Clg.
Amalgamated	83¾
Am. Agri. Chem	56½
Am.Sm.&Ref.,com	78
Am. Sm. & Ref., pf.	106
Am. Sm. Sec., pf. B	85
Anaconda	42¾
Batopilas Min	1½
BethlehemSteelpf	69
Chino	46¼
Federal M. & S., pf.	42
Goldfield Con	1⅞
GreatNor.,ore.,ctf.	45½
Guggen. Exp	54¼
Homestake	102
Inspiration Con	19½
Miami Copper	27¾
Nat'nalLead,com.	60¼
National Lead, pf.	108½
Nev. Consol	22⅝
Phelps Dodge	215½
Pittsburg Coal, pf.	91
Ray Con	22⅜
Republic I&S,com.	27½
Republic I & S, pf.	89
SlossSheffi'd com.	48½
Sloss Sheffield, pf	96
Tennessee Copper	41
Utah Copper	63¼
U. S. Steel, com	73⅛
U. S. Steel, pf.	110¼
Va. Car. Chem	46¼

BOSTON EXCH. Dec. 3

Name of Comp.	Clg.
Adventure	‡6
Ahmeek	‡325
Algomah	3½
Allouez	42
Am. Zinc	30⅜
Ariz. Com., ctfs	3⅞
Bonanza	‡.30
Boston & Corbin	5¼
Butte & Balak	3½
Calumet & Ariz	79
Calumet & Hecla	575
Centennial	18¾
Cliff	‡3
Copper Range	55¼
Daly West	3¾
East Butte	14¾
Franklin	9⅛
Granby	72½
Hancock	26½
Hedley Gold	‡25½
Helvetia	‡¾
Indiana	17
Island Cr'k, com.	57
Island Cr'k, pfd	‡87
Isle Royale	34½
Keweenaw	2
Lake	28¾
La Salle	5¾
Mass	‡6
Michigan	‡1¾
Mohawk	64
New Arcadian	3
New Idria Quick.	‡5½
North Butte	36
North Lake	‡3½
Ojibway	‡3
Old Dominion	58¼
Osceola	108½
Quincy	‡86
Shannon	14
Shattuck-Ariz	31¼
Superior	‡43
Superior & Bost.	$1\frac{9}{16}$
Tamarack	41
Trinity	5
Tuolumne	‡$2\frac{13}{16}$
U. S. Smelting	44½
U. S. Smelt'g. pf.	51
Utah Apex	$2\frac{1}{16}$
Utah Con	11⅝
Victoria	‡2½
Winona	‡4
Wolverine	73
Wyandot	1½

N. Y. CURB Dec. 3

Name of Comp.	Clg.
Barnes King	‡ 60
Beaver Con	.46
Braden Copper	10⅛
B. C. Copper	4⅝
Buffalo Mines	2½
Caledonia	40
Con. Ariz. Sm.	$\frac{7}{16}$
Davis-Daly	2⅛
Diam'field-Daisy	4
Ely Con	11
Florence	65
Giroux	3⅝
Gold Hill Con	$\frac{5}{16}$
Greene Cananea	9⅜
Greenwater	04
Internat. S. & R.	‡124
Kerr Lake	2⅝
Keystone	2
La Rose	$2\frac{9}{16}$
McKinley-Dar-Sa.	$2\frac{3}{16}$
Min. Co. of A. new	2⅞
Motherlode Gold.	‡ 60
Nev. Utah M. & S.	‡ 05
Nipissing Mines	8⅝
Ohio Copper	1¼
Pacific Sm. & M	$\frac{3}{16}$
Puebla S. & R.	‡2
South Live Oak	2
South Utah M. & S	⅜
Standard Oil (Old)	1110
Stand'd Oil of N.J.	389
Stewart	$1\frac{5}{16}$
Tonopah	6½
Tonopah Ex.	$2\frac{9}{16}$
Tonopah Merger	78
Tri-Bullion	$\frac{11}{16}$
Tularosa	1⅛
Union Mines	$\frac{3}{16}$
United Cop., pfd.	10
Yukon Gold	3

LONDON Dec. 1

Name of Com	Clg.
Camp Bird	£1 3s 3d
Dolores	1 10 0
El Oro	0 17 3
Esperanza	2 2 6
Mexico Mines	7 7 6
Oroville	0 5 0
Stratton's Ind.	0 3 1½
Tomboy	1 8 3

BOSTON CURB Dec. 3

Name of Comp.	Last
Alaska Gold M.	[illegible]
Bingham Mines	4¼
Boston Ely	$1\frac{5}{16}$
Boswyocolo	01
Butte Central	9
Cactus	08
Calaveras	2
Chief Cons	1
Corbin	24
Cortez	70
Crown Reserve	3
First Nat. Cop.	$1\frac{11}{16}$
Majestic	45
Mazatan	‡ [illegible]
Moneta Porc.	‡ 03
Nevada-Douglas	$3\frac{1}{16}$
New Baltic	1
Oneco	1
Raven Copper	22
Portsmouth Coal	65
San Antonio	‡3¼
Smokey Dev	1
S. W. Miami	5
South Lake	6
Trethewey	32
United Verde Ext.	54

‡Last quotation

Mining Companies—United States

Name of Company and Situation		Shares Issued	Shares Par	Dividends Total	Dividends Latest	Dividends Amt
Acacia, g	Colo	1,438,989	$1	$129,618	Jan. '11	$0.01
Adams, s.l.c	Colo	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c	Mich	50,000	25	1,000,000	Oct '12	6.00
Alaska Mexican, g	Alas	180,000	5	3,093,381	Nov. '12	0.30
Alaska Treadwell, g	Alas	200,000	25	12,710,000	Nov. '12	1.00
Alaska United, g	Alas	180,200	5	1,162,290	Nov '12	0.50
Am. Zinc, Lead & Sm	U. S	165,360	25	938,360	Oct '12	0.50
Anaconda, c	Mont	4,332,500	25	68,420,625	Oct '12	0.75
Argonaut, g	Cal	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf	Ariz	1,426,120	1.20	2,057,233	Nov. '12	0.047
Arizona Copper, com	Ariz	1,519,896	1.20	14,691,796	July '12	0.30
Bagdad-Chase, g., pf	Cal	84,819	5	202,394	Jan. '09	0.10
Baltic, c	Mich	100,000	25	7,050,000	June '11	5.00
Bingham N. H., c	Utah	228,690	5	294,219	July '12	0.10
Bonanza Dev., g	Colo	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g	Cal	200,000	1	670,000	Nov. '12	0.05
Bunker Hill & Sul., l.s	Ida	327,000	10	13,846,350	Nov. '12	0.20
Butte-Alex Scott, c	Mont	74,000	10	74,000	Nov. '12	0.50
Butte & Ballaklava, c	Mont	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c	Ida	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c	Ariz	596,353	10	15,478,118	Sept '12	1.00
Calumet & Hecla, c	Mich	100,000	25	118,850,000	Sept. '12	12.00
Camp Bird, g.s	Colo	1,100,000	5	8,383,558	July '12	0.24
Centen'l-Eur., l.s.g.c	Utah	100,000	5	3,600,000	Oct. '12	1.50
Center Creek, l.z	Mo	100,000	10	445,000	Oct. '12	0.05
Champion, c	Mich	100,000	25	7,500,000	Nov. '12	1.00
Cliff, g	Utah	300,000	1	90,000	Feb. '12	0.10
Cliff, g	Alas	100,000	1	180,000	Nov. '12	0.05
Colo. Gold Dredging	Colo	100,000	10	200,000	Nov. '12	0.25
Colorado, l.s.g	Utah	1,000,000	0.20	2,570,000	June '12	0.03
Columbus Con., g.s	Utah	285,540	5	226,832	Oct '07	0.20
Commercial Gold	Ore	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur., g	Utah	1,000,000	1	3,415,313	July '12	0.03
Continental, z. l	Mo	22,000	25	275,000	July '12	0.50
Copper Range Con., c	Mich	393,445	100	12,906,711	Oct. '12	0.50
Daly Judge, s.l	Utah	300,000	1	405,000	Oct. '12	0.15
Daly West, s.l	Utah	180,000	20	6,565,000	Oct. '12	0.15
Doctor Jackpot, g	Colo	3,000,000	0.10	90,000	Mar. '11	0.00½
Doe Run, l	Mo	65,782	100	3,139,176	Sept. '12	1.50
Elkton Con., g	Colo	2,500,000	1	3,079,460	Nov. '12	0.02
El Paso, g	Colo	490,000	5	1,597,295	Oct. '12	0.10
Fed. M. & S., com	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf	Idaho	120,000	100	7,488,685	Sept. '12	1.50
Florence, g	Nev	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g	Nev	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g	Colo	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g	Calif	200,000	2.50	166,000	Nov. '12	0.02
Frontier, z	Wis	1,250	100	146,272	Nov. '12	2.00
Gemini-Key'ne, l.g.s	Utah	5,000	100	2,130,000	Oct. '11	6.00
Gold Chain, g	Utah	1,000,000	1	40,000	Sept. '12	0.02
Gold Coin of Victor	Colo	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con	Colo	2,500,000	0.10	87,500	Sept. '12	0.00½
Gold King Con., g	Colo	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g	Colo	1,500,000	5	2,160,000	Nov. '12	0.02
Golden Star, g	Ariz	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g	Nev	3,558,367	10	23,839,066	Oct. '12	0.30
Grand Central, g	Utah	500,000	1	1,470,750	Oct. '12	0.05
Granite, g	Colo	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g	Cal	900,000	1	864,000	July '12	0.01
Hecla, l.s	Idaho	1,000,000	0.25	2,600,000	Nov '12	0.02
Hercules, l.s	Idaho	1,000,000	1	3,650,000	July '11	0.06
Homestake, g	S. D	218,400	100	28,740,440	Nov '12	0.50
Horn Silver, l.s.z	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l	Colo	1,666,667	1	200,166	June '11	0.00½
Iowa-Tiger Leasing g.s	Colo	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g	Utah	1,000,000	0.10	1,370,000	Oct. '12	0.10
Iron Silver, s.l.g	Colo	500,000	20	4,500,000	Jan. '12	0.10
Jamison, g	Cal	390,000	10	378,300	Jan '11	0.02
Jerry Johnson, g	Colo	2,500,000	0.10	150,000	Aug '11	0.01
Kendall, g	Mont	500,000	5	1,375,000	Jan. '12	0.02
Kennedy, g	Cal	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g	Ariz	200,000	1	396,000	Aug. '09	0.12
Klar Piquett, z.l	Wis	20,000	1	147,500	Sept '12	0.25
Knob Hill, g	Wash	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g	Colo	130,551	5	522,093	Oct '10	1.00
Little Bell, l.s	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g	Nev	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c	Utah	400,000	25	2,280,000	Oct. '12	0.15
Mary McKinney, g	Colo	1,309,252	1	986,011	Oct. '12	0.02
May Day, g.s.l	Utah	800,000	0.25	108,000	Sept. '08	0.01½
Mexican, g.s	Nev	201,600	2.50	20,160	Aug '11	0.10
Miami, c	Ariz	664,993	5	997,408	Nov. '12	0.50
Modoc, g.s	Colo	500,000	1	275,000	Dec. '11	0.01
Mohawk M. Co	Mich	100,000	25	2,675,000	Aug '12	2.50
Monarch-Mad'a, g.s.l	Colo	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g	Nev	921,865	1	430,000	June '12	0.10
Mountain, c	Cal	250,000	25	4,216,250	May '08	0.44
National, g	Nev	750,000	1	570,000	May '11	0.10
Nevada Con., c	Nev	1,999,394	5	8,977,870	Sept. '12	0.37½
New Century, z.l	Mo	330,000	1	237,600	Oct. '09	0.01
New Idria, q	Cal	100,000	5	1,630,000	Oct. '12	0.30
North Butte, c	Mont	410,000	15	10,453,000	Oct. '12	0.50
North Star, g	Cal	250,000	10	3,661,989	Sept. '12	0.30
Old Domin'n, M. & Sm	Ariz	162,000	25	2,556,000	Oct. '12	1.25
Ophir, s. g	Nev	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l	Utah	898,978	0.25	62,927	Oct. '12	0.02
Oroville Dredging	Cal	700,000	5	1,383,036	Dec. '09	0.12½
Osceola, c	Mich	96,150	25	10,881,650	Oct. '12	3.00
Parrot, c	Mont	229,850	10	7,152,399	Nov. '12	0.15
Pearl Con., g	Wash	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g	Colo	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g	Alas	5,000,000	1	4,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l	Ida	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g	Nev	2,790,000	1	502,200	Oct. '12	0.02
Portland, g	Colo	3,000,000	1	9,157,080	Oct. '12	0.02
Quilp	Wash	1,500,000	1	67,500	Feb. '12	0.01
Quincy, c	Mich	110,000	25	20,363,000	Sept. '12	1.25
Republic, g	Wash	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.z	Mo	1,900	100	188,396	Dec. '10	0.50
Round Mountain, g	Nev	866,426	1	328,404	Sept. '10	0.04
Seven Troughs Coal. g	Utah	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l	Mo	1,000,000	10	8,408,357	Sept. '12	0.15

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Shares Par	Dividends Total	Dividends Latest	Dividends Amt
Shannon, c	Ariz	300,000	$10	$600,000	Oct. '07	$0.50
Shattuck-Arizona, c	Ariz	350,000	10	1,050,000	Jan. '11	1.00
Silver King Coal. l.s	Utah	1,250,000	5	1,659,885	Jan. '10	0.15
Sioux Con., s.l.g	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g	Cal	1,000,000	5	275,000	May '12	0.02½
Smuggler, l.s.z	Colo	1,000,000	1	2,235,000	Nov. '06	0.03
Snowstorm, c.g	Ida	1,500,000	1	1,079,655	Oct. '12	0.03
South Eureka, g	Calif	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s	Cal	178,394	10	5,229,809	Jan. '12	0.10
Stratton's Ind., g	Colo	1,000,000	0.60	364,500	Apr. '12	0.06
Success, z	Ida	1,500,000	1	835,000	Sept. '12	0.03
Superior & Pitts., c	Ariz	1,499,793	10	3,089,574	Sept. '12	0.30
Tamarack, c	Mich	60,000	25	9,420,000	July '07	4.00
Tennessee, c	Tenn	200,000	25	3,106,520	Aug. '12	1.00
Tomboy, g.s	Colo	300,000	4.85	2,918,430	June '12	0.24
Tom Reed, g	Ariz	909,555	1	946,023	Nov. '12	0.07
Tonopah Belm't, s.g	Nev	1,500,000	1	3,593,000	Oct. '12	0.25
Tonopah Ext., g.s	Nev	943,433	1	330,201	Oct. '12	0.02½
Tonopah of Nev., s.g	Nev	1,000,000	1	9,650,000	Oct. '12	0.40
Tri-Mountain, c	Mich	100,000	25	950,000	Dec. '10	1.00
Tuolumne, c	Mont	800,000	1	360,000	Aug. '11	0.15
Uncle Sam, g. s. l	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c	Wash	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g	Colo	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c	Ariz	23,000	10	839,500	Oct. '12	7.50
United Verde, c	Ariz	300,000	10	30,997,000	Sept. '12	0.75
Utah, s.l	Utah	100,000	10	325,000	Dec. '10	0.02
Utah, c	Utah	1,562,599	10	15,048,516	Sept. '12	0.75
Utah Con., c	Utah	300,000	5	7,200,000	May '12	0.50
Valley View, g	Colo	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g	Colo	1,500,000	1	2,587,000	Oct. '12	0.03
Wasp No. 2, g	S. D	500,986	1	371,966	Nov. '12	0.02
Wellington Mines, g	Colo	10,000,000	1	200,000	July '12	0.00½
Wolverine, c	Mich	60,000	25	7,440,000	Oct. '12	5.00
Work, g	Colo	1,500,000	1	172,500	July '08	0.00½
Yak, s.l	Colo	1,065,000	1	1,417,685	Oct. '10	0.04
Yankee Con., g.s	Utah	1,000,000	1	162,500	July '07	0.01½
Yellow Aster, g	Cal	100,000	10	1,081,789	Jan. '12	0.05
Yellow Pine, l.z.s	Nev	950,000	1	104,508	Nov. '12	0.02
Yukon Gold, g	Alas	3,500,000	5	4,210,000	Sept. '12	0.07½

Coal, Iron, Industrial and Holding Companies

Name of Company and Situation		Shares Issued	Shares Par	Dividends Total	Dividends Latest	Dividends Amt
Amalgamated, c	Mont	1,538,879	$100	$7[illegible],043,159	Nov. '12	$1.50
Am. Sm. & Ref., com	U. S	500,000	100	2[illegible],208,333	Sept. '12	1.00
Am. Sm. & Ref., pf	U. S	500,000	100	4[illegible],708,333	Sept. '12	1.75
Am. Smelters, pf. A	U. S	170,000	100	7,119,000	Oct. '12	1.50
Am. Smelters, pf. B	U. S	300,000	100	10,667,000	Oct. '12	1.25
Cambria Steel	Penn	900,000	50	16,210,000	Nov. '12	0.62½
Consolidation Coal	Md	190,247	100	26,833,042	Oct. '12	1.50
Greene Cananea	U. S	2,471,314	25	1,856,454	Nov. '12	0.25
Guggenheim, Expl	U. S	831,732	25	14,689,986	Oct. '12	2.50
Inter'l Nickel, com	U. S	115,826	100	6,296,671	Sept. '12	7.00
Inter'l Nickel, pfd	U. S	89,126	100	3,743,189	Nov. '12	1.50
Inter'l Sm & Ref	U. S	100,000	100	2,700,000	Nov. '12	2.00
Lehigh Coal & Nav	Penn	482,956	50	22,535,092	Nov. '12	1.00
National Lead, com	N. Y	206,554	100	7,021,650	Sept. '12	0.75
National Lead, pf	N. Y	243,676	100	25,429,765	Sept. '12	1.75½
Old Dominion, c	Ariz	293,245	25	3,213,290	Oct. '12	1.25
Phelps, Dodge & Co	U. S	450,000	100	20,459,304	Sept. '12	2.50
Pittsburgh Coal, pf	Penn	297,010	100	15,137,583	July '12	1.25
U. S. Steel Corp., com	U. S	5,083,025	100	175,342,507	Dec. '12	1.25
U. S. Steel Corp., pf	U. S	3,602,811	100	319,853,982	Nov '12	1.75
U. S. S., R. & M., com	U.S.-Mex	486,320	50	4,518,866	Oct '12	0.75
U. S. Sm., R. & M., pf	U.S.-Mex	351,105	50	11,263,105	Oct. '12	0.87½

Canadian, Mexican and Central American Companies

Name of Company and Situation		Shares Issued	Shares Par	Dividends Total	Dividends Latest	Dividends Amt
Ajuchitlan, g.s	Mex	50,000	$5	$200,000	Oct. '12	$0.25
Amparo, g.s	Mex	2,000,000	1	920,000	Nov. '12	0.03
B. C. Copper	B. C	591,709	5	526,642	Oct. '12	0.15
Beaver Con., s	Ont	1,996,490	1	349,890	Oct. '12	0.03
Buffalo, s	Ont	1,000,000	1	1,560,000	Nov. '12	0.03
Cobalt Townsite, s	Ont	1,000,000	1	150,000	May '12	0.05
Coniagas, s	Ont	800,000	5	4,160,000	Nov. '12	0.45
Con. M. & S. Co. of Can	B. C	58,052	100	1,014,661	Oct '12	4.00
Crown Reserve, s	Ont	1,768,814	1	4,422,036	Oct. '12	0.05
Crow's Nest Pass C. Co	B. C	248,506	25	2,182,861	Mar '11	0.25
Dominion Coal, com	N. S	150,000	100	5,400,000	July '12	1.06
Dominion Coal, pf	N. S	50,000	100	4,915,000	Aug. '12	3.50
Dos Estrellas, g.s	Mex	300,000	0.50	7,030,000	Sept. '12	2.50
El Oro, g.s	Mex	1,147,500	4.85	8,389,575	July '12	0.24
Esperanza, s.g	Mex	455,000	4.85	10,835,127	June '12	0.36
Granby, s.l.c	B. C	148,496	100	4,197,111	Dec. '10	1.00
Greene Con., g	Mex	1,000,000	10	7,594,400	Nov. '12	0.40
Guanajuato D., pf., s	Mex	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold	B. C	120,000	10	684,000	Sept. '12	0.30
Hollinger, g	Ont	2,750,000	1	175,000	Nov. '12	0.03
Kerr Lake s	Ont	600,000	5	4,170,000	Sept. '12	0.25
La Rose Con., s	Ont	1,498,407	5	3,140,179	Oct. '12	0.12½
Le Roi No. 2, g	B. C	120,000		1,428,840	July '12	0.24
Lucky Tiger Com., g	Mex	715,337	10	1,553,736	Nov. '12	0.05
McK.-Dar.-Sa., s	Ont	2,247,692	1	2,812,089	Oct. '12	0.10
Mines Co. of Am. (new)	Mex	1,700,000	10	*877,500	Jan. '12	0.15
N. Y. & Hond. Ros	C. A	150,000	10	3,082,500	Mar. '12	0.15
Nipissing, s	Ont	1,200,000	5	9,090,000	Oct. '12	0.37½
Peñoles, s.l.g	Mex	80,000	25	5,910,688	Sept. '12	1.25
Peregrina M. & M., pf	Mex	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s	Mex	20,000	100	600,000	Oct. '11	3.00
Right of Way Mns†	Ont	1,685,500	1	[illegible]	Dec. '11	0.02
Rio Plata, s	Mex	373,437	5	351,000	Mar '12	0.10
San Rafael, g.s	Mex	2,400	25	1,439,780	Oct. '12	0.90
San Toy, g	Mex	6,000,000	1	360,000	Dec. '11	0.10
Sopre[illegible]a, g.s	Mex	19,200	20	1,517,438	Jan. '11	31.00
Stand'd Silver-Lead	B. C	2,000,000	1	325,000	Oct. '12	0.02½
Timiskaming, s	Ont	2,500,000	1	1,234,155	Oct. '12	0.03
Tim. & Hud. Bay, s	Ont	7,761	1	1,08[illegible],157	Oct '12	3.00
Trethewey, s	Ont	1,000,000	1	861,998	July '12	0.10
Wettlaufer-Lorrain, s	Ont	1,416,590	1	495,807	Oct. '12	0.05

*Previous to reorganization, $5,258,881.

†Previous to January, 1910, $324,644.

INDUSTRIALS

The Ash Grove Portland Cement Co. has purchased a Ruggles-Coles dryer for treating coal.

The Proctor Engineering Co., 150 Nassau St., New York, has just issued a circular describing the new Proctor direct automatic bucket tipple.

The Penberthy Injector Co. is sending out an 80-page book, and every superintendent and engineer at all interested in engine- and boiler-room practice will want a copy.

The Wern Machinery & Engineering Co., 30 Church St., New York, announces that it is now manufacturing the "Synchron" artificial respiration apparatus in this country. It is a Swedish device.

The Industrial Car Co., West Park, Ohio, announces that its name has been changed to the Electric Locomotive & Car Co. There is no change in the ownership and the offices remain the same as heretofore.

The Hardinge Conical Mill Co., 50 Church St., New York, has just issued a booklet entitled "Advantages of the Hardinge Patent Mill Over Other Grinding Devices." Anyone interested in grinding will want a copy.

Mr. C. H. Warfield, secretary and treasurer of the Goulds Manufacturing Co., of Seneca Falls, N. Y., has resigned his position with that company. Mr. B. R. Wells has been appointed treasurer and Mr. H. S. Fredenburgh, secretary, to succeed Mr. Warfield.

The Traylor Engineering & Mfg. Co., 30 Church St., New York, is pleased to advise that they have had a great revival in business and that the orders received in the last two months have been away beyond their fondest expectations, and their works are now operating at full capacity.

The Wood Drill Works, of Paterson, N. J., claim that a large measure of the efficiency and economy of their drills is obtained because they use vanadium tungsten iron for certain parts of their rock drills, such as the cylinder, chest and air heads. They invite investigation of this feature.

Mr. C. L. Newcomb, Jr., who has been connected with the International Steam Pump Co. as Denver sales manager for the past two and a half years, has resigned and the company will close its Denver office. Mr. Newcomb will take a six months' vacation before considering any of the offers he has on hand.

The Wheeler Condenser & Engineering Co., of Carteret, N. J., manufacturer of high vacuum surface and jet condensers and general condensing machinery, announce that they have opened an office in Cleveland, Ohio, at 1325 Citizens' Building, which will be under the management of Mr. Walter G. Stephan.

It is announced that the reorganization of the Platt Iron Works Co. is completed. The new company took over all the physical assets as well as the inventory and accounts receivable from the Trustees on Sept. 30. It starts in business not only free of all floating indebtedness, but with a working capital of $700,000 as well. The new company is a Maine corporation.

The Alberger Pump & Condenser Co., of 140 Cedar St., New York, announce that they now possess the exclusive right to manufacture and sell the well known Hammond meter. This meter has been largely used in power stations for keeping an accurate record of boiler feed. It is also adaptable for measuring other fluids, and for use in modern industrial plants.

The Indianapolis office of the Western Electric Co. is shortly to move into new quarters which have been leased at 121 South Pennsylvania St. The new building, which contains 31,000 sq.ft. of floor space and is five stories high, is better adapted to the needs of the local organization than the old building, which it has occupied for the past five years.

The C. O. Bartlett & Snow Co., of Canada, Limited, has been granted a Dominion charter, to deal in, manufacture and install elevating and conveying machinery, power transmission, machinery, engines, boilers, hoisting machinery, brick machinery, garbage reduction and destruction machinery, paint machinery, grain and cereal machinery, and to carry on a general line of engineering, manufacturing and construction work.

The S. Jarvis Adams Co. wishes to announce a change of its name to Pittsburgh Iron & Steel Foundries Co.; also that its general offices will from this date be located at the works, Midland, Beaver County, Penn. All correspondence, freight (via Penn. lines, C. & P. Division) and expressage (via Adams Express) should be addressed Midland, Beaver County, Pennsylvania, and telephone communication may be established through No. 998 on the Rochester, Penn., exchange.

S. E. Hendricks Co., 74 Lafayette St., New York, have just issued the 21st annual revised edition of "Hendrick's Commercial Register of the United States for Buyers and Sellers." Its aim is to furnish complete classified lists of manufacturers in architectural, engineering, electrical, mechanical, railroad, mining, manufacturing and kindred trades and professions. It is an invaluable book of reference for every business house and is expressed to any part of the country on receipt of $10.

At the regular monthly meeting of the Board of Directors of the Joseph Dixon Crucible Co., held Monday, Oct. 21, the following changes in the officers and Board of Directors were made on account of the death of Vice-President William H. Corbin. Mr. George E. Long, former treasurer, was elected vice-president to succeed Mr. Corbin; Mr. J. H. Schermerhorn, former assistant secretary and assistant treasurer, was elected to membership in the board of directors and treasurer of the company. Mr. Albert Norris was elected to the office of assistant secretary and assistant treasurer.

The H. W. Johns-Manville Co. has recently opened a new Southern warehouse at No. 31½ South Broad St., Atlanta, Ga. The entire building, embracing three floors and a basement, with a total floor area of about 10,000 sq.ft., will be utilized exclusively as a warehouse for a stock of such J-M products as roofing, boiler and pipe coverings, cements, packings, fire extinguishers, electrical, railway and automobile supplies. A feature of particular advantage in this new site will be found in the location of the Atlanta office of the H. W. Johns-Manville Co. in the same building with the local warehouse, which will materially help to minimize the chance of delay in deliveries.

The Smooth-On Manufacturing Co. has just issued a new edition of their Smooth-On iron cement book No. 7. Smooth-On iron cement No. 7 is a hydraulic, chemical iron cement, prepared and sold in powdered form and used for waterproofing, stopping leaks of concrete, hardening concrete and for bonding concrete to concrete and brick to brick or any porous substances. The new instruction book is illustrated; the illustrations show a few of the many ways in which this Smooth-On iron cement No. 7 has been used and the results obtained. It will prove valuable and interesting reading to anyone troubled with concrete leaks or the hardening of concrete. A copy of this book will be sent free of charge to anyone sending their name and address to the Smooth-On Manufacturing Co., Jersey City, N. J.

The Fairbanks-Morse Co., of Chicago, announce: Mr. Cyril J. Atkinson, M. I. Mech. E., inventor and patentee of the Atkinson gas producer and a number of special devices pertaining to gas producers, has severed his connection with the Dornfeld-Kunert Co., of Watertown, Wis. Mr. Atkinson's services and the use of all his patents have been secured by us, and a number of Mr. Atkinson's valuable patents will be incorporated in the Fairbanks-Morse gas producers at once. This company will place Mr. Atkinson's services at the disposal of the public for adapting the Fairbanks-Morse gas producers to meet the requirements of the various industries desiring to substitute producer gas for fuel oil. This will be of particular service and effect large economies in forge shops, malleable iron foundries, galvanizing plants, enameling works, brass foundries, etc."

The Western Electric Company's family of distributing houses has been increased by the addition of one in Cleveland, Ohio, as the result of taking over the business of the Cleveland Electrical Supply Company. The Western Electric Company retains the entire personnel of the supply company which it supersedes, with the exception of R. F. La Ganke, vice-president and manager, who is retiring from active business. H. A. Speh, of the Buffalo house succeeds to the post of manager. Louis Griesser, sales manager, has been twenty years in the electrical business at Cleveland. The Cleveland house has, in Mrs. M. L. Hausman, the only saleswoman in the company's employ. The new house takes up its work with good prospects. It is probable that a warehouse will be established in the near future for the service of the Central Union Telephone in Ohio. A telephone sales department has also been organized under the supervision of F. E. Triebner, formerly of the electric company's Nashville office.

TRADE CATALOGS

Earle Gear and Machine Co., Philadelphia, Penn. Bulletin. Herringbone gears. Illustrated.

McKiernan-Terry Drill Co., 115 Broadway, New York. Bulletin. "Busy Bee" hammer drills. Illustrated, 16 pages, 6x9 inches.

Pulsometer Steam Pump Co., 17 Battery Place, New York. Catalog 18. The Pulsometer. Illustrated, 48 pages, 6x9 inches.

C. W. Hunt Co., West New Brighton, N. Y. Catalog No. 12-8. Manila Rope Transmission and Hoisting. Illustrated, 48 pages, 6x9 inches.

Reading Iron Co., Reading, Penn. Pamphlet. "Court of Actual Experience." Wrought Iron Pipe vs. Steel Pipe. Illustrated, 48 pages, 6x9 inches.

Union Construction Co., 604 Mission St., San Francisco, Calif. Catalog. Placer mining dredges for gold and tin. Illustrated, 52 pages, 7x10 inches.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres ROB'T MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 31—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

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Electric Zinc Smelting

Electric zinc smelting is still very far from being a commercial process. Out of the great amount of experimentation that has been going on, it has been learned, we think, that such smelting is metallurgically feasible, i.e., that zinc oxide may be reduced in an internally heated, electrically heated retort and spelter directly condensed therefrom. It is doubtful if anything more than that may positively be said as yet. Nobody knows yet what may be the advantages, what the disadvantages in comparison with the conventional method of zinc smelting. However, these are interesting subjects of speculation, which are indulged in freely, not always by those most competent to judge. In a recent discussion before an engineering association, the following disadvantages of the common externally heated retorts were enumerated:

1. Low thermal efficiency (maximum 6%) using a maximum of four tons of coal per ton of ore.
2. Impossibility of controlling the temperature.
3. Losses are large (from 120 lb. to 180 lb. of zinc per ton of ore).
4. Impossibility of using units containing more than 100 lb. of roasted ore.
5. Short life of the clay retort, which is attacked by mineral impurities in the ore.
6. Impossibility of treating low-grade ore.

In contrast the electric furnace is considered to present the folowing advantages:

a. High thermal efficiency, the heat being communicated directly to the ore to be roasted, and not from the outside through a fireclay wall.

b. Absolute control of temperature, resulting in a minimum loss of metal.

c. Possibility of using larger units, with longer life and reduced labor charges.

d. Possibility of treating lower grades of ore.

e. Purer and more uniform product.

f. Recovery of lead, copper, silver and gold, which the ore may contain.

g. Capital invested per ton of ore is much lower, assuming electric energy can be purchased at from $10 to $18 per hp.-year.

The supposed advantages and disadvantages above expressed may be concisely reviewed under the respective heads:

1. The maximum thermal efficiency is higher than 6%. Reduction and distillation of ordinary ore containing about 50% zinc requires about 1000 calories per metric ton. The process is done in the best practice with about one ton of coal of 8000 cal. In such cases the thermal efficiency is about 12½%.

2. Experienced furnace men control the furnace temperature within a range of about 50° C.

3. In good practice the loss may be as little as 90 lb. of zinc.

4. The Silesian retort takes a charge of about 200 lb. of ore.

5. The retorts are admittedly a weak point of the present process.

6. Ore containing only 15% zinc is, or has been, treated in Silesia.

a. The difference between development of the heat inside and outside of the retort is a matter of about 150° C. The relative thermal efficiency *in toto* is a different matter. If electrical power is derived from a steam plant, coal is burned, but in a different kind of furnace. If the steam plant possesses a thermal efficiency of 10% and the electric furnace 75%, the efficiency of the whole system is only 7½%, which is less than with some regenerative smelting furnaces in which the coal is used directly. If the power be derived from gas engines, the ultimate thermal efficiency will be higher. If the power be derived from falling water, no coal at all will be burned. In these comparisons, however, the first cost of plant is a highly important factor and any statement that fails to take it into consideration is fallacious and misleading.

b. Unknown.

c. Probably correct as to the possibility of larger units; unknown as to the other points.

d. The validity of this assertion depends upon whether it is to be considered in the abstract or in the concrete. From the practical standpoint, the verdict at present must be rendered "unknown." Some metallurgists are working upon the line of treating mixed ores, obtaining zinc, lead and perhaps copper matte in one smelting operation. Other metallurgists consider that the first successful use of the electric furnace will be to restrict it to the highest available grade of zinc-bearing material and are directing their attention in that way.

e. Purity of product is a function of composition of ore and temperature of smelting. The electric furnace may not be expected rationally to be any more magic in this respect than the ordinary furnace.

f. Lead, copper, silver and gold are recovered in the ordinary process, but the percentage of recovery is relatively low. Increase of these percentages is perhaps the most hopeful outlook for electric smelting. Electric smelting also offers a possible opportunity of treating some kinds of ore that are especially objectionable in the conventional process.

g. This assertion is launched wholly into the domain of the unknown.

It may be added that while the retorts are a weak point of the conventional process, the electrodes are a weak point of the electric smelting. Nobody yet can say which will be the weaker.

These remarks are not intended to be an exhaustive review of the subject, but are merely some comments that may dispel certain phases of nonsense.

Return of the Principal

The directors of the Nevada Consolidated in declaring the extra dividend of a few weeks ago remarked that it was to be considered as a payment out of surplus in return of principal invested in the enterprise. It would have been interesting if they had further stated how much money had been put into the enterprise *ab initio* and how many extra-dividends would have to be paid to return it.

However, this would have been only of academic interest, because a large part of the stockholders have to reckon their amortization on what they paid for their stock in the market, not on the capital actually invested in the business, the difference representing the cream skimmed off by the wise promoters. In spite of extra dividends for capital redemption they will probably do well to continue to amortize themselves out of the regular dividends. However, it is safe to prophesy that they will not, and that in this case as in many others, a large part of the amortization will fall on the belated holders of the stock, i.e., those who own the shell after the kernel has been extracted and eaten, but don't know about it. In the case of Nevada Consolidated this is fortunately unlikely to happen for many years yet, its ore reserves being still very large.

While we are on the subject of dividends, we may appropriately remark the difference between the actual rates and the earnings forecasted by brokers' circulars in connivance with the respective managements of most of the porphyry copper companies. The circulars still talk about 6, 7 and 8c. costs of copper, but the dividends look more like 9, 10 and 11c., considering that the metal has been fetching upward of 17c. in the market for a long while past.

The Smelters' Trust

Representative Martin, of Colorado, is irrepressible. The affairs of the American Smelting & Refining Co. were investigated by a Federal grand jury, which was unable to find any violation of the Sherman law. Then Mr. Wickersham put his legal sleuths on the job; they, too, were unable to discover anything. Yet Mr. Martin is unconvinced. Evidently he sees some connection between the official whitewash brush and the Guggenheim senatorial chair. Last March he asked for a congressional investigation, hinting that it would throw some light upon the uses of the Guggenheim "barrel" and the debauchery of the electorate of Colorado. Mr. Martin flatly denied the assertion of the attorney general that competitive conditions prevail in the smelting business. Nevertheless, he was unable to make his own contentions prevail in the last session of Congress.

However, things are going to be different in the next Congress. Mr. Martin is going to have his investigation. In the meanwhile the voters of Colorado have been considering a constitutional amendment to bring the "smelter trust," as the tribunes of the "peepul" are wont to call it, under the jurisdiction of a public service commission. Incidentally this amendment, if adopted, may be troublesome to the independent smelters and millmen, it being, of course, constitutionally impossible to exempt them and single out the A. S. & R. Co. As for that company it might conceivably close its Colorado works and leave it to the Colorado ore producers to ship their ore to Salt Lake, Omaha or Chicago as they might see fit.

State control of an industry will apparently have to be complete to be effective because competition untrammeled may work in a variety of ways. Thus Salt Lake reports a very vigorous competition in the ore market among three powerful smelting interests and ore producers as enjoying very favorable rates, but the same competition is upsetting the lead market and lead ores do not realize so much in consequence thereof. A pegged price for lead and a cut-throat competition for ore would seem to be the proper remedy for this.

The canals connecting Lake Superior with the lower lakes at the Sault Ste. Marie have established a new record this year. From the opening of the season up to Dec. 1 vessels carrying a total of 71,067,000 tons of freight passed through their locks; this total being 8,704,000 tons above the previous record in 1910, and 17,620,000 tons above last year's figures. A few cargoes pass in December before the ice finally closes the passage, and a total of at least 72,000,000 tons will probably be the figure for the year.

The copper refiners' statistics for November are not especially illuminating of anything. The celerity with which the strikes at the mines in September-October were reflected in the refiners' statistics, not to speak of the fact that it was chiefly ore rather than blister copper that was cut off, is in marked contrast to the delay in showing the increased production of the early months of the year.

By the Way

In a report recently submitted to him, an engineer finds the following gem of geologico-chemical information: "The sulfate of uran being soluable has left yellow spots on the rock where the action of the water has not washed it away. Oxide of uran is worth $2 a pound."

Talk about fish stories! How many of them can equal this duck story, which comes by telegraph from Mexico: "Oil producers and refiners in the Tampico fields will lose more than $500,000 because millions of wild ducks have migrated to Mexico since the advent of cold weather, and hundreds of thousands of them have alighted in the great lakes of oil and perished there. These unnumbered flocks of dead water fowl have ruined the crude oil, which, because of the decomposed animal matter, cannot be refined."

R. B. Watson, in his excellent paper upon the unique and extraordinarily efficient metallurgical process introduced by the Nipissing company, referred to the development of this process by "Charles Butters and his assistant, G. H. Clevenger." We observed, after publication of this article, that this language might be construed as implying that Professor Clevenger had joined the staff of Mr. Butters. At the time of his collaboration in this process, Mr. Clevenger was associate professor of metallurgy in Stanford University, Calif., which is his present position.

Investigation of the alleged "smelter trust," including the Guggenheim and Green interests, will be demanded this winter by Representative Martin (Dem., Colo.). Chairman Henry, of the rules committee, says that Mr. Martin will be accorded an early and complete hearing. A mass of evidence has been accumulated by Mr. Martin, who charges that the "trust" has stifled competition by closing up smelting works. Thus reads a Washington press dispatch of last week. It will be recollected that Mr. Wickersham investigated the smelting industry a year or two ago and absolved everybody, but we do not remember that he looked into the Green interests, who may be the guilty party. We wonder who they are.

"It has been suggested and probably with some truth that the present ownership of the Lake Superior Copper and iron district by the United States is due to the reports of the early French explorers," says A. H. Meuche, in a publication of the Michigan Geological Survey. "While Doctor Franklin was in Paris, during the American Revolution, representing the interests of the colonies, he probably became acquainted with the records of the Jesuit Fathers and learned of the existence of copper along the southern shore of Lake Superior. Knowing this, would not his foresight tempt him to draw the boundary line as he did? This is particularly probable when we notice how the line curves up to take in Isle Royale."

We wonder often if we Americans obtain the same kind of mistaken ideas about foreign countries that foreigners do of us. This wonder is renewed by the following remarks in a late number of the *Australian Mining Standard*. "Everything points to the possibilty of war in the very near future between the United States and Mexico. The result will probably be the annexation of the latter republic by its great neighbor, though the work cannot be accomplished without the overcoming of constitutional difficulties and without considerable disturbance of the foundations of the polity of the American Union. A considerable section of the people of the United States has long looked forward to the acquisition of the Spanish-speaking republic, especially since its great mineral resources have been developed." We recommend to our Australian contemporary a subscription to the New York *Evening Post*.

The Carnegie "old boys" assembled on Friday evening, Dec. 6, at the home of Mr. Carnegie, Ninety-first St. and Fifth Ave., New York, for the 11th annual dinner and to give themselves up once more to the exchange of stories of the old days when they knew not of such things as check books and bank accounts. The Carnegie Veteran Association gathers every year at Mr. Carnegie's home. The association elected officers before it sat down to dinner. Andrew Carnegie was returned as president; Charles M. Schwab was elected vice-president, and Charles L. Taylor is the secretary. Of course, Mr. Carnegie made a speech. Then Charles M. Schwab reviewed the battles, victories and defeats of the members. J. H. Reed, a director in the United States Steel Corporation; H. P. Bope, John McLeod, A. C. Dinkey and W. E. Corey, ex-president of the Steel Corporation, were other speakers.

Charles A. Kuenzel has patented (U. S. pat. No. 1,042,567) a method of producing a combustible gas by feeding small quantities of oil into a compressor cylinder, vaporizing the oil by compressing the mixture, and maintaining this pressure until the mixture is consumed in external burners or engines without further addition of air. How near the critical point this process might work may be realized when one remembers that the Diesel oil engine fires its charge of oil and air simply by the heat generated by compression. This reminds us of a process we saw once where a compressor was pumping sulphuretted hydrogen through a closed circuit consisting of the compressor, an air receiver, and a closed chamber. Somewhere a little air got in which evidently joined forces with the sulphuretted hydrogen and a little volatilized cylinder oil, and one day there was a tremendous explosion, during which the cylinder took on a wonderfully wide-open aspect, and neighboring movable disappeared. The inventor on arriving at the scene, looked at the remains for a minute or two and remarked: "Well, that won't happen very often, anyhow." Mr. Kuenzel's process has been saved, at least temporarily, from this denouement by extradition papers issued by the Governor of Colorado on complaint of R. C. Thompson, of Spokane, who claims that he purchased stock in Mr. Kuenzel's earlier smelting enterprise which did not fulfill the claims made for it by the inventor.

John M. Oskison, financial editor of *Collier's Weekly*, in a lecture on "Sucker Lists and Gold Bricks," has given us an adequate characterization. "The secret of being a successful seller of gold-brick securities," he said, "is to pick out something to capitalize and promote which the average person with a bank account of from $50 to $1000 knows nothing about, and then suggest, without making any definite promises, that the buyer will make at least 100% within three years. A sucker is one in whom hope is strong. He allows it to overshadow reason. He will kid himself into believing that by putting $5 into 400 sq.ft. of land only 15 miles in a straight line from some proven oil field, he is likely to own a "gusher" some day and sit in council with John D. Archbold or go down in history as a rival of John W. Gates. That is because he knows nothing about the oil business. Ask him to buy stock in a company which has capitalized the earning power of the American hen, however, and he will laugh at you. He knows too much about a hen to fall for the perfectly true statement that you can capitalize her for $15 apiece and make 10%. The best sucker lists are made up from preachers, teachers and doctors—all persons of limited income, many needs, and a highly developed sense of duty. A large family in these days of high living cost, an inelastic income, and a thrifty instinct help to make thousands of victims of the gold-brick peddlers. Ignorance of the financial side of business accounts for perhaps half the long sucker list—here are written the names of the thousands of working women, widows with payments from the life-insurance companies to invest, and those impractical souls to whom modest legacies are left. More than half a million suckers lost over $120,000,000 to the promoters who fell into the net of the post-office inspectors last year. Probably not half of the losses for the year were represented in the list of those put out of business by the postal authorities."

How Sucker Literature Is Made

In the trial of Freeman, Quincy, Hawthorne and Morton, some interesting testimony was given on Dec. 9 respecting the preparation of the bait for suckers offered through the columns of the jackal press.

Joseph D. Barker, who is employed on the *United States Investor*, was the first witness. He described an interview in 1908 with Freeman, in which arrangements were made for the publication of an article on the Temagami properties. Freeman agreed to take 900 copies of the publication containing the write-up at 12c. each. The article was published, and it was commendatory in its terms. A second story was published on Apr. 10, 1909.

"Who gave you the information in the second story?" asked Assistant United States District Attorney Dorr.

"Mr. Freeman," replied the witness, "and we were paid $20 for it."

"Did Mr. Freeman revise the proofs?"

"He did."

In this article it was declared that the development of the Temagami mines was being pushed with energy and intelligence and spoke of a "main contact vein."

Extracts from the Hawthorne literature were then read to the jury, in which it was stated that the article in the *Investor* was the result of the investigation of the *Investor's* own engineer.

"Are you an engineer, or did you represent yourself as one?" Mr. Dorr asked of the witness.

"I am not one, and I never said I was," was the reply.

"Who furnished the technical information in the article?"

"Doctor Morton."

Counsel for the defense succeeded in bringing out in cross-examination that that article was written only after the publication in question had solicited the business.

"I was neither a miner nor a geologist," said Mr. Barker, "and I relied on the statements of Mr. Freeman and Doctor Morton."

Frank S. Adams, who was employed by *The Mercantile and Financial Times*, was then called to explain an article that appeared in his newspaper.

"Some of the Hawthorne literature," he said in explanation, "drifted into the office. It looked good to me, and I told some one to fix it up. I took the proofs to Mr. Freeman and said I should like to print it. He agreed to take 1500 copies at 10c. each."

In the article appeared the statements that "the company had uncovered well defined veins" and that "not one of the 30 claims of the Temagami-Cobalt company is without mining value."

"Did the writer get his information from any of the defendants?"

"No, just from the literature," was Mr. Adams' explanation.

Henry C. Stryker, a real estate man, told how *The Cobalt News Bureau* received on its own solicitation $200 for the publication of an article for which Mr. Freeman furnished the copy. It was favorable in tone and declared that the gold deposits were so rich that the promoters did not know whether they would make more from gold or silver. On cross-examination Mr. Stryker admitted that *The Cobalt News Bureau* was published at irregular intervals and had no representative in Cobalt. The publication was produced in New York.

The jackals of the press are of a lower class than the prostitutes. They are to be found in other places than in New York.

Southern Pacific Oil Land Litigation

WASHINGTON CORRESPONDENCE

Attorney General Wickersham has made in his annual report the first comprehensive statement concerning the policy that is being pursued by the Department with reference to the question of suits against the Southern Pacific R.R. Co. for the purpose of annulling patents issued to that company. Mr. Wickersham says:

> In my last report I called attention to certain proceedings against the Southern Pacific R.R. Co. to annul patents issued to that company in 1904-05, under the Act of July 27, 1866, purporting to convey some 8000 acres of land believed to be chiefly valuable for petroleum. Rapid progress has been made in the most important of these suits. The case, involving the title to 6000 acres in the Elk Hills, in the southern district of California, valued at $18,000,000, has been brought to an issue, and all of the Government's testimony in chief has been taken.
>
> This litigation rests upon the theory that the mineral lands in question were erroneously patented by the General Land Office, of which the officials were misled by representations that the lands were nonmineral, although the patents contained no express exceptions of mineral land. In this connection other litigation concerning mineral, and particularly petroleum lands of immense value, but of different legal aspect, is soon to arise between the Government and the Southern Pacific R.R. Co. and others claiming under it. The legislation under which that company obtained its grants of public lands expressly excepted mineral lands other than iron or coal. The patents in express terms except from the premises patented all mineral lands other than iron or coal lands. Among the lands which, but for the exceptions, the patents would convey, are large areas of oil lands in California, said to be of a value exceeding $500,000,000. It is the contention of the railroad company and those claiming under it that the exceptions in the patents are void. This Department, however, and the Department of the Interior have for many months been engaged in preparing to test this question. The preparations for these suits are about completed, and the suits will be instituted at an early day.

Shannon Copper Co.

The Shannon Copper Co. reports, for the year ended Aug. 31, 1912, a production of 16,406,336 lb. of copper, 170,691 oz. of silver, and 2615 oz. of gold, from which the returns were $2,594,867. Operating expenses were $1,678,737; freight, refining and all Eastern expenses, $231,900; interest and taxes $33,199; development, $90,416; leaving a net operating profit of $560,615. In addition there were other receipts, $20,401; and profit from the Shannon-Arizona Ry. of $15,723; leaving total profits of $596,739. As the $600.000 in bonds of the Shannon-Arizona Ry. are guaranteed by the Shannon Copper Co., $130,000 worth were bought by the latter corporation during the year.

The extraction was 285,210 tons, of which 42,125 tons came from opencut work. Exploration and development work amounted to 11,031 ft. Mining expenses were about the same as before (no figures given). There were few changes in the reduction works, but all the plant has been thoroughly overhauled.

Experimenting in the use of basic instead of acid converters will be carried out as soon as a new blowing engine can be installed. Experiments in leaching the semioxidized ores are still being carried on, but without commercial result so far. However, it is believed the problem will eventually be solved.

Molybdenum in the United States

No commercial production of molybdenum is known to have been made in the United States during 1911, according to the U. S. Geological Survey report. About 60 tons of rock carrying molybdenite are said to have been mined in the Ten Mile district, Summit County, Colorado, and shipped to Denver for concentration, but the material was too poor to pay for treatment. Some further work was reported as having been done upon the Catherines Hill deposit near Cherryfield, Me., but it was developmental and experimental, and there was no commercial production. The use of molybdenum in steel making does not appear to be increasing, although magnet steels are being made which contain about 6% of Mo. Other uses are being developed, however, particularly in making small electric furnaces, for which it is said to be the best substance yet employed. Some of the tungsten filaments used in electric lamps are supported at the lower end by molybdenum wire.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

The Work of the Bureau of Mines

There has recently come to my desk a copy of *Bull.* 43, from the Bureau of Mines, entitled: "Comparative Fuel Values of Gasoline and Denatured Alcohol in Internal Combustion Engines." In glancing it through I find that the pamphlet covers, index and all, 243 pages, and records a bewildering array of experiments, tests, with diagrams, curves and everything necessary to give to the subject a fitting air of finality and profundity.

A somewhat closer inspection shows, however, that the results arrived at are no different from other recent investigations, particularly an exhaustive series carried out by Profs. Lucke and Woodward along practically the same lines. Moreover, the same results can be definitely predicted from the chemical analyses and thermo-chemical properties of the two substances. Prof. J. W. Richards gives in his "Metallurgical Calculations" the heats of combustion of 1.0 cu.ft. of benzene, methyl- and ethyl-alcohol gases, which are, respectively, 3869, 799 and 1544 B.t.u. Hence the idea of comparing the values of substances, which in point of calorific power stand in the ratio of 4.6:1.0:1.9 respectively, when the ratio of cost between gasoline and denatured alcohol is about 1:3 or 4 in favor of the former, is not very evident.

So many dreary pages devoted to answering a question that can, for most practical purposes, be answered in a few moments from the principles of thermochemistry ought, surely, to be considered in the light of a "settler," yet we are reminded on the concluding page of the work:

> However, because of the changing character of the gases as combustion progresses and the consequent changes in the specific heats, a study of these features (efficiency of denatured alcohol at different degrees of compression) will be surrounded with many difficulties. Nevertheless, future work along this line could be profitably spent in analysis of exhaust gases with a view to learning something of their specific heats, in the hope that knowledge thus obtained may enable investigators to attack the problem in the future with greater intelligence and knowledge of the principles involved.

So it seems, after all, that after traversing a long and misty path we are brought back once more to the point from which we started; and evidently there is a chance for another attack, and probably a good many more, depending upon the amount of funds available.

Now, if a humble citizen may be so bold as to ask, what is the use of the Bureau of Mines devoting its time and money to the investigation of a subject which concerns the industries connected with the production of denatured alcohol and not mining? And why, after the Department of Agriculture, in which such investigations would properly belong, had completed and published a conclusive report, should an almost exactly similar investigation be undertaken by the bureau? Is it because the bureau has on its payroll a numerous bunch of retainers, and in order to keep them busy something must be found for them to do? Judging from the number and character of the bulletins issued from the bureau since its establishment the object too often appears to have been to "get busy" with something and then feed it to the press.

Granting, of course, that a new bureau, in order to meet all the claims made by its promoters (and the bureau itself, once established) as to the utter lack of scientific management, lack of knowledge, criminal extravagance, and general depravity and ignorance hitherto prevailing in the mining industry, which said bureau is to remedy, is rather "up against it," and has a difficult position to maintain in these days; yet it would seem that with the exercise of a little knowledge on the part of those directing the work, more pertinent topics might be selected.

ENGINEER.

Knoxville, Tenn., Dec. 3, 1912.

Food Supplies for Miners

The following list was compiled by a Canadian Pacific R.R. engineer from several years' store sheets, and refers to construction camps. The bacon and flour may be a little high, but much depends upon the work being done, working temperature and cook's ability. If tinned meat be taken, the bacon can be reduced.

DAILY RATION

	lb.		lb.
Flour	1.75	Salt	0.10
Bacon and ham	1.10	Mustard and pepper	0.01
Beans	0.17	[illegible]	0.03
Dried fruit	0.20	[illegible]	0.01
Sugar	0.10	[illegible]	0.15
Tea	[illegible]	[illegible]	0.05
Coffee	0.08	Tom., [illegible] or [illegible]	0.01
Baking powder	0.06	Syrup	0.03

Beside the supplies in the list, a little lard was used in the cooking, for which no allowance is made. The total of the above ration is 4.32 lb. Other supplies on a *per diem* basis were: Soap, 0.05 lb.; candles, 0.01 pound.

A. H. BROMLEY.

Mexico, D. F., Nov. 25, 1912.

Underground Efficiency

Much has been said and written about efficiency of workmen in the different departments of the mill, smeltery, shop, and various other branches. The efficiency of labor in the concentrating and cyaniding mill and smeltery has gone far ahead of that in the mine. F. W. Taylor's paper read before the American Society of Mechanical Engineers excites the greatest respect for the amount of time he has spent in systematizing the work in machine shops and industrial establishments. On the other hand, too little attention has been paid to the results obtained in underground work, and it now seems high time that more interest be awakened in studying the problem of raising the efficiency of the usual underground labor which enters to such a large extent in the cost of producing ore.

This does not apply at all places, of course, but it will be found to be singularly true in the majority of cases. The Utah Copper Co. and Nevada Consolidated, for instance, have systematized their operations of ore extraction by steam-shovel work to such a point that any further reduction of costs of even a few cents per ton can now be reached only after a great amount of outlay in capital and thought. Costs at the Douglas Island, Alaska, group of mines are so low that further reduction seems almost impossible. However, such statements can be made in regard to but few mines.

In extenuation of this fact it can be said that the men working in a mine are scattered over several thousand feet or even sometimes miles of poorly lighted workings, rendering supervision and inspection of their work a difficult matter; also, that mines are made profitable by being exhausted and hence at the close of operations the work of perfecting an organization and systematizing the work is largely lost. The last is not the case with an industrial enterprise where it is the intention steadily to improve and increase the value of an established business. These facts may deter many a man from taking the trouble that he otherwise would if his mine were to be a permanent institution. Yet, second thought should point out the decadence of a mine as a greater cause for increasing the efficiency to the highest possible point at the earliest moment, since there is no opportunity of retrieving later the time and money lost in producing the ore that has been extracted from year to year at a higher per ton figure than necessary.

From this the inference should not be drawn that a perfect organization can be acquired in a month or even a year; consequently the maximum efficiency cannot be obtained in a limited space of time. It has been my observation in visiting a good many mines, that where fair results are being obtained there is a tendency to "let well enough alone"; and yet the only way that the maximum efficiency can be obtained, is by keeping continually "at it" month after month, and year after year. As in other lines of work, radical changes are often dangerous, frequently resulting in serious accidents, dissatisfaction among the employees, or even strikes, and thereby results in a reduced efficiency. Hence, changes should be brought about gradually, the men being shown by increased pay for increased effort that it is to their interest as well as to that of the company to do more and better work. There is altogether too little attention paid by the manager and superintendent to the actual time required in performing the various underground operations. A superintendent is not, of course, expected to spend his time in actually timing the work of the men, but he should have men appointed to do the work of timing the various operations and to tabulate results afterward, putting them in a well arranged and comprehensive form which can be readily grasped.

The time lost in underground work would prove a revelation to the superintendent were more of this done. As a rule, too little attention is given to the pointing of holes. This should be studied for the purpose of determining how to break the maximum tonnage with the minimum footage of holes drilled, and should be based on careful, systematic study and not on guesswork. Careful attention should be paid to the sharpening and tempering of drill steel, so that the miner can get the maximum footage of holes with the minimum expenditure of effort. The quality and quantity of explosives, caps and fuse consumed should be given careful consideration in order to get the maximum benefit. Many a superintendent eases his conscience with the thought that the large consumption of dynamite is no concern of his, when the work is done on contract, since the contractor has to pay for the supplies. A moment's consideration should show him that the contractor must add the cost of supplies to the price of his labor before bidding for the work; and hence the company finally has to bear the expense.

Proper shovels should be provided the muckers, and the easiest way of handling the work should be worked out. Grades on tracks should be properly laid out and easy-running cars be procured in order to obtain the maximum efficiency from the carmen. Timbering from its nature should have the most careful supervision in order to obtain the best efficiency in the workman and maximum economy in the use of timber. In short, only the most careful thought and calculation of the various elements that make up the underground work will result in the desired efficiency. And finally, by never becoming discouraged and pushing ahead continually, results will be accomplished that at first seemed impossible. From time to time, valuable cost data are published in the technical magazines,* and there should be more of it; and these cost data should be accompanied so far as possible with a statement of the conditions under which these costs were obtained. If this were done it would be of invaluable assistance to men in charge of mining properties, in helping them to solve their own peculiar problems.

S. F. SHAW.

Charcas, S. L. P., Nov. 20, 1912.

Settling of Slime

I wish to thank C. H. Jakin for his frank criticism in the JOURNAL of Nov. 12, 1912. The results of the two tests given in this criticism in no wise disprove the principle set forth in my article; on the contrary, Mr. Jakin's tests tend to prove the accuracy of my experiments and deductions. Let us examine the results of Mr. Jakin's tests:

In Test 1, it required seven hours to settle a pulp to a desired thickness in a tank 12 ft. deep, and 45 min. to settle to the same thickness in a 5-gal. oil can, which is 1.25 ft. deep. In Test 2, it required 17 hr. to settle a pulp to a desired thickness in a tank 10 ft. deep, and two hours to settle to the same thickness in an oil can (1.25 ft. deep).

An inspection of the above results will show that these two tests closely conform to the following principle of settling: The time required to settle a dilute slime to a required degree of thickness is proportional to the depth of the settling column. Mr. Jakin has noticed this fact and concluded that the rate, or efficiency, of settling is greater in the shallow than in the deep tanks. He has failed to consider, however, that the amount of pulp settled is also proportional to the depth of the settling column.

Imagine two tanks of the same diameter, one 10 ft. deep and the other 1.25 ft. deep (the depth of an oil can). If the two tanks are filled with the same kind of pulp, we would expect that the deep tank would require eight times as long to settle to a desired thickness as would be required in a shallow tank. This fact is brought out by both my own and Mr. Jakin's tests. But it must be remembered that eight times as much pulp is settled in the deep tank as is settled in the more shallow one. It, therefore, follows that the settling rate or efficiency must be the same in each case, and is independent of depth of vessel.

EFFECT OF SETTLING RATE

Test No	H Depth Column	T Time Min.	P_1 Original % Moisture	P_2 Final % Moisture	L (from formula) Depth in feet of liquid formed	$\frac{L}{T}$ Settling rate Depth liquid formed per minute
1	12.00	420	59	46	3.88	0.0092
	1.25	45	59	46	0.40	0.0089
2	10.00	1020	90	81	5.05	0.0050
	1.25	120	90	81	0.63	0.0052

It will be remembered that one of the most important deductions made from my tests was that, in settling a dilute slime to a desired degree of thickness, the settling rate (or depth of clear liquid formed per minute) is independent of the depth of the settling column.

In order to show that Mr. Jakin's tests conform to this principle, I have calculated the depth of clear liquid formed in each of his tests by the following formula:

$$L = H - \frac{H(100 - P_1)(P_2 + 61)}{(100 - P_2)(P_1 + 61)}$$

In which,

L = Depth in feet of clear liquid formed;

H = Depth in feet of settling column;

P_1 = Original per cent. moisture;

P_2 = Final per cent. moisture.

The accompanying table gives the results of my calculations on Mr. Jakin's tests and show that in his tests, as in my own, the settling rate is practically independent of the depth of the settling column.

El Tigre, Sonora. R. T. MISHLER.
Nov. 28, 1912.

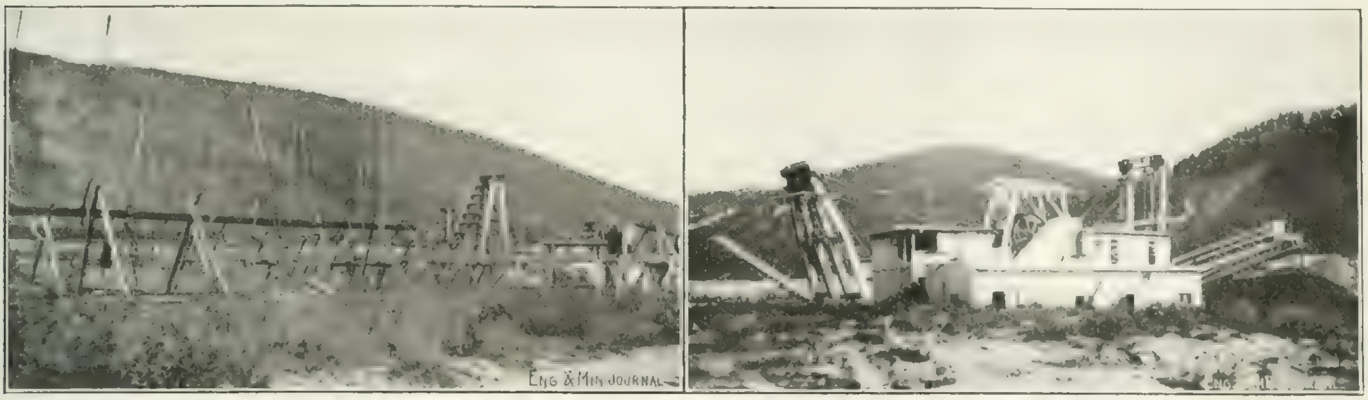
Leaching of Copper Ores

The report of the Shannon Copper Co. again makes reference to experiments in leaching the semi-oxidized ores. The other big copper interests are likewise experimenting, but saying little. Braden was understood to have solved the problem, but is now also working on flotation, I hear. Will anything ever be known of the schemes that failed, or will these fruitless efforts remain as mysterious as the many-years-old success of the Arizona Copper Co. in the same field?

A. A. NASON.

New York, Dec. 9, 1912.

Photographs from the Field



Thawing Frozen Gravel with Steam Points Previous to Dredging

General View of Dredging Operations on Bonanza Creek, Yukon Territory

Unloading Wood at a Thawing Plant

Dredged Creek, Showing Waterway Left between Banks

Dredging on Bonanza Creek, Yukon Territory

By Henry Mace Payne*

On Bonanza Creek, Yukon Territory, both dredging and hydraulicking operations are being carried on. Whenever practicable the dredging of the creek bottom precedes the hydraulicking in order to avoid handling the hydraulic tailings through the dredge. In some instances, however, especially where the hydraulicking was done in the early days and the recovery of gold was not thorough, it has been profitable to wash these tailings again through the dredges. Likewise, modern methods, by which a much higher percentage of recovery is possible, have made possible the profitable dredging of claims thought worthless 10 years ago and subsequently covered with hydraulic tailings from the hills above.

At the plants which generate steam for thawing the frozen gravel, wood is exclusively used for fuel at present, although fuel oil and the local lignites have been tried and the subject of producer gas has been investigated. As a result the mountain sides have been denuded of all timber for many miles within the vicinity of Dawson. The timber now used is rafted from the headwaters of the Klondyke, and from Stewart and the upper Yukon Rivers. The large logs are used for cribbing and the smaller ones for fuel.

The logs are cut into cordwood length at the river bank, and loaded in rope slings on flat cars of the Klondyke Mines R.R. Upon arrival at the thawing plant the cars are unloaded by a portable electric crane, the wood in any pile being sufficient to thaw all the area within a radius of 1500 ft. Another pile is then started about 3000 ft. beyond, and by the time the thawing plant is moved forward, a large amount of wood has accumulated in readiness.

The Yukon River being exceedingly swift and full of rapids, the wood contractors suffer heavy losses from rafts which break away, and, drifting below Dawson become a total loss, as no market is then available for many hundreds of miles; the cost of towing them up the river again would be prohibitive.

The gold-bearing gravel and overlying muck being frozen, it is first thawed by driving steam points down to bedrock. These points are spaced at intervals of from eight to 10 ft., and driven from five to 30 ft. down, depending on the depth of the frozen overburden.

Steam is generated by portable boilers and transmitted through a main 3-in. pipe to 2-in. headers and 1½-in. goosenecks, with which the points are connected by rubber hose. These points are in varying lengths, like drill sets, and are advanced as thawing takes place by men standing on step ladders and wielding sledge hammers.

It is aimed to thaw several weeks in advance of the dredges in order that the ground may "sweat," and thus thoroughly disintegrate the frozen mass, the black muck on the surface acting as an insulator and retaining the heat introduced through the points.

The dredges are of the regular type, with buckets averaging 7 cu.ft. capacity, and a chain speed of 18 buckets per minute, giving a theoretical capacity of 6720 cu.yd. per 24 hr. Dredges with 16-cu.ft. buckets have been completed recently on Klondyke River and will be put in operation next season.

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*[illegible] Stephen T. Williams, [illegible] Broadway, New York

Belgian 1911 Metal Production

In 1911 there were 13 zinc smelters and 11 zinc rolling mills working in Belgium, employing a total of 8732 workmen. These works consumed all of the Belgium mineral production and 470,290 tons of foreign ore. There were 958,370 tons of coal consumed by these works. The production of spelter was 198,238 tons, of which 49,635 tons were rolled.

There were six lead works operating in Belgium employing 1806 workers. These treated, in 1911, 69,440 metric tons of ore, coming almost exclusively from foreign countries; 103,870 tons of plumbiferous and argentiferous byproducts and 51,970 metric tons of work lead. Not including the work lead from foreign countries which was treated in Belgium the refined lead production was 44,308 metric tons. There were 252,720 kg. of gold and silver produced, and 310 tons of copper matte as a byproduct.

There were 17 works operating iron blast furnaces. There were 46 furnaces in blast which consumed 2,186,820 tons of coke and 5,442,550 metric tons of ore. Of this ore 54,470 tons were domestic. Pig-iron production amounted to 2,046,280 metric tons. Of this 1,882,960 tons were used for steel making.

It appears from the figures of stock on hand at the beginning and end of 1911, and considering the imports and exports of that year, that the true domestic consumption of Belgium in 1911 was 2,727,878 tons of pig.

The only mercury mines now being exploited in Russia are those of Auerbach & Co. in the Ekaterinoslaff government. They are being transferred to Belgians, says the *Mining Journal*, Oct. 26, 1912. These mines were abandoned of recent years on account of financial troubles. The cinnabar there appears as a crystalline mass in sandstone, and partly in quartzites underlying the sandstone. Besides cinnabar, stibute is common there, also sulphur in stelliform accumulations.

American Mining Congress

Special Correspondence

The annual meeting of the American Mining Congress began at Spokane, Wash., Nov. 25, continuing until Nov. 29. At the opening meeting addresses of welcome were made by Mayor W. J. Hindley, R. Insinger of the chamber of commerce and Graham B. Dennis. The leading address in response was made by David Ross, labor commissioner of Illinois. Others who spoke were Glenville A. Collins, representing the Peruvian government, E. Jacobs of British Columbia, George E. Baldwin of Valdez, Alaska, Paul Clagstone of Clagstone, Idaho; W. B. Shackleford, of Joplin, Mo., and R. L. Dougherty of Leads, S. D. President S. A. Taylor also made an address.

In the evening President Taylor delivered his annual address, in which he reviewed in detail the work of the sessions that have led up to this, the 15th congress, and named some of the things that lie within the scope of future activity. These included conservation in the broader sense and the protection of investors in mining property. The diversity of mining law in different states, the federal control of mineral and water-power sites, and the subject of workmen's compensation were all taken up during the address. In concluding, President Taylor declared that the future of the organization was sure, and took up some details for strengthening its machinery during the course of the coming year.

Other sessions during the week were devoted to reports of committees, the presentation and discussion of resolutions.

New Officers

The officers elected for the ensuing year were: President, D. W. Brunton, Denver. Vice-presidents, Hennen Jennings, Washington; E. A. Montgomery, Los Angeles, and Carl Scholtz, Chicago. Secretary, J. F. Callbreath, Denver.

At the meeting of the incorporated body the following directors were chosen: For three years, Harry L. Day, Wallace, Idaho; George H. Dern, Salt Lake City, Utah; W. G. Conrad, Helena, Montana; D. W. Brunton, Denver, Colo. For one year, W. B. Shackleford, Joplin, Missouri.

The following is a summary of the resolutions passed at the meeting:

Nos. 1 and 2—Urging the President-elect of the United States to select as secretary of the interior a resident in the Public Lands states, acquainted with public-land laws and who by actual experience is familiar with western conditions.

No. 3—That an appeal be made to Congress for an appropriation adequate for immediate compilation and publication by the Census Bureau of the data now on hand relating to mines and quarries.

No. 4—That in all cases where active development is in progress, unproductive mining property may not be burdened with taxation. Asking that every inducement be offered to stimulate effort that will create property able to bear the burden of taxation. Also, that a committee on mine taxation be appointed, and asked to report to the next session of this congress.

No. 5—Advocating that some measure of relief be afforded miners and prospectors by providing for the construction of roads in isolated mining districts located within forest reserves, and that the Forest Service be required to assist in constructing and maintaining such roads.

No. 7—That as a number of the states are now considering the advisability of placing upon their statute books laws governing and controlling the sale of stocks and bonds, a committee be appointed to gather information on this subject and ascertain what laws are now on the statute books of various states, and submit a report thereon to the next meeting of this congress, or to the board of directors for appropriate action.

No. 9—Recommending to Congress the enactment of a law authorizing claimants to coal lands in Alaska located prior to Nov. 12, 1906, to maintain actions in the courts of Alaska against the United States, to determine the validity of their respective claims, etc.

No. 10—Asking that the Mt. Olympus National Monument (a reserve of more than 600,000 acres within the Olympic National Forest, State of Washington) be abolished and that area be restored to the Olympic Forest, which will amply protect the scenic value of the region without prohibiting prospecting and mining.

No. 11—Asking that Congress legislate to secure similar charges for assaying gold in the United States assay offices of the West and on the Pacific Coast, as at the United States assay office, New York.

No. 12—Favoring legislation conferring jurisdiction upon the proper United States courts to entertain suits and determine the law of fact *de novo* and render final decision in all cases involving the claim or right to possession, title, etc., to any non-mineral or mineral lands under mining or other public-land laws, under certain stated conditions.

No. 14—That laws be enacted extending the principal of eminent domain to aërial trams, electric lines, and to pipe lines and other proper utilities.

No. 15—That Congress be commended for authorizing the beginning of studies of problems of metal mines, such as exist in the West—in particular mining accidents; also the treatment of low-grade ores and tailings not at present commercially valuable for lack of suitable means of treatment.

No. 16—Superseded by a later resolution.

No. 17—Again urging the passing of legislation now pending, and providing for Federal assistance to state mining schools.

No. 18—Authorizing the president of the American Mining Congress to appoint a committee on Alaskan affairs (1) to give publicity to deliberations of the congress on Alaskan questions; (2) to urge the United States Congress to grant prompt relief as proposed; and to work to secure the passage of laws that will permit development of Alaska's varied resources; also, to work to secure the construction of railways.

No. 19—Urging enactment of state laws against mills, smelteries, etc., disguising or destroying identity of any lot of ore before its value shall have been definitely agreed upon between the buyer and the seller.

No. 20—Advocating thorough revision of Federal mining law, and to secure a commission to study and report on a form of revision.

No. 21—Advocating the retention of the present tariff duties on lead and zinc ores, and pledging opposition of the American Mining Congress to any reduction.

No. 22—In connection with compensation to working men injured in industry, reaffirming faith in the justice of the position that each industry should carry its own burdens, resulting from accidents incident to it, and urging the passage of laws embodying this principle.

No. 23—Favoring the construction of two trunk lines of railway from the Pacific coast of Alaska to the great navigable water systems of the interior; either by government aid, or by the government itself. Also, the repeal of the annual license tax of $100 per mile and the warehouse tax in Alaska.

No. 24—Recommending legislatures of the various states containing large areas of Federal reservations to endeavor to secure, by their representatives in Congress, appropriations necessary to coöperate with all main and trunk line wagon roads, etc. Congress to be requested to provide for the construction of roads through Federal reserves.

Resolutions Nos. 25 and 26 dealt with matters connected with financing the American Mining Congress, and No. 27 was an expression of appreciation of help and entertainment provided by local bodies and all others.

The congress adjourned at the close of the session of Friday afternoon, Nov. 29. Then two days were occupied in visiting Cœur d'Alene city, Kellogg, Wallace, Burke and Mullan, Idaho, and at each place generous entertainment was provided for the visitors. The chief mines and mills seen were those of the Bunker Hill & Sullivan, the Hecla, and the Morning companies. The return to Spokane was made on the night of Dec. 1, and the visitors then dispersed.

Dominion Nickel-Copper Co., Sudbury

Special Correspondence

The Dominion Nickel-Copper Co., which was formed about six years ago, to acquire properties in the Sudbury district, principally on the North Range, has been considering the building of a smelting plant. If built, the smeltery will probably be erected at the site of the old Murray plant, on the property recently purchased from the Vivian estate, of Swansea, Wales, by the Dominion company.

An examination of the mine has recently been made for the company by a staff of engineers, under the direction of Benjamin B. Lawrence, of New York. The company has spent nearly $250,000 in drilling, chiefly on the North Range holdings and on property in Falconbridge township. The principal properties on the North Range are around Nickel Lake, in the township of Bowell, and Joe Lake, in the township of Wisner.

At the Whistle mine, at the far northeastern corner of the district, the company has done extensive work and has the property ready for production. A town called Nickelton has been established at this mine. The company has recently purchased the Murray mine and the properties of the Lake Superior Corporation—the Gertrude, Elsie and the Victor. It has also taken an option on the Kirkwood. All of these new acquisitions are on the South Range except the Victor. Drilling is now in progress and good results are reported, particularly on the Murray. The company now has the largest holding of ore reserves in the Sudbury nickel district, except the Canadian Copper Co., the local organization of the International Nickel Co. The Mond company, a British corporation, also has extensive ore reserves in the district. The Dominion company is financed and controlled by J. R. Booth, of Ottawa, and M. J. O'Brien, of Montreal. The general manager is J. A. Holmes and the business manager J. N. Glidden. The company's headquarters are at Sudbury.

Bureau of Mines Budget

The probable expenses of the Bureau of Mines for the fiscal year June 30, 1913, to June 30, 1914, are estimated as follows: General expenses, $70,240; investigating mine accidents, $347,900; fuel investigations, $135,000; investigations into the treatment of ores and other mineral substances, $250,000; inspecting mines in Alaska, $6500; books and publications, $2500; toward erection of a laboratory at Pittsburgh, $115,000; collection of statistics, $25,000; purchase or lease of land for headquarters of mine-safety cars, $2000; total, $954,140.

The increases asked for include $4140 for general expenses, $27,900 for investigating mine accidents, $200,000 for investigations into the treatment of ores and other mineral substances, $1000 for the purchase of books and other publications, $115,000 toward a new fireproof laboratory, and $25,000 for the collection of statistics concerning accidents in the mining industry and other interests.

Ray Consolidated Copper Co.

The report of the Ray Consolidated Copper Co., operating at Ray and Hayden, Ariz., for the third quarter of 1912, shows a production of 9,295,818 lb., made up as follows: July, 3,105,165 lb.; August, 3,055,490; September, 3,135,163 lb.; derived from 429,411 tons of 1.6148% ore of which 24% was produced by development work.

The average daily tonnage for the quarter was 4667 tons, but an average of 5000 tons was maintained during September. The extraction for the quarter was 67.026%, which is attributed to the fact that much of the tonnage is still derived from the upper levels of the mine and therefore contains considerable quantities of oxidized ore, and to the dropping of the grade of the ore by 0.1%, as compared with the previous quarter, in which the extraction was 69.37 per cent.

The total production of concentrates for the quarter was 25,926 tons, containing an average of 17.93% copper, and the ratio of concentration was 16.56:1. The average cost per pound of net copper produced during the quarter, after allowing for smeltery deductions and after crediting the earnings of the Ray & Gila Valley R.R. against operating costs, is given as 10.027c. as compared to 9.954c. for the preceding quarter. This cost includes all operating and general charges, as well as 12½c. per ton, or approximately 0.6c. per lb. on the quarter's production for the extinguishment of mine development expenses.

The direct operating profits for the quarter were $640,748; miscellaneous income, rent, etc., $9965, and total net profits for the quarter, $650,713. The earnings are computed on the basis of 17.13c. per lb. for copper, or approximately 0.5c. per lb. less than was actually received for the copper sold during the period. This has been done in order to bring the inventory price of copper in transit down to 12¼c. per lb. The entire stock of copper in transit or unsold is now said to be carried at that figure. It is stated that at the close of the quarter no copper due for delivery from the refineries remained unsold.

In this quarter the sixth section of the Hayden plant was put into operation, and the seventh section is well toward completion, leaving only one to finish, and this last is also partly completed, all the material and apparatus required for it being on the ground. The power plant and all other accessories are completed with the exception of unimportant details, and on the whole the expenditure necessary to finish the entire plant will be comparatively small.

Sinking of the No. 3 shaft on the original Ray Central territory has progressed more slowly than was expected, due to this shaft being deeper than any workings in the vicinity and consequently draining the entire surrounding territory, giving more water to handle than was anticipated. The shaft should be finished in November, and ore production from the high-grade body in the Ray Central territory started in December, or at all events not later than Jan. 1, 1913. Development work amounted to 37,715 ft. during the quarter, bringing the total workings in the mine at the end of September up to 264,000 ft., or about 50 miles.

Allis-Chalmers Reorganization

The Allis-Chalmers reorganization committee reports that securities deposited under its plan now total as follows:

	Deposited	Outstanding	Per cent.
Bonds	$10,458,000	$11,148,000	93.8
Preferred stock.	14,146,500	16,050,000	88.1
Common stock.	17,215,600	19,820,000	86.9

The United States District Court of Milwaukee has entered final decree of sale in the suit to foreclose the first mortgage of the company, and sale will take place on Feb. 3, 1913. (Cf. Eng. and Min. Journ., p. 726, Oct. 19, 1912). This sale through the reorganization committee representing the bondholders, is a formality necessary to make the new organization plan, with its new stock and bond allotments, effective.

Iron Blast Furnace Capacity

According to the figures collected by the American Iron & Steel Association, there were, on June 30 last, blast furnaces in existence having a total nominal yearly capacity of 42,950,000 tons of pig iron. Between June 30 and Nov. 30, one new furnace, of 20,000 tons capacity, went into blast; and four, of 86,000 tons capacity, were definitely abandoned and wholly or partly dismantled, leaving the capacity on Nov. 30 at 42,893,060 tons yearly.

Of these furnaces, however, there are a number having a total yearly capacity of 1,766,000 tons, which have been long idle. Most of these, by reason of antiquated construction and equipment, or unsuitable location, will probably never go into blast again, and they should be deducted from the total iron-making capacity; leaving it at 41,127,000 tons yearly. The condition of these furnaces on Nov. 30. expressed in terms of their total yearly capacity, was: In blast, 35,068,000 tons; out of blast, but expecting to resume within a few months, 1,986,000; out of blast, with no date for resumption fixed. 3,673,000 tons. All of the last named class have made iron since 1898, and may be considered as capable of entering the active list. The production of pig iron reported on Nov. 30 was at the rate of about 31,800,000 tons yearly.

Southern Pacific Geologist not in Government Employ

Complaints have been received from Barstow, Calif., that a geologist in the employ of the Southern Pacific R.R. is using in that vicinity cards representing him as connected with the U. S. Geological Survey. The Director of the Survey has secured further evidence and is convinced that there is substantial basis for the complaints and therefore informs all concerned that Leon J. Pepperberg resigned from the U. S. Geological Survey, Mar. 23, 1910, and since that time he has not been employed by the Survey nor has he been authorized to collect data for its use or to represent it in any capacity. Mr. Pepperberg's use of a business card reading "Mining Geologist, U. S. Geological Survey, Washington, D. C.," is wholly unwarranted and his title prior to his resignation was not even geologist, his grade being "Junior Geologist," and neither his title nor his work was in any sense that of Mining Geologist. Such self-designation was not truthful prior to 1910 and since then is absolutely false.

Director Smith adds that the public can be assured that anyone in the employ of the Southern Pacific or any other corporation in the United States, who represents himself as a member of the U. S. Geological Survey is an imposter, as the Survey policy based upon a federal statute specifically prohibits such double employment.

Ferrochrome Syndicate

The international ferrochrome syndicate, which, though only in course of formation, has played a most prominent part from the beginning of this year in regulating prices, has now been definitely constituted, with a head office in Paris, says the *Mining Journal*, Nov. 2, 1912. It embraces all important European producers, but it has not been considered necessary to include the Americans, the reason being that the whole of the American output is absorbed by domestic consumers, while, on the other hand, the prohibitive tariff prevents imports from Europe.

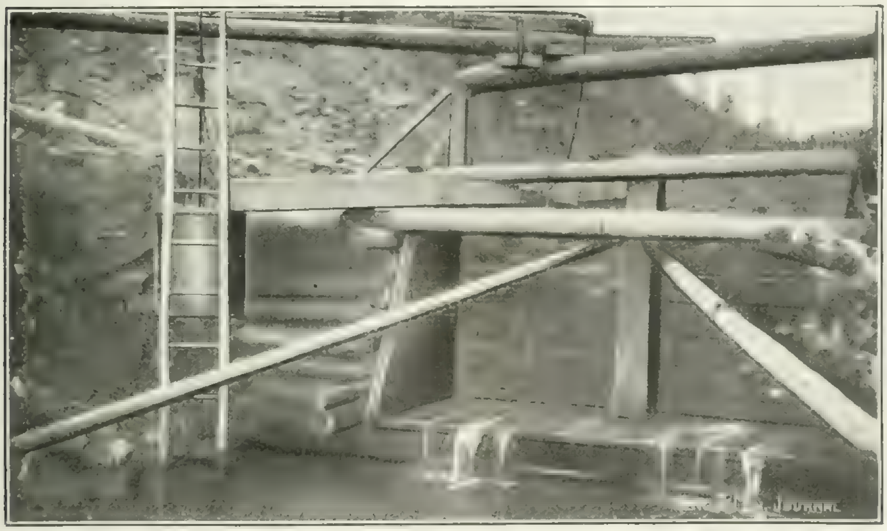
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

An Automatic Splash Dam

By Henry Mace Payne*

This ingenious arrangement, while having been used in California in the past, is nevertheless sufficiently interesting to warrant passing attention. The accompanying photograph was taken on Dominion Creek, Yukon Territory, where the mining company is ground-sluicing the top muck away from the underlying gold-bearing gravels. The material so eroded must be carried many miles down the creek and into Indian River, in order to avoid building up flats in the stream and thus nullifying the process. This requires a larger volume of water and a swifter current than could normally be obtained.



Automatic Splash Gate, Dominion Creek, Yukon Territory

The gate is built in vertical slides, and from its top a small wire rope passes over pulleys on the headframe and down to a suspended iron tank, formerly used as a container for oil. Inset about an inch in the top of the gate, and leading to the iron tank, is a sluice box about 12 in. wide and deep.

When the water has reached the level of the sluice box, and just before overflowing the dam, it flows into the iron tank, which when full, weighs more than the weight of, and pressure on, the gate. As a result the tank settles, raising the gate and allowing the pond to empty.

In the meantime the water in the tank has been slowly escaping through a small hole punched in the bottom, so that by the time the pond has been emptied, the tank has also emptied and the weight of the gate being greater than that of the empty tank, the tank rises and the gate falls back into position. By this simple arrangement advantage is taken of the entire stream flow, which would otherwise be too sluggish to accomplish results of any value.

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*Mining engineer, Stephen T. Williams & Staff, 346 Broadway, New York.

Planetable Surveying

The planetable is a most useful instrument to those engaged in topographic and geologic work in more or less isolated and rugged mining districts; but as yet it is seldom used by mining engineers. The reasons for this are twofold; the technical schools do not teach the use of the planetable in such a way that the student can grasp its full possibilities, and there is an entirely reasonable hesitancy in undertaking any new methods in the midst of the press of work with which one is usually surrounded, says D. F. Higgins (*Economic Geology*, Aug., 1912).

In a new mining camp the geologist is confronted with the problem of working out the detailed geology of a considerable area in a limited length of time. In a new and rough country traversing is tedious and difficult, and even with the stadia it is inaccurate without special precautions. In the summer of 1911 such a piece of work was undertaken with the planetable as outlined below.

The problem was to map on a scale of 1500 ft. to one inch an area about one mile wide by five miles long. The maximum relief on this five square miles was between 2300 and 2400 ft.; and the area extended over a pass about 2000 ft. above each of its extremities. The principal geologic feature of the area was an irregular contact between an intrusive basic granite and a sedimentary series. The country was fairly treeless and fairly easy upon which to move. In doing this geologic work a Bumsted, or "baby," planetable tripod was used. A light 18x24-in. drawing board was substituted for the usual 15x15-in. top. For sighting, a light and cheap Japanese telescopic alidade with stadia hairs, and vertical circle reading to 3′ was used. The straight edge on the alidade was 11 in. long. The weight of this outfit was 12½ lb. In addition to the planetable and alidade were carried the usual impedimenta—hand-level, hammer, hand compass and clinometer, collecting bag, etc.; and an 8-in. peep-sight alidade carried in the hip pocket was useful for secondary sights.

On the first day the south base, 1475 ft., was measured with a 500-ft. steel tape, and a reconnaissance triangulation net was laid out. This was done by "occupying" the ends of the base and likely stations, expanding the base roughly. Bearings were taken with a Brunton compass, and in the field they were plotted to a small scale on a notebook page with a protractor. In this way the area was roughly laid out for control, although all the stations used later did not have to be visited. The next day freshly hewn 3-in. square stakes were placed on all the points not already sufficiently marked by prominent rocks. Two assistants were used on the second day. On the third day the triangulation was expanded on the planetable and carried northward. Late in the afternoon of the fourth day the net was closed on the stations *O*, *P* and *Q* which had been located from the north base, 388 ft., by transit observations. In this work especial care was taken to center the planetable over the stations and to extend all lines of sight on the paper. Stations *A*, *B*, *D*, *E*, *F*, *H*, *I*, *J*, *K*, *L*, *N*, *O* and *Q* were occupied. The sides of the triangle *OPQ* were computed from the transit observations and compared with the distances as scaled to one-third of one-fiftieth of an inch, or to the nearest 10 ft., from the graphic work as developed from the south base. The results were:

Line	Computed Distances, Feet	Scaled Distances, Feet
OP	3254.2	3250
OQ	2224.2	2220
PQ	2766.9	2750

Thus the expense and the time necessary for an instrumental survey were obviated, and the accuracy of the work was well within that demanded by the geologic mapping. Vertical control was established throughout and numerous secondary points located.

The geologic mapping and the topography in 50-ft. contours were then begun and carried on with the aid of one assistant carrying a stadia rod. In many cases the assistant was sent to outcrops with rod and hammer to give a reading and to bring back a specimen. Although this system saved much climbing for the geologist it could be used only where inspection of the outcrop from the planetable made the character of the rock fairly certain, and it is not to be generally recommended. Magnetic stadia traverses were run at intervals as required and frequent checks on position were possible by the three-point location from known points.

Planetable Triangulation No.

The total time occupied in this piece of work was 30 days, and the time spent actually in the field was 16 days. The total cost was about $175 or about $35 per square mile. This work was done in Chosen, where the cost was probably somewhat less than it would be in the United States.

It must be borne in mind that a high degree of accuracy and speed with the planetable does not come without great care and practice in manipulation. For instance, the refinements of close scaling (traverses have been run in which the distances have been plotted to scale by the naked eye to less than 1/500 of an inch), of a properly sharpened plotting needle, of the wedge-pointed hard lead pencil, of the extension of the lines of sight on the edges of the paper and of drawing lines from the centers of the small needle holes must be appreciated and acted upon in order to secure thoroughly satisfactory results. But even without much practice, fair and rapid results may be obtained.

With regard to the carrying of the planetable it may be said that some planetable users have noticed that after a few weeks in the field it is easier to get over rough ground with the planetable than without it. The reason for this is that the light tripod is often used as an alpine staff, and at other times the planetable can be used advantageously to balance one's self. In fact, one is conscious of a peculiar sensation of insecurity when in difficult positions without its friendly assistance.

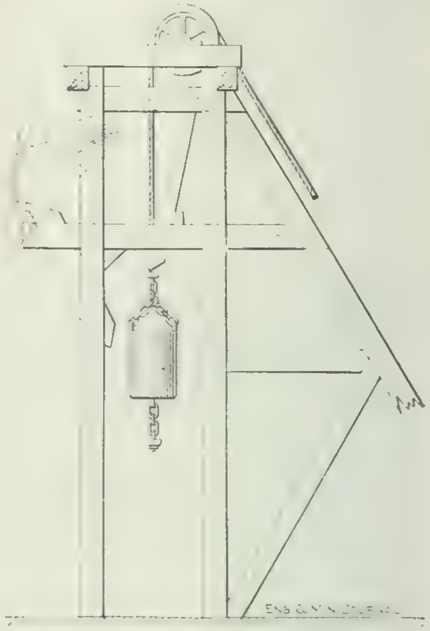
And lastly, attention must be called to a characteristic of the planetable which has often been remarked upon in conversation by topographers but which doubtless has seldom found its way into print. Anyone who has seen the topographer or geologist poring over the map on his planetable of an evening after a strenuous day's field work can realize that the planetable has risen from the rank of a mere scientific instrument to that of a creative instrument; for in addition to its scientific value the work of an honest and enthusiastic mappist is in the truest sense artistic and creative. Thus in the common cause of earnest effort to record Nature's truths, the instrument and the man become in a way a part of each other. Often alone, and far from camp, the days and weeks spent together in the field, meeting common dangers and solving common problems, develop a feeling of comradeship which can scarcely be appreciated except by those who have had the experience themselves. The notebook cannot rise to this degree of esthetic merit.

At some of the U. S. Smelting, Refining & Mining Co.'s mines, a considerable saving is being made on mine-car wheels. When the tread of a wheel becomes worn, it is machined down so that a steel band can be shrunk on the rim. When tempered carefully, the new rim lasts three times as long as the original cast rim and can be replaced whenever worn.

A Direct Automatic Bucket Tipple

By Olin S. Proctor*

A direct automatic bucket tipple has recently been devised so that lowering and raising the bucket in the shaft completes the operation without any short lifts with the hoist or the manipulation of catches or triggers. The special mechanism comprises a tilting chute provided with a bale, a swinging arm and two balls; one ball is attached to the cable just above the bucket and the other to the bottom of the bucket by a short chain. The bucket in the dumped position can be carried up close to the sheave wheel, thus giving room for chutes or for bins the height of the head frame.



Direct Automatic Bucket Tipple

The regular four-post head frame with the usual bracing is shown, but this device can easily be adapted to almost any headframe, since there are only two pivot points to be supported in proper relation to each other and the cable. Considering the chute as the front, the swinging arm is hung on a shaft or hinge behind the cable up near the sheave wheel. Usually this can be done by passing a piece of shafting through timbers of the headframe and the swinging arm. When the bucket is down the swinging arm rests against a cross timber so the cable plays freely through the slot or hole formed in the lower end of the swinging arm. When the bucket is hoisted the ball on the cable comes in contact with the lower end of the swinging arm, which causes the bucket to move up and over into the tilting chute. At this time the arm, acting through the bale of the chute, tilts the back end of the chute up to an angle of about 50° to the horizontal.

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*Mechanical engineer, 150 Nassau St., New York.

The bucket is prevented from sliding down the chute by the ball attached to the bottom engaging a V-shaped notch in the rear of the chute. The weight of the bucket carries the chute and arm back to the normal position when the cable is slacked to lower. This simple mechanism makes the operation of a bucket as fast or faster than a cage, and it works on incline or vertical shafts. It is being placed on the market by the Proctor Engineering Co., 150 Nassau St., New York.

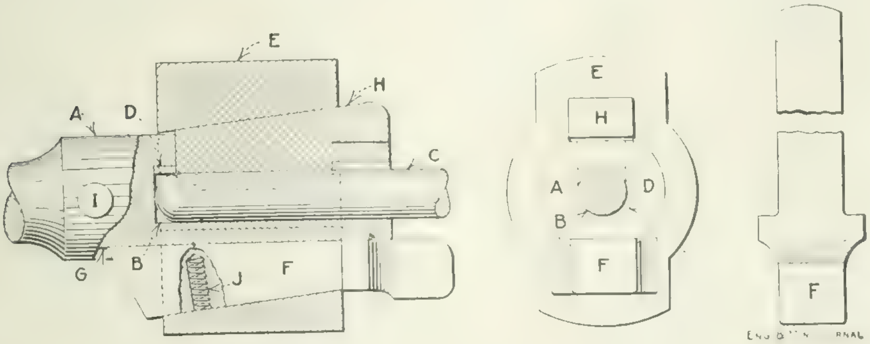
The Vaught Drill Chuck

The drill chuck illustrated in the accompanying sketches was invented by J. C. H. Vaught, now of Calumet, Mich., who claims that the device has been successfully used in the Bunker Hill & Sullivan mine in the Cœur d'Alene district in Idaho, in the Argonaut mine at Jackson, Calif., in the Copper Queen at Bisbee, Ariz., in Goldfield Consolidated, Tonopah Midway, Anaconda, and Butte & Superior mines. The advantages claimed for the invention are that when once assembled the parts that make up the chuck cannot unintentionally be taken apart, no U-bolts are used to hold the drill steel, there are no nuts to tighten and loosen and the steels may be changed by striking the shouldered releasing and retaining key *F* a blow with a hammer or wrench which will force the sliding sleeve *E* to disengage with the gib *H*, thereby leaving the steel free to be renewed at will by the operator, and as soon as another steel has been inserted in the socket, the air may be turned on instantly and with the first impact of the piston, the sliding sleeve is forced forward on the tapered face of the gib *H*, causing the latter to engage the drill shank positively. The design is such that when in operation the chuck tends to grip the steel tighter rather than to lose hold by the shock and vibration of the piston.

In the accompanying sketch, *A* is the chuck proper; *B*, the opening in the chuck to receive the shank of the drill steel *C*. This opening is lined with the bushing *D*. The chuck proper is enveloped by the sliding chuck-sleeve *E*, within which is cut a groove in which is fitted a shouldered releasing and retaining key *F* that also fits in the keyway *G*. On the opposite side of the chuck body a slot is provided to receive the gib *H* which is brought to bear upon the drill shank *C*, through the pressure exerted by the sleeve *E* upon the gib when the sleeve is forced forward by the impact of the drill steel with the rock. A groove is cut in the sliding sleeve to receive the gib. As shown below *H*, the chuck and bushing extend below the main part of the gib *H*, so that the gib cannot slide out from beneath the chuck sleeve.

The retaining and releasing key *F* is prevented from sliding out of the sleeve by the enlargement at the rear end; the chuck on account of the tapered gib *H*, and the pin *I* limits the extent to which it can slide upward, thus neither gib nor key can fall out.

A spring *J* in a recess in the key *F* holds the sleeve back and off the gib while replacing the drill steel. This design, as shown in the sketches, should permit of making an unusually strong chuck and it would seem that no part of the device is as weak as the U-bolt used in so many similar devices.



Details of the Vaught Drill Chuck

Method of Locating a Shaft

By J. B. Moore*

The method of locating a shaft as herein described has, I believe, some advantages over the method described by H. G. Henderson in an article entitled "Survey Method of Locating a Shaft," and published in the Journal of Nov. 23, 1912.

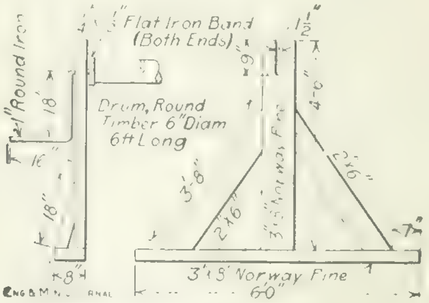
First select the place underground through which the shaft is to be sunk and mark each corner. Then begin at the mouth of the adit and survey it to within a few feet of this place and from the last setup of the instrument sight and measure to each corner of the proposed shaft and calculate the total coördinates of the survey to these points. Then return to the starting point of the survey and carry it outside to within 10 or 20 ft. of the shaft location, figuring the coördinates as the survey is made. From the last point calculate the distance and direction to points vertically above the corners of the shaft marked underground, then set up the instrument on the last point of the survey, turn the required angles and measure and mark each of these points which will be the corners of the shaft.

By selecting a position for the last setup so that the measurements to each corner can be made horizontally the operation is very simple and can be done in one visit to the mine. Then work may be started at both ends of the shaft if desired.

Test Pit Windlass

By L. D. Davenport*

In the open-pit mines of the Chisholm district, Minnesota, it is the custom during the winter season to put down a large number of test pits in the ore for exploration purposes. These pits are usually about 3x4 ft. in cross-section and range in depth from 10 ft. to 80 ft. The accompanying sketch shows the details of the windlass used to hoist the ore from these pits. Four railroad ties are placed around the mouth of the test pit to form a collar and the bottom of the windlass frame is spiked to this collar. The windlasses used for underground test pits are made on the same general plan, except that they are smaller.



A Simple Windlass

Utilizing Discarded Brass Screens

It is a comparatively simple matter for any machinist to make small brass castings in the usual run of machine-shop work at a mine or mill. As a rule the work is simpler than making iron castings and the metal may be melted in graphite crucibles, such as are used for melting amalgam sponge or cyanide precipitate. Sand or clay may be used for molding.

If brass screen cloth is used in the mill, a supply of brass can be obtained at practically no cost. The discarded screens are carefully washed, folded up into a compact mass, dried and dropped into the crucible in the furnace. Screens so melted may remain in the crucible a long time without melting, greatly retarding the work. The remedy is simple and consists in melting a few pieces of scrap brass, so that the wads of screen cloth can be partly submerged in molten metal when dropped into the crucible. A large number of screens can thus be melted in a short time.

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*Superintendent, Jimulco Mining Co., Otto., Coah., Mexico.

*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

An Electric Battery for Blasting

By C. Carleton Semple

There is a notion entertained by many miners, that electric detonators cannot be used in blasting except in conjunction with a magneto machine or a lighting or power circuit, but comparatively few mines are lighted by electricity and still fewer are wired for power. Blasting machines are rather expensive, especially for the man mining on a small scale. In order that they may be used conveniently several machines will be needed on every working level, and in case operations are on even a moderate scale, the initial cost of an adequate supply of blasting machines amounts to no mean total.

Furthermore, the magneto machine is notoriously liable to get out of order and to be affected by dampness. Its mechanism is not easily comprehended by many miners who might be called upon to make their own repairs. It is these reasons as well as vague notions entertained by some as to the difficulties of wiring, that are accountable for the fact that in mines fuse is still the favorite means of detonating explosives, even for work under water. The advent of first- and second-delay action detonators has made it possible to secure the desired intervals between the breaking of groups of holes in a round in electric blasting.

A cheap blasting machine can be made by using dry batteries such as are usually sold for about 20 to 25c. each for electric call-bell work. While I have been unable to thoroughly test out such a battery, I have secured excellent results which warrant my suggesting the device to those who can. I have found that at least two caps can be detonated for each cell in the battery. This would indicate that a battery of eight cells should suffice for any ordinary drift round.

The eight cells may be placed in a wooden box, conveniently in two rows of four cells in the row. The cells should be connected in series; one battery terminal being connected to one of two binding posts placed near together at one end of the box. The other battery terminal should be connected to the center of a two-point switch secured to the end of the box near the two binding posts. One point of the switch should be connected to the second binding post; the second point of the switch, not being connected, is the off position. The box should be equipped with a substantial hinged cover, preferably locked in place, and a stout strap which may be slung over the shoulder for carrying the battery about.

The operation is simple. The switch is carried on the off or blank point. The wires from the round are secured in the binding posts and when ready to blast the switch is slipped over to the other position. The effect is, of course, instantaneous unless an attempt is made to fire too many holes for the number of batteries used. While the flow of current is strong, the circuit is broken so quickly by the detonation of the charges that the dry cells should recover quickly and be serviceable for a long time. How long, I am unable to state, as I have not yet had opportunity to blast frequently enough to exhaust a battery.

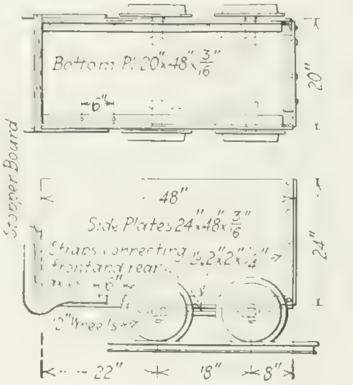
It is a simple matter to arrange such a battery so that the circuit may be tested by sending through a small current before switching on the full current of all the cells in series. I have found that 1 lb. of No. 22 copper magnet wire, wound on a spool for convenience, placed in the circuit of only one electric detonator, will enable one to send the current of one dry cell through the circuit without exploding the detonator. If, then, the battery box is so arranged with one cell in circuit with such a spool of wire for resistance, it will be possible to arrange a three-point switch in such a manner that the lead wires from the round may be attached to the binding posts while the switch is on the blank point. Obtaining a spark at the switch while making and breaking contact with the second point to which the single cell and coil of wire is connected, would indicate a closed circuit which will be fired upon throwing the switch over to the third point to which all the cells of the battery are connected. A still more elaborate device can be made by placing a cheap and simple galvanometer on the end of the box connected with the second point of the three-point switch and the one cell and resistance coil; the movement of the needle would then indicate a closed circuit much better than would sparking at the switch.

Sublevel Tram Cars

By H. L. Botsford*

In the sublevel system of mining there is need for a special tram-car which can be easily brought into and removed from the subdrifts. The only access to the subdrifts is usually by a raise or winze through which it is impossible or inconvenient to take the main-level cars.

The accompanying illustrations show two types of small tram-cars which are well adapted to this work. They are so constructed as to be dismantled for moving, and quickly assembled. A light steel car is shown in Fig. 1. The sides are bolted to the bottom and the end to the bottom and sides. The front axle only is bolted to the car box. The front and rear axles are connected by straps, so that the box lifts off the rear axle when being dumped. A wooden car, built with detachable sides and end is shown in Fig. 2. The truck is hinged, and only the front half is fastened to the car box. The sides of the car are provided with cleats which fit into stirrups bolted to the bottom planking.



Bottom Pl. 20"x48"x$\frac{3}{16}$"
6"
20"
Stopper Board
48"
Side Plates 24"x48"x$\frac{3}{16}$"
Straps connecting front and rear 2"x$\frac{1}{4}$"
6"
12" Wheels
24"
22"
18"
8"

Fig. 1. Steel Sublevel Car

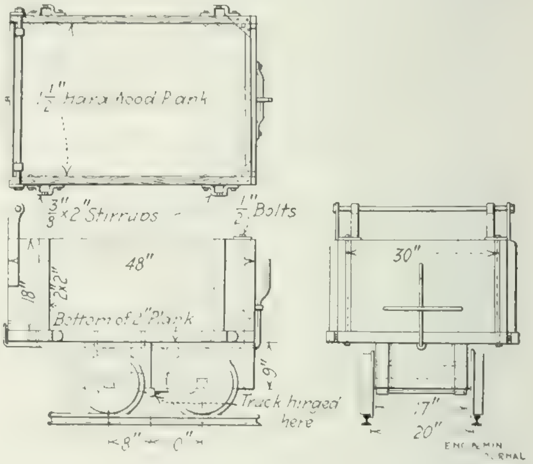


Fig. 2. Wooden Sublevel Car

A satisfactory pipe vise can be made from an ordinary steel vise by taking a piece of coarse sandpaper about 3 in. x 6 in. in size and after doubling it place it around the pipe, then place the part with the sandpaper on it between the jaws of the vise and tighten, says the November, 1912, *Pemberthy Engineer and Fireman*. The pipe may then be either threaded or cut without difficulty.

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*Creighton Mine, Ontario.

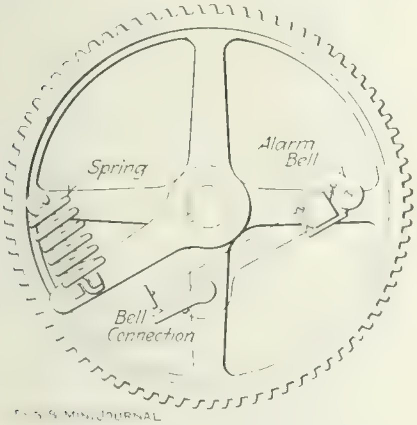
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Overload Alarm for Dorr Thickeners

An interesting and ingenious device has been arranged to be placed on Dorr thickener tanks to call attention to an overloaded condition. The arrangement is as follows:

Above the usual gear wheel, which moves the vertical shaft, is placed a cast-iron arm keyed to the vertical shaft. The gear wheel itself is not keyed to the shaft, but is loose on it and free to move independently. The arm and gear wheel are connected by means of a spring, the tension of which may be adjusted for working conditions. The power being applied, as usual, to the gear wheel, the arm is moved through the spring, and the vertical shaft moves with the arm. However, should the load be too heavy, the gear wheel continues to move but the arm remains stationary, the load on the shaft being too much for the spring, which opens. Hence the relative position of the arm and gear wheel is not maintained and the arm drags back.



Overload Alarm on Dorr Thickener

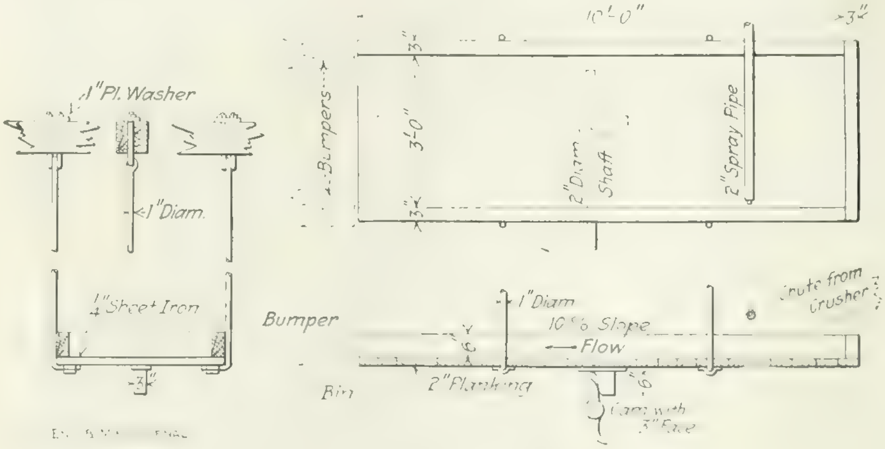
When the arm has moved, with reference to the gear wheel, a few inches, it presses on a small plunger rod, which makes an electrical connection and rings a bell. The connection and bell are fixed on the large gear wheel, and the movement of the arm need be only small to make the connection and ring the bell. Attention is thus immediately called to the condition of the thickener and the mill man takes immediate steps to lighten the load by cutting off the feed to the machine or increasing the discharge or any other convenient method.

The contrivance works well and is of great use on thickeners, particularly where the feed or discharge to them is variable. It is used on the Dorr thickeners at the mill of the Blue Flag Gold Mining Co., of Cripple Creek.

Bumping Picking Table

By Edward H. Orser*

During the first days of mining in and around the Cobalt district, most of the mining companies erected small rock houses in order to cut out as much of the waste rock from the hoisted material as possible. In these plants hand-picking was almost unanimously resorted to, and was carried on by either dry picking or "cribbing," or else on moving tables where the broken ore was subjected to the washing action of a stream of water. In this way the ore was made more easily discernible.



Bumping Picking Table Used in Cobalt District

The accompanying sketch is intended to show one of these tables. It is essentially an inclined tray hung from the roof timbers by four iron rods. The upper end is under the chute from the crusher, and the lower end extends over the bin for waste. The bumping is accomplished by the use of a cam-and-tappet arrangement on the under side of the tables and driven from the main lineshaft by pulley and belt.

The swing of the table is about one foot On its return it strikes a bumper of timber at the lower end. This action, and the inclination of the tables, which is about 10%, effect the forward movement of the material at a rate not too fast for clean picking. A 2-in. spray pipe at the upper end of the table supplies the wash water, and this can be regulated by a 2-in. globe valve on the pipe.

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*9 Frontenac St., Kingston, Ont.

Slotted vs. Round-Hole Trommel Screens

By R. S. Handy*

At intervals during the last year I have been experimenting with slotted punched-steel screens in an effort to find something to replace the round-hole screens on trommels, which, in my experience, have always shown low efficiencies.

My first order for slotted screens was as follows: One 30x151-in. steel screen, ¼-in. gage, punched with slots 10 mm. wide by 1 in. long; one 30x151-in. steel screen, $\frac{3}{16}$-in. gage, punched with slots 7 mm. x ¾ in.; one 30x151-in. steel screen, ⅛-in. gage, punched with slots 5 mm. x ½ in.; slots to run with the circumference and to be staggered, as in Fig. 1. When these screens were put in the place of round-hole screens, with the width of the slot corresponding to the respective diameter of the round-hole, the jigs receiving their feed from the slotted trommels were swamped with feed and the slotted screens had to be removed. The 7-mm. slotted screen was then put in place of a 10-mm. round-hole screen. Table I shows the screen tests on the oversize of these two screens.

The 10-mm. slotted screen was substituted for an 18-mm. round-hole, and the 5-mm. for a 7-mm. round-hole screen; each gave as good service and slightly better oversize screening tests than the round-hole screen which it replaced.

The results of these tests were encouraging but, with the exception of the

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*Mill superintendent, Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho.

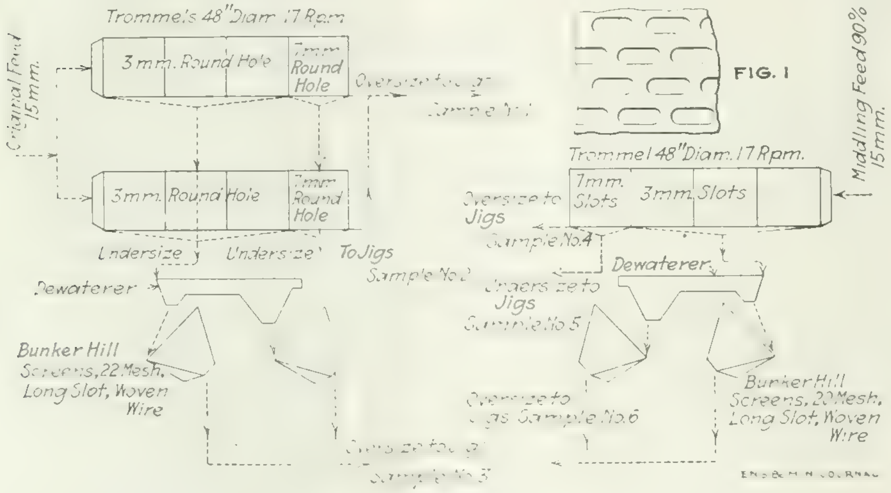
5-mm. size, the slotted screens "blinded" greatly, and there was too large a proportion of elongated pieces in the undersize. To overcome these faults the gage of the steel and the length of the slots were changed and the following screens were ordered: Three 30x153-in. steel screens, No. 14 W. & M. gage, closely punched with oblong slots, running with the circumference, 3 mm. wide by 3/16 in. long; one 30x153-in. steel screen, ⅛-in. gage, punched as closely as possible with oblong slots, as above, 7 mm. wide by ⅜ in. long; screens to be rolled to a 4-ft. circle, with the small side of the slot inside.

TABLE I COMPARATIVE GRADING ANALYSES OF TROMMEL OVERSIZE

	Oversize 10mm. Round-hole %	Oversize 7mm. Slotted Screen %
+10mm	84.2	87.4
+7mm...........	11.2	11.8
+5mm...........	4.1	0.8
−5mm	0.5	

These screens were lately put into service on the middlings side of the Bunker Hill & Sullivan West Mill No. 2 in competition with double the number of equivalent round-hole screens handling the same tonnage of about the same size material on the original-feed side of the same mill.

Results of a test covering eight hours of regular service of these trommels are shown in Tables II and III. In Table II are given the screen tests on products (samples 1 and 2) from two trommels, each consisting of 180 in. of 3-mm. round-hole screen and 60 in. of 7-mm. round-hole screen; and on the oversize (sample 3) of two Bunker Hill screens with 22-mesh, long-slot, woven-wire screens. Table III shows the screen tests of products (samples 4 and 5) from one trommel having 90 in. of 3-mm. slotted screen and 30 in. of 7-mm. slotted screen; and of the oversize (sample 6) of two Bunker Hill screens with 20-mesh, long-slot, woven-wire screens. Reference to the accompanying flow sheet will make clear the arrangement of the trommels.



ARRANGEMENT OF TROMMELS FOR COMPARATIVE TESTS

It is interesting to note that the slotted screens are showing no tendency to blind, while the round-hole screens have to be cleaned at intervals.

The specifications for the original-feed trommels are as follows: Six 30x153-in. steel screens No. 14 W. & M. gage, closely punched with 3-mm. round holes; two 30x151-in. steel screens, ¼-in. gage, punched with 7-mm. round holes, 7/16 in. centers; the screens to be rolled as above.

TABLE II. GRADING TESTS ON PRODUCTS OF ROUND-HOLE TROMMELS AND BUNKER HILL SCREENS

Standard Screens	Sample No. 1 Oversize 7mm %	Sample No. 2 Oversize 3mm %	Sample No. 3 Oversize 22 mesh %
+7mm	64.6		
−7mm	35.1		
+3mm		89.2	
−3mm		10.8	
+20 mesh...			77.5
−20 mesh...			22.3

The inefficiency of round-hole trommels is due, I believe, to the fact that in their operation they hold the mass of the pulp away from the full opening of the orifices in the bottom of the trommel and up on the side at an angle of about 20° with the horizontal. A vertical projection of a 30-mm. round opening in a screen ½ in. thick on a 4-ft. trommel at this angle is only about 16 mm. wide. That is, the largest particle which could fall freely through a 30-mm. hole at this angle would be 16 mm. wide. This ratio decreases as the sizes grow smaller, until a projection of a 3-mm. hole in a 14-gage screen is little more than one millimeter wide. It is not surprising, then, to find the efficiency of round-hole trommels decreasing as the sizes grow smaller.

TABLE III. GRADING TESTS ON PRODUCTS OF SLOTTED SCREENS

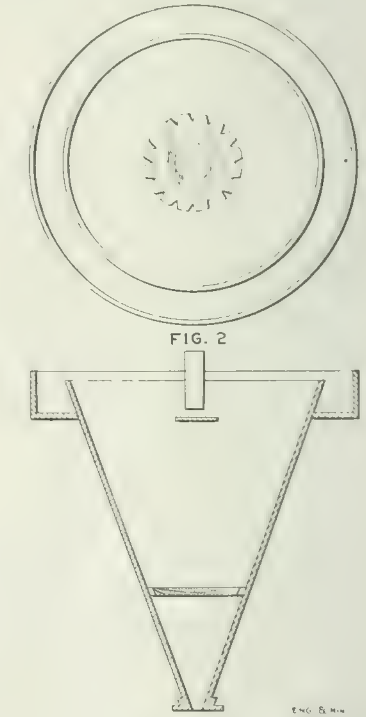
Standard Screens	Sample No. 4 Oversize 7mm %	Sample No. 5 Oversize 3mm %	Sample No. 6 Oversize 20 mesh %
+7mm	89.6		
−7mm	10.4		
+3mm		97.7	
−3mm		2.3	
+20 mesh			90.9
−20 mesh			9.1

It was this condition which led me to the slotted form of screen and I endeavored to arrange the length of the slots and the gage of the steel so that a vertical projection of the slot at an angle of 20° would be a circle of the same diameter as the width of the slot.

The Bunker Hill ore breaks to a granular form, and in this there is some advantage in favor of the slotted screen, but I believe the dimensions of the slots and the gage of the steel could be arranged to give high efficiencies with trommels on almost any ore.

Improved Caldecott Cone

W. A. Caldecott, of Johannesburg, has patented (U. S. pat. 1,008,524) the use of a circumferentially notched plate to assist in the settlement of solids in overflow classifiers. The object is to avoid the holes or passages which form in the ordinary classifier in the solids, which result in sudden rushes of the liquid through the aperture in the bottom of the vessel. In large tanks, there may be perforations in the plate, as well as circumferential notches. The accompanying illustration shows a notched plate in a conical classifier.



NEW DISK FOR CALDECOTT CONE

Increased efficiency in concentration at the Federal mill, Flat River, Mo., is attributed to the use of Esperanza-Federal classifiers because they give a clean separation of sand and slime and also furnish an even table feed by acting as accumulators.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

The Tantalum Industry

The first use which brought tantalum into great prominence was making filaments for incandescent lamps. The first successful metallic filaments were made from it, and owing to the toughness of the wire it seemed likely that it would remain a valuable material for this purpose, for although its efficiency was lower than that of the tungsten lamp, the first tungsten filaments were so brittle as to make their carriage precarious.

However, processes have now been devised by which tungsten wire can be drawn nearly as tough as the tantalum, and the tantalum lamps are being driven from the markets. It has been recommended for making surgical and dental instruments, pens and other such small apparatus, but apparently the first workers in this metal overestimated its hardness and such uses will not be as important as at first promised.

No tantalum minerals are known to have been produced in the United States during 1911, according to the U. S. Geological Survey, except a few hundred pounds of columbite, produced by Emil E. Hefnard, Custer, S. D., which was sold for mineralogical specimens. There was a considerable quantity of tantalum wire imported from Siemens & Halske, of Berlin, Germany, during the year.

Determination of CO_2 and H_2O in Minerals

Water and carbon dioxide are found by Dittrich and Eitel to be completely expelled from minerals and rocks by heating to a sufficiently high temperature in a current of dry air, and the authors describe (*Zeit. anorg. Chem.*, p. 365, 1912; *Journ. Soc. Chem. Ind.*, Nov. 15, 1912) apparatus by means of which, except in substances containing organic matter, graphite, or much fluorine, these constituents may be determined in a single operation. For temperatures below 1000° C., the heating is effected in a tube of quartz glass, the substance being contained in a platinum boat, and for higher temperatures, up to 1400° C., a tube and boat of platinum-iridium (10% of iridium) are employed. The heating, in either case, is effected by means of an electric resistance furnace, and the evolved water and carbon dioxide are collected in absorption apparatus in the usual way, the purifying and absorption apparatus being connected to the heating tube by ground joints. For the retention of sulphur and halogens, a roll of silver gauze, heated by a bunsen flame, is placed in the forward part of the tube, or, with a quartz tube, a heated mixture of lead oxide and peroxide may be employed. The results obtained are in agreement with those given by the Ludwig and Sipöcz method for the determination of water in silicates, as modified by the authors (*Zeit. anorg. Chem.*, 1912, p. 373).

Selenium Glass

The use of selenium as a coloring matter or "stain" in glass, dates from 1891 (*Chem. Zeit.*, p. 1149, 1912; abstr. *Journ.* Soc. Chem. Ind., p. 1033, 1912), when Welz patented the use of selenium alone or with cadmium sulphide for producing a red or orange "stain." In 1894, Spitzer used selenites or selenates in conjunction with sulphites or arsenites, the latter acting as reducing agents. A year later, selenium in combination with gold was employed for red colors and as a decolorizer in white glass. For discharging the green color due to iron, selenium is a valuable agent. In order to study the physical and chemical condition of selenium in glass, the author used a glass of the formula: $6SiO_2CaO2Na_2O$, which was heated for 24 to 30 hr. at 1400° C. He finds that the element selenium can only produce a red under strongly reducing conditions. The pigment is in a condition of true solution, but if by insufficient reduction the "stain" is not fully developed it is not all dissolved. The coloration depends on the reduction and not on temperature nor length of firing. There may also exist in solution, in a colloidal state, selenites of the type, M_2Se, and compounds less oxidized than selenites, of a type similar to thiosulphates. These colloidal solutions are sometimes colored, sometimes not.

Constitution of Aluminates

We are in the habit of thinking of the hydrated oxide of aluminum acting as an acid in the formation of aluminates, but from experiments by Edward G. Mahin, of Purdue, detailed before the International Congress of Applied Chemistry, it appears that the colloidal character of alumina has more to do with its solubility in alkalis that has its possession of any amphoteric characteristics, that is, alumina is a base, and goes into colloidal solution in alkalis, and not as the acid radical of a salt.

These experiments included: The heat of solution of $Al(OH)_3$ in NaOH; the quantity of $Al(OH)_3$ precipitated by a known weight of $NaNO_3$ from a Na_3AlO_3 solution; and the relative weights of aluminum oxide and oxygen produced by electrolysis of an Na_3AlO_3 solution.

[If these conclusions are correct for fusions, it will have a great influence on our ideas of slag formation.—EDITOR.]

Marr Timber Preserving Process

A new process for the preservation of timber is that of R. A. Marr, of Richmond, Va. The preservative material is melted paraffin with silica in suspension, together with a percentage of naphthalene. The silica used is a diatomaceous earth of which 92% will pass 200 meshes to the linear inch. The naphthalene is supposed to cause expansion of the pores and cells of the wood, and to get up an active circulation, expelling the moisture and sap from the pores and drawing in the preservative mixture. This mixture, upon cooling, forms a solid coating over all the interior cells and pores. It does not leach out, it is impervious to water and all organic acids, and being also antiseptic it prevents the entrance of spores which cause wood to decay says *Engineering News*, Nov. 21, 1912.

It is claimed that wood can be permeated to the center, regardless of the dimensions of the timber, in a maximum of four hours as against 12 to 24 hours for creosoting. The treatment, it is claimed, will prevent checking, adds resilience to the timber, and renders it immume to the attacks of the teredo and other marine borers, owing to the hardness of the contained silica. The treatment is claimed to be successful with white oak and other hard woods which are impenetrable by other process. The process is an open-tank one, the experimental plant consisting of a vertical cylindrical tank just large enough to admit a railroad tie and jacketed to retain the heat furnished by a gasoline burner beneath the tank. This contains about 125 lb. of the preservative.

The ties were dipped vertically, and were handled by a block and tackle on a gallows frame. Wood treated by this process, it is claimed, does not become waterlogged, no matter how deeply or how long it may be submerged in water.

Spikes and nails hold better than in creosoted or in untreated wood, and will not rust. The cost of the preservative is about 3c. per lb., and it is claimed that complete protection may be afforded by this method and material, at a cost greatly below that of creosoting or any other known treatment. For complete impregnation of oak and pine it requires about 1.65 to 2.0 lb. of solution per cubic foot of timber. Unseasoned timber is said to respond as readily to treatment as does seasoned. If the claims made are true the process should have a wide field in the treatment of mine timbers.

Preparation of Borax and Boric Acid

The preparation of borax and boric acid is thus described by E. L. Fleming and T. L. Miller in French pat. No. 442,820. Natural calcium borate or the double borate of calcium and sodium is boiled and agitated with a solution of sodium sesquicarbonate, until decomposition is complete. The calcium carbonate produced is separated centrifugally and the solution cooled, so as to bring about crystallization of the borax. Boric acid is obtained by concentrating the mother-liquor and treating it with chlorine (obtained electrolytically from brine), the boric acid being made to crystallize by cooling the solution, and sodium chlorate may be recovered from the mother-liquor. Both the borax and boric acid are separated and dried in centrifugal apparatus. The sesquicarbonate required may be prepared by carbonating the sodium hydroxide obtained by electrolysis.

Radium from Autunite

The possibility of using phosphatic uranium micas, such as autunite (phosphate of uranium and lime) and copper autunite, as a source of radium is discussed by F. Glaser (*Chem. Zeit.*, p. 1166, 1912, abstr. *Journ.* Soc. Chem. Ind., p. 1030, 1912). The determination of the uranium content of such ores is accomplished by the separation of uranium from iron by means of ammonium carbonate. If dilute solutions are used, with a large excess of ammonium carbonate, there is no danger of uranium being carried down with the iron precipitate, while all the phosphoric acid will be combined with the iron. A little iron remains in solution with the uranium and is subsequently precipitated with it. This is removed by fusing the ignited and weighted precipitate with potassium bisulphate, dissolving in water, filtering and treating the filtrate with ammonia and ammonium sulphide. The iron is precipitated on standing, while the uranium remains in solution. The specimens of Portuguese rocks containing autunite examined by the author have yielded from 0.1 to 4.5% of U_3O_8. For separation of the uranium the autunite is extracted with hydrochloric acid, and the extract neutralized with lime, which precipitates uranium, copper, radium and iron. Another method of decomposing the mineral is to boil with sodium carbonate, when the uranium is dissolved and the radium retained. This process is slow for calcium autunite, but more rapid for copper autunite, from which, however, some copper goes into solution with the uranium. It is found that appreciable quantities of sulphuric acid in the commercial hydrochloric acid used for extraction, do not greatly decrease the amount of radium extracted, in spite of the very low solubility of radium sulphate. Presumably this solubility is increased by the ferric salts, etc., which are also present. Although the processes of extraction are thus comparatively simple, the profitable working of calcium autunite is only possible where the percentage of uranium is exceptionally high.

Gravimetric Separation of Zinc and Nickel

The gravimetric separation of zinc and nickel has been investigated by Cockburn, Gardiner and Black (*Analyst*, p. 443, 1912), special attention being directed to obtaining zinc sulphide in a form in which it could be filtered readily.

The precipitation of zinc sulphide from an acetic acid solution yields satisfactory results under the following conditions, the average error in the weight of zinc found being 0.0004 gram with quantities of zinc varying from 0.1 to 0.7 gram and when the amount of nickel did not exceed 0.2 gram. The slightly acid solution of the two metals is treated with sodium carbonate until a faint turbidity is produced, 100 c.c. of glacial acetic acid are then added, the mixture is cooled, and hydrogen sulphide is passed through it at the rate of two bubbles per second for one hour. After standing for a few hours, the zinc sulphide is collected on a filter, washed with hydrogen-sulphide solution containing 2% of ammonium acetate, dried, ignited and weighed as oxide. The zinc oxide obtained does not yield a reaction for nickel when submitted to Tschugaeff's test.

For the precipitation of zinc as zinc sulphide in presence of formic acid, the acid solution of the metals is rendered neutral to methyl orange by the addition of sodium hydroxide solution, a 50% formic-acid solution is added drop by drop until the mixture is acid, 0.5 c.c. is added in excess, the whole is diluted with water until 100 c.c. contain not more than 0.2 gram of zinc, then heated to 80° C., and treated with hydrogen sulphide. The zinc sulphide is collected on a filter, washed with hot water, and ignited to oxide. This method also yields accurate results when the proportion of nickel is not too high.

The precipitation of zinc as sulphide from a solution faintly acid with hydrochloric acid, and Zimmermann's process (*Ann. Chem. Pharm.*, 1897, p. 3) yielded unsatisfactory results. With a view to determining the nickel in the filtrate from the zinc sulphide, the authors investigated the process described by Dede, but could not obtain trustworthy results, owing to the occlusion of alkali by the precipitate. Accurate results were obtained by the dimethylglyoxime method of separating nickel from zinc.

Metallizing Siliceous Surfaces

A process of giving a metal coating to siliceous surfaces, such as those of glass, pottery and the like, is given in *La Revue des Produits Chimiques*, Oct. 20, 1912. The method consists in treating the surface, which must not be enameled or varnished, with a solution of silver fluoride and then exposing it to the action of a current of illuminating gas. The article is later exposed to a temperature of about 50° C., and while at that temperature exposed to a current of bisulphide of carbon. These operations result in the deposition of a finely divided deposit of silver on the nonconducting surface. To secure the best results this deposit should then be burnished, after which it can be used as cathode in an electrolytic bath for the deposition of any metal.

Electric Furnace Pig Iron

Analyses of the ore used by the Noble Electric Steel Co., at Heroult, Calif., and of the product made from it, are given by Lyon and Langenberg, in *Metallurgical and Chemical Engineering*, August, 1912:

ORE ANALYSIS

	%		%
Fe	69.9	MgO	0.30
Fe_3O_4	89.4	SiO_2	2.40
Fe_2O_3	7.3	P	0.011
MnO	0.18	S	0.009

PIG IRON ANALYSIS

	%		%
Si	3.64	C(comb.)	0.00
S	0.00	C(total)	3.58
P	0.02	Mn	0.00

Alizarin as an Indicator

Using alizarin as an indicator (*Journ.* Soc. Chem. Ind., p. 1030, 1912) it was found that: (a) sodium sulphate, potassium sulphate and sodium nitrate each give an alkaline reaction when their aqueous solutions are boiled; (b) sodium chloride, potassium chloride and potassium nitrate do not give an alkaline reaction under similar conditions; (c) weak bases such as aniline are able to liberate a small quantity of caustic alkali from neutral salts such as sodium sulphate or chloride.

Nipissing High Grade Mill, Cobalt

By Herbert A. Megraw

A mill treating rich silver ore by a combination of amalgamation and cyanidation. Amalgamation is performed in a tube mill during the pulverization of the ore by the pebbles. Cyanidation is performed in wooden tanks with flat bottoms arranged for mechanical agitation. Cyanide for the whole treatment is added to the tube mill during amalgamation, and no lead salts are used. Precipitates are melted in a blast furnace and an oil-fired reverberatory furnace is used for melting and refining bullion.

Note—Mr Megraw, a member of the editorial staff of the Journal, studied the Nipissing process and prepared an article about it before Mr. Watson's article was received by us. We withheld Mr. Megraw's article in favor of Mr. Watson's, naturally giving precedence to a manager's account of his own process. However, Mr. Megraw makes some comments upon the process that are interesting, and we have thought it worth while to present his article minus paragraphs on the subjects that Mr. Watson has already treated fully. Inasmuch as this will cause Mr. Megraw's article to have a disjointed character, this explanation is due to him and our readers. This article is the third of a series by Mr. Megraw, of which previous articles appeared in the Journal of Nov. 2, 1912, and Nov. 23, 1912.—Editor.

The works of the Nipissing Mining Co. Ltd. is situated on the east side of Cobalt Lake, nearly opposite the town of Cobalt in Ontario. The company has had to solve a metallurgical problem that presented unusual features, and has resulted in a unique plant for milling the high-grade silver ore.

An Extremely Complex Ore

The ore to be treated contains a large variety of elements, among which may be mentioned about 40% arsenic, 6% cobalt, 6 to 7% nickel and varying percentages of antimony, manganese and a large amount of sulphur * * * *

In addition to the elements already mentioned, the ore is extremely rich in silver, being indeed, one which is not usually considered in any sense a milling ore. It carries from 2000 to 4000 oz. per ton, an average of 2500 oz. silver per ton being usual over long periods of time.

The suggestion of treating an ore of this grade, running nearly 80 kg. per ton in silver, by any milling process would be treated warily by most metallurgists, the difficulties certain to be encountered being more than most would care to face. The first impulse would be to ship this rich ore to a smeltery in the confidence that a nearly total extraction might be obtained at a cost lower than could be hoped for under milling conditions.

After careful consideration, however, the Nipissing Mining Co., Ltd. of which R. B. Watson is manager, came to the conclusion that the highest economy lay in treating the ore on the ground, making only one product—bullion. The problems of metallurgy were placed in the hands of Charles Butters, consulting metallurgist for the company, assisted by G. H. Clevenger and James Johnston, who built the mill and has since been in charge of it. The result is the so called high-grade mill * * * *

Ore of this character, containing as it does, pieces of rock of varying grade from nothing up to native silver, cannot be satisfactorily sampled in a coarse state. At the Nipissing mill the sampling is done after the ball mill has crushed the entire material to pass a 20-mesh screen, when it can be done with accuracy * * * *

As all the breaking and grinding up to this point is performed on the dry ore, there is naturally some dust formed, and it follows from the grade of the material that this dust contains a valuable quantity of silver. In order that this rich dust shall not be lost, pipes from a small exhaust fan are led to places where it can best be collected, the fan delivering into a baghouse from which point it may be returned to the treatment system.

The fine ore * * * * is taken to a platform over a 4x20-ft. Krupp tube mill. This portion of the metallurgy is unique and somewhat astonishing.

Extraordinary Amalgamating Barrel

The tube mill has its axial entrances sealed up except for a small compressed-air pipe which enters it at one end and a corresponding air exit at the other end. The mill has the usual manholes in the tube, but these are seldom used. Instead there are three handholes with the usual covers equally spaced over the length of the mill on the same horizontal line. Through these holes the mill is charged and discharged, the larger holes being necessary only when relining or repairing inside the tube * * * *

Here, then, is a tube mill used as an amalgamating barrel, but under conditions which were probably never before sought for amalgamating purposes. The combination of an extremely high cyanide solution, a complex ore which contains all sorts of elements, and mercury all ground violently in a pebble mill, would seem to induce conditions quite the reverse of satisfactory. The natural expectation is that the mercury would become floured and that a large loss of it would be incurred. Particularly would this seem to be the case after the absorption of a quantity of silver would have resulted in the formation of amalgam with a tendency toward granulation, an ideal condition to be thoroughly "sickened" by the foreign elements in the ore.

Mercury Kept Clean by Cyanide

It is stated that this does not occur, which must be largely due to the strong cyanide solution keeping the mercury clean and allowing the fine particles to coalesce without hindrance from a coating of foreign substances. The heat formed in the mill may also have some effect in a beneficial way by tending to keep the mercury fluid and active. There is a great deal of heat generated in the mill, in fact steam would be formed were it not for the stream of compressed air which enters one axis of the mill and is discharged through a standing pipe at the other. This keeps down the temperature, though even with this cooling assistance the temperature of the mixture after completion of the agitation period is about 90 degrees.

No Lime or Lead Salts Used

It is noteworthy that neither lime nor lead salts are used during this process, and that after the agitation is complete, there is still sufficient cyanide to carry on the subsequent operations without further addition. The amount originally added to the tube mill is sufficient to produce a very strong solution, which is capable of partially outlasting the destroying effect encountered within the mill.

The agitation is continued for nine hours, after which time 97% of the contained silver has been extracted from the ore. The tube mill makes 37 r.p.m. and, contrary to the general practice of the day, is lined with silex brick.

Balanced Tube Mill Requires Low Power

The charge which is put into the mill fills it more than half full; there is little space left after putting in the total charge. This results in balancing the mill so that during the agitation process it requires only about 17 hp. to keep it in motion. When the mill is emptied of the charge and contains only the pebbles, it requires nearly 40 hp. to move it * * *

Cyanidation of the Ore Pulp

The agitating tanks are of the flat-bottomed type, having mechanical agitating appliances. These consist of a vertical shaft, to which arms are fixed, reaching nearly to the periphery of the tank. The vertical shaft is moved at a rate of 30 r.p.m., by means of crown wheel and pinion gearing. The high speed of these agitators is worthy of note, the necessity for it being found in the high specific gravity of the ore, which is almost equal to an ordinary concentrate. Besides, the ore is so hard that only a small portion of it ever becomes a true slime, but remains in a granular form and has that tendency to settle characteristic of such material. The high speed is necessary to keep the solids in suspension * * * *

The striking feature of the cyanidation of the pulp is not in the method followed, which is the usual one, but in the fact that it is carried out in solutions, which must necessarily be in a state which is not usually regarded as being efficient for cyanidation. A consideration of what these solutions must contain, coming, as they do, from intimate contact with the conglomeration of elements found in the tube mill, will indicate that they must be more or less foul and in a condition which is not favorable to maximum efficiency. This matter will be referred to later * * * *

Precipitation on Zinc Shavings

The solutions are precipitated by means of zinc shavings in a box of the usual design, which has eight compartments, each compartment having room for about six cubic feet of zinc. The shaving used is rather coarser than that usually used, resembling a stout wire, the width of the shaving being nearly equal to the thickness of the sheet from which it is cut * * * *

The refinery department presents some unusual features. There are six retorts of the horizontal tubular type set in brick, each retort measuring 14x60 in. These retorts are heated by oil burners, thus making the operation simpler, cleaner and easier than when wood or coal is used. The oil burners are capable of generating a degree of heat which is entirely satisfactory and the operation is not troublesome * * * *

The precipitate from the cyanide department is mixed with a borax-soda flux of the composition usual for precipitate, briquetted and melted in a small blast furnace, together with the skimmings from the reverberatory furnace and other cleanings of value. This blast-furnace system of melting is not new, having been practiced before in different places. It is a good system when properly followed, but is not to be promiscuously recommended * * * *

Action of Cyanide during Amalgamation

From the standpoint of cyanidation there are several points about this metallurgy which attract attention. The first one is the use of a solution high in cyanide content for the amalgamation process. Of course, the intention is to use the cyanide entirely as an aid in amalgamation, there being not the least effort to put silver into solution during this stage. Nevertheless a portion of the silver must be dissolved along with a large number of other elements. The wonder is that there is any available cyanide left at all after the amalgamation period is over.

Is Mercury Dissolved?

A question which is naturally suggested is whether the mercury is dissolved to any extent, and if so, what becomes of it. Some authorities claim that mercury in the native state is not dissolved by cyanide solutions while others take the opposite view. I am inclined to believe that it depends a great deal upon conditions. A volume of mercury in quiet contact with cyanide solution will probably not dissolve to any great extent, but mercury in a finely divided state and amalgamated with other metals will be likely to go into solution. Such a finely divided and amalgamated state is certain to exist inside the tube mill during the amalgamation period when it is subjected to the grinding action of the pebbles, and it seems quite likely that a portion of the mercury would be dissolved. In any case it is well known that some compounds of mercury are readily soluble in ordinary cyanide solutions and it is not at all unlikely that some such compounds are formed during the amalgamation period, so that it seems reasonable to assume that there would be some mercury in the solution.

If this is agreed upon it is easy to see why lead salts are not necessary in subsequent cyanide treatment, for the mercury would decompose the soluble sulphides precipitating HgS. In addition, the double cyanide of mercury, $K_2Hg(CN)_4$, formed is an active solvent of silver and might assist in recovering additional amounts of it.

While it has been stated that no lime is added to the tube mill during the amalgamation period, the fact that mill solutions are used makes it necessary that lime in solution be present, at least at the initial period, though it is conceivable that it would be destroyed soon after agitation had been started.

Other Elements in Solution

In addition to the mercury there are elements in the ore, such as nickel, cobalt, manganese, sulphur, and arsenic, which would enter solution. This presents an opportunity for all sorts of chemical reactions to take place which would be exceedingly difficult to follow. The well known affinity of mercury for sulphur would account for its removal from solution and it seems likely that the other elements would be precipitated in some form at some stage of treatment. It is only reasonable to expect that the solution of the metallic elements as cyanides and their consequent transformation into other forms would act as reducers to the solution, robbing them of some of the oxygen which would otherwise be available and retarding the dissolution of silver.

Solutions Not Clear

A peculiarity of the solutions used in this treatment is that they contain quantities of a brownish-black precipitate floating in them. This precipitate is not noticeable until the solutions enter the precipitation box where so much of it is liberated that it obscures the zinc. In spite of this condition, which would apparently be fatal to good precipitation, the results are good, as shown by the solution assays already given, and the action in the zinc box is lively and normal, shown by the evolution of gas.

The floating precipitate is light in weight and does not remain on the zinc to any large extent, but does settle in the sump tank, an analysis of it showing that it contains practically all the elements mentioned as existing in the ore, together with portions of zinc and mercury.

The zinc in the zinc box does not show much effect of mercury, which has the property of amalgamating with the zinc and causing it to break up into a soft mass of short, amalgamated zinc. There may be some slight indication of it, but not enough to account for the presence of any considerable quantity of mercury in the solution * * * *

Enameled Steel Signs for Mine Signals

Enameled-steel signs designed to be practically indestructible under the most severe underground or surface conditions at mines are being marketed by J. W. Stonehouse, 907 Eighteenth St., Denver, Colo.

From the standpoint of safety as well as economy it is highly desirable that the hoisting signal code and other important information should be in permanent legible form. Signs of paper, cloth, or even of wood, cannot be said to possess the quality of permanency and for this reason are being displaced by the enameled sign, which is made by fusing pure imported enamels on a sheet of charcoal-rolled steel under high heat.

Among the important mines using these signs may be mentioned the following: Stratton's Independence, Vindicator Consolidated, Cresson Consolidated, Golden Cycle and other gold mines of the Cripple Creek district, Colorado; Copper Queen Consolidated, Calumet & Arizona, Shattuck-Arizona, United Verde, Old Dominion, Arizona Copper, Ray Consolidated, Detroit Copper, Inspiration Copper and other large copper mines as well as the Tom Reed and Goldroad gold mines in Arizona. The Portland Gold Mining Co., Victor, Colo., is to install the "Indestructible" signs as soon as the present equipment needs replacing.

Mechanical Efficiency in Crushing

By Algernon Del Mar*

In comparing crushing machines conditions must be, as nearly as possible, the same for each machine under test, and proper credit must be given to the work already performed on the rock. A system of comparison is worked out using reciprocals of diameters crushed to as an index of work done and this system is compared with Stadler's method of reduction of volume. An allowance for inaccuracies is made, as no system is absolutely correct.

To make a comparison of the amounts of work done by various machines there are certain exact figures which must be known. Clearly these include the sizes of the particles before and after the rock goes to the machine, and also the number of tons crushed per unit of time and the amount of power consumed in doing this work.

Necessity for Similar Conditions

When a rock breaker or any other crusher precedes the machine under consideration the work done by the preliminary crusher must be taken into account. For example, it would not be fair to consider the amount of work done by a machine that fed a 2-in. product with one fed a ½-in. product, for more work has been done on the latter than on the former before going to the respective machines; nor to compare the work done by a stamp mill having old shoes and dies with one which has new ones unless the records extend over enough time for an interchange of old and new wearing parts.

As pointed out by some writers, it is not possible to compare the amount of work done by a machine on one material with the work done by another machine on a different material, for the physical characteristics of ores are so different that no comparison is possible. Neither is it possible to gage the actual efficiency of any machine on a variety of ores unless we know the unit efficiency of each ore. This would be an endless job, for even with the ore from one mine, different pieces require different amounts of work to break a unit volume to some other volume. It may be possible, though, to compare the work done by different machines on the same ore, particularly when the ore has been delivered to the two machines at about the same size. The facts and calculations set forth may prove to be a new aspect of milling to some operators, in which case it is hoped it will stimulate endeavors along this line of thought just as A. W. Warwick's paper[1] has been indirectly responsible for this extension of Stadler's work.

Law of Crushing According to Rittinger and Richards

The theory of crushing as propounded by Rittinger is that the work required for crushing is proportional to the reduction in diameter. Richards[2] says the work done in crushing is proportional to the surface exposed in crushing. As the surface exposed is proportional to the reduction in diameter, both statements are identical, or the same idea may be stated thus: "The work required to crush rock is very nearly proportional to the reciprocals of the diameters crushed to." The reciprocal of ½ is 2, of ⅛ is 8, of $\frac{1}{32}$ is 32.

TABLE I APERTURE SIZES OF BRASS WIRE LABORATORY SCREEN

Mesh	Size aperture in inches				Richards' average grain size, in.
	Tyler	De Kalb	Inst. M. & M.	Ludlow-Saylor	
2	0 437	0 4346		0 435	
3	0 279			0.275	0 283
4	0 203	0 2007		0 201	
5	0.159		0 100	0 160	0 1548
6	0 132			0 132	
8	0 097	0 0952	0.06_	0 095	0 1012
10	0 075	0 0728	0.05	0 073	0 0724
12	0 060	0 0528	0 0416	0 058	0 0568
14	0 051			0 048	0 04948
16	0 0445	0 0417	0 0312	0 042	0 0429
18	0 0386			0 0368	0 03716
20	0 034	0 0334	0 025	0 0335	0 03287
24	0 0267	0 0278	0 02	0 0279	0.02614
30	0.0198	0 0210	0.0166	0 021	0.01852
35			0.0142		
40	0.0150	0 0147	0 0125	0 0147	0 01531
50	0.0110	0 0108	0 01	0 0110	0.01236
60	0 0087	0 0091	0 0083	0 0091	0 00948
70	0.0073	0 0074	0 0071	0 0078	
80	0 0068	0 0067	0.0062	0 00675	0 00677
90	0 0059	0 0061		0 00611	
100	0 0055	0 0054	0 005	0 0055	0 00527
110	0 00484			0 00484	
120	0 00433	0 0043		0 0043	0 00468
130	0 00409			0 00409	
140	0 00394			0 00394	
150	0 00367	0 0033	0 0033	0 00367	
160	0 00345			0 00345	
170	0 00328			0 00328	
180	0 00315			0 00315	
190	0 00306			0 00306	
200	0 0030		0 0025	0 00300	

Allowance for Inaccuracies

That the law is not exact is mainly due to the fact that the amount of ore crushed by a given amount of power often depends upon the size of the particles being crushed and this is particularly true of the finer meshes where an approach is made to the colloidal state.

Just what percentage should be allowed to cover inaccuracies in the calculation is difficult to fix, but from an example given herein I should think 5% would be sufficient; therefore, if calculations come within 5% both machines may be considered of the same efficiency. It will be shown that this difference is entirely due to the inability of screens to measure accurately the broken rock, and to judge of the mean sizes of particles remaining on the coarsest and passing the finest mesh used.

In Table I the size of the meshes from two to 20 in the Tyler market grade of wire cloth is calculated from the size of the wire, from 20 to 200 mesh in their new standard testing sieves. The sizes of the Ludlow-Saylor screens are all calculated from the size of the wire. The last column is the average size of the grains in each class as determined by Richards.

Since the Tyler company has abandoned the use of gage numbers and uses only the diameter of the wire, the sizes as given in Table I for the brass-wire screens, are the same as for the steel-wire mill screens. The Ludlow-Saylor Co., on the contrary, uses the Old English gage for the brass-wire and the Washburn & Moen gage for the steel screens; the difference in size of openings for market grades is shown in Table II.

Determination of Relative Diameters of Pulp Grains

It may be well to consider the laws here set forth a little more closely in order to make the idea clearer. The work done in crushing is proportional to the surface exposed in crushing. If we start with an inch cube the surface will be 6 sq.in.; if now we cut this cube into ½-in. cubes we have 12 sq.in. of surface; if we cut the cube into ⅛-in. cubes we have 48 sq.in. exposed. In thus breaking up the cubes in the proportions of 6: 12: 48 or 1: 2: 8, we have reduced the diameters in the proportion of 1: ½: ⅛, or if we use the reciprocals of the diameters; of 1: 1, as ½: 2, as ⅛: 8, so that all three methods are identical.

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*Mining engineer, Los Angeles, Calif.

[1] "Mining World," July 30, 1910.

[2] "Ore Dressing," Vol. I, p. 3050.

The problem then becomes the mathematical one of determining the relative diameters of the grains of pulp before and after passing through the machine under consideration. The first requisite is to grade the pulp by screening and to determine the average diameters in each grade. To do this effectively the successive screens should vary as little as possible in size. This bars screens arranged in an arithmetical progression, so that for practical purposes I shall consider the sizes of the ordinary laboratory screens and the sizes of the apertures shown in Table III, as represented by the Tyler standard testing sieve which, so far as I know, is the only exact screen made. For sizes of screens coarser than 20 mesh I have adopted in this table, the figures of De Kalb, which are so close to the Tyler standard in the meshes above 20, that I am led to take his other figures. Chart *A* is a graphic illustration of the Tyler standard sieve from 20 to 200 mesh, of De Kalb's from four to 20 mesh and a comparison with the standard as adopted by the Institution of Mining and Metallurgy of London.

TABLE II -LUDLOW-SAYLOR GAGES FOR STEEL AND BRASS WIRE SCREENS

Mesh	Wire No.	Steel screen in.	Wire No.	Brass screen in.
2	8	0.338	16	0.435
3	10	0.198	17	0.275
4	12	0.145	18	0.201
5	13	0.108	19	0.160
6	14	0.087	20	0.132
8	16	0.062	22	0.095
10	18	0.053	23	0.073
12	19	0.042	24	0.058
16	22	0.025	26	0.042
20	24	0.027	28	0.0335
24	26	0.021	30	0.0279
30	28	0.0173	31	0.021
40	31	0.0115	33	0.0147

TABLE III—THE OLDER STYLE OF TYLER STANDARD TESTING SIEVES

No mesh's per lineal inch	Wire No. O.E.	Decimal size of wire in.	Size aperture in.	Size aperture mm.
20	28	0.0165	0.0335	0.8509
30	30	0.01375	0.0195	0.4953
40	33	0.01025	0.0147	0.3734
50	35	0.009	0.011	0.2794
60	36	0.0075	0.0091	0.2311
80	38	0.00575	0.00675	0.1714
100	40	0.0045	0.0055	0.1397
120	42	0.004	0.0043	0.1093
150	44½	0.003	0.0036	0.0914
200	47	0.002	0.003	0.0762

The feature of the I. M. M. screens is that the reciprocals of the sizes of screen aperture increase in an arithmetical progression; thus for five mesh the reciprocal is 10; for 10 mesh, 20; for 20 mesh 40; for 40 mesh, 80; for 80 mesh, 160; for 100 mesh, 200.

MEAN DIAMETER OF GRAINS IN FEED AND DISCHARGE

To find the average size of the grains in each grade, the arithmetical mean of the sizes of the apertures in the screen used and in the next larger size must be taken. That this is not absolutely correct there can be no doubt, but it is the best that can be done. The nearer the sizes of successive screens come to each other, the less the error in approximating the average diameters of the grains in a given class.

The average size of the particles going through the finest-mesh screen used can only be approximations, but it will be found that any reasonable average will be fair alike to both machines. Chart *B* is a graphic illustration of the mean diameters of particles remaining on the indicated sieves taken from the Tyler standard and the average of many tests by Richards, as explained in "Ore Dressing." The full line labeled "De Kalb" shows the average diameters using 4, 8, 16, and 20 mesh, while the dotted line shows the average diameters using 4, 8, 16, and 20 mesh, thereby showing the difference when the successive meshes are differently situated in the scale. When the relative efficiencies of two machines crushing to a certain mesh is under consideration, not the mean diameters but the size of the particle going through that mesh is required for comparison with the size of the aperture of the standard sieve.

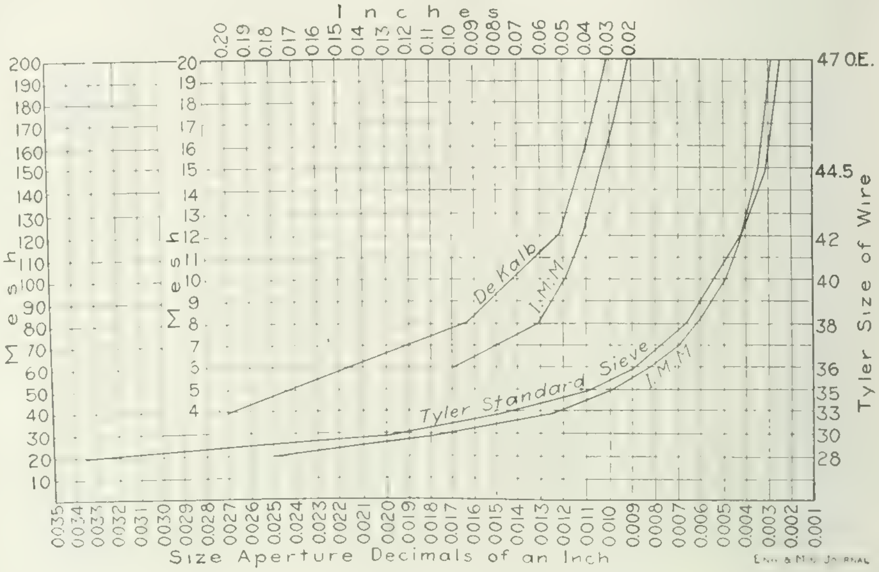

CHART A. DATA OF STANDARD SIEVES

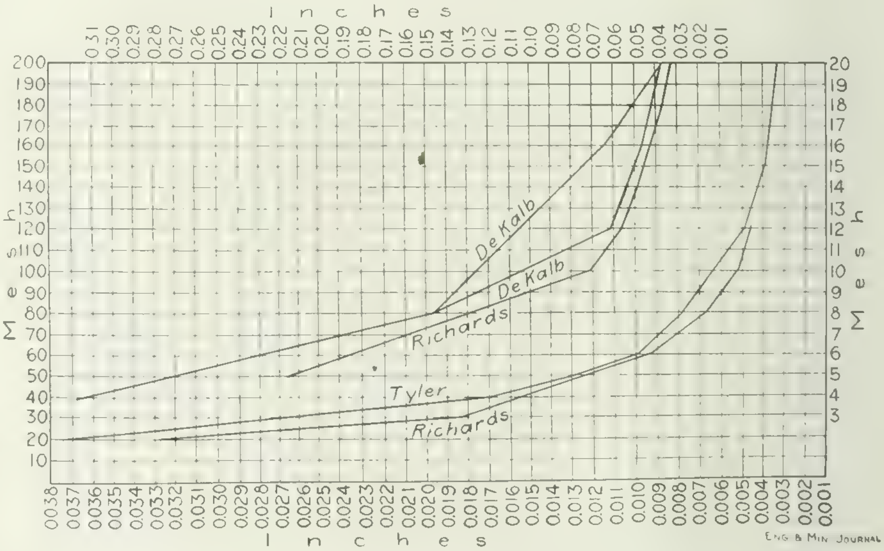

CHART B. MEAN DIAMETERS OF PARTICLES REMAINING ON VARIOUS MESH SCREENS

DETERMINING RELATIVE SURFACE OF GRADES

"Since for any definite weight of ore the total surface area varies inversely as the diameter, the relative surface exposed by each grade may be determined by dividing the weight of that grade by the average diameter of the particles of the grade." A table, as in Table IV, of the reciprocals of the size of each aperture in each grade may be made. It will then only be necessary to multiply the reciprocal by the per cent. in each grade to determine the amount of reduction performed by the machine, then having the amount of reduction done on the material before it has entered the machine and after it has been discharged from the machine a means of arriving at some comparative figures is obtained.

The first three columns in Table IV show the mesh of screen, size of aperture and the reciprocal of the size of the aperture.

The next three columns show the mesh, the mean size of the particles remaining on or going through this mesh, indicated by the plus or minus sign, and the reciprocal of the size of that grade.

TABLE IV—RECIPROCALS OF SIZES OF SCREEN APERTURES

Mesh	Diameter of opening, in.	Reciprocals	Mesh	Mean diameter of grade, in.	Reciprocals	Mean diameter of grade, in.	Reciprocals
20	0.0335	29.8	+20	0.0376	26.5	0.0376	26.5
30	0.0195	51	+30	0.0265	37.7		
40	0.0147	68	+40	0.0171	58.4	0.0241	41.4
50	0.011	91	+50	0.01285	77.7		
60	0.0091	110	+60	0.01005	99.5	0.0119	83.6
80	0.00675	148	+80	0.00792	138	0.00792	138
100	0.0055	182	+100	0.00612	163	0.00612	163
			100	0.0049	204	0.0049	204
120	0.0043	232.5	+120	0.0049	204	0.0049	204
			—120	0.00395	253	0.00395	253
150	0.0036	277.7	+150	0.00395	253	0.00395	253
			—150	0.0033	303	0.0033	303
200	0.003	333.3	+200	0.0033	303	0.0033	303
			—200	0.0025	400	0.0025	400

The last two columns show the size of the mean grade, leaving out the 30- and 50-mesh screens, and the reciprocal. The mean size of particles going through a 40-mesh screen when a 30-mesh screen is used is 0.0171 in. but when the next larger screen is 20 mesh then the mean size is 0.0241 in. The mean size of the plus 20 mesh is taken as the mean between 16 and 20 mesh, of the minus 200 between 200 and 250 mesh. It is not practical to measure by wire screens the sizes of particles smaller than 200 mesh. This must be done with the microscope or expressed in time of settling in still water. As ore of this fineness approaches the state called "colloidal" it will not be considered here.

Comparison of Efficiencies

A concrete example will now be considered showing how the table is used. In two mills under consideration there are regrinding machines taking pulp from a stamp mill. They are being run side by side and we want first to compare their mechanical efficiencies and then compare their mechanical efficiencies when crushing the ore to go through 120 mesh, which is as fine as is desired.

Mill No. 1 puts through 75 tons a day with an expenditure of 30 hp.; it therefore crushes 2½ tons per hp. No. 2 mill puts through the same amount of ore with 25 hp, or three tons per horsepower. The screen analyses given in Table V show the condition in each mill.

It may be that the screening analysis is submitted in the form of a screening diagram, two samples of which are shown in chart *C*.

TABLE V—SCREEN ANALYSES OF MILL MATERIAL

	Mill No. 1		Mill No. 2	
Mesh	Mill feed %	Discharge %	Mill feed %	Discharge, %
On 20......	3.1		15.1	3.5
On 40	15.5	3.2	35.6	21.2
On 60	15.6	4.5	10.4	14.1
On 80	14.6	10.5	11.1	17.9
On 100	9.6	15.8	6.4	11.2
On 120.	2.4	2.4	0.7	1.6
Thro 120	39.2	63.6	20.7	30.5

TABLE VI—EFFICIENCY OF MILL NO. 1

Mesh	Reciprocal of average size	Feed %	Relative surface in feed	Discharge %	Relative surface in discharge
+20	26.5	3.1	82		
+40	41.4	15.5	641	3.2	132
+60	83.6	15.6	1,304	4.5	376
+80	138	14.6	2,015	10.5	1,449
+100	163	9.6	1,564	15.8	2,575
+120	204	2.4	489	2.4	489
—120	253	39.2	9,917	63.6	16,090
Units of work in feed.....			16,012	Units of work in disch....	21,111
Units of work in feed....					16,012
Difference, units of work done					5,100

The left diagram shows the product of mill No. 1 plotted by simple percentages, which will be needed to find the relative efficiencies of two machines. The other diagram shows the product of mill No. 2 plotted cumulatively, which will be necessary in arriving at the efficiencies of the two machines crushing to a given mesh. There are other methods of making screen diagrams using logarithmic figures, but this degree of refinement need not bother the millman. Having all the figures, the comparison of mills Nos. 1 and 2 as to their efficiencies as crushing machines will be made. Tables VI and VII show this calculation.

Mill No. 1 has done 5100 units of reduction with an output of 2½ tons per hp. or 5100 × 2½ = 12,750 units of reduction work, while mill No. 2 has done 3737 units of reduction with an output of three tons per horsepower or 11,211 units of reduction. Now if 5% is allowed for the limit of accuracy the total is 11,771 as compared with 12,750, showing that mill No. 1 is by far the more efficient machine of the two, having done 8.7% more work than the other mill.

TABLE VII—EFFICIENCY OF MILL NO. 2

Mesh	Reciprocal of average size	Feed %	Relative surface in feed	Discharge %	Relative surface in discharge
+20	26.5	15.1	400	3.5	92
+40	41.4	35.6	1,473	21.2	877
+60	83.6	10.4	919	14.1	1,178
+80	138	11.1	1,532	17.9	2,470
+100	163	6.4	1,043	11.2	1,825
+120	204	0.7	143	1.6	326
—120	253	20.7	5,237	30.5	7,716
Units of work in feed			10,747	Units of work in disch...	14,484
Units of work in feed....					10,747
Difference units of work done					3,737

Using Richards' figures for the mean diameter of the particles in the different grades, except minus 120-mesh, where a conventional figure is used, the difference in the amount of work is found to be 33%; 20-mesh, 0.03287 instead of 0.0376; 40-mesh, 0.01531 instead of 0.0241; 60-mesh, 0.00948 instead of 0.0119; 80-mesh, 0.00677 instead of 0.0079; 100-mesh, 0.00527 instead of 0.00612; 120-mesh, 0.00468 instead of 0.0049; minus 120-mesh, 0.0038 instead of 0.00395.

TABLE VIII—CUMULATIVE PERCENTAGE THROUGH MILL NO. 1

Mesh	Reciprocals	Feed %	Relative surface in feed	Discharge %	Relative surface in discharge	Difference
20	29.8	96.9	2887	100	2,980	93
40	68	81.4	5535	96.8	6,582	1047
60	110	65.8	7238	92.3	10,153	2915
80	148	51.2	7577	81.8	12,106	4629
100	182	41.6	7571	66.0	12,012	4441
120	232.5	39.2	9114	63.6	14,787	5673

Efficiencies through Various Screens

It being desired to know the relative efficiencies of these two mills crushing through the various mesh screens, it is necessary to know the cumulative percentages or the amount passing each screen. This is shown in Tables VIII and IX, the reciprocals used being those of the various size screens.

If the output of these two mills was the same it would only be necessary to compare the differences for the several meshes, but No. 1 has an output of 2½ tons per hp., while No. 2 has an output of three tons. The two results are tabulated in Table X after multiplying No. 1 by 2½ and No. 2 by three.

We now see that No. 2 has done better work than No. 1 on meshes 20, 40 and 60, but it rapidly falls behind in the meshes from 80 to 120.

TABLE IX CUMULATIVE PERCENTAGE THROUGH MILL NO 2

Mesh	Reciprocals	Feed %	Relative surface in feed	Discharge %	Relative surface in discharge	Difference
20	29.8	84.9	2530	96.5	2875	345
40	68	49.3	3352	75.3	5120	1768
60	110	38.9	4279	61.2	6732	2453
80	148	27.8	4114	43.3	6408	2294
100	182	21.4	3894	32.1	5842	1948
120	232.5	20.7	4812	30.5	7091	2279

TABLE X -COMPARISON OF UNIT EFFICIENCY

	Mill No. 1 E.U.	Mill No. 2 E.U.
At 20 mesh	--	1035
40 mesh	2,617	5304
60 mesh	7,287	7359
80 mesh	11,574	6882
100 mesh	11,102	5844
120 mesh	14,182	6837

EFICIENCY OF ONE MILL UNDER DIFFERENT CONDITIONS

The method herein described may be used to compare the relative mechanical efficiencies of the same mill working under different conditions, by varying the height of discharge, height of the drop, number of drops per minute or the mesh of the screen. Table XI shows an example of a mill using two different meshes of screens. The author has, however, stated that the screen analyses are of little value as the ore in the second analysis was softer than when the mill was running on the ore from which the first analysis was taken. If the ore fed to the mills was of the same average fineness in both cases, the weight of stamp, height of drop, frequency of drop, and height of discharge and other factors were the same in both cases, we would expect the relative mechanical efficiencies to be influenced only by the size of the screen aperture. As the result of the comparison here shown agrees closely with the relative costs per ton of crushing, but not closely with the power consumption, the difference must be due to the increased softness of the ore.

TABLE XI—MILL DUTY ON TWO DIFFERENT SCREENS

Output, 6 tons per stamp, 12-mesh screen

Mesh	Mean diam in.	Recip.	%	Value
+20	0.0376	26.5	15.6	148
+40	0.0241	41.4	28.2	1167
+60	0.0119	83.6	18.1	1513
+80	0.00792	138.0	5.3	731
+100	0.00612	163.0	5.4	880
+200	0.0029	344.8	6.4	2206
—200	0.0025	400.0	20.0	8000
				14645

14,645×6 = 87,870

Output 8.46 tons per stamp, 4-mesh screen

Mesh	Mean diam. in.	Recip.	%	Value
+20	0.0376	26.5	15	397
+30	0.0265	37.7	34	1281
+50	0.01525	65.5	10	655
+80	0.00887	112.0	10	1120
+100	0.00612	163.0	3	489
+150	0.00455	219.0	3	657
+200	0.0033	303.0	4	1212
—200	0.0025	400.0	20	8000
				13811

13,811×8.46 = 116,841

The relative mechanical efficiencies of the two systems are then nearly as 8: 11 in favor of the second analysis which was made with a coarser mesh than the first, showing that with this ore and arrangement of the battery system crushing to a 4-mesh screen is more economical than to a 12-mesh.

COMPARISON OF SINGLE STAMP AND FIVE-STAMP MILL

The case of a single unit and a 5-stamp unit mill working on the same ore will next be considered. The single unit is a Nissen stamp of 1659 lb., 7½-in. drop at 100 per minute crushing 5½ tons per stamp per day through a 40-mesh screen. The 5-stamp unit is a fast crushing design, 1250 lb., 7½-in. drop, 100 per minute, crushing 2.25 tons per stamp per day.

The amount of energy developed by a falling body depends upon the weight, all the other factors being constant, and the amount of rock crushed by a falling body depends upon the amount of energy developed by the falling body, all the other factors being equal, but the two mills to be considered differ not only in the weight of the stamps but also in the shape and size of the mortar and the condition of the screening surfaces. Table XII shows the figures for determining the comparative mechanical efficiencies.

The Nissen stamp has done 23,651 units of reduction with an output of 5½ tons and an estimated expenditure of 4.44 hp. or

$$\frac{23{,}651 \times 5\frac{1}{2}}{4.44} = 29{,}200 \text{ units of reduction}$$

while the 5-stamp mill has an output of 2.25 tons with 3.36 estimated hp., or

$$\frac{25{,}916 \times 2\frac{1}{4}}{3.36} = 17{,}300 \text{ units of reduction}$$

The mechanical efficiencies are then as 1: 0.59 in favor of the Nissen stamp. The compiler of the figures stated[3] that the power consumption was 50% less for the Nissen stamp. The above figures more than bear this out.

TABLE XII—COMPARISON OF SINGLE AND FIVE-STAMP UNITS

Mesh	Nissen stamp Discharge %	Nissen stamp Reciprocal	Nissen stamp Mechanical value	5-stamp unit Discharge %	5-stamp unit Reciprocal	5-stamp unit Mechanical vlaue
+40	8.56	41.4	354	5.19	41.4	214
+60	13.92	83.6	1163	13.75	83.6	1149
+80	19.73	138.0	2722	18.23	138.0	2515
+100	3.40	163.0	554	3.21	163.0	523
+200	6.39	235.2	1502	8.45	252.2	1987
−200	43.39	400	17356	48.82	400	19528
Totals.....			23651			25916

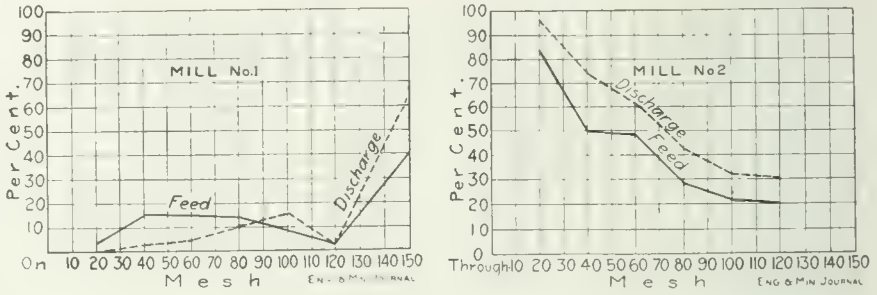

CHART C. SIMPLE AND CUMULATIVE SCREENING DIAGRAMS

THEORY OF CRUSHING

The theory of crushing so far outlined may be stated as follows: *The work done in crushing is proportional to the area exposed and to the power required per unit of weight.*

Having discussed the relative efficiencies of several crushing machines calculated on the basis that the amount of energy required to crush rock was proportional to the reduction in diameter or to the surface exposed, the same examples will again be analyzed but the energy required to crush rock will be considered proportional to the reduction in volume or weight or more exactly, proportional to "the volume at every stage." The figures and ideas are all taken from H. Stadler's paper[4]. The idea is to compare the two methods and to arrive, if possible, at some idea of the relative suitabilities of the methods to the problems of crushing ores.

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[3] Can. Min. Journ., XXXI, 1910.

TABLE XIII—ENERGY UNITS OF GRADES AND SCREEN APERTURES

E. U. of mean grade			E. U. of screen opening		
Mesh	In.	No.	Mesh	In.	No.
+20	0.053	13.75	20	0.034	14.65
+40	0.0245	16.1	40	0.015	18.2
+60	0.0118	19.25	60	0.0087	20.5
+80	0.0077	21	80	0.0068	21.5
+100	0.0062	22.0	100	0.0055	22.5
+120	0.0049	22.8	120	0.00433	23.5
+200	0.0036	24.8	200	0.003	25.2
−200	0.0025	26.0			

STADLER'S METHOD OF COMPARISON

Stadler says: "The volumes of the particles decrease from grade to grade at the same ratio as the number of the particles (constituting in their total the volume of the unity) increases, and the product of the volumes into the number of the particles of the grade is therefore, constant for each grade. As in conformity to the above law, the amount of energy absorbed is proportional to the volume of the body to be crushed, it follows again also that the total energy required for reducing the weight of the unit is constant for each grade."

TABLE XIV—E.U. OF MILL NO. 1

Mesh	E. U. average size	Feed %	E.U. feed	Discharge %	E.U. discharge
+20	14.2	3.1	44.0		
+40	16.2	15.5	251.1	3.2	51.8
+60	19.2	15.6	299.6	4.5	86.4
+80	21.0	14.6	306.6	10.5	220.5
+100	22.0	9.6	211.2	15.8	347.6
+120	22.8	2.4	54.7	2.4	54.7
−120	24.0	39.2	940.0	63.6	1526.4
Totals			2108.0		2287.4

TABLE XV—E.U. OF MILL NO. 2

Mesh	E.U. Average size	Feed %	E.U. Feed	Discharge %	E.U. discharge
+20	14.2	15.1	214.4	3.5	49.7
+40	16.2	35.6	576.7	21.2	342.4
+60	19.2	10.4	199.6	14.1	270.7
+80	21.0	11.1	233.1	17.9	375.9
+100	22.0	6.4	140.8	11.2	246.4
+120	22.8	0.7	15.9	1.6	36.4
−120	24.0	20.7	496.8	30.5	732.0
Totals	....	....	1877.3		2053.5

"The ordinal numbers of any arithmetical progression given to these grades represent consequently the relative values of the energy which has to be spent upon producing the respective grade from the initial unit, or the mechanical value of the grade."

"For obtaining the mechanical value of mixed sands, we need only to multiply the percentages of the gradings by the number of the energy units of the respective grade and add the products. This possibility of having the gradings of pulps condensed and expressed in one representative figure proves to be of great value."

"The useful work done per unit by any crushing machine is determined by the difference between the mechanical values of the samples, taken at the inlet and the discharge of the machines, and for obtaining the total work done this difference has to be multiplied by the tonnage dealt with."

MECH. VALUES	SIZE INCHES	MESH INCHES
1	0.7937	3/4
2	0.63	5/8
3	0.50	1/2
4	0.3970	3/8
5	0315	5/16
6	0.250	1/4
7	0.1985	3.5
8	01575	4
9	0125	6
10	009922	8
11	007875	10

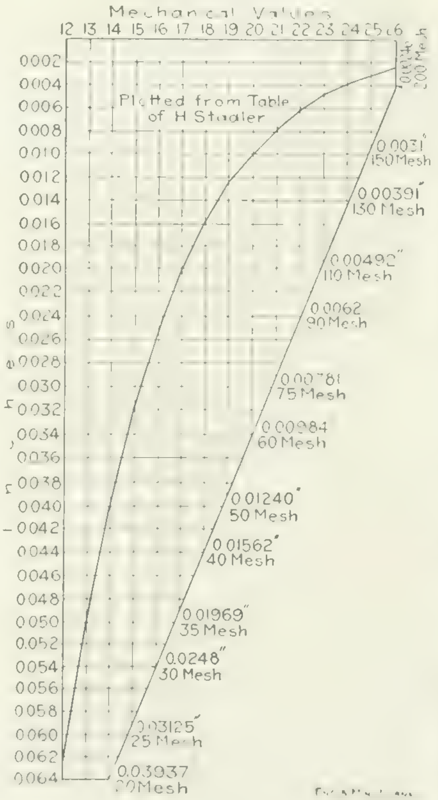

CHART D. GRAPH OF STADLER'S ENERGY UNITS

"The relative mechanical efficiency is the value obtained by dividing the total work done by the unit energy (for instance horsepower):

$$\textit{Relat. Mech. Efficiency} = \frac{\textit{Tonnage} \times \textit{work done per unit in E. U.}}{\textit{Unit of energy (hp.)}}"$$

To many Mr. Stadler's method of arriving at the formula he adopts is a closed book, likewise the working of the equation N (the energy number of the grade) $= -10 \log S$. I propose to do my best to explain both. Let

K = Coeff. of molecular resistance per unit area.

F = Area of fracture

f = Force to cause fracture. Then

$f = KF$.

The distance through which the crushing force acts is proportional to the diameter of the piece, just before crushing. That is distance $= Kd$, where K is a constant and d the diameter of the particle to be crushed.

TABLE XVI—SCREEN EFFICIENCY OF MILL NO. 1

M'h	E.U.	Feed %	E.U. feed	Discharge %	E.U. discharge	Difference
20	14.65	96.9	1423	100	1465	42
40	18.2	81.4	1481	96.8	1761	280
60	20.5	65.4	134	92.3	1892	552
80	21.5	51.2	1100	81.8	1758	658
100	22.5	41.6	936	66.0	1485	549
120	23.5	39.2	921	63.6	1501	780

The work is the product of the force, distance and number P, of p particles to be crushed, $=$ constant $\times F \times d \times P$.

Suppose we divide an initial volume of unity successively into half, quarter, eighth, etc. Thus

Volume each part	1	½	¼	⅛	$1/P$
Number of parts	1	2	4	8	P
Total volume	1	1	1	1	$P \times 1/P$
Energy at each grade (by assumption)	1	1	1	1	1
Total energy	0	1	2	3	N
Total energy	0	1	2	3	$\frac{\log P}{0.301}$

$$\frac{\log P}{\log 2} \qquad N \times \log 2 = \log P \text{ and } 2^N = P$$

The total energy is the summation of the energy of preceding steps.

The answer to the formula $N = -10 \log S$, where N is the energy number and S the size of mesh aperture may be worked out as follows:

TABLE XVII—SCREEN EFFICIENCY OF MILL NO. 2

M'h	E.U.	Feed %	E.U. feed	Discharge %	E.U. discharge	Difference
20	14.65	84.9	1243	96.5	1413	170
40	18.2	49.3	897	75.3	1370	473
60	20.5	38.9	797	61.2	1254	457
80	21.5	27.8	597	43.3	927	330
100	22.5	21.4	481	32.1	722	211
120	23.5	20.7	486	30.5	716	230

Suppose the mesh aperture is 0.125 then the formula becomes

$$N = -10 \log 0.125$$
$$(\log 0.125 = \bar{1}.09691 = -0.90309)$$
$$N = 10 \times 0.90309 = 9.03, \text{ or } N = 9$$

ENERGY UNIT CURVE

Chart D is an attempt to plot the Stadler energy-unit curve so that the numbers corresponding to a given size of screen aperture may be found without calculation. It is a very near approximation. As the figure taken to represent the mean size of particles going through a screen is an approximation, the diagram will give figures close enough for practical working conditions.

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[4] Trans. I. M. M. Vol. XIX, 1909-1910.

Referring to the diagram the numerals on the top beginning at 12 and ending with 26 are the figures representing the energy units for these lines. If it is desired to find the energy unit (E. U.) corresponding to a screen with aperture of say 0.028 in., find 0.028 in the left-hand column and follow this line to the right until it strikes the curve. This will be about half way between 15 and 16 so the E. U. for this screen will be 15½. Table XIII shows the E. U. of the mean grades of particles passing through Tyler screens and the E. U. of the size of opening in the respective grades. It will be seen that for the smaller meshes the value of E. U. of the mean grade departs considerably from the E. U. value of size of screen opening.

TABLE XVIII—COMPARATIVE EFFICIENCY FOR EACH MESH

Mesh	No. 1	No. 2
20	105 E.U.	510 E.U.
40	700	1419
60	1380	1471
80	1645	990
100	1372	723
120	1950	690

Comparison of Two Regrinding Mills

The first example, that of the two regrinding machines using the volume method, is worked out in Tables XIV and XV. For mill No. 1, this difference is 179 E. U. As the work done was 2½ tons per hp., this multiplied by 2½ will equal 447 E. U. For mill No. 2, the difference is 177.2. As the work done was three tons per horsepower, this multiplied by three equals 531 E. U. The work done by mill No. 2 is therefore 18% more than that done by mill No. 1, a direct contradiction of the relative efficiencies obtained by the reduction-in-diameter method.

TABLE XIX—COMPARISON OF SINGLE AND FIVE-STAMP UNITS

	Nissen stamp		5-stamp mill		
Mesh	E.U. average size	Discharge %	E.U. discharge	Discharge %	E.U. discharge
+40	16.2	8.56	138.6	5.19	84.0
+60	19.2	13.92	267.2	12.75	264.0
+80	21.0	19.73	414.3	18.23	382.8
+100	22.0	3.4	74.8	3.21	70.6
+200	23.7	6.39	151.5	8.45	200.2
−200	26.0	43.39	1128.4	48.82	1269.3
Totals	..		2174.8		2270.9

The relative advantages of the two mills crushing to the respective meshes, shown at Tables XVI and XVII, are calculated. Multiplying the difference for mill No. 1 by 2½ and that of mill No. 2 by three, we have the figures shown in Table XVIII, of efficiency for each mesh. This shows that for meshes 20, 40 and 60, No. 2 mill is superior to No. 1, and for meshes 80, 100 and 120, mill No. 1 is superior to mill No. 2. These are the same results obtained in the example using the reduction of diameters.

Comparison of Single and Five-stamp Units.

Table XIX shows the case of the Nissen stamps working in competition with the 5-stamp unit battery. The Nissen stamp has crushed 5½ tons with an estimated horsepower of 4.44 or

$$\frac{2175 \times 5\frac{1}{2}}{4.44} = 26.94$$

while the 5-stamp unit has crushed 2¼ tons with 3.36 hp. or

$$\frac{2271 \times 2\frac{1}{4}}{3.36} = 15.2$$

The two mills then have done work in the ratio of 1 : 0.56, nearly the exact ratio found by the previous calculation, using the reduction by diameter.

Having considered the case of crushing from an impartial standpoint, it has been found that in two cases under review the results are nearly identical, while in one case they are the reverse. In the case where the volume method shows the recrushing mill No. 2 to have done better work than No. 1, the actual fact is that mill No. 1 does better work as shown by the reduction-of-diameter method.

I believe that it will be agreed that Stadler's statement is still open for discussion and those who will contribute to clear up this perplexing problem ought to do so, for there is nothing in the domain of practical milling than is of more importance than a means of comparing the work of different machines.

Determination of Sulphur in Oil

The only method which the Bureau of Mines has found satisfactory for the determination of sulphur in all classes of combustible material, including all grades of liquid fuel, is combustion in a bomb with pure oxygen under a pressure of 30 to 40 atmospheres (*Tech. Paper* 26, U. S. Bureau of Mines). The method is described as follows:

From 0.7 to 1.0 gram of the sample is burned in a calorimetric bomb containing 10 c.c. of water, and oxygen under a pressure of 30 atmospheres. A lower pressure sometimes gives inaccurate results. If the sample contains more than 3% sulphur the bomb is allowed to stand in its water bath for 15 min. after ignition of the charge. In case the sulphur content is as high as 5%, oxygen under 40 atmospheres pressure is used. With these high pressures in a Berthelot bomb of 500 c.c. to 600 c.c. capacity repeated trials have failed to show even traces of carbon monoxide or sulphur dioxide. If a smaller bomb of about 175 c.c. capacity, such as the Peters or Kröker, is used, incomplete combustion from a lack of oxygen may result, if too large a sample be taken.

In this connection it is stated that one gram of a mixture of pyrite and coal, the mixture containing 25% of sulphur, was burned in a bomb under a pressure of 18 atmospheres. Upon opening the bomb the odor of SO_2 was noticeable. With a pressure of 30 atmospheres the sulphur content was 0.2% lower than that determined by the Eschka method. The combustion would have been complete if a pressure of 40 atmospheres had been used.

After cooling—15 min. are usually enough—the bomb is opened, and its contents are washed into a beaker. If the bomb has a lead washer, 5 c.c. of a saturated solution of sodium carbonate is added, the contents are heated to the boiling point, boiled for 10 min., and are then filtered. This operation is necessary to decompose any lead sulphate from the washer. The united washings are then filtered, acidified with hydrochloric acid, boiled to expel all carbonic acid, and the sulphuric-acid content is determined in the usual way with barium chloride.

Gravimetric determination is preferred to volumetric, because the nitrogen contained in the air originally in the bomb is oxidized in part to nitroacids, which cause a small error if the volumetric determination alone is used. The sulphur content of any combustible material, from light gasolines weighed in a tared gelatin capsule to solid bitumens and cokes, can be readily determined by this method.

This method of burning in a bomb is accurate, practicable, and rapid, and is recommended in preference to all of the other methods described. The calorimetric determination, if desired, can be made at the same time.

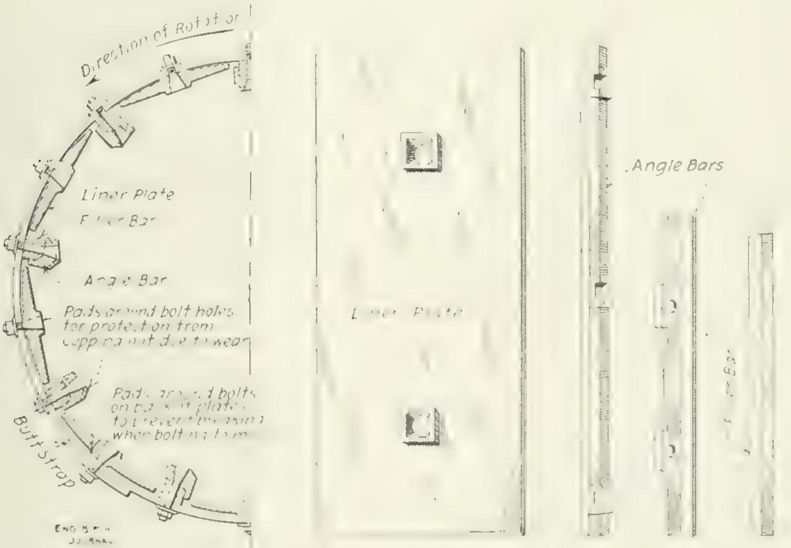
In regard to other methods, ignition in pure oxygen at atmospheric pressure, as recommended by Hempel, will sometimes give low results, owing to incomplete oxidation. Burning in an organic combustion train is tedious and requires constant supervision from a trained chemist, but is accurate. Burning in a lamp in atmospheric oxygen is applicable to burning oils, but not to gaseous oils or heavy residues.

There are at present 2145 coal-cutting machines in operation in British collieries, says *Engineering*. The majority of them are worked by compressed air

Komata Tube Mill Liner

The Komata tube-mill liner is a metal liner consisting of a series of plates and lifting bars, which was first introduced in New Zealand at the Komata Reef mine. It has been in use in New Zealand for the last five years and has replaced the silex, honeycomb and other forms of liners. It is now being used in mills in the Goldfield and Tonopah districts of Nevada and other parts of this country.

The angle bars, which form the ribs of the liners, are of "Stag" brand manganese steel, as a tough, unbreakable metal is required. Liner plates of the same metal are also usually recommended, as long wear, and what is more important, no breakage is thus secured. However, the situation of the user's plant and local conditions often make it advisable to have the liner plates of either semi-steel, white, gray or hematite iron. In this case the manufacturers have the plates made at a local foundry and shipped direct, thus saving the operator the cost of freight.


Direction of Rotation
Liner Plate
Filler Bar
Angle Bar
Pads around bolt holes for protection from cupping out due to wear
Pads around bolts on back of plates to prevent breaking when bolts tighten
Butt Strap
ENG. & MIN. JOURNAL
Liner Plate
Angle Bars

Komata Tube-mill Liner

The filler bars, which are placed underneath the angle bars, are not exposed to wear, therefore are of soft cast iron. The several pieces of the liner are fastened to the shell of the mill by means of square-headed tapered bolts, so that even though worn extremely thin they are held in place.

To prevent the liner from cupping around the bolt-holes, raised bosses are placed on the casting around each hole. Also when cast-iron plates are used, bosses ⅛ in. high are placed on the under side around each bolt hole, the object being to keep the liner from fitting close against the shell of the mill, thus avoiding danger of breaking when bolts are tightened. The pulp soon gets behind the plate and makes a backing for it. The ribs, or angle bars, are spaced about 18 or 20 in. apart, according to the diameter of the mill. Wicking or oakum is used around bolts to seal from leaks. The joints are staggered with the joints of the liner plates to prevent the forming of grooves.

The points of merit claimed for this liner are: (1) It gives a maximum area of mill and therefore increased capacity; (2) absence of slipping of pebbles on the liner results in prolonged life of the liner, the prevention of flattening of the pebbles and the avoidance of much waste power; (3) by reason of the cascading action of the pebbles, their spherical shape is maintained; this great commotion and rolling action of the pebbles produces a greatly increased grinding action; (4) the consumption of pebbles or flints and the amount of power required per ton of sand ground are small; (5) the metal is distributed to give the greatest amount of life and the least amount of scrap when worn out; (6) it alters but slightly as regards thickness and shape, which means constant peripheral speed on the inside of the liners and uniform efficiency; (7) it is easily and quickly installed and repaired; (8) it can be cast at local foundries of semi-steel, white, gray or hematite iron.

The inventor and patentee of this liner is F. C. Brown, who has granted the sole manufacturing and selling rights in the United States to the Edgar Allen American Manganese Steel Co., Chicago, Ill.

The chief use of lithium (*Bull.* U. S. Geol. Survey) is in storage batteries, where it is used as the carbonate. Small quantities are used for medicinal, photographic and pyrotechnic purposes.

October Operations at Goldfield Consolidated

During October, 1912, the total production of the Goldfield Consolidated Mines Co. was 30,573 tons, containing $456,779, or an average of $14.94 per ton, of which 29,782 tons was milled with an average extraction of 90.48%, and 791 tons was shipped of an average value of $20.24 per ton, the net recovery from all ore being $13.57 per ton. The total net realization was $242,163, or $7.92 per ton.

GOLDFIELD CONSOLIDATED OPERATING COSTS FOR OCTOBER, 1912

Mines, including stoping and development	$3.16
Transportation	0.07
Milling	1.93
Marketing	0.05
General expense	0.37
Bullion tax	0.04
Marketing ore	0.11
Total cost of operation	$5.73
Miscellaneous earnings	0.06
Net cost per ton	$5.67

During the month 4084 ft. of development work was performed. The total cost of mining, development, transportation, milling, office and general expense was $5.67 per ton, distributed as shown in the accompanying table.

In regard to the work in the individual mines, C. D. Keading, assistant superintendent, reports that in the Combination mine the 136 BX stope on the second level was extended and produced 505 tons of $26 ore. The 2460 stope, 450 ft. east of shaft between the third and fourth levels, was extended and produced 518 tons of $38 ore. The sill being cut on the orebody in the 414 C raise produced 276 tons of $32 ore. The 402 DX raise being run from the 492 intermediate below the fifth level, 250 ft. east of the shaft, encountered ore, and produced 88 tons of $34 ore.

In the Mohawk the 40 drift on the 150-ft. level, going north from the Sheets-Ish workings, produced 185 tons of $26 ore. The 107 X drift, driven in the hanging wall under the Sheets-Ish workings, on the 250-ft. level, encountered a body of ore which has not been opened at any other point, and produced 82 tons of $28 ore. This new orebody should produce a considerable tonnage of good grade ore. The 215 PX stope, between the first and second levels, 560 ft. northwest of the shaft, produced 500 tons of $30 ore. The southern end of the 307 stope, between the second and third levels, was extended and produced 1160 tons of $26 ore. The 490 R stope from the intermediate between the third and fourth levels, and just south of the big 354 stope, was highly productive, 1738 tons of $218 ore being extracted.

The 420 S stope, in the Clermont, between the 600- and 750-ft. levels, just south of the 413 sill, produced 814 tons of $55 ore. This is the downward extension of the big 413 orebody, and will produce a large tonnage of excellent grade ore. The downward extension of the 510 orebody, between the 750- and 900-ft. levels, produced 443 tons of $23 ore. The 700 F and G stopes, between the 1200-ft. level of the Grizzly Bear and the 1000-ft. level of the Clermont produced 719 tons of $67 ore. The 802 stope was extended and produced 227 tons of $45 ore.

In the Jumbo No. 2, the stope carried up from the 220 drift produced 791 tons of $41 ore. A winze has been started on this oreshoot, and the south drift on the 300-ft. level is being advanced to open the downward extension of the ore.

Bullwhacker Experimental Leaching Plant

Butte Correspondence

The Bullwhacker Copper Co. was organized in 1906 to develop the Bullwhacker claim in the Butte district, Montana. A shaft was sunk 400 ft. and crosscuts driven to the orebody on the 100-, 200-, 300- and 400-ft. levels. During 1906 and 1907 lessees shipped 6228 tons of ore containing 5% copper from above the 100-ft. level, and this quantity, together with the ore mined by the company, brought the production of the property during the two years to a total of about 850,000 lb. of fine copper. With the decrease in the price of copper in 1907 the mine was closed.

Commercial Ore Chiefly Chrysacolla

The orebody occurs as an impregnation or replacement of the crushed granite contained in a fault zone 50 ft. or more in width, which traverses the eastern portion of the Bullwhacker claim. This fault fissure, which has a general north and south strike, is one of the Continental series of faults. Copper-bearing solutions have penetrated the crushed granite and clay fault-material, replacing portions of the granite, and filling cracks and cavities, also being absorbed by the clay in places. The body of the ore is chrysacolla, a copper silicate, but in addition there are small bunches of carbonates and oxides. The ore is low grade, carrying about 5% copper in the richest portions, and grading down to noncommercial ore on the outer edges. As far as the property has been developed, the highest grade of ore has been found to lie above the 100-ft. level, and practically nothing of value has been found below the 200-ft. level.

Recently lessees again began operations. Two one-compartment shafts, 125 ft. apart, were sunk to depths of 75 ft., on the western edge of the orebody. Short crosscuts were driven to the center of the deposit, and mining by glory-holes was begun. A platform was built at the bottom, upon which the ore was blasted in benches from the sides of the opening. From here, until recently, it was shoveled into buckets and hoisted, one hoist being operated by electricity and the other by compressed air piped from the Pittsmont property, adjoining the Bullwhacker on the southeast. As an improvement over this method a 45° incline shaft was recently sunk to the 75-ft. level between the vertical shafts and ore from the glory-hole is shoveled into mine cars and hoisted on the incline directly to the surface by means of a newly installed air-hoist. Thence the ore is trammed to the bins for shipment by wagon to the East Butte and Washoe smelteries.

Ore Too Siliceous for Profitable Smelting

An average of between 30 and 40 tons of ore, assaying about 4.8% copper is being shipped daily at present. The ore is highly siliceous, carrying about 80% silica, for which reason the smelters penalize it severely. Experimenting has been going on for some time to determine a cheaper and more efficient method of ore treatment, with the result that a plant is now in the course of erection at the property for the purpose of leaching the crushed ore with sulphuric acid, and recovering the copper thus dissolved by electrolytic methods.

Copper Dissolved in Sulphuric Acid

The framework of the new leaching mill, situated 250 ft. west of the orebody, has been completed. A crusher, a set of rolls, a trommel, and part of the solution tanks are in place, and it is calculated that operations will be begun before the first of the year. As the plant is being built largely on an experimental basis no definite plan of procedure can be given. Roughly, however, the ore is first crushed in a 9x15-in. Blake crusher, thence it passes through a set of rolls, from which it is elevated to the height of the crusher, and sized through a 10-mesh trommel, the rejected portion being conveyed back to the rolls, and thence to the trommel again. From the trommel the product is conveyed by gravity to two 5000-gal. leaching tanks containing a 10% solution of sulphuric acid. This strength has been determined upon for first experiments, and may be changed. It then undergoes mechanical agitation for from six to eight hours to bring it into solution as copper sulphate. Laboratory tests have established the fact that with agitation the ore can be brought into solution in this length of time, whereas 48 hr. is needed to perfect the leaching process in a quiet solution. The copper sulphate is then drawn off into circular electrolytic deposition tanks 10 ft. in diameter, where the copper is deposited upon a series of 16 cathode plates under current of about 3000 amperes. The company plans to treat in the neighborhood of 50 tons of ore per day at first, but as the process is perfected this quantity will be increased gradually to from 250 to 300 tons by enlarging the tank and crusher capacity.

Tin Smelting in Yunnan

It is reported from Yunnan, China, that a railway connecting the tin mines at Kochiu, with the main French line from Haiphong to Yunnanfu, at Mengtze, is to be built by a French firm (*Min. Journ.*, Nov. 16, 1912). Further, it is said that the great smelting plant at Kochiu is about to be operated for the first time. The Germans built it at the cost of a million dollars, and it has (according to the *Malay Mail*) been an elephant on the promoters' hands, having no definite supply of tin ever assured it, and being also without funds to operate even should the miners agree to furnish the supply. Now, however, an arrangement has been concluded covering both difficulties, though the Chinese who know are reticent as to the source of the capital.

Plans for resuming the survey of the West River Ry., by which the province of Yunnan will be connected with Canton via the province of Kwangsi, are about to be carried into effect.

Wells' Method of Making Nickel Salt

Recent reference has been made to Wells' patent for the extraction of nickel from matte by hydrochloric acid (Eng. and Min. Journ., Dec. 7, 1912). The manufacture of nickel salt from this solution is covered by U. S. pat. No. 1,039,861, issued to H. L. Wells, of New Haven. The solution is treated with sulphuretted hydrogen to precipitate copper, and an oxidizing agent, such as black oxide of nickel, is added and the iron is precipitated in any suitable manner (for example, by adding calcium carbonate); sufficient sulphuric acid is then added to react with the chloride present, and sufficient ammonium sulphate to form nickel ammonium sulphate, which is recovered in the crystallized state. The mother-liquor may be utilized in dissolving fresh matte.

South Russian Manganese

In the first half of the year 1912, in the district of Nikopol, in the government of Ekaterinoslaff, 108,451 tons of manganese ore were produced, against 174,840 tons in the corresponding period of 1911, or 32.3% less (*Min. Journ.*, Nov. 9, 1912). There were exported from the Nikopol district 115,693 tons, or 30.7% less than in the 1911 corresponding period, by drawing on the stocks.

The Treasury Tunnel Raise

By H. Y. Russel*

The Treasury Tunnel Raise, near Red Mountain, Colo., was driven in the vein for prospecting purposes, but was subsequently to be trimmed and serve as a shaft. The total length was 930 ft.; outside dimensions 11x5 ft.; dip from 45° to 60°. Average progress was 100 ft. per month and average cost about $31.79 per ft. Difficulty was experienced from fine dirt blocking the rock chute.

In 1909 the Treasury Tunnel Co., operating in Ouray County, Colo., having cut a vein in their tunnel at a distance of 5500 ft. from the mouth and at a vertical distance of 1200 ft. below the apex, decided to prospect it by a raise and drifts therefrom. It was decided that the raise should follow the vein and that care should be taken to keep it straight so that it could be trimmed out for a shaft. The outside dimensions were to be 11x5 ft., the long side to be with the strike of the vein; two compartments, one 5x5 ft. in the clear for a rock chute, and the other 4x5 ft. for the ladders, slide for bucket and air pipe. The original intention was to raise 600 ft. but the ultimate slope length was 930 feet.

In order to keep the tunnel itself clear, a drift 40 ft. long was driven on the vein and the raise started in this drift about 10 ft. from the tunnel. This gave storage room for a train of cars beyond the raise, no switching being necessary in loading. The dip of the vein varied from 45° to 60° from the horizontal, and no sudden variations occurred. The dip at the start was 55° gradually flattening to 45° and then straightening to 60°. Some minor rolls occurred but they were not important.

COMPRESSOR RAN CONTINUOUSLY FOR VENTILATION

The equipment used for the work consisted of a Sullivan straight-line air compressor, simple steam, compound air, 320 cu.ft. per min. air capacity; two Waugh stoping drills, size 3 C., together with one set of repair parts and a good supply of 1-in. cruciform steel. For hoisting a 5x6-in. Davis hoist driven by compressed air was used.

A 4-in. compressed air line delivered the air at the bottom of the raise. This line was 6000 ft. long, and a 2-in. pipe carried the air up the raise. This gave the only ventilation in either raise or tunnel and I may say that except when flying rock from a blast struck the air valve handle at the top of the raise, thus partly closing the valve, we had very little trouble with gas or bad air. It was necessary, however, to keep the compressor running continuously day and night.

No station was cut for the hoist which was set at the foot of the raise and remained there until the work was completed. It was placed across the drift opposite the manway and about 10 ft. therefrom. Sufficient height was left for a mule to pass under the cable. In setting the hoist enough of the floor of the drift was leveled to set two 6x6-in. timbers, the hoist was securely bolted to these and they were braced down from the roof of the drift.

A ⅝-in. flexible steel cable was used and about 400 ft. of it put on the drum to start with. As the raise got higher more cable was spliced on until finally we had altogether 1900 ft. of cable. Of this 900 ft. had to be taken on the drum and in order to allow this the flanges of the drum were extended 3 in. by bolting segments of sheet steel to the original flange. There was just enough play between the drum flanges and the foundation frames to allow this. After leaving the drum the cable entered the raise under a 20-in. sheave wheel and at the top of the raise it ran over a 12-in. snatch block which was securely hooked to a 30-lb. rail supported on stulls and fastened to them to prevent end slipping.

ROUND PEELED TIMBERS USED FOR STULLS

The timbering consisted of two rows of stulls, one 12 in. diam. between the manway and the chute, the other 7 or 8 in. diam. on the side of the manway. The latter supported the side of the bucket-slide and also the necessary lagging. Stulls were placed 5 ft. apart and great care was taken in placing them, particulerly those between the chute and the manway. Hitches not less than 5 in. deep were cut, and in many places where the foot wall was soft or broken, hitches 20 in. deep were cut; and in all cases solid rock was reached. No head boards nor wedges were allowed. In every case the stulls had to be cut to drop tightly into the hitches and fit exactly.

Round peeled timbers, mostly white spruce, were used for stulls. Line was kept on the chute side of the stulls and errors due to varying sizes of stull timber, etc., were thrown into the manway, it being considered most important to keep the chute lining straight and smooth.

The topmost pair of stulls supported the rail to which the snatch block was attached and also a heavy bulkhead, which prevented anything falling down the manway. The chute was lined on the stulled side alone with 3-in. plank 10 and 12 in. wide, this lining being bought in 10 and 12-ft. lengths and cut in the drift to fit the occasion. The proper lengths and bevel were carefully taken with a carpenter's slide staff. The lining was spiked to the stulls with 60d. nails and was kept close to the top, the hanging wall half of the topmost panel alone being left out to allow access to the place of work.

Usually as soon as there was room for an additional pair of stulls, they were put in and the bulkhead raised. On occasions, however, when the roof was good, two or three pair of stulls were put in above the bulkhead before it was raised. Twenty feet was the greatest distance the bulkhead was ever raised at one time, and this did not occur more than twice as the vein was fairly soft.

BREAK MADE IN THE CHUTE AT 450 FT.

In raising great care was taken not to break the hanging wall. When the vein was less than 5 ft. wide the foot wall was broken. In this way it was rarely necessary to timber the back of the raise. This wall was carefully watched and when signs of slacking were noticed the manway was lagged.

The raise was put up 450 ft. without any break in the chute and for this distance the chute was always full after the round had been blasted, the rock was then gradually drawn off until it was 20 or 25 ft. below the top of the lining, leaving room for the next round.

At 450 ft. a break was made in the chute and a door was put in and the lower chute was gradually emptied until there was only about 50 ft. of rock left in it, which protected the door of the lower chute from the rock coming down. The break in the chute was made necessary by reason of the continued blocking by fine dirt. The upper chute was carried to 900 ft. and was kept full except before blasting, when 20 to 25 ft. of rock was drawn off to leave room for the round.

In hoisting lighter materials such as steels, tools and chute lining, they were placed in the bucket and securely fastened to the cable. Heavier materials such as stulls and pipe were fastened to a ring in the bottom of the bucket and were dragged up. The hoist was operated by the foreman, though one of the timbermen could usually run it when necessary.

Two Waugh stoping machines were used, two machine men being on each shift so that drilling could be started at any time. Eight or nine 5½-ft. holes was a round and the drilling time averaged about 2½ hr. When the drilling was done the machine men assisted the timbermen to cut hitches, put in the stulls and raise the bulkhead. The air pressure in the compressor room was kept between

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*Mining engineer, 423 Guy St., Montreal, Canada

100 and 105 lb. giving the hoist and drills from 90 to 95 lb. pressure. When the raise was 900 ft. high it took the shift less than 30 min. to climb from the bottom to the top.

Chute Blocked by Fine Dirt

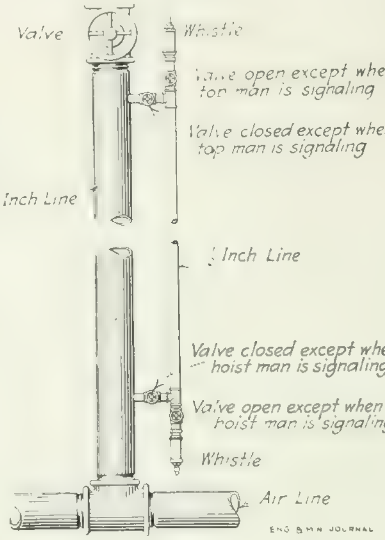
After reaching a height of 350 ft. trouble began to be experienced owing to the fine dirt sticking to the foot wall and gradually closing the chute. This dirt would in places almost close the chute for 50 or 60 ft., then a block occurred and while it was watched as carefully as possible it happened at times that open spaces 50 ft. long developed. Our original plan had been to bore holes through the lining close to the lower end of the block, make a hole in the dirt with a pointed bar and use a quarter of a stick of powder to start the block. This was not a success as owing to the tightness with which the dirt was packed the hole acted as a gun and splintered the lining without loosening the dirt. The most satisfactory method was found to be to pound the lining with an 8-lb. hammer until the blockade broke. This was slow and therefore expensive but was better than injuring the lining. It was rather terrifying to break a block with anywhere from 150 to 250 ft. of rock in the chute above and was at first done either by the foreman, or if he was away, by the superintendent, and one man. When it was found that the chute would stand the strain, however, the men were allowed to do it.

The 3-in. lining of the lower chute, which had kept in fair shape so long as the chute was drawn gradually, began to show signs of wear when the rock from above was dropped through 400 ft. of it. At times a part or even a whole panel was smashed out, but when 930 ft. was reached, the chute was still in a satisfactory condition. Several hundred feet of drifting was done at 900 ft., and the rock was passed through the chute without more than a fair amount of repair being necessary. Not more than 10 or 12 stulls broke altogether. If, however, much more work had been done, it would have been necessary to reline about 75% of the total chute, and perhaps divide the chute into 200-ft. lengths.

No Night-shift Boss Necessary

Seventeen men were employed altogether on the work. This included a foreman and also a cook and waiter in the boarding house, but did not include the clerk nor the engineer in charge. The latter took care of other company interests, but one-half of his salary, as well as the clerk's whole salary was charged to the raise. The inside crew consisted of two 8-ft. shifts; two machine men and two timbermen on each shift. As the raise got above 250 ft., one and at times two extra men were put on the day shift to look after repair work, etc. The principal reason for employing these men was to have men to replace machine men and timbermen when they quit and they were a good investment for this reason alone.

The rock was taken out of the tunnel by mules. One man on the day shift loaded the cars from the chute and drove the mule, 25 to 30 cars taking out a round. A second mule took the night shift in and out and was driven by one of the shift men. No tramming was done at night except in an emergency. No shift bosses were necessary, the foreman usually coming out early in the afternoon and going in with the night shift to see them properly started. Outside there were the blacksmith and helper and two compressor men and the cook and waiter.


Valve
Whistle
Valve open except when top man is signaling
Valve closed except when top man is signaling
2 Inch Line
½ Inch Line
Valve closed except when hoist man is signaling
Valve open except when hoist man is signaling
Whistle
Air Line
ENG & M N JOURNAL

Whistle Signaling Arrangement

Explosives

Sixty per cent. 1⅛-in. gelatin powder was used and a "nihilte" cap. This was rather a departure from the regular custom, but was found to work most successfully. The powder was given out by the foreman after he had examined the ground, so that no more than necessary was used. The cap, which I should say was between two and three times as strong as a 6 X, gave complete combustion and little gas. The rock was broken up into small fragments, which was an important matter. The ground was easily soft enough to be broken by 40% powder, but I think it was owing to the 60% and the strong cap that we had so little trouble with ventilation. The smaller amount of powder used and the smaller holes drilled made the cost practically the same, if not less, than if 40% had been used. The fuses were cut long enough to allow the men to get to the bottom of the raise before blasting occurred.

Signaling a Difficulty

Two minor difficulties were more than usually annoying, the worst being to arrange a signaling device. Heavy telephone wire, supported on the stulls by staples and attached to gongs, was tried. This did not work at all, owing to the friction and the weight of the wire, and to the impossibility of keeping the wire taut. Electric bells were installed, using double rubber-covered wire, but the fine rock that found its way into the manway speedily cut the insulation, and it was impossible to keep the line in working order. The failure of these attempts led to orders being given that hoisting should be done at prearranged times, when no one was allowed in the manway. When the bucket reached the top, it was hung up on the stulls until it was unloaded, so that it could not be lowered. When unloaded, raps on the pipe notified the hoistman to lower. When the foreman or engineer wished to go up the raise, he went with the shift.

A whistling device, suggested by the general manager, similar to the accompanying sketch would, I think, have worked though it would have been expensive. There was always enough pressure in the 2-in. line to turn into the ½-in. line and blow the whistle. The suggestion came when the raise was nearly completed and was not tried.

The other difficulty was with rollers, several kinds being tried, but after a few days they all stopped turning and cut in half. Finally that half of the cable attached to the bucket was allowed to drag on the slide, and where it was drawn against the roof 6-in. round timbers were put in for it to run against, these timbers being replaced when necessary. The return part of the cable was held either up or down with 6-in. snatch blocks attached to the roof or to the timbers the other cable ran against. These snatch blocks were cheap and lasted from two to four weeks before cutting in half. The difficulty of returning the bucket to the bottom against the weight of the cable was overcome by loading the bucket with scrap iron.

But one accident occurred in driving the raise, and at a time when, being shorthanded, but one shift was working. The machine men reported two missed holes and returned to work next day, no one having been there meanwhile. They found that the ground had broken well, but a large block of rock was lying on the bulkhead. Without examining this rock they started to break it up with a hammer and exploded some powder, part of the missed hole's. One man was slightly injured, but the other man's eyes suffered severely. No breakages occurred in the cable, as it was carefully watched and defective parts cut out as soon as noticed.

Average Progress 100 Ft. per Month

Some of the results attained in speed were interesting. The average speed for the 930 ft. was 100 ft. per month. The greatest monthly progress was 107 ft., which was driven between 746 and 853 ft. In fact just as good speed was made in the last 400 ft. as in the first 500 ft. The costs were practically the same.

In considering the accompanying cost sheet, it must be borne in mind that there was no work other than the raise going on; that with the same outside expense about three times as much work could have been done, and that the compressor had to run all the time for ventilation. The company's other interests made the employment of a supervising engineer necessary, and part of his salary was charged to the raise. The company also ran its own boarding house, which usually lost money, owing to the small number of men employed, and a clerk was necessary to do the ordering and check supplies in and out. The costs are given, however, as they may be of assistance to others facing a similar problem. Contracting the work was discussed but it was impossible to get men to take hold of it except at an exorbitant figure. The idea was unusual and they did not care to tackle it.

For Heights Greater Than 400 Ft., 6-in. Lining Should be Used

From experience gained in this raise, I should say that for a raise up to 400 ft. 3-in. lining, spiked to 12-in. stulls, will stand. If, however, much drifting is contemplated before making the raise into a shaft, or if a greater height than 400 ft. is figured on, 6-in. lining fastened to the stulls with lag screws should be used. With this heavier lining, 1000 to 1200 ft. could, I think, be successfully driven, and the repairs would be light.

The number of times the rock chute would have to be broken and doors put in depends largely on the dip of the vein and the character of the vein filling, but 400 or 450 ft. on a 55° to 60° slope should offer no great difficulties.

The reason greater speed was not made in the Treasury raise was almost entirely due to the time it took to cut hitches, frame the stulls and put them in place. The drilling took only about 2½ hours, but five rounds per week was the best we could do, and at the same time it was economy to employ two shifts of machine men.

Two items in the cost sheet might be explained. The coal consumption in May and June included heating several buildings; this was cut out in July and August. Maintenance includes only supplies, except for August, when the cable was twice spliced at a cost of $15 per splice, and about $75 was spent on the boiler plant. Cost of board is the boarding-house deficit each month.

COST SHEET, TREASURY TUNNEL RAISE

(All costs except fire insurance and taxes are included)

Labor and Supplies	May		June		July		August	
	Drove 100 ft. 448-548 ft.		Drove 105 ft 548-653 ft.		Drove 92.5 ft. 653-745.5 ft.		Drove 107.5 ft. 745.5-853 ft.	
	Total Cost	Cost per ft.	Total Cost	Cost per ft.	Total Cost	Cost per ft.	Total Cost	Cost per ft
Machine men	$465 50	$4 65	$471 30	$4 49	$468 80	$5 06	$478 68	$4 45
Timbermen and helpers	618 70	6 19	539 79	5 14	434 01	4.70	561 87	5 24
Tramming	113 50	1 14	102 81	0 98	87 30	0 94	110 17	1 02
Explosives	118 42	1 18	142 27	1 35	76 95	0 83	83 42	0 78
Candles and oil	23 61	0 23	21 40	0 20	20 05	0.21	23 39	0 21
Timber, lumber, and timber supplies	128 74	1 29	147 02	1 40	171 28	1 85	169 07	1 57
Hauling expenses	23 72	0 24	40 45	0 39	36.14	0 40	36 19	0 33
	$1492 19	14 92	1465 13	13 95	1294 53	13 99	1462 79	13 60
Salaries and office expenses	$213 72	2 14	216 87	2 06	222.31	2 40	205 00	1 91
Foreman	158 00	1 58	154 50	1.47	159 20	1 72	162 80	1 51
Compressor men	254 00	2 54	249 00	2 38	261 40	2 83	262 60	2 44
Blacksmith and helper	121 00	1 21	169 80	1 61	217 77	2 34	129 01	1 20
Coal	1066 13	10 66	951.75	9 06	584.19	6 32	441 15	4 10
Compressor supplies	22 30	0 22	21 43	0 21	24 24	0 26	23 94	0 22
Tools and shop supplies	5 70	0 05	4 73	0 04	3 38	0 04	4 35	0 05
Maintenance or repairs	4 58	0 05	8 83	0 08	20 18	0 22	147.19	1 37
	$1845 43	18.45	1776 91	16 91	1492 67	16 13	1376 02	12 80
Employers liability							273 71	2 55
Cost of board	40 37	0 40	77 14	0 73	142.03	1.54	125 93	1 17
Total cost	3377 99	33.78	3319 18	31 61	2929.23	31.66	3238 45	30 12

Cobalt in the United States in 1911

No cobalt was produced in the United States in 1911, although it is probable with an active demand that the concentrates saved in extracting lead ores at Fredericktown and at Mine LaMotte, Mo., might be made profitably productive, according to the U. S. Geological Survey; likewise deposits near Blackbird, Ida., when transportation facilities are improved. The great cobalt-producing locality is now Cobalt, Ont., and the supply for the United States is said to come entirely from there. Imports of cobalt ore and zaffer into the United States in 1911 amounted to 579,520 lb. The new alloy of cobalt and chronium, stellite, has already been described in the columns of the Journal.

South African Mining Notes

Johannesburg Correspondence

The Zaaiplaats tin mine, which is working deposits of tin ore occurring in pipes in the Waterberg district of the Transvaal, made a profit of £108,364 for the year 1911-1912, £90,000 being paid in dividends. Fifteen stamps crushed 29,330 tons, assaying 3.76% metallic tin, and yielded 1647 tons of concentrates, assaying 67% Sn. Ore reserves are 24,622 tons of estimated value 3.42% Sn, with 60,000 tons of 1 to 2% tailings. The mine is suffering from a water shortage and only five stamps are now running. The orebodies are erratic and similar pipes have become unproductive in the neighboring Groenfontein mine.

The other large producer is the Rooiberg mine, working fault fissures and impregnations along joint planes in quartzite overlying granite; further to the east this mine in 1911-1912 milled 20,799 short tons for a yield of 884.58 tons of 67.9% concentrates, the assay value of the ore treated being 4.94%. Tailings amounting to 44,500 tons, assaying 2.51% Sn, are now being retreated in a new 15-stamp mill with Cornish tin-dressing appliances. Ore reserves amount to 21,300 tons, assaying 4.7% Sn. Development work appears so far to have been somewhat disappointing, as no payable ore has been met with in the lowest, the 310-ft. level. Early concentrating practice was, as may be judged by the value of tails, exceedingly poor in the case of these South African tin mines.

The Barnato brothers, who hold large interests in the Jagersfontein and De Beers mines, have acquired large interests in the Premier mine, and now concerted action between these diamond producers, with a view to regulating prices, may be looked for. The alluvial diamond areas along the Vaal River, in the neighborhood of Boshoff, in the southwest Transvaal, still continue to afford occupation to a large army of diggers. One digger recently found a 30-carat stone, which sold for £800.

Van Ryn Deep Gold Mining Co. holds 700 claims on the dip of the Van Ryn and Kleinfontein mines. There is fully developed 790,818 tons of mill ore, assaying 7.50 dwt., with 347,500 tons of 3.06 dwt. value. The new mill under construction will consist of eighty 1900-lb. stamps, with eight tube mills, 16½x6 ft. This plant is expected to crush 40,000 tons per month, and as under the new law the mill may not run on Sundays, about 20 tons per stamp per day must be crushed; room will be left for another 10 stamps. The mill will be electrically driven from purchased power. The sand plant will consist of three collecting vats and eight treatment tanks equipped with Blaisdell distributors. The slime will be treated by vacuum filters.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

D. C. Jackling has gone to Alaska.

H. C. Hoover has returned from California.

J. Parke Channing is expected home about Dec. 20.

Frederick G. Clapp is examining oil properties at Bartlesville, Oklahoma.

John J. Penhale, of Sherbrooke, P. I., recently spent some time in New York.

Percy L. Fearn has returned to New York after a trip to South America on professional business.

Walter H. Case, of El Paso, Texas is now at Courtland, Arizona, making examinations for Eastern men.

Dr. L. D. Godshall has been appointed manager of the Tecopa Consolidated Mining Co., in Inyo County, California.

Morril B. Spaulding is now manager of the Pittsburgh district of the Crocker-Wheeler Co., with headquarters in the Oliver Building, Pittsburgh.

William Hague, managing director of the North Star Mines Co., Grass Valley, Calif., is in New York attending the annual meeting of his company.

Hon. Mr. Armstrong, minister of mines for Nova Scotia, was in Toronto, Ont., recently making inquiries concerning the mining legislation of Ontario.

John Rooke-Croowell has been appointed manager of the Cordova mine, in Hastings County, Ont. He was formerly in California and more recently in Mexico.

Colin Fraser, late of the New Zealand Geological Survey and now of London, England, has returned from a trip to British Columbia and is now in Northern Ontario.

Henry H. Armstead is leaving New York for Vera Cruz, Mexico, Dec. 19, to make an inspection of the Mexican United Co. properties, in Guanajuato, Jalisco and Tepic.

J. A. McGowan, purchasing agent for the United States Metals Refining Co., at Grasselli, Ind., severed his connections with the firm on Dec. 1. L. R. Pratt has been appointed in his place.

F. A. J. FitzGerald, formerly chief chemist of the Carborundum Co., at Niagara Falls, N. Y., spoke recently at the Franklin Institute in Philadelphia, on "Experimenting with the Electric Furnace."

William B. Dickson, for many years connected with the Carnegie Steel Co., and for several years first vice-president of the United States Steel Corporation, has been chosen president of the International Steam Pump Co., to succeed the late Benjamin Guggenheim.

At Johnstown, Penn., Dec. 5, the association of business men gave a testimonial banquet to James A. Farrell, president of the United States Steel Corporation; William H. Donner, newly elected president of the Cambria Steel Co.; Daniel Coolidge, president of the Lorain Steel Co., and Vice-President John A. Reis, of the United States Steel Corporation.

William E. Hartman has resigned his position as managing engineer of the H. Koppers Co., Chicago, manufacturer of byproduct coke ovens. Some additional changes have also been made in the organization and the list of officials is now as follows: President, H. Koppers; first vice-president, John C. McMath; second vice-president, Thomas V. Salt; chief engineer, Allan Strale; secretary and treasurer, Joseph M. Butler.

Dr. William B. Phillips, director of the Bureau of Economic Geology and Technology, University of Texas, is examining silver-lead prospects in Brewster County, Texas. On the completion of this work he is to examine the old silver and lead mines, near Nieves, Zacatecas, Mexico. This district is looking up, now that the railroad from Durango to Canitas is approaching it from the west. It will probably cross the Rio Grande, Zacatecas, at Rio Grande, and connect with the Mexican Central system, at Canitas. This will give an outlet for the Nieves ores for shipment to Aguascalientes.

OBITUARY

H. M. Ephraim, aged 30 years, and mine captain at the Helen iron mine, in the Michipicoten district. Ontario, was killed Dec. 3, by falling 150 ft. down a shaft. He was from Flint, Mich., and was a graduate of the Michigan College of Mines.

James Burke died at Reno, Nev., Dec. 1, aged 82 years. He was born in Canada, but went West at an early age and was one of the first of the California pioneers. He is said to have been the last survivor of the party led by James Marshall, who discovered gold in California.

Robert T. Hopper died at Montreal, Nov. 14, aged 54 years. He had been identified with the mining industry for 35 years, first in connection with the manufacture of portland cement, and later in the mining and production of asbestos and marble. The *Canadian Mining Journal* says: "He was a charter member of the Canadian Mining Institute, in which organization he took a keen and active interest. That his services to the society were valued is attested by the fact that he served as a member of Council for no less than nine terms, a record so far unequalled. A man of warm sympathies, generous-hearted, broad-minded, loyal and upright in character, the death of 'Bob' Hopper, as he was affectionately termed among his intimates, is a sad loss. He fought an uphill fight against odds for 30 years. That having achieved success he should not live to enjoy its fruits seems hard, yet he had the consciousness that he left behind him the record of a clean and useful life."

Societies and Technical Schools

Canadian Mining Institute, Ottawa Branch—At a meeting held in Ottawa, Dec. 4 a branch of the Canadian Mining Institute was organized. The following officials were elected. Chairman, W. R. Askwith; secretary, George L. Burland: executive committee, J. McLeish, G. C. McKenzie; Dr. A. D. Cairns, Robert Harvey and W. J. Dick. Dr. A. E. Barlow, president, and H. Mortimer-Lamb secretary of the Canadian Institute, gave addresses on the work and aims of the organization.

Austrian Congress of Mines and Metallurgy—The Allgemeiner Bergmannstag, held at Vienna, Sept. 16 to 20, was the eighth of these international congresses since their inauguration by Dr. Ferdinand Stamm, in 1858. The papers presented bore on the subjects of electricity in mines; power production by large central stations; rescue work in mine disasters; sand filling with hydraulic transportation; wireless telephony in mines; diamond drilling; iron blast-furnace gas purification, and briquetting processes for iron ores.

West Virginia Mining Institute—The meeting, held at Parkersburg, W. Va., Dec. 10 and 11, was largely attended, more than 150 members being present. The meeting was the occasion for a number of demonstrations showing what progress has been made during the past year in lessening the dangers in coal mines and what inventions have been made to minimize disasters.

American Association of Manufacturers of Sand-lime Products—The ninth annual convention of this organization was held on Dec. 3 and 4 at the King Edward Hotel, Toronto. President S. O. Goho, of Harrisburg, Penn., occupied the chair. There was a large attendance. Among the technical papers presented were "The Results of Testing Sand-lime Brick," by Warren E. Emley, of the U. S. Bureau of Standards, Pittsburgh; "The Present Condition of the Industry," by W. H. Crane. The delegate made an inspection of the local plants of the Toronto Sand-lime Brick Co. and the Toronto & Harbor Brick Co., and declared the bricks equal to those manufactured in the large American cities. The election of officers resulted as follows: President, S. O. Goho, Harrisburg, Penn.; vice-president, F. B. Allan, Toronto, Ont.; secretary, W. G. Plummer, Jr., Buffalo, N. Y.; treasurer, John L. Jackson, Saginaw, Mich. Harrisburg, Penn., was chosen as next place of meeting.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Dec. 4—W. H. Storms, state mineralogist, has submitted to the state controller and board of control an estimate of the monetary requirements of the State Mining Bureau for the two years beginning July 1, 1913. The estimate totals $135,000 and covers the following general and special items: Salary of state mineralogist and support of the bureau, including salaries of attachés, $46,000; preparation of general report, employing six fieldmen, $39,000; for special work on the Mother Lode, iron deposits, metallurgy, mining methods, ancient channels, $15,000; printing, $10,000; Panama-Pacific Exposition, $25,000. The work contemplated embraces features of special importance and of general interest to the mining industry of the state. The estimates for field work are not only conservative, but so low that it will be necessary to practice every economy in order to complete the work to the satisfaction of the state mineralogist and to the best interests of the state. The revival of the general reports will be appreciated in every mining district in the state. These reports were issued annually from 1880 until 1890, inclusive, and were followed by three biennial reports, making a total of 13 general reports; they were abandoned in 1897. Since then the state has been dependent upon the U. S. Geological Survey and the technical mining press for records and data that should have been supplied by the State Mining Bureau under the provisions of the act creating and maintaining the bureau. The special features contemplated embrace subjects of great importance at present, and if permitted to be exploited by the appropriation to be recommended by the board of control, will no doubt be followed in the second half of the present term of the state mineralogist by other work of equal importance. Much of the work of the bureau in the last 15 years has been delayed to the extent of detracting from the value of the publications. This may be avoided. The estimate for representation of the state at the exposition is quite conservative, but sufficient to make a valuable exhibit.

Denver

Dec. 6—In November the Cripple Creek district added more than $1,000,000 to the world's store of gold. The tonnage was 3621 tons greater than October, and the bullion value somewhat less, owing to the largely increased low-grade production milled. All the small local mills were in operation through the month. The total tonnage was 79,097 with a gross value of $1,175,035.

It is reported that John F. Barnett and G. F. Bradley, of Ouray, will build a 200-ton concentrating and zinc separating plant on the site of the P. F. Walsh pyritic smeltery at Silverton. They plan to separate the concentrates of other mills, and the cyanide plant will be operated in conjunction with the separator. It is stated that the money has been raised in New York and Boston, plans have been drawn, and the company is ready to commence work. It is further announced that Dr. J. M. Pascal, chairman of the mining committee of the Silverton Commercial Club, is to erect a similar plant at Silverton early next spring under the name of the San Juan Ore Reduction Co.; J. M. McClave, of Denver, consulting engineer. Other interesting mill news is to the effect that the much talked of Edison concentrator is at last to be tried out at Georgetown, where it is said ground has been broken for a new mill to be equipped with Edison machines. It will adjoin the Pelican 200-ton mill, which is also to be utilized to a larger extent, also that the new 10-stamp mill at the Empress tunnel on Corode Mountain will be ready to run in two weeks. This plant is equipped for amalgamation and concentration.

Butte

Dec. 4—During November, Madison County led all others in the production of gold in Montana, the amount which was deposited at the U. S. Assay Office at Helena being $61,709. The amounts deposited by the other counties were as follows: Lewis & Clark, $26,515; Fergus, $21,808; Chouteau, $15,053; Ravalli, $4961; Missoula, $2592; Powell, $1508; Broadwater, $897; Park, $502; Silver Bow, $394; Granite, $376; Flathead, $198; Meagher, $196; a total of $136,709.

A consignment of 12 boxes of Montana sapphires, weighing 4069 lb., was recently shipped from the mines of the Yogo district, near Utica, in Fergus County, to the New Mines Sapphire Syndicate, London, England. These mines have been operated for several years, the stones always being sent to England to be cut before being placed upon the market at New York. The sapphire mines in the Yogo district are noted for their size and brilliancy, and two shipments per year are made.

At a sheriff's sale held at Butte, Dec. 3, T. S. Crosley, of New York, purchased the holdings of the La France Copper Co. for $100,000, acting as the representative of the newly organized La France Copper Co. The sale was held for the purpose of satisfying a judgment for $2,000,000 given to the Lincoln Trust Co. as trustees for the holders of bonds for that amount, issued in 1906, and upon which the company defaulted upon the payment of both interest and principal. The following claims were represented in the sale: Wild Pat, Lexington, Louisa, Angela, Allie Brown, Atlantic, and Wappelo, with the machinery, warehouses, and other property. Although the future plans of the new company have not yet been made public, it is probable that operations will be begun shortly at the Lexington mine, which is known to contain large shoots of zinc ore.

Salt Lake City

Dec. 4—The copper-production report for 1911, by B. S. Butler, of the U. S. Geological Survey shows that 25,632,585 tons of concentrating copper ore averaging 1.34% copper were handled by the various states. Of this total, Utah produced 5,480,370 tons of ore, from which 228,583 tons of concentrates, carrying 106,744,211 lb. copper were obtained. Utah stood second to Michigan, which handled the greatest tonnage of concentrating copper ore. Of direct-smelting copper ore, Utah produced 640,729 tons, averaging 2.55%. Regarding the history of the industry in the state, the first recorded production was in 1872. The state did not become an important producer until late in the nineties, since which time the industry has steadily grown. The total recorded production to the close of 1911 has been 797,044,788 lb., or 4.89% of the output of the United States since 1845. During 1910, Utah ranked fourth among the copper producing states, and in 1911 produced 12.97% of the output.

Negaunee, Mich

Dec. 6—After five weeks' trial the concentrator at the American iron mine is still in the experimental stage. Several problems remain to be solved, but it is believed the idea of concentrating low-grade iron ore has been demonstrated to be entirely practical and that the undertaking will be a success. One of the unlooked for developments is the large proportion of fines (material under 2 mm.) made in crushing. The low-grade ore as it comes from the mine is crushed to 1 in. in the gyratory-crusher plant at the shaft, where two different size crushers are in operation. After being conveyed by belt conveyor to the mill, it is crushed to ⅝ in. by rolls; this completes the crushing process. It was originally believed that the fines would constitute about 10% of the whole, but this proportion is greatly exceeded and is usually several times that amount. This concentrator, the only one in Michigan, differs materially from those on the western Mesabi range, one of the principal differences being that the American mine plant uses Richards pulsator jigs to produce the bulk of its product. The concentrator was originally intended for 500 tons capacity per day, but it is not yet known what amount it will handle, as the introduction of further changes in the flowsheet may considerably increase this figure. The addition of full jigs is contemplated. The material fed to the mill assays between 40% and 48% in iron; the concentrated product about 62%; the tails 18 or 20% iron. The water used at present varies between 2500 and 3000 gal. per min. The small lake from which the water-supply is obtained lowered only a few inches and has remained at that level. The flowsheet, although not definitely made up as to detail, contains the following: rolls, trommels, Richards pulsator jigs, Callow belt, Callow screen and Deister tables.

Deadwood, S. D.

Nov. 22—Each employee of the Homestake Mining Co. will receive in addition to December pay an amount equal to 7% of his total earnings with the company during the year 1912. The disbursement will be made on pay day in January, and will embrace every man on the December payrolls, no matter whether he has worked a year or only part of a month. The company is making this disbursement for the first time in its history, and is the direct result of the most prosperous year the company has ever had. It will mean the distribution of nearly $200,000 among the employees.

The annual report of the state mine inspector, R. L. Daugherty, for the year ended Nov. 1, 1912, shows that the production of gold in South Dakota was $8,035,598, "the largest total since this office has been established, and while the quantity of ore treated also shows an increase, the average value of the ores milled is greater than before." The largest producer, as usual, is the Homestake, with $6,596,00 recovered from 1,529,474 tons. The Golden Reward produced $323,846.78, Wasp No. 2, $308,595.82, Mogul, $242,567.99. The total number of employees of South Dakota mining companies is given at 3808. During the year covered by the report there were but three fatalities underground and an equal number above ground. Dividends of the year include $1,310,400 by the Homestake and $85,000 by the Wasp No. 2. The inspector states the industry to be in excellent condition, and growing steadily.

Casper, Wyo

Nov. 28—Although oil springs were known to exist near the present site of Lander, in Wyoming, and were described by Captain Bonneville, in 1833, later by the Mormons, in 1847, and although the oil springs near Newcastle and on the Belle Fourche River supplied oil for lubricating purposes in the early days of Black Hills gold mining, only desultory work was done in the way of test wells drilled and small quantities of oil obtained until about three years ago, when the discovery of oil in large quantities in the Salt Creek field revived interest and activity, which now is greater than ever before in this state. At present Salt Creek field has over 100 miles of 6-in. pipeline, equipped with pumping facilities adequate for the transportation of 18,000 bbl. of oil daily, which quantity, of course, is in advance of the present production, but anticipates future production. Of this pumping capacity, the largest amount, or 13,000 bbl., is owned by the Midwest Oil Co., and the remainder by the Franco-Wyoming Oil Co. The Midwest has a storage capacity of over 500,000 bbl., while that of the other companies aggregate about 250,000 bbl., making a total storage capacity of over 750,000 bbl. The two refineries at Casper, of the Midwest company and the Franco-Wyoming company, have a total capacity of 18,000 bbl., with 160 railroad tank-cars in its service.

Seward, Alaska

Nov. 29—Practically every citizen in Seward attended a recent indignation meeting to protest against the alleged illegal actions of W. J. Lewis, special agent of the land department, who is accused of threatening homesteaders and miners with prosecution, if they did not furnish evidence to aid in the conviction of local residents on charges of cutting firewood on forest and naval reserves. The meeting was held under the auspices of the Seward Commercial Club and a committee was appointed to draw resolutions for the immediate recall of Lewis and an investigation of his conduct. Public feeling against him is exceedingly bitter.

Under the laws alleged to be unconstitutional all the land within 40 miles of Seward has been segregated from the government domain and placed in forest and naval reserves, upon which the timber may not be cut. Because the coal has been withdrawn from entry and must be imported from British Columbia at a cost of from $17 to $20 per ton, residents of Seward have made a practice of cutting the timber for firewood.

Cobalt

Dec. 7—It is stated that the Elk Lake branch of the Timiskaming & Northern Ontario Ry. will be completed to the town of Elk Lake by Christmas. As soon as the railroad is in, several shipments of ore will be made from Gowganda, where they are being held until cheaper transportation is available.

Good results are being obtained at the Mann property; two cars of high-grade ore are on hand. It has been reported that a small concentrating plant will be built in the near future. It is generally believed that the advent of the railroad will assist in opening this district, where the surface showings are regarded, by men competent to judge, as equal to or better than those at Elk Lake.

Porcupine

Dec. 7—An unfavorable turn was given the strike situation during the last week by the shooting of three strikers by Thiel detectives, who were guarding the properties. Fortunately, none of the men shot were seriously hurt. This has, however, much intensified the ill feeling existing between the Thiel men and the strikers. A carload of strike breakers *en route* for Timmins was stopped near Golden City. The car was smashed and the strike breakers driven out. Several disorderly acts of this sort have called attention to the necessity for more protection in the shape of provincial officers. Individual mines were guarded by detectives, but there were not enough policemen in the town to subdue the many acts of rowdyism which were continually taking place. Strong representations were made to the authorities in Toronto and it was decided to send a force of at least 25 provincial officers into the district.

Interest in the situation has been developed by the act of the Hollinger in swearing out summonses against about 300 of the men who went on strike, alleging a breach of the Lemieux act. This, it is stated, will be the first case of its kind under the act, and no doubt will be made a test. Five mines only, not including the Hollinger, submitted their case to a conciliation board, but the men went on strike at the Hollinger also, and left without giving due notice, thereby constituting a breach of the act. The men are liable to a fine of $10 per day for the time they are on strike. The Hollinger seems to be the key to the situation. The strikers have focused their attention upon this mine and when the strike is finally broken there, no further trouble will be experienced throughout the camp. At the Dome, no trouble has been experienced since the beginning of the strike and the property is being operated with about 250 or 300 men.

The Mining News

The Current History of Mining

Alaska

Great Northern Development Co.—It is reported that on Dec. 9, a snowslide on Copper Mountain, near Cordova, carried away seven buildings on the property of this company and it is believed that nine men were buried beneath it.

Alaska United—During October, 18,704 tons of ore was milled at the Ready Bullion mill from which $62,015 or $2.15 per ton in gold was recovered at an estimated net profit of $37,284. At the 700-Ft. Claim mill, 19,677 tons of ore was milled, from which $50,175 or $1.38 per ton was recovered, at a net profit of $24,734.

Ebner—It is announced by Judge J. R. Winn, of Juneau, that satisfactory arrangements have been made for the opening of this mine early in the spring. This will give employment to several hundred men.

Alaska Gold Mines Co.—The first power drill has been set at work in the tunnel at the Alaska-Gastineau mines, at Sheep Creek, which will connect the Perseverance and Sheep Creek properties. The tunnel is 8x10 ft. and will be 8000 ft. long.

Reliance—Martin Hanais, of Fairbanks, has taken a lease on this property on Dome Creek and will open up from the 100-ft. shaft and make other improvements.

Rainbow—Maddocks & Roth, of Fairbanks, have purchased F. Zimmerman's interest in this property, and are making preparations for building a two-stamp mill.

Newsboy Mining Co.—The five-stamp mill, which had been removed from its former site at the mine to the head of Cherry Creek, was placed in operation, Oct. 15. The well drilled at the mill by the Star drilling outfit is expected to furnish water for the entire winter. A cleanup made after 11 days indicated a yield of $16.67 per ton. The ore is being hauled from the mine to the mill, a distance of 4000 ft., by teams. In the mine, two stopes are being worked from the west drift of the 215-ft. level. In the east drift, at a point 165 ft. from the shaft, crosscuts are being driven in an effort to pick up the vein where it is faulted. On the 315-ft. level, where nothing has been done beyond the cutting of a station, work is to be resumed at once. Louis Golden is manager.

Tolovana—The two-stamp Nissen mill on this Willow Creek property has been running steadily for the last two months. Some ore is being stoped from the 85-ft. level, but not enough to supply the mill. The deficiency is made up from the lower-grade ore left on the dump by the old Huntington mill, which was discarded a few months ago. From a new vein recently discovered on the Bedrock side of the ridge, some very rich ore was taken. The shaft is down 40 ft. on this vein, and shows it to be irregular in size and gold content.

Arizona

Gila County

Southwestern Miami—Three Star drill rigs are in operation. Hole No. 7, 1391 ft. deep and bottomed in schist, will be finished in the near future. Hole No. 9, which is on the recently acquired Prospectors' group, is 395 ft. deep and is still in schist. Hole No. 10 is 102 ft. deep and is also in schist. The assessment on the Prospectors' portion of the property is nearing completion under the charge of the original owners of the property, although the expense is being borne by the company, this being according to the stipulation of the contract of sale.

Old Dominion—The new crusher plant excavation work is progressing well and should be completed soon. A new 750-kw. turbine has been installed at the smeltery power plant and a new geared hoist will be shipped from the factory early in December for installation at the "A" shaft. The management hopes to have the new basic converters running in January.

Gibson—General Manager Henderson expects to ship six carloads of copper ore from the Summit this month as against seven carloads for November. The lessees will ship two carloads of ore as they did last month. There are two parties of lessees, one on the Pasquale and the other on the Summit vein. The ore being mined by the company is coming from the fourth level, but as soon as a shute has been finished to the sixth level, the ore from the fourth level will be dropped through to the sixth and the ground between those two levels will be worked.

Superior & Boston—The ore recently encountered continues as driving and other exploration work along the vein progresses. The east drift on the eighth level continues in the ore and the raise started from the place on that level where the ore was first encountered has been lifted 20 ft. toward the sixth level and is wholly in ore.

Miami—Extensive improvements are in progress in the way of erection of buildings and installation of equipment. The usual progress in development is being maintained. The new mine machine shops are completed and the engineering force has entered its new and thoroughly equipped offices. In the same building are the mine offices. The concrete foundation for the change house near No. 4 shaft has been finished and the new hospital building is well along in course of construction. Two churn drills and two diamond drills are being operated; a perpendicular hole is being sunk from the lowest level of the mine. Another 600-hp. boiler, the fourth, has been finished at the power plant and is now generating power.

White Metal—Rich silver ore has been found at this mine in the Apache Mountains. William Fisk and Henry Snell are interested in the property.

California

Amador County

Memphis—It was reported in July that a 12-ft. vein had been disclosed at the 50-ft. level in the shaft on this mine, south of Plymouth. The shaft will be deepened to 100 ft. The pay ore is said to be about six feet wide and will average $5 per ton. Memphis Mining Co., owner; J. A. Monteverde, president. The property is one of the old Boyson claims, and was only recently developed.

Lincoln Consolidated—The report of a strike of good ore in the extension of the 1950-ft. level of the Lincoln into Wildman ground is corroborated. The small stringer of pay ore had widened out to about eight feet, carrying free gold and sulphides. This is about 400 ft. deeper than the old workings of the Wildman and is the only important find that has been made in the last 30 years. The present operators have developed on the theory that the Wildman payshoot would be found at depth. The ore is characteristic of the Mother Lode. W. J. McGee, of Sutter Creek, is manager. A. Noce is superintendent.

Keystone Mines—The legal contest between this corporation, which is the owner of the Keystone mine, and the former owner commonly known as the old Keystone company, has been transferred to the superior court of San Francisco. The contest concerns only the disposition of money withheld from the purchase price for the payment of receiver's certificates issued to former employees, should the certificates be held by the court not to be a lien on the property. Since the court has so decided, the receiver is seeking to recover from the money withheld from the purchase price. The suit in no way affects the title to the property nor the ownership by the Keystone Mines. The mine is being developed on a large scale, and is well equipped with machinery. C. R. Downs, of Sutter Creek is manager.

FRESNO COUNTY

Pacific Quicksilver Co.—Cinnabar claims have recently been located and purchased in the western part of the county, near the line of San Benito County, in the Mercy district. A good quality of cinnabar ore is reported to have been discovered.

INYO COUNTY

A. J. Carpenter and others, of Independence, are reopening the old Kearsarge district. There are 17 claims that are being prospected, from which samples of high-grade ore have been taken.

Southern Belle—Buildings, cars, track and whim formerly in use at this mine, near Laws, have been removed across the line into Mono County, to be reconstructed at the St. Ives mine, recently reopened.

KERN COUNTY

The Standard is building a new refinery in the Kern River field, near the Oil Center branch of the Southern Pacific R.R., east of the Standard's tank farm. The plant will be equipped for making illuminating, lubricating and other oils, gasoline and distillates, for the San Joaquin Valley market.

MONO COUNTY

St. Ives—This mine, near Laws, has been reopened by the Lone Star Mining Co., of Goldfield. The shaft will be straightened, and from the 50-ft. point will be made vertical for 125 ft. From the 125-ft. station to the bottom, a total depth of 270 ft., the shaft is inclined. It will be timbered and drifts driven on the orebodies. Under lease the mine formerly produced ore worth $15 to $30 per ton. E. E. Green is superintendent.

PLACER COUNTY

Soudan Gold Mining Co.—This is a new company, organized to develop under a purchase bond the Knoff mine, adjoining the old Hathaway, in the Ophir district. It is reported that a Beer roller mill will be installed, and electric power used for operating the mill and mine. The incorporators of the company are E. W. Wallace and Elizabeth A. Wallace, of Seattle, F. G. Beuck, of Minneapolis, C. Tilton and E. P. Stephenson, of Sacramento.

SHASTA COUNTY

Bully Hill—Work is being continued in the experimental zinc-extraction plant.

Standard Mining Co.—A suit has been brought in the Superior court to restrain the directors from selling the stock of certain shareholders, and demanding an accounting. The company has been reopening the Uncle Sam mine, formerly a large producer, and it is charged that $24,000 has been spent in conjunction with the Big Seven Consolidated Mining Co., and that only $4000 worth of improvements have been made. Some low-grade ore has been mined, it is claimed, without profit.

TRINITY COUNTY

Samuel Williams and John Clayton are building a five-stamp mill at their mine in Ames Gulch, about eight miles north of Lewiston. A large quantity of milling ore is reported, and some shipping ore also has been mined.

Trinity Dredging Co.—The new dredge is in operation on Trinity River, north of Lewiston.

TUOLUMNE COUNTY

Clio—The mine and surface equipment has been taken over by forced sale by the Ora Mining Co. The mine was reopened about a year ago by the Clio Power & Mining Co., and $55,000 in bonds were issued, no part of which was paid. It was formerly a producer and in the last year had again been placed in the producing class. It is situated near Jacksonville.

Tarantula—Five men were overcome by gas in this mine, near Chinese Camp; it is reported that one died. It is stated that a new cyanide plant is to be built. The mine is equipped with a 20-stamp mill.

Sunnyside—A cyanide plant and a boarding house are being built. It is reported that ore of good quality is being mined. The property is operated by Los Angeles men. Mr. Walker, of Sonora, is superintendent.

O. K.—A bond on this property north of the Rawhide mine given by the Tuolumne County Bank has been transferred to A. A. Coud, of Reno. It is reported that active development will be started immediately.

YUBA COUNTY

Yuba Consolidated—The pit is being dug preparatory to construction of the No. 1A all-steel 15-cu.ft. bucket dredge in the Yuba Basin district, at Hammonton. The boat will be built by the Yuba Construction Co., at Marysville, P. R. Parker, superintendent. The field construction will be in charge of P. E. Morse, general superintendent of construction for the Yuba Construction Co.

Colorado

GILPIN AND CLEAR CREEK COUNTIES

Eureka—This mine, long idle, is being rapidly put in shape by Superintendent Bray for active development. A new Clayton compressor is on the ground and will be installed as soon as the shaft house has been enlarged and a 50-hp. motor will be put in place to run the compressor. The shaft is 700 ft. deep and is equipped with pumps. It is stated that at the 600 level, a shoot of ore has been exposed for 240 ft. in length. The shaft will be sunk another 300 feet.

Pelican—Frank Graham, lessee, is employing a force of 12 men, and a heavy tonnage of mill ore is being broken. During the last two months the 50-ton mill has been enlarged and shortly after the first of December not less than 100 tons will be treated daily. There is now waiting treatment several hundred tons of custom ore, the product of the Gambetta and Josephine mines.

Idaho Pride—This company sent out a 50-ton shipment last week that averages better than $46 per ton. The 400-ft. tunnel level has been retimbered and is now ready for stoping. Driving from the Seaton to the Idaho-Bride vein is now underway.

GUNNISON COUNTY

Activity among lessees, on Fryer Hill, in their search for zinc-carbonate ore, continues, and a good tonnage is going out in addition to the iron ore being shipped.

A big strike has been made in the Raymond mine in a vein intersected by the long crosscut. This is on the same series of gold veins as the Gold Links and the Carter. All three have mills on Ohio Creek, and all three work the veins through crosscuts from 2000 to 6000 ft. long. The ore is galena and iron pyrite, the smelting ore carrying from 2 to 16 oz. gold per ton, about 9 oz. silver and 10% lead. The Gold Links has taken $500,000 out of one stope in one shoot 1500 ft. long. The new strike on the Raymond is probably on a parallel vein to this, known as the Sacramento. Eugene Lamont is the manager. The Carter mine and mill is under the management of Carroll Carter.

LAKE COUNTY—LEADVILLE

Little Johnny—This mine still continues to produce occasional lots of rich ore, and it is said that in November, several lessees opened new oreshoots, thereby largely increasing the tonnage. Some of the ore taken out assayed 200 oz. in gold and the statement is made that several lots were actually settled for at the Arkansas Valley smeltery at 70 oz. gold per ton.

Ponsardin—A 33-ft. shoot of 18% zinc-carbonate ore has been opened by lessees on this property, but just too low grade to ship.

La Plata—This mine, on Rock Hill, continues to ship a good tonnage of zinc-carbonate ore weekly, and from the size of the shoot, this can be kept up for many months.

Mount Champion Mining Co.—The mill and tramway have been completed and sufficient ore has been opened to repay the capital. Four streaks of fair milling ore, about eight feet in width, have been opened. The mill has a capacity of 75 tons per day and consists of Simons and disc crushers and tube mills. A new tunnel from the Half Moon side of Mt. Champion is contemplated and will cut the oreshoots at a great depth.

San Juan District

In the U. S. district court, Federal Judge Lewis denied the injunction asked for by the Cimarron company to restrain the Tomboy company from using the water from the Ophir tunnel and Thorne Lake, for the mill in Savage Basin.

Hamlet—Etienne A. Ritter is expected at Silverton to make arrangements to have work resumed on this mine, which was one of the early shippers.

Tomboy—During November, 10,000 tons of ore was crushed at this Exploration Co., Ltd., of London, property, from which $86,000 worth of bullion and concentrate were recovered, the net profit being $34,788.

Teller County—Cripple Creek

Portland—The rich shoot of ore opened on the 1600 level of the Portland mine, has been developed already for 150 ft. into both north and south headings in high-grade ore. As soon as recession of water will permit, the company will see what the 1700 will produce. From 15 to 20 carloads per month are being shipped by lessees.

American Eagle—This mine, belonging to the Stratton estate, and under lease to the Colorado Mines & Investment Co., has just sent out a carload of medium-grade ore, mined by Matheson & Co., sublessees.

Coriolanus—This mine, on Battle Mountain, is operated by Colonel Burbidge, manager of the Alboa Gold Mining Co., and has just sent out a carload of mill ore. This company is opening considerable ore ahead of extraction.

Isabella—A carload of ore per day is being shipped from the Lee dump by Knute & Fackerill, lessees.

Acacia—The tenth dividend of 1c. per share has been declared, payable at Christmas. This makes a total of $136,699 paid to stockholders.

El Paso—It is stated that the October dividend of 2c. per share paid in October, amounting to $49,000, will be duplicated this month. El Paso surplus is given at $140,000 and the company is earning at the rate of 24% per annum on its capital and paying dividends at the rate of 12%. The production for November was 144 carloads of ore; 100 carloads shipped on company account, averaged $30 per ton, and 44 cars by lessees averaged $18 per ton.

Idaho

Bonner County

Idaho-Montana—The company has about 1500 tons of high-grade silver-lead ore piled up at Katka awaiting the completion of the Great Northern spur to that place. Development is being pushed at the 300-ft. level with encouraging results.

Idaho County

Brown Bear—Development has been suspended indefinitely, owing to lack of funds.

Major Group—Work on the shaft is progressing rapidly and the oreshoot, which averages three feet in width shows a gain in value with depth.

Kootenai County

Idaho Continental—The sawmill machinery has arrived and during the winter lumber will be sawed for the 300-ton concentrator which the company plans to build in the spring.

Pend d'Oreille—The long crosscut tunnel has reached the 1000-ft. mark. About 200 ft. more must be driven to cut the vein.

Shoshone County

National—An excellent body of copper ore of unknown width has been developed for a length of 125 ft. at a point 1700 ft. from the surface. This is the most important strike in the Mullan district this season and is having a stimulating effect on the owners of near-by properties.

Gertie—At the annual meeting of the stockholders it was decided to resume operations on this property.

National Copper—High-grade copper ore rich in silver has been encountered in a 200-ft. drift at the end of the 4500-ft. tunnel.

Last Chance—The old "L" and "M" stopes, long since abandoned, will be reopened and the filling will be taken out and worked in hand jigs.

Western Silver-Lead Mining Co.—A vein of clean galena has been opened in this property. Development shows that former operators had driven parallel with the oreshoot for a considerable distance.

Hypotheek—The 700-ft. level is being unwatered in preparation of the work of seeking the extension of the orebody found on the 523-ft. level. Shipments have been begun from the ore encountered on the 523-ft. level, which appears to be the top of an oreshoot.

Michigan

Copper

Old Colony—No. 19 drill hole reached the Mayflower lode at a depth of 1474 ft., which at the point of intersection was about 14 ft. wide, but the core showed evidences of faulting and it is likely that a portion of the lode had slipped below the point of contact, which explains the comparative narrowing of the lode. This hole was put down further east than any of the previous holes in either this or the Mayflower property.

Indiana—This company is installing a new hoisting equipment, which will be ready to go into commission within a few weeks.

North Lake—Sinking has been temporarily suspended at a depth of about 50 ft. The hoisting equipment now in service at the Indiana property has been bought and as soon as it can be installed operations will be resumed, in the meantime a temporary shaft house is being erected and the other necessary mine buildings, so that when sinking is again resumed it can go forward without interruption.

Michigan—This mine has resumed exploratory work, and a new shaft has been started which has penetrated the overburden and is well established in the lode. A crosscut is also being driven to the north, toward the Butler lode. It is deemed advisable to start this work from the good results that were shown in the drilling work done about a year ago.

Centennial—An increase has been made in the shipments to the mill, about 500 tons daily being handled, also a slight improvement has been noted in the copper tenor of the ore in the lateral openings in proximity to the Wolverine.

Allouez—This mine is sending about 1200 tons of ore to the mill daily, being about equally divided between Nos. 1 and 2 shafts. The rock house at No. 1 shaft is to be remodeled for more efficient handling of the rock from the dump to the crushers, and an enlarged skip will be put in service at this shaft. The No. 2 shaft equipment is working satisfactorily.

Iron

Ashland—The Cleveland-Cliffs Iron Co. surrendered its lease on this Gogebic range mine, at Ironwood, Dec. 1, and will remove its machinery. It is understood that the Hays Bros., to whom the mine reverts, will operate it. The mine was opened in 1884, and has shipped ore every year since then, making a total of nearly 6,000,000 tons. The Cleveland-Cliffs Iron Co. has operated the property for the last 10 years and has averaged approximately 250,000 tons per year. It is thought that the ore reserve of the mine is rather low The ore is of good grade.

Rolling Mill—The new Sullivan hoist for No. 2 shaft just completed has been installed in the engine house. The new shaft and equipment will be used to handle men and material for some time at least, while No. 1 shaft will continue to hoist ore.

Cleveland-Cliffs Iron Co.—For several weeks this company has been calling for more men for its Negaunee and Maas mines. There are now 425 men at the Negaunee mine and 175 men at the Maas mine. It is expected that by next spring these two mines, which are adjacent, will be employing nearly 1000 men, which is more than ever before. At the Negaunee mine the old shafts and buildings have been abandoned, and the new No. 3 shaft and elaborate equipment are in full operation.

Breitung-Hematite—The hoisting shaft is being sunk deeper and will be continued 180 ft. below the bottom level; one-man "Jackhammer" drills are used in sinking. A crosscut will then be driven 600 ft. to the south and a raise put up to connect with the new hoisting shaft that will soon be sunk on the hill back of the mine buildings. A diamond-drill has been testing the ground at the proposed site and has demonstrated that at last a place has been found where there is no ore. The shaft to be sunk here will eventually be 2000 ft. deep. The management of this mine has been trying to find a place for a new shaft for two years.

Missouri

Joplin District

The Aylor land, west of Purcell, is now the scene of much mining activity. The land is being drained by three large pumps and lessees are waiting for the water level to be lowered before commencing operations. Prospect drilling is in progress on a 40-acre lease of the land.

Most of the concentrates from the Alba camp are coming from the old tailing piles which are being remilled. Nesbach & Co. are operating a number of mills which formerly handled large tonnages of mine dirt but are now converted into tailing mills. The East Alba Mining Co., operating a 300-ton mill at the eastern end of the camp, is the only company making regular productions from mine-run ore.

Stewart Mill—The Stewart tailing mill, between Carterville and Webb City, was destroyed by fire, Dec. 3. The mill was valued at $7000 and had just been overhauled.

Porto Rico—A new mine is being opened on the W. A. Knoland. The ground has been prospected with a churn drill and by drifting, sheet ground being proved at 190 ft., similar in character to that of adjoining properties. The mill is being moved from the Marvel mine at Duenweg and is to be remodeled to have a capacity of 150 tons.

New Dividend—This company, operating on the American Lead, Zinc & Smelting Co. land, northeast of Joplin, is sinking a shaft to take care of the ore from the drawing of pillars. The underground haul will be lessened and an inclined tramway will be built from the new shaft to the mill.

Otis Mining Co.—This company is moving the old Millard mill from Porto Rico to West Seventh street, Joplin. It will be installed at a mine developed by Spiva & Co. and will operate on 5% ore.

Quick Seven—Because of the ore extending to within 20 ft. of the surface over a part of the company's holdings, at Neck City, and the numerous cave-ins that have occurred, this company has decided to install a steam shovel and work the ground from the surface down. The ore will then be handled by an inclined tramway instead of a combination of aërial tram and underground haulage as at present.

Montana

Butte District

Butte & Superior—On Nov. 28, the newly installed Nordberg hoist at the Black Rock shaft, was tried for the first time. A few minor adjustments are now being made, but it is expected that ore hoisting will begin in a few days, after the shutdown of two months to change the engines. Remodeling of the mill is about completed, and while the present stockpile output will not be materially increased at once, the quantity of ore treated will be gradually added to until the full capacity is reached.

Davis-Daly—The grade of ore in the north vein on the 1900-ft. level of the Colorado shaft is increasing as progress is made in drifting. Recent assays gave returns of 5.3% copper and 9.3 oz. of silver per ton. About 90 tons of ore are being mined and shipped daily from the Colorado shaft alone, and in addition, a considerable amount in royalties is being received from lessees operating other claims. The present shipment tonnage is the greatest in amount and regularity in the history of the company.

Deer Lodge County

Blue-Eyed Nellie—Spokane men have had a force of five men engaged during the last few weeks cleaning out this silver-lead mine, three miles west of Anaconda, for the purpose of making a careful examination. The property was closed 12 years ago, after having produced approximately $750,000 worth of ore. Before the slump in silver, Frank Brown, the owner, was offered a large sum for the property, which he refused. Later Mr. Brown erected a mill, which he was unable to operate profitably and the shutdown resulted. W. A. Clark at one time owned an interest, which he disposed of after unsuccessfully attempting to gain control. The ore is similar to that in the Leadville, Colo., district.

Red Lion—Two shifts are working steadily at this property, at Georgetown, and low-grade ore has been blocked out, which can now be mined profitably.

Butte & Anaconda—At the property of this company, which lies between the Southern Cross and Red Lion groups, a shaft is being sunk on a vein believed to be an extension of the Southern Cross vein. It is the intention to begin driving on the vein in both directions within a short time, as well as to crosscut to the other veins on the property.

Hidden Lake—Occasional shipments of ore are being made from this property, but the management is principally interested in blocking out ore for shipment by the railroad; such shipments will probably begin in a short time.

Sanders County

Mountain View—Preparations are being made to begin operations at this property, which consists of eight quartz and three placer claims, eight miles northeast of Trout Creek, near the Summit of the Cabinet range of mountains. The property is traversed by a number of strong silver-lead veins in quartzite, and limestone-slate formations. Considerable surface development has been done, and three tunnels having lengths of 50, 75 and 175 ft., respectively, have been driven on the veins. It is planned to drive a crosscut tunnel a distance of 1200 ft. to tap three known veins. In this distance a vertical depth of 1600 ft. will be attained. A. J. Williams is president; James Hvlent, vice-president, and W. E. Williams, secretary and treasurer of the company.

Nevada

Comstock Lode

Union Consolidated—The annual report of Superintendent Symmes of work performed in the mine, during the last fiscal year, shows a total footage of 2043 ft. of exploration and development work done. Most of this was performed on the 2500-ft. level. The work has not resulted in the discovery of new orebodies.

Mexican—The annual election was recently held in San Francisco, when the entire old board of officers, and mine officials, were reëlected for another year. The financial sheet showed available resources of about $85,000, including $70,000 in cash, and the balance in supplies on hand and paid for, and bullion unsold. The annual report on mine conditions by Superintendent Symmes was favorable.

Ophir—The first cleanup has been recently made at the new cyanide plant, and six bars of bullion have been shipped to the smeltery.

Consolidated Virginia—New work is being done on the 2500-ft. level of the mine, the southwest drift from Ophir being continued on from the north boundary line in a southerly direction. The objective point is to reach the vein in which a rich shoot of ore was found on the 2400-ft. level.

Sierra Nevada—Work has been resumed, driving north on the vein on the 2500 level, with quartz showing in the face. A raise has also been started at a place where high-grade ore was extracted from the vein.

Crown Point—Complete returns have been received from the smelter of concentrate and bullion shipments from the last run of ore at the Yellow Jacket mill, showing a gross yield of $25,413. This run was completed in October, and run No. 9 has now been started.

ESMERALDA COUNTY

Goldfield Consolidated—The production for November is officially estimated at $429,000, recovered from 27,614 tons of ore at a net profit of $244,000.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Nov. 30, are as follows:

Mines	Week	Year to Date
Tonopah Mining....	3,700	161,219
Tonopah Belmont...	2,924	120,818
Montana-Tonopah..	1,009	49,155
Tonopah Extension..	1,050	48,413
West End	800	37,027
Midway........	..	820
MacNamara.	417	18,156
North Star ..		401
Mizpah Extension...		40
Jim Butler	300	4,700
Tonopah Merger.	200	300
Totals	10,400	441,049
Estimated value.	$260,000	

WHITE PINE COUNTY

Giroux—According to Thompson, Towle & Co., this company has been earning upward of $60,000 per month on a production of approximately 1,000,000 lb. of copper. Inasmuch as copper has been realizing upward of 17¼c., the reported profit indicates a cost of production of about 11¼c. per lb. of copper.

Oregon

JOSEPHINE COUNTY

Pacific Interior R.R. Co.—This company has been incorporated for building a railroad from Grants Pass, Ore., to tidewater at Crescent City, Calif., 80 miles. The incorporators are E. T. McKinstry, George Colvig and W. P. Quinlan and the company is capitalized at $100,000 in 10,000 shares each of $10 par value. The principal place of business is Grants Pass. Grants Pass will vote, Dec. 18, on a bond issue of $200,000, to help finance the road; $250,000 has been raised at Crescent City. The railroad will enable the opening of many mines in this vicinity that at present are idle.

LAKE COUNTY

C. M. Sain, together with other Los Angeles men, is preparing to obtain salt, potash and soda products from Alberta and Summer Lakes, which are said to contain 40,000,000 tons of salts of potash and soda. The Oregon state land board leased these lakes for 40 years to Mr. Sain and his associates, who guarantee to pay a royalty of at least $50,000 per year, starting with 1913. Royalties will be $1 per ton on all soda and potash taken from the lakes and 50c. per ton on common table salt. The nearest railroad is Lakeview, Ore., which is 40 miles from the lakes.

LANE COUNTY

Treasure—Charles A. Phelps, of Los Angeles, Calif., and associates, have taken over this mine in the Blue River district and will commence development work at once. A vein of rich free-milling ore was recently found. The mine is equipped with a 12-stamp mill, which is in good condition. Mr. Phelps will have charge of the mine.

Utah

JUAB COUNTY

May Day—There is a large tonnage of zinc ore developed, and the lead ore of shipping grade recently opened on the 1100-ft. level is being developed. November shipments are reported at 1300 tons, of which 250 tons were lead ore, and the remainder, zinc. December shipments are expected to amount to 2000 tons. The output for the week ended Nov. 30 was 12 cars.

Opohongo—Two cars were shipped the week ended Nov. 30, the ore coming from between the 350- and 600-ft. levels. Driving to the east is being done on the 300-ft. level, as well as prospecting at depth. There is some ore in the bottom of a winze 50 ft. below the 700-ft. level.

Gemini—At a stockholders' meeting held by this company and the Godiva, the old board of directors was reëlected. In the beginning of November, the Gemini declared a dividend of $6 per share, or $30,000, the capitalization being 5000 shares. Lessees are mining zinc ore, of which two cars were shipped recently. Shipments for the week ended Nov. 30 amounted to five cars.

Yankee—This company shipped three cars of zinc ore of good grade the week ended Nov. 30.

Grand Central—Ore is being shipped from the 2300, the lowest level in the mine, and conditions here are reported excellent. The output for the week ended Nov. 30 was 13 cars.

Victoria—This company expects to complete the electrification of its plant in the near future. A new compressor has been ordered, and when this is in operation, work can be extended, and shipments increased. Six cars were shipped the week ended Nov. 30.

Chief Consolidated—Shipments for the week ended Nov. 30 amounted to 24 cars.

Gold Chain—Ore of shipping grade has been opened in the western part of the property, through the 1500-ft. level of the Gold Chain. Nine cars of ore were shipped the week ended Nov. 30.

Lower Mammoth—Four cars of zinc ore were shipped in November. Development is being done on the 700-, 1200- and 1500-ft. levels.

SALT LAKE COUNTY

Utah Copper—The surface force has been increased and is now about 80% of the usual number. The output for October was 2,188,792 lb. The regular quarterly dividend of 75c. per share has been declared, payable Dec. 31.

Michigan-Utah—Arrangements for financing development work have been completed.

Alta Consolidated—A drift has been driven westward for 50 ft. from the Brooklyn raise, and north and south crosscuts from this drift have opened ore over a distance of 10 ft. Connections with the Brooklyn shaft have been completed, improving the air, and facilitating shipments. Twelve teams are hauling ore. Arrangements have been made for the use of the Michigan-Utah tramway. The new boarding house has been completed, and winter supplies laid in.

Ohio Copper—The final dividend of 25c. per share in liquidation is ready for stockholders who failed to meet either of the two recently levied assessments of 50c. per share. The dividend will be paid by the New York office upon receipt of certificates of stock properly indorsed. The working force is sufficient so that two sections of the mill can be operated, and between 1700 and 2000 tons of ore is being treated daily.

SUMMIT COUNTY

Park City shipments for the week ended Nov. 30 amounted to 3,044,650 pounds.

Daly West—A strike on the 1700-ft. level is reported.

Daly-Judge—The regular quarterly dividend of 15c. per share has been declared, with an added Christmas dividend of equal amount, making a total of $90,000, to be paid Dec. 20. The report for the quarter ended Sept. 30 showed a surplus of $540,000. Steady shipments are being made, while ore reserves are being added to.

Washington

FERRY COUNTY

El Oro Mining Co.—This company has been organized with offices at Spokane for the purpose of building a 125-ton cyanide mill at Republic for treating the ores of that vicinity. A site has been selected, and work is to be started at once.

Keller & Indiana Smelting Co.—This property, at Keller, was recently sold at public sale to Jasper King and H. J. Lefever, of Walla Walla, who are planning considerable development work.

San Poil—The mill at this property in the Republic district has now been running 70 days, with an output of $23,000 in gold and silver bullion.

LEWIS COUNTY

Mutual Oil & Development Co.—This company has recently been organized with headquarters at Centralia. It has leased 1000 acres of land in that vicinity and will begin drilling for oil.

STEVENS COUNTY

Imperial—Operations at this mine have been suspended and will not be resumed until Mar. 1, 1913. A. H. Anderson, Chewelah, is superintendent.

Blue Star—A pump and other machinery have been purchased and are being installed at this property near Chewelah by Mark Mitchell.

Chewelah Copper King—New machinery is being installed at this mine, and the company expects to make regular shipments in the near future. S. P. Domer has charge of the work.

Canada

BRITISH COLUMBIA

Kootenai Gold Mines, Ltd.—The capitalization of this company will be increased from $250,000 to $500,000 if the decision of the directors is ratified by the stockholders. The company owns the Granite-Poorman mine.

ONTARIO

Parham Feldspar Mine—A shipment of ground feldspar from this mine, in Frontenac County, 30 miles north of Kingston, has been made to the Ideal Manufacturing Co., Port Hope, Ont. This is stated to be the first feldspar mined in Canada.

Moose Mountain—A briquette of iron ore produced by the Grondal magnetic concentrating process from the output of the Moose Mountain iron mine, north of Sudbury, has been received by the Ontario Bureau of Mines. It contains 63.40% of metallic iron, 0.02% phosphorus and is free from sulphur and is pronounced to be of bessemer quality. The company also has contracts for ore which does not require briquetting.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Dec. 6, and for the year to date, were:

Bailey		21.57
Beaver		363.75
Buffalo	114.34	1,103.84
Casey Cobalt		255.15
Chamb.-Ferland		427.83
City of Cobalt		914.99
Cobalt Lake	100.15	961.03
Cobalt Townsite		1,729.02
Colonial		63.14
Coniagas	123.57	1,997.90
Crown Reserve	20.02	437.84
Dominion Reduction Co.		56.64
Drummond		383.05
Hudson Bay	31.65	662.85
Kerr Lake		743.05
La Rose	60.00	3,291.09
Lost & Found		27.80
McKinley-Darragh		2,350.99
Nipissing		1,735.62
O'Brien		325.43
Penn.-Canadian		97.90
Provincial		22.22
Right of Way		242.82
Seneca Superior	32.26	227.89
Timiskaming	43.85	958.66
Trethewey		501.89
Wettlaufer	30.25	437.21
Totals	556.09	20,344.17

Buffalo—During October the mill ran 586 hr. and treated 4438 tons of ore, from which 213,608 oz. of silver was recovered.

Cobalt Lake—A dividend of 2½% has been declared. The output for the current year is officially estimated at approximately 1,000,000 oz. Early next year 20 additional stamps will be installed.

Mann—A concentrator is to be built at this Gowganda property. The gross value of the ore produced during the last year was over $100.000.

ONTARIO—PORCUPINE

Jupiter—The Drummond Syndicate, of Montreal, has exercised its option on the treasury stock of this company at 40c. per share. There will be sufficient cash and stock in the treasury to assure the development of the property and building a mill.

Hollinger—Two bars of bullion, valued at approximately $30,000, have been shipped this week. No financial statement accompanied the dividend checks for November as the last statement was brought down to Oct. 25 and there were only four more days left in the month. At the time of the next dividend payment, the statement issued will indicate the present position of the mine.

QUEBEC

Loughborough Mica Co.—This Ottawa company has established a new mica splitting plant at Maniwaki, Que., which gives employment to 100 operators.

YUKON TERRITORY

Boyle Concessions, Ltd.—All properties of the Granville Mining Co. in the Klondike watershed have been merged with those of the Canadian Klondike company; the combined property, comprising about 40 sq.mi., will hereafter be operated as Boyle Concessions, Ltd. Two Marion 16-cu.ft. bucket dredges have recently been completed on Bonanza Basin at the junction of the Klondike and Yukon Rivers; these dredges will not be started until next May. The Granville Mining Co. will have a 49% interest in the new incorporation and will continue the operation of its other properties.

Mexico

MEXICO

A force of rebels recently attacked the town of Temascaltepec, near Toluca, but was repulsed with heavy loss.

OAXACA

All the heavy machinery for the Cubilete mill, at Taviche, has been received at Ocotlan. The installation, however, is being postponed until conditions in the state are improved. The erection will be undertaken under contract, and four months will be required to finish the job. The mill will have a capacity of 150 tons per day, and will not only treat ores from the company's mines, but undertake a general custom business. This will be the first cyanide mill in the district.

ZACATECAS

Protectora—This mine, at San Salvador, a producer of high-grade copper-silver ore, resumed operations in July of this year, after a shutdown of four years. Recent exploration work has disclosed ore containing 18% of copper and 800 grams of silver. Shipments at the rate of 250 tons per month are now being made regularly. The ore occurs as irregular bodies and cave filling in limestone, and the minerals are the carbonates and oxides of copper and silver chloride. No water is encountered in this region of the central plateau of Mexico for a depth of several hundred feet. No timbering is required at this property, and gasoline hoists are employed. About 200 men are on the payroll. The property was a small dividend payer during 1906 and 1907, and on Dec. 15, 1912, will resume dividends, the board of directors having declared a 5% dividend on the capital stock for that date. P. A. Babb is president of the company and engineer.

Asia

CHOSEN

Oriental Consolidated—The cleanup for November is estimated to be worth $141,500.

PHILIPPINE ISLANDS

Philippine Exploration Co.—The 6-cu.ft. bucket gold dredge, built by the New York Engineering Co., for the Gumaus placers, in the Paracale district, was completed and put in operation for the first time Sept. 25, 1912. It is a typical modern Empire dredge with timber hull.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Dec. 11—The situation in the West remains about the same, with the exception of a slight improvement in car supply. Prices have eased off a trifle, but there is no important change.

The seaboard bituminous trade again shows rather better supply, with less pressing demand from the coastwise trade. The shoal-water ports are very near closing.

Anthracite is coming out more freely and dealers are less urgent in their demand for supplies, although the cold snap this week has developed a larger demand for domestic sizes. Shipments this month are keeping up well.

Shipments of coal through the Sault Ste. Marie canals in November were 1,849,093 short tons, making a total of 14,468,497 tons for the season.

Anthracite shipments in November were 6,165,636 long tons, being 499,785 tons less than in October, and 27,778 tons less than in November, 1911. For the 11 months ended Nov. 30, the total was 63,838,872 tons in 1911, and 57,666,076 in 1912; a decrease of 6,172,796 tons this year.

German Foreign Trade—Exports and imports of fuel in Germany, 10 months ended Oct. 31, metric tons:

	Exports	Imports	Excess
Coal	25,728,783	8,478,727	Exp. 17,250,056
Brown coal	44,766	6,028,872	Imp. 5,984,106
Coke	4,816,143	494,174	Exp. 4,321,969
Briquettes	2,236,672	146,266	Exp. 2,090,406
Total	32,826,364	15,148,039	Exp. 17,678,325

Of the briquettes exported, 475,536 tons were made of brown coal or lignite.

Spanish Coal Trade—Imports of coal into Spain, nine months ended Sept. 30, were 1,653,010 metric tons, an increase over 1911 of 100,591 tons. Imports of coke were 266,994 tons, an increase of 32,223 tons.

IRON TRADE REVIEW

New York, Dec. 11—The iron and steel trades show little change from recent reports. The pressure on mills for deliveries is quite as strong as it was.

The past week has shown a further diminution in far forward business in steel products, and it is a question in the trade whether the decrease represents a change of sentiment on the part of buyers, or is simply due to the business being already done for a period as far ahead as buyers usually care to commit themselves.

The National Tube Co. of the Steel Corporation, through the export branch, has booked a record order for line pipe, involving about 550 miles of 5-in., 9-in. and 10-in. pipe, about 35,000 tons. The pipe is taken by the Rumanian government, to build a line from the Rumanian oil fields to the Black Sea. The National Tube Co. has booked also an order for 20 miles of 20-in. line pipe from the Hope Natural Gas Co., a Standard Oil interest, operating in the West Virginia field.

The Steel Corporation's unfilled orders at the close of business, Nov. 30, were 7,852,883 tons, the record since 1906, when much was included in "unfilled tonnage" which would not meet the more conservative policy in compilation since adopted The November gain in unfilled tonnage was 258,512 tons, against 1,042,874 tons in October, which was the record gain for a month. The total bookings showed a decrease of about one-third from October to November, shipments being practically at capacity in each month.

Pig iron is a little less active, so far as new buying is concerned. Purchasers of steel-making irons seem to be satisfied for the present, and foundry-iron orders have been for comparatively small lots, though it is known that several large contracts have been under negotiation in seaboard territory.

Pig-Iron Production—The reports of the blast furnaces, as collected and published by the *Iron Age,* show that on Dec. 1, there were 283 coke and anthracite stacks in blast, having a total daily capacity of 86,950 tons; a decrease of 1350 tons from Nov. 1. Making allowance for the charcoal furnaces, the total make of pig iron in the United States in November was 2,660,900 long tons; for the 11 months ended Nov. 30, it was 26,895,325 tons. Of this total approximately 19,688,400 tons, or 73.2%, was made by the furnaces owned or controlled by the steel companies.

Baltimore

Dec. 9—Exports for the week included 445,463 lb. miscellaneous iron and steel to Havana. Imports included 5500 tons pyrites from Huelva, Spain, 5700 tons iron ore from Cuba.

Birmingham

Dec. 9—The last month of the year promises to be interesting in the Southern iron and steel markets. The production will be kept up to the pace set and shipments are not to be interrupted if possible. Some pig iron is being shipped from this district for export, the month to see about 5000 tons of iron started for foreign shores. The quotations for pig iron continue around $15 per ton, No. 2 foundry, delivery during the first half of the year. There is a considerable inquiry for iron, delivery during the first half of 1913. The home consumption is active, pipe makers in particular melting steadily.

The activity in steel is unabated. There is need for active operations at the several plants. Rails are being delivered as quickly as they can be produced and inspected. Additional orders are looked for shortly. Fabricated steel is far from being slow. Concrete-steel rods are in strong demand and the plant of the Southern Iron & Steel Co., at Gadsden, is behind in filling orders. Efforts will be made to lose as little time as possible at the steel works in this section during the holiday season.

The production of pig iron in Alabama reached about 167,000 tons in November.

Chicago

Dec. 10—The iron market remains quiet. Pig iron is in a very quiet condition; sales are small and are expected to remain small until after the first of the year. Inventory time approaches and demand naturally slackens, while the imaginary line of the first is a signal for cautious buying to many. There are a few sales of standard foundry irons, with prices firm, Northern No. 2 holding to $18 furnace (about $18.50 delivered) and Southern No. 2 to $14, Birmingham ($18.35, Chicago), for delivery anywhere up to the end of the first half. Lake Superior charcoal holds to $18.75, Chicago.

The pig-iron situation is fairly satisfactory to selling agents and there is no reason to believe that it means weakness of the market; the cessation of buying is the customary thing at this time of the year and no disposition exists on the part of the furnaces to unload at any cost. They are well sold up to at least the end of the first quarter, in general, and they, as well as the melters, can afford to wait.

In the market for finished products, dullness is a little more pronounced; the approaching holiday season affects business generally as a brake. Railroad supplies are still actively in demand and the problem is of delivery; the leading roads are buying heavily or preparing for large purchases soon; standard rails and track fastenings alike are in demand for delivery as soon as possible, though that may be several months hence. Structural-material contracts are somewhat in abeyance, owing to weather and difficulties of delivery, but are sought. The market for bars is still an eager one on the part of the purchasers; steel bars are deliverable only far in the future and iron bars find a brisk market at high figures. Plates and sheets are eagerly sought for second-quarter delivery, but mills are so crowded that the seller has by far the advantage. In practically all lines of finished goods, in short, the pressure for supplies continues great, and the outlook for future business is highly promising.

Cleveland

Dec. 9—November shipments of ore from the upper ports were 4,066,129 tons. Since Dec. 1 three small cargoes, about 12,500 tons in all, are reported, which will probably close the season.

Pig Iron—Demand is fair and the market is firm, furnaces finding no trouble in getting the advanced prices. Current quotations are $18.25@18.50 for bessemer, $17@17.25 for basic, $17.75@18 for No. 2 foundry, $19.75 for Lake Superior charcoal, all Cleveland delivery.

Finished Material—The mills are in a strong position and are not chasing orders. Some structural steel is being ordered now which will not be needed until spring. There is a strong demand for reinforcing bars for concrete work.

Philadelphia

Dec. 11—Demand for pig iron has fallen off in large purchases but numerous small lots for earliest possible delivery are reported. The oversold conditions and the known winter and spring necessities of many consumers enable makers to keep up prices. With all the check to demands, both basic and bessemer are nominally higher, but there are fewer over-anxious buyers who want to see how the crude-iron market can hold itself together. Makers say they will soon find out all they want to know. Producing capacity is strained to the limits and the furnaces are groaning under the lash. The next scramble will be for forge and knowing makers wink when they are asked what January quotations will be. Mill owners are very anxious to arrange for large lots, even though at present fairly supplied. First quotations today are: No. 2 foundry, $18.50; forge, $17.75; basic, $18.50. Southern iron is held with exceptional firmness.

Steel Billets—Nothing has developed to warrant any change of views expressed a week ago. Quite a lot of partially concluded business is hanging fire.

Bars—The almost imprecedented rush of car-building work and the low condition of stocks of refined iron in consumers' hands accounts for the urgency of demand at the mills and the growing lateness of delivery. The oversold condition of mills has not been equaled for years.

Pipes and Tubes—The possibility of an early modification of discounts has had a stimulating effect on demand for later deliveries.

Plates—The pressure for plates is increasing. The mills are unable to do more than to name dates when they will have capacity to offer.

Structural Material—The oversold conditions of some Western mills has washed back a good deal of business into this territory, some of which is accepted under the elastic agreement to do the very best possible. New bridge requirements for winter delivery have been booked.

Steel Rails—A number of fair-sized orders for Eastern and Southern systems have been placed with the arrangement that they will be squeezed in between bigger orders. Capacity is being kept in cold storage for a lot of business long talked about but not yet placed.

Scrap—Scrap dealers have been able to keep within sight of their promised deliveries, but the trouble is that scrap is not made as fast as it is wanted. Yards look bare.

Pittsburgh

Dec. 10—The Carnegie Steel Co. this week scheduled for full operation the mills and furnaces which had been affected by the strike, which started Nov. 28. The loss in production may have reached 50,000 tons altogether, confined to the Homestead and Edgar Thomson works. No concessions whatever were made to the men.

Pig Iron—Pig iron has become extremely scarce for prompt shipment, particularly foundry and basic. While bessemer may not strictly be scarce, it is a fact that brokers have had great difficulty even in borrowing small lots. For small lots of prompt foundry, $18, Valley, has been paid, while it is reported also that $17, Valley, has been paid for basic, for a lot of 1000 tons, these prices being 50c. above those quoted, nominally at least, as the market. It now becomes a question, however, whether furnaces would sell for extended delivery at the prices recently quoted, seeing the higher prices sometimes obtained for prompt. Inquiry is rather limited, which retards a testing out of the situation. We quote: Bessemer, $17.25; basic, $16.50@17; No. 2 foundry, $17.50@18; gray forge, $17@17.50; malleable, $17.25@17.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Sellers of ferromanganese have marked up prices again, putting the second-half price up from $61.50 to $65, Baltimore, and the contract price for first half to a minimum of $70, though some deliveries are difficult to arrange at less than $75. For carloads for prompt shipment the market is $75 to $80, Baltimore, freight to Pittsburgh being $1.95 per ton.

Steel—The market for unfinished steel is practically nominal, there being no regular quotations out. The last authentic market quotations were: Bessemer billets, $27; sheet bars, $27.50; open-hearth billets, $28; sheet bars, $28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are quotable at $30, Pittsburgh, but cannot always be secured at that figure.

Sheets—There has been a decrease in specifications for sheets against regular contracts. Specifications since the first of the month have been running at perhaps 20 to 35% under shipments, but as the mills had a large accumulation they are still far behind, and many, if not the majority, have enough specifications to run them into February. Buyers have been specifying so freely of late that their low-priced contracts, good to Dec. 31, are tending to run out early. Forward contracting is diminishing, as the mills are very reserved about selling. Premiums are the rule for any delivery in the next few weeks, and some sales of galvanized over the whole first quarter have been made at premiums. We quote the general market, with higher prices paid in some cases, as follows: Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.50c.; blue annealed, 10 gage, 1.65@1.75c.; painted corrugated, 2.45@2.50c.; galvanized corrugated, 3.45@3.50c. per pound.

St. Louis

Dec. 9—The sales of pig iron have dropped off a trifle. This is quite natural as nearly all of the melters are well covered for the next few months. The market will probably not be so active again until after the first of the year. The demand for finished products continues to be very good. All the steel foundries and car shops are booked ahead for months. No. 2 Southern foundry iron is quoted at $14.50 Birmingham, or $18.35 St. Louis for first-quarter delivery. A premium of 25 or 50c. per ton is being asked for second- and third-quarter delivery. Northern No. 2 is in fair demand at around $19 St. Louis. Coke is still scarce and is quoted at $6.80 for the best Connellsville foundry, and $6 for byproduct, f.o.b. St. Louis.

Iron Ore Trade

In the East it is reported that 8c. per unit has been offered for Cuban bessemer ores, but sellers want 8.5c. Sellers are not pressing ore, however, owing to the present difficulty of securing vessels.

Shipments of Lake Superior ore by the various railroads up to Dec. 1 are reported as below, in long tons:

Railroads:	Gross tons
Duluth, Missabe & N. (Duluth)	10,505,577
Duluth & Iron Range (Two Harbors)	9,370,970
Great Northern (Superior)	13,936,899
Soo Line (Superior)	305,000
Lake Superior & Ishpeming (Marquette)	2,224,217
Duluth, S. Shore & Atlantic (Marquette)	1,054,085
Chicago & Northwestern (Ashland)	3,776,500
Soo Line (Ashland)	1,018,788
Chicago & Northwestern (Escanaba)	4,050,190
Chicago, Mil & St. Paul (Escanaba)	1,202,600
Total	47,444,826

A few scattering cargoes are all that can be expected in addition to these figures. The rail shipments, however, are to be added to make up the season totals. November weather was good and the upper Lake docks are unusually well cleared. A good deal of stripping and exploration work at mines will be done through the winter.

Foreign Iron Trade

German Pig Iron Syndicate—Matters have been finally arranged between the German Pig Iron Syndicate and the iron companies of Luxemburg and Lorraine. The latter have finally agreed to join the syndicate on an agreement which is to run for four years.

METAL MARKETS

New York, Dec. 11—The metal markets are again fairly active, but with no marked changes in price. In some lines there is a slight weakness.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January	110	111	July	112	114
February	115	109	August	117	120
March	112	111	September	111	127
April	114	115	October	112	133
May	118	118	November	111	129
June	115	117	December	110	...

Year 1909, 115; 1910, 115; 1911, 112.

Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Oct. 1912	$330,270	$11,887,492	Imp $11,557,222
" 1911	3,983,994	4,102,427	Imp 118,433
Year 1912	44,058,544	50,677,285	Imp 6,618,741
" 1911	22,247,304	49,279,533	Imp. 27,032,229
Silver			
Oct. 1912	6,171,820	4,683,784	Exp. 1,488,036
" 1911	5,087,087	3,404,458	Exp. 1,682,629
Year 1912	58,519,766	40,985,536	Exp. 17,534,230
" 1911	54,615,048	37,100,888	Exp. 17,514,160

Exports from the port of New York, week ended Dec. 7: Gold, $14,500; silver, $1,323,320, chiefly to London and the West Indies. Imports: Gold, $1,570,221, chiefly from London and Paris; silver, $103,203, principally from South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. No more gold is reported taken in London for New York account.

Gold production in the Transvaal in November was 757,337 oz., being 11,524 oz. less than in October and 37,608 oz. more than in November, 1911.

Platinum—The market is steady and unchanged, at $45@46 per oz. for refined platinum, according to quantity; $47.50@48.50 per oz. for hard metal, up to 10% iridium.

Silver—The market continues steady to firm. It is to be noted that the prices for spot and forward silver have recently been reversed. Whereas futures for a long time had commanded a premium over spot, now spot is ⅛d. higher than futures. This is owing to an apparent scarcity of silver in London for prompt delivery. This helps to give tone to the general market.

SILVER AND STERLING EXCHANGE

Dec.	5	6	7	9	10	11
New York	64	63⅞	64⅛	64⅛	64⅛	64
London	29⅝	$29\frac{9}{16}$	$29\frac{11}{16}$	$29\frac{11}{16}$	$29\frac{11}{16}$	29⅝
Sterling Ex.	4.8445	4.8455	4.8445	4.8465	4.8455	4.8465

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

Copper—The market has again experienced a very dull week, but at the close there is perhaps a little better tone, inspired by the idea that manufacturers, both at home and abroad, cannot much longer delay the replenishment of their stocks. The leading producers continue to stand firmly for the pegged price. The small volume of business that is being transacted represents hand-to-mouth buying by manufacturers from the smaller producers who are willing to sell. Some moderate sales of electrolytic for December delivery were made this week at 17.40c., cash, New York. There were lower offerings for January and later deliveries. In fact one small sale corresponding to 17.25c., cash, New York, was reported. Some small sales of special brands of Lake copper were made at 17¾c., but good ordinary brands of Lake copper sold at 17½@17⅝c. Although consumers, both in this country and Europe, have continued to refrain from buying, there has been more inquiry during the last few days, and it is noteworthy that interest is shown by consumers in copper for early delivery. This is considered to confirm the reports to the effect that stocks in the hands of manufacturers are very low indeed. Consumption continues excellent and a buying movement is expected shortly.

NEW YORK

Dec.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
5	17½ @17⅝	17.35 @17.40	49½	4.35	4.20	7.10 @7.20	7.05 @7.15
6	17½ @17⅝	17.35 @17.40	49¼	4.35	4.20	7.10 @7.20	7.05 @7.15
7	17½ @17⅝	17.35 @17.40	49¼	4.35	4.20	7.10 @7.20	7.05 @7.15
9	17½ @17⅝	17.35 @17.40	49¼	4.30 @4.35	4.15 @4.17½	7.10 @7.20	7.05 @7.10
10	17½ @17⅝	17.35 @17.40	49¼	4.30 @4.35	4.15 @4.17½	7.10 @7.20	7.05 @7.10
11	17½ @17⅝	17.35 @17.40	49¼	4.30 @4.35	4.15 @4.17½	7.10 @7.20	7.05 @7.10

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Dec.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
5	75⅞	76¾	82½	226¾	225½	$18\frac{1}{16}$	26½
6	75¾	$76\frac{1}{16}$	82	225⅝	225	$18\frac{1}{16}$	26½
7							
9	75⅞	76¾	82	226	225⅞	$18\frac{1}{16}$	26½
10	75½	76½	82	225	225	$18\frac{1}{16}$	26½
11	75¼	76¼	82	225	225	$18\frac{1}{16}$	26½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

The Producers' Association's statistics were favorably received, the increase in this country being counterbalanced by the decrease in stocks abroad and the world's supplies remaining at a comparatively small figure. At the close, Lake copper is quoted 17½@17⅝c.; electrolytic in cakes, wirebars or ingots, 17.35@17.40c. Casting copper is quoted nominally at 17.20@17.25c., as an average for the week.

Under the influence of bear operations, the standard market declined from £75 17s. 6d. for spot and £76 15s. for three months on Dec. 5, to £75 5s. spot and £76

1s. 3d. three months on Dec. 6. A better feeling, however, prevailed on the 9th, 10th and 11th, and there was some short covering by the bears as well as some purchases for bull account, as a result of which the market in general ruled about 10s. higher and closes at £75 10s. for spot and £76 10s. for three months.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for large quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6036 long tons. Our special correspondent gives the exports from Baltimore at 1433 tons for the week.

Tin—At the lower prices ruling in the London market during the latter part of last week, a fair business developed with Americans consumers. This found its reflection in a strong and advancing market on Dec. 9, although transactions were small. At the higher level business fell off considerably, and again a lower market was the consequence thereof. The market closes easy at £225 for spot and the same for three months, and about 49¼c. for December tin here.

Exports of tin from the Straits, 11 months ended Nov. 30, were 49,182 long tons in 1911, and 53,829 in 1912; an increase this year of 4647 tons.

Lead—At the close of last week, following the cut to 4.35c. by the A. S. & R. Co., the independent producers were for a while uncertain what to do. This week they made up their minds and began cutting the price again. This is the natural consequence of a good deal of lead being pressed for sale. There has been a somewhat better demand for lead at the lower prices, which, however, has been freely met. At the close lead is quoted 4.15@4.17½c., St. Louis; 4.30@4.35c., New York.

The London market is unchanged, Spanish lead being quoted £18 1s. 3d.; English lead 7s. 6d. higher.

The A. S. & R. Co. does not now issue a schedule of prices for lead at various places, but its present terms on contract shipments from smelter in 50-tons are said to be approximately as follows:

Place	Desilverized	Corroding
Philadelphia	4.40	4.50
Chicago...	4.30	4.40
New York	4.35	4.45
Cincinnati.	4.35	4.45
Boston.	4.40	4.50
Pittsburgh.	4.40	4.50
Buffalo	4.40	4.50
Baltimore	4.40	4.50
Syracuse..	4.40	4.50
Rochester.	4.40	4.50
Utica....	4.40	4.50
Providence	4.40	4.50
Detroit..	4.37½	4.47½
Cleveland	4.37½	4.47½
St. Louis.	4.27½	4.37½

The average price of lead for the week ended Dec. 11 was 4.3375c., New York.

Spelter—A considerable tonnage of January spelter was sold at 7.10c., St. Louis, in the early part of the week. Since then spelter has been offered liberally at that price without finding buyers. Transactions in foreign spelter have again made New York a basing point and destroyed the usual differential between New York and St. Louis. Consumption, both in the galvanizing and brass trade continues excellent, but buyers are pretty well covered for the moment. At the close St. Louis is quoted 7.05@7.10c., and New York at 7.10@7.20 cents.

The European market is unchanged, good ordinaries being quoted £26 10s.; specials 15s. higher.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7½@7⅝c. per lb., New York.

On Jan. 1, 1913, the National Zinc Co. will take over all the works of the United Zinc & Chemical Co. under a long lease.

Other Metals

Aluminum—The market is still rather quiet, and there seems to be no scarcity of metal at present. Quotations remain about the same, at 25½@26c. per lb. for No. 1 ingots, New York.

A report was recently noted that the Aluminum Co. of America had been buying up surplus stocks of metal abroad. The truth of this report is officially denied, and it is stated that the company has been making no efforts to control supply or prices.

A memorial has been filed with the Ways and Means Committee of the House of Representatives urging that the duty on aluminum be abolished and free imports permitted.

Antimony—The market is dull and prices are inclined to be weak. Cookson's is quoted at 10.15@10.50c. per lb. and Hallett's at 9.45@9.75c. Outside brands are unchanged at 9.12½@9.37½c. per lb. being asked for Hungarian and Chinese.

Quicksilver—The market is quiet and prices are easier. New York quotations are rather nominal at $41 per flask of 75 lb., with 58@59c. per lb. asked for small lots. San Francisco is $40.50 for domestic orders and $38 for export. The London price has been reduced 5s. and is £7 7s. 6d. per flask, with £7 5s. asked from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The latest quotation from Germany is 725@750 marks per 100 kg., f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

Nickel—Shot, blocks and plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Selenium—Producers of this metal quote large lots at $2.75@3.50 per lb., according to size of order; while as high as $4.50@5.50 is paid for retail lots.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, 10 months ended Oct. 31, figures in long tons, except quicksilver, which is in pounds:

Metals	Imports	Exports	Excess	
Copper, long tons	109,062	47,696	Imp.	61,366
Copper, 1911....	120,763	62,819	Imp.	57,944
Tin, long tons....	35,191	36,934	Exp.	1,743
Tin, 1911.......	38,040	38,617	Exp.	577
Lead, long tons	173,111	48,299	Imp.	124,812
Lead, 1911......	180,743	55,105	Imp.	125,638
Spelter, l'g tons..	119,161	8,646	Imp.	110,515
Spelter, 1911....	110,365	8,062	Imp.	102,303
Quicksilver, lb...	3,499,691	2,060,088	Imp.	1,439,603
Quicksilver, '11	3,369,757	2,061,779	Imp.	1,307,978
Minor met's, tons	6,382	22,874	Exp.	16,492
Minor 1911.	4,938	18,634	Exp.	13,696
Ores				
Tin ore and con	21,540	....	Imp.	21,540
Tin ore, 1911.	24,849	.	Imp.	24,849
Pyrites..........	729,727	....	Imp.	729,727
Pyrites, 1911...	731,925	... .	Imp.	731,925

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Minor metals include nickel, aluminum and the minor metals and alloys.

Spanish Metal Exports

Exports of metals and minerals from Spain, eight months ended Aug. 31, reported by *Revista Minera*, in metric tons:

Metals	1911	1912	Changes	
Pig and manuf. iron	30,845	28,430	D.	2,415
Copper..............	10,747	15,867	I.	5,120
Copper precipitate..	9,878	9,848	D.	30
Lead	111,885	122,379	I.	10,494
Zinc .	1,461	1,835	I.	374
Quicksilver	1,480	1,478	D.	2
Minerals				
Iron ore............	5,211,711	5,647,999	I.	436,288
Manganese ore	23,825	22,679	D.	1,146
Copper ore..........	218,699	102,610	D.	116,089
Lead ore .	1,964	2,457	I.	493
Zinc ore . .	94,699	79,875	D.	14,824
Pyrites	1,783,604	1,924,068	I.	140,464
Salt.... .	388,402	428,861	I.	40,459

Pyritic ores are not classed as copper ores unless they carry 2.5% or over in copper; below that they are classed as pyrites. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 7—The high price paid for zinc sulphide was $61, the base per ton of 60% zinc ranging from $54 to $58. Zinc silicate sold at $30@33 per ton of 40% zinc. The average price, all grades of zinc, is $52.54. Further decline in the lead market leaves $53 the base price per ton of 80% lead. The average price, owing to a bulk of the ore being purchased ahead, shows $53.54 per ton.

SHIPMENTS WEEK ENDED DEC. 7

	Blende	Calamine	Lead Ore	Value
Webb City Carterville	4,163,250		828,960	$137,455
Joplin	2,692,250		315,620	83,750
Galena	1,205,450		48,02[illegible]	31,42[illegible]
Duenweg	838,640		61,840	24,669
Miami.	720,450		225,850	[illegible]
Alba-Neck	667,500			17,315
Granby	77,730	710,570	12,430	14,695
Oronogo	374,010		249,420	14,628
Spurgeon	337,500	185,980	45,820	11,434
Jackson	395,380			10,872
Cave Springs	262,950		6,810	[illegible]
Carl Junction	200,890			6,827
Lawton	192,320			5,385
Aurora.	64,710	141,610		4,013
Carthage	145,840	.		3,936
Wentworth...	.	67,900		1,138
Totals	12,338,960	1,106,060	1,793,970	$401,358
49 weeks...	539,066,150	34,208,210	87,852,260	$17,516,784

Blende val the week, $[illegible]; 49 weeks, $14,450,705

Calamine, the week, 18,679; 49 weeks, 545,002

Lead value, the week, 48,049; 49 weeks, 2,501,077

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January....	$41 85	$44 90	$40.55	$43.54	$55 68	$58 92
February...	40 21	45 75	39 16	43 31	54 46	52 39
March. ..	39 85	51 56	38.45	49.25	54.57	54.64
April .. .	38 88	52 00	37 47	50 46	56 37	54 18
May. . . .	38 25	55.30	36 79	53.27	55 21	52 45
June	40 50	55 88	38.18	54 38	56 49	55 [illegible]
July........	40 75	58 85	38 36	56 59	58 81	58 83
August .	42 50	55 13	41 28	53.27	60 74	57 01
September.	42 63	59 75	41 29	57 07	59 33	61 26
October.....	42 38	57 00	40 89	55.97	54.72	63 22
November..	45 40	55 69	43.25	53.98	57 19	56 55
December..	44 13	..	40.76	..	62 03	
Year. .. .	$41 45		$39.90	......	$56.76	.

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Dec. 11—The general markets continue active and rather strong.

Arsenic—Trade has been rather dull and prices are unchanged. The quotations are \$4.87½ per 100 lb. for both spot and futures.

Copper Sulphate—Trade is fair and prices are unchanged at \$5.50 per 100 lb. for carload lots, and \$5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is a little better, though inclined to be spasmodic. Quotations remain at 2.60c. per lb. for spot and futures up to Apr. 30. Futures are 2.57½c. for May, 2.55c. for June and 2.52½c. for July and later deliveries.

Petroleum

The monthly report of the *Oil City Derrick* shows new wells completed in November as follows: Pennsylvania, New York and West Virginia, 483; Lima-Indiana, 73; Kentucky, 16; Illinois, 139; Kansas-Oklahoma, 799; Texas-Louisiana, 138. In all the divisions 1653 wells were completed, having a new production of 58,836 bbl. Of the new wells 267 were failures and 170 gas wells. The number of oil-producing wells was 1216, as against 1190 in October. The new work under way at the close of the month showed 567 rigs and 1566 drilling wells, an increase of 48 rigs and a decrease of 78 drilling wells. The principal increase in new work is found in the Texas-Louisiana fields.

Dec. 3 advances were reported in Standard buying rates of 5c. per bbl. on Pennsylvania grade oils and 3c. per bbl. on Lima and Indiana grades.

Production of oil in California in October is reported at 8,158,814 bbl.; deliveries, 7,772,016 bbl.; stocks at end of month, 46,304,666 bbl. During October 67 wells were completed with a total production of 5650 bbl. daily.

MINING STOCKS

New York, Dec. 11—Dec. 5 the Exchange was dull and weak, chiefly because of high money rates. On the Curb coppers were in some demand, but other mining stocks were neglected.

Dec. 6 there was a rally on the Exchange, but dealings were moderate and chiefly professional. The Curb was rather dull and mining stocks were weak.

Dec. 7 the Exchange was dull and irregular. Curb trading was also light, with small changes.

Dec. 9 there was heavy trading on the Exchange, but generally at receding prices and the close was weak. Mining stocks on the Curb were active, but nearly all lost in price, especially the copper shares.

Dec. 10 and 11 the heavy selling was met by an unexpected amount of buying on the Exchange. Prices were confused, rallying and then breaking again. On the Curb trading in mining stocks was good, but the movement of quotations was irregular.

Boston, Dec. 10—Copper shares, in common with others, show sharp declines in comparison with the prices of a week ago. Outright liquidation has followed and present market conditions are rather chaotic, to say the least. The present depression in the price of copper shares is purely technical and is due to the strained money conditions and uncertainity regarding the future.

Nine mining stocks sold at the lowest of the year today, while many others, including Osceola, equaled the low level of the year. Adventure made a low record of \$5, Algonah \$2.50, Allouez \$35, Copper Range \$48.50, Lake \$24, Ojibway \$2, with the \$1 assessment paid, Superior & Boston \$1.12½, Wolverine \$69.50 and Wyandot \$1.

In the slump today Amalgamated broke to \$75.50. Butte & Superior broke \$9.50 to \$37.25, Calumet & Arizona \$13.12½ to \$66.75, Calumet & Hecla \$43 to \$515, Granby \$11.75 to \$62, Mohawk \$6 to \$58, North Butte \$6.75 to \$30 and U. S. Smelting common \$5 to \$40 per share.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies (except in the few cases noted by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the figure represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Sept.	October	Sept.
Alaska shipments	1,726,715	[illegible]	....
Anaconda	24,500,000	25,250,000	24,250,000
Arizona, Ltd.	3,340,000	3,200,000	3,000,000
Copper Queen	[illegible]	8,184,575	8,807,940
Calumet & Ariz. .	4,462,000	4,404,000	4,918,000
Chino	3,217,369	3,638,500	[illegible]
Detroit	1,881,668	1,934,828	[illegible]
East Butte	1,250,000		
Mammoth. ..	1,834,937	1,883,283	
Giroux. . .	1,005,208		
Mason Valley... .	1,200,000	[illegible]	
Nevada Con. .	5,607,578	850,741	
Ohio	635,000		.
Old Dominion .	2,204,000	[illegible]	[illegible]
Ray	2,978,404		3,201,500
Shannon	1,142,000	1,210,000	1,436,000
South Utah........	225,568		
United Verde* .	2,750,000	[illegible]	
Utah Copper Co.	6,616,887	2,022,352	.
Lake Superior* .	19,250,000	21,500,000	20,400,000
Non-rep. mines*...	8,094,792	8,250,000	8,250,000
Total production	[illegible]		
Imports, bars, etc.	[illegible]		
Total blister.....	[illegible]		
Imports, ore & matte	[illegible]	...	.
Total American	135,317,548		
Miami†	2,949,150	2,577,750	2,972,000
Brit. Col. Cos.:			
British Col. Copper	....	1,022,904	
Granby ...	2,083,118	2,018,424	
Mexican Cos.:			
Boleo†		2,612,400	
Cananea	3,500,000	4,248,000	5,064,000
Moctezuma	771,844	3,045,667	2,112 377
Other Foreign:			
Cape Cop., S. Africa	678,720	757,120	
Kyshtim, Russia...	1,750,000		
Spassky, Russia	[illegible]	974,400	
Tilt Cove, Newf'd..		86,785	
Exports from:			
Chile...............	6,048,000	8,512,000	
Australia	7,616,000	9,520,000	
Arrivals in Europe‡	8,518,720	13,771,520	. .

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
XI, 1911	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912..........	119,337,753	62,343,901	80,167,904
II............ .	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	[illegible]	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796
X	145,405,453	84,104,734	47,621,342
XI	134,695,400	69,369,795	55,906,550

VISIBLE STOCKS

	United States	Europe	Total
XII, 1911.......	114,785,188	161,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	[illegible]	[illegible]	221,131,843
III	62,939,988	141,142,400	204,082,387
IV .	62,367,557	136,819,200	199,186,757
V..............	65,066,029	[illegible]	199,242,029
VI	[illegible]	117,801,600	167,417,243
VII	[illegible]	108,186,000	152,521,001
VIII	[illegible]	113,299,200	[illegible]
IX...	46,701,374	[illegible]	160,269,374
X	63,065,587	[illegible]	170,473,587
XI	76,744,964	103,801,600	180,546,564
XII	86,164,059	96,947,200	183,111,259

Curb trading has been of fair volume. The feature was a sharp break in Butte Central shares from $9.43¾ to $4.75, with recovery to $6.37½. The calling of loans enforced selling of the stock. Mexican Metal receipts were exchanged into stock today and the stock is active at $1.50 and just under.

Assessments

Company	Delinq	Sale	Amt.
Bonnie Brier, Utah	Nov. 30	Dec. 20	$0.001
Brunswicd-Potosi, Nev.	Nov. 21	Dec. 19	0.01½
Butte & Anaconda, Mont.	Jan. 1	Feb. 1	0.0
Challenge Con., Nev.	Dec. 4	Dec. 27	0.05
Consolidated Virginia, Nev.	Nov. 26	Dec. 20	0.15
East Crown Point, Utah.	...	Dec. 30	0.01
East Hercules Ext., Ida.	Dec. 1	Jan. 3	0.001½
Echo, Ida.	Dec. 11	Jan. 8	0.001
Hider Nevada, Utah	Dec. 20	Jan. 11	0.0½
Honolulu, Ida.	Nov. 20	Dec. 21	0.001½
Hypotheek, Ida.	Dec. 18	Jan. 10	0.005
Jack Waite, Ida.	Nov. 30	Dec. 21	0.01
Leroy Gold & Copper, Ida	Nov. 28	Dec. 28	0.002
Little North Fork, Ida	Nov. 16	Dec. 16	0.001
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Moon Creek, Ida	Dec. 4	Jan. 4	0.002
Nabob, Ida	Dec. 2	Dec. 23	0.005
North Star, Ida.	Nov. 30	Dec. 30	0.001
N. Y. Bonanza, Utah	Dec. 7	Dec. 28	0.02
Ojibway, Mich.	Dec. 9	Dec. 10	1.00
Overman, Nev	Dec. 5	Dec. 24	0.05
Scorpion, Nev.	Nov. 27	Dec. 18	0.01
Seven Troughs Mon., Utah	Dec. 15	Jan. 6	0.0¼
Sierra Nevada, Nev.	Dec. 2	Dec. 23	0.10
Signet, Utah	....	Dec. 15	0.005
Superior & Boston, Mont.	Jan. 4	......	1.00

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	63.471	25.596	24.594	29.299
November	55.635	55.719	62.792	25.680	25.649	29.012
December	54.428	54.905	......	25.160	25.349	
Year	53.486	53.304		24.670	24.59	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.105	17.498	12.634	17.644	56.260	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	76.389
November	12.616	17.326	12.769	17.617	57.253	76.890
December	13.552		13.768		62.068	......
Year	12.376		12.634		55.973	

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.185	43.923	October	41.185	50.077
May	43.115	46.053	November	43.125	49.891
June	44.606	45.815	December	44.655	
			Av. Year	42.281	..

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.655
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265	5.071	4.139	4.894	15.332	20.630
November	4.298	4.615	4.181	4.463	15.821	18.193
December	4.450	.	4.332	.	15.648	. .
Year	4.420	. .	4.286	.....	13.970	. . .

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	7.371	6.223	7.221	26.795	26.804
December	6.301	.	6.151	......	26.849	. .
Year	5.758	.	5.608	......	25.281	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	17.90	13.44	17.18	14.34	17.22
November	14.92	18.07	13.30	17.09	14.25	18.00
December	15.15		13.10	.....	13.90	
Year	$15.72	......	$13.94	......	$14.49	

STOCK QUOTATIONS

COLO. SPRINGS Dec. 10		SALT LAKE Dec. 10	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.04⅝	Beck Tunnel	.09
Cripple Cr'k Con	.01⅝	Black Jack	.11
C. K. & N.	.16	Cedar Talisman	.01
Doctor Jack Pot	.06	Colorado Mining	.21
Elkton Con.	.63½	Columbus Con.	.10
El Paso.	5.50	Crown Point	.04
Findlay	.03	Daly-Judge	‡6.15
Gold Dollar	.18	Grand Central	.80
Gold Sovereign	.02½	Iron Blossom.	1.30
Isabella	.18½	Little Bell	‡.25
Jack Pot	.05	Lower Mammoth	.05
Jennie Sample	‡.06	Mason Valley	8.00
Lexington	.006	May Day	.22½
Moon Anchor	.01	Nevada Hills	1.30
Old Gold	.03⅝	New York	‡.00½
Mary McKinney.	.74½	Prince Con	1.65
Pharmacist.	.01½	Silver King Coal'n	3.50¼
Portland	1.05	Sioux Con.	.02
Vindicator	.88	Uncle Sam.	.12
Work	‡.01	Yankee	.12½

TORONTO Dec. 10

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.45	Foley O'Brien.	.25
T. & Hudson Bay	‡60.00	Hollinger	15.10
Temiskaming	.42	Imperial	.03
Wettlaufer-Lor.	.25	Pearl Lake	.20
Am. Goldfield	‡.40	Porcu. Gold.	.18¼
Apex	.00	Preston E. D.	.03
Crown Chartered	.02½	Rea	.25
Dobie	‡.25	Standard	‡.00½
Dome	19.00	Swastika	.09¾
Dome Exten	.09	West Dome	‡.13

SAN FRANCISCO Dec. 10

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	8.02½
Belcher.	.20	Jim Butler	.57
Best & Belcher	.05	MacNamara	.17
Caledonia	.76	Midway	.26
Challenge Con.	.03	Mont.-Tonopah	1.67½
Chollar	.02	North Star	.17
Confidence	.30	West End Con.	1.12½
Con. Virginia	.30	Atlanta	.13
Crown Point	.30	Booth	.05
Gould & Curry	.01	C.O.D. Con	.07
Hale & Norcross	.09	Comb. Frac	.07
Mexican	‡1.80	Jumbo Extension	.21
Occidental.	.70	Pitts.-Silver Peak	.64
Ophir	.30	Silver Pick	.05
Overman	‡.50	St. Ives	.30
Potosi	.02	Tramp Con	‡.02
Savage	.07	Argonaut	‡2.00
Sierra Nevada	.30	Bunker Hill	‡4.50
Union Con.	.21	Central Eureka.	.39
Yellow Jacket	.34	So. Eureka	‡1.50

N. Y. EXCH. Dec. 10		BOSTON EXCH. Dec. 10	
Name of Comp.	Clg.	Name of Comp.	Clg.
Amalgamated	76⅜	Adventure	5
Am. Agri. Chem.	54¼	Ahmeek	330
Am.Sm.&Ref.,com	69¾	Algomah	2⅝
Am. Sm. & Ref., pf.	104	Allouez	36
Am. Sm. Sec., pf. B	84	Am. Zinc	27
Anaconda	39	Ariz. Com., ctfs.	3
Batopilas Min	1¼	Bonanza	‡.30
BethlehemSteelpf	63⅞	Boston & Corbin	4¾
Chino	41½	Butte & Balak	3¾
Federal M. & S., pf.	38½	Calumet & Ariz	67½
Goldfield Con.	1⅝	Calumet & Hecla	520
GreatNor.,ore.,ctf.	41½	Centennial	18¼
Guggen. Exp	50⅞	Cliff	‡3
Homestake	103	Copper Range	49½
Inspiration Con.	17¾	Daly West	4
Miami Copper	25⅝	East Butte	14
Nat'nalLead,com.	55¼	Franklin	8⅜
National Lead, pf.	104	Granby	63
Nev. Consol.	19⅛	Hancock	23
Phelps Dodge	215½	Hedley Gold	23
Pittsburg Coal, pf.	86	Helvetia	70
Ray Con.	19¾	Indiana	14
Republic I&S,com.	24⅞	Island Cr'k, com.	52½
Republic I & S, pf.	86	Island Cr'k, pfd.	85½
SlossSheffi'd,com.	45	Isle Royale	29¼
Sloss Sheffield, pf.	97	Keweenaw	2
Tennessee Copper	36¾	Lake	24
Utah Copper	58	La Salle	5
U. S. Steel, com	65¾	Mass	5
U. S. Steel, pf.	108	Michigan	2
Va. Car. Chem.	42½	Mohawk	58½
		New Arcadian	2¼
		New Idria Quick.	7
		North Butte	31
		North Lake	3
		Ojibway	2¼
		Old Dominion	52½
		Osceola	102
		Quincy	75
		Shannon	12⅜
		Shattuck-Ariz	28¼
		Superior	36
		Superior & Bost.	1⅛
		Tamarack	34½
		Trinity	4¼
		Tuolumne	2¾
		U. S. Smelting	41¼
		U. S. Smelt'g, pf.	49⅞
		Utah Apex	1⅞
		Utah Con	10¼
		Victoria	2
		Winona	3½
		Wolverine	69
		Wyandot	1

N. Y. CURB Dec. 10

Name of Comp.	Clg.
Barnes King.	‡.60
Beaver Con	.41
Braden Copper	9⅝
B. C. Copper	4
Buffalo Mines	2½
Caledonia	.40
Con. Ariz. Sm.	½
Davis-Daly	1¼
Diam'field-Daisy	‡.04
Ely Con.	.10
Florence	.62
Giroux	$3\frac{5}{16}$
Gold Hill Con.	$\frac{5}{16}$
Greene Cananea.	8⅝
Greenwater	.04
Internat. S. & R.	‡124
Kerr Lake	2½
Keystone	2
La Rose	$2\frac{7}{16}$
McKinley-Dar-Sa.	2¼
Min. Co. of A. new	2⅞
Motherlode Gold	‡.60
Nev. Utah M. & S.	.04
Nipissing Mines	8¼
Ohio Copper	1¼
Pacific Sm. & M.	$\frac{3}{16}$
Puebla S. & R.	$2\frac{3}{16}$
South Live Oak	2
South Utah M. & S.	‡⅜
Standard Oil (Old)	1110
Stand'd Oil of N.J.	382
Stewart	$1\frac{11}{16}$
Tonopah.	6⅞
Tonopah Ex.	2⅜
Tonopah Merger	¼
Tri-Bullion	½
Tularosa	$1\frac{5}{16}$
Union Mines	‡$\frac{7}{16}$
United Cop., pfd.	10
Yukon Gold	3

LONDON Dec. 11

Name of Com.	Clg.
Camp Bird	£1 18s 9d
Dolores.	‡1 10 0
El Oro	0 17 3
Esperanza	2 0 0
Mexico Mines	7 7 6
Oroville	0 6 6
Stratton's Ind.	‡0 3 1½
Tomboy	1 8 3

BOSTON CURB Dec. 10

Name of Comp.	Last
Alaska Gold M.	9½
Bingham Mines	4½
Boston Ely	1½
Boswyocolo	.01
Butte Central	6½
Cactus	.07
Calaveras	2½
Chief Cons.	1
Corbin	.12
Cortez	.70
Crown Reserve	3½
First Nat. Cop.	1
Majestic	.41
Mazatan	‡⅜
Moneta Porc.	‡.03
Nevada-Douglas.	3½
New Baltic	1½
Oneco	1½
Raven Copper	.21
Portsmouth Coal.	‡.05
San Antonio	‡3½
Smokey Dev.	.02
S. W. Miami	4
South Lake	6
Trethewey	.33
United Verde Ext.	⅜

‡Last quotation.

The Engineering and Mining Journal

Vol. 94 DECEMBER 21, 1912 No. 25

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres Rob't McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 31—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Anthracite Decision

The decision of the Supreme Court in the case against the anthracite companies under the Sherman law was given on Dec. 16. It was on an appeal from the Circuit Court decision and was of a mixed character, in part sustaining and in part reversing the lower court. It holds that the organization of the Temple Iron Co. and the use of that concern to control the independent operators and to prevent the building of an independent outlet for the anthracite mines was an illegal combination in restraint of trade and that the injunction against the management and control of that company by the large anthracite companies must be enforced. The well known fact that the directorate of that company formed a convenient means of consultation among the heads of the large companies did not appear in the case.

The contracts with the independent operators, whereby their coal was bought at 65% of the tidewater price, are also pronounced illegal as in restraint of competition and are to be enjoyed in the future. These contracts gave the large companies the entire control of the selling and marketing of anthracite.

With regard to the general question of combination, the court finds that the government has produced no evidence sufficient to prove the existence of any trust or agreement to control the trade. The court, therefore, takes no action and makes no decision on this point, except so far as it sets aside the decision of the lower court on this point. The questions as to the existence of partial and minor pools and their effect in restraint of trade is left open for further investigation.

This decision again shows the uncertainty of the law. Probably no great trade in this country is so closely controlled and unified as that in anthracite. There is, however, nominally no trust, and there is no tangible agreement or combination among the companies. The control is through stock ownership and common interest, and is exercised in ways the law does not reach and which it cannot be brought to touch without the greatest difficulty under existing conditions.

An Episode in the History of Copper

A prominent feature of discussion last week was the testimony given by Tobias Wolfson, of the United Metals Selling Co., in response to the interrogatories of Samuel Untermyer, before the Pujo Committee, which for the enlightenment of the House of Representatives is engaged in hunting the "money trust." Mr. Untermyer extracted from Mr. Wolfson the testimony that we quote on another page. The story thus developed was incomplete, the most interesting aspects of the case were missed, and inasmuch as Mr. Untermyer is a well informed man, there is naturally a supposition that he had some particular axes to grind. If the Pujo Committee is going to be taught history in this way, it will need to be careful. There are plenty of authoritative, contemporary records to which it may refer if it chooses.

The "runaway" market of 1906 had carried the price of copper to 25½c. per lb., from which it had settled to 25c., in the early part of 1907. As early as March in that year the signs of coming financial trouble had become unmistakable, and following disturbances in the stock markets of both Europe and America, the price for copper had begun to waver. Several important copper producers made sales at the market right along, although several large interests continued to hold out for their pegged price of 25c., but in the main buyers were conspicuous by their absence. Those who needed copper were always able to obtain it. In fact it was urged upon them. As early as May unsold stocks began to accumulate in outside hands, as well as in the hands of the United Metals Selling Co. By the end of June some more of the big interests had broken away and were slashing the price in the effort to place all the copper they could. The price for the metal had, by that time, receded to about 22c. The United Metals Selling Co., and at least one other large interest, did not realize the situation and continued to stand for the old price of 25c. Of course they had made no sales worth mentioning for months previous, just as Mr. Wolfson testified. This was the situation when Mr. Rogers returned from Europe and delivered his famous remarks (in which he was unquestionably sincere, but fearfully ignorant).

In July the United Metals Selling Co. cut its price to 22c., but its competitors immediately undercut and continued to take the business just as they had been doing previously. For several months then the policy of the United Metals Selling Co. was vacillating. Loaded with a large and increasing accumulation of copper, it was hoped at every halt in the downward course of the metal that the bottom had been reached, but almost immediately the crumbling away would begin again through the efforts of the competing selling agencies and producers to find customers, and there was no way for the big fellow to take the market except by a boldness that it was unable to work up to. Even if it had cut the price to 11¾c. in one fell swoop there is no certainty that it would have stayed there. The course of the copper market of 1907 was entirely normal under the circumstances, and neither the United Metals Selling Co., nor anybody else, was carrying copper because they wanted to, but simply because they had to. If the United Metals Selling Co. had acted differently, it might perhaps have sold more copper on the decline, but the decline would have been even more precipitous than it was, and perhaps more cataclysmic.

If Mr. Untermyer had been fair in his interrogatories, he would have developed for the information of the Pujo Committee that the abstention of the United Metals Selling Co. from the market did not deprive any consumer from obtaining all the copper he wanted, and at substantially his own price. In the latter part of 1907 there was no producers' "hold-up." On the contrary, the shoe was on the other foot. If the United Metals Selling Co. saw fit to prefer copper to money, and to accumulate a large, unsold stock at the expense of its own and borrowed money, it certainly did not commit any economic or social crime, although it may have done bad business for itself.

The Hollinger Mill

In the fourth of his series of articles on American cyanide practice, in this issue, Mr. Megraw describes and discusses the Hollinger mill at Porcupine, Ont., which is one of the newest cyaniding constructions. In treating of such new constructions the critic and commentator is always at a disadvantage because he observes and studies a practice that seldom has become settled, but is likely to be modified as experience is gained.

Thus in the case of the Hollinger mill, which has given an excellent extraction of the gold of the ore treated, and probably is not radically wrong in any of its departments, there are nevertheless advantageous changes which can, and no doubt will, be made, that will lead to a higher extraction and lower working costs. For example, the method of treating the concentrates will have to be changed. We understand also that Dorr thickeners will be substituted for the Trent agitators, this involving merely the substitution of one type of revolving arms for another. With this change the milling practice will become continuous decantation, which it is thought will reduce the metallurgical loss.

Such modifications in the metallurgical scheme of a new mill are, of course, the common thing. The establishment of a well settled line of practice is always a matter of study and of experimentation, and especially of time.

Metal Tariff Hearings

As reported by our Washington correspondent, the Ways and Means Committee of the House of Representatives has appointed Friday, Jan. 10, as the date for hearings on the metal schedules of the tariff. We are not going to urge one thing or another about the tariff in principle, but we do hope that some intelligent, unbiased person will step forward to point out, and secure the abolition of, certain absurdities, which become pieces of rank injustice. We refer especially to the collection of duties upon the metal contents of ores that the smelter does not save. Many copper ores contain zinc, but the smelter does not get any zinc out of such ore. It goes into his slag and thence to the dump, and from beginning to end is a bother to him. Similar is the case of the zinc smelter who buys zinc ore containing lead. Either he does not recover any of that lead, or obtains but a small modicum of it, and that at heavy expense. The new tariff law should be drawn so as to relieve importers from paying duty on metal that they do not and cannot deliver for consumption.

The importance of operating data for comparison is recognized by every operator and engineer who has occasion to estimate the cost of new work. The article by Robert E. Hanley, on page 1182 of this issue of the Journal, gives some highly interesting operating details regarding the driving of the No. 5 tunnel at the Mammoth copper mine in Shasta County, Calif. Articles of this character are most helpful by giving operators details that will enable them to estimate closely the funds that must be provided when similar work is to be undertaken. Both General Manager Metcalfe and the company are to be complimented on their generosity in offering such valuable technical data to the profession and industry. It is in line with the more enlightened attitude of reciprocity now being adopted by the large operating companies. Articles of this character, we are glad to note, are being more frequently offered.

The copper producers who are hanging to the pegged price for copper, point with one hand to the certainty (supposition, surmise, hope) that the buyers must be nearly bare of supplies, and consequently must soon enter the market and pay the demanded price; but with the other hand they point with pride to the enormous deliveries during the last month as evidence that the aforesaid buyers are still taking in great quantities of copper. The two things do not seem to jibe. The consumers are, no doubt, eating up supplies steadily, but so long as large supplies are going to them right along, they may, perhaps, be in no such desperate a state as is fancied. It might be imagined that an exhaustion of supplies would be foreshadowed by a marked diminution in the current shipments.

By the Way

A "scrap" expert is the latest addition to the naval personnel, according to the annual report of Rear Admiral T. J. Comie, paymaster-general of the Navy. His duty is to reclaim materials thrown aside as waste. By the new system large quantities of scrap metals have been collected and classified and either sold to dealers or sent to foundries to be reworked and returned to the government for further use. Some industrial concerns might advantageously imitate this practice of the government.

The latest achievement in high-speed tool steels is recorded by the Becker Steel Works, of Crefeld-Willich, Germany, in a full-page advertisement in the *Kölnische Zeitung.* It refers to the use of iridium for high-speed steel and high claims are made for it. The use of iridium is certainly novel, remarks *Metallurgical and Chemical Engineering.*. We will add "improbable" to "novel." So long as iridium fetches $68 per oz. and the world's annual production is but a few ounces, we do not think that much is going to be used in steel-making. To get 0.01% iridium, 3.2 oz. would be necessary for each ton of steel, costing $217.60. We have heard of a steel containing 2% iridium being offered to miners in this country, but we have not taken any stock in it.

The Royal Society of Edinburgh is forming a provisional committee to consider how the tercentenary of the discovery of logarithms may best be celebrated. The year for this celebration will be 1914, as it was in 1614 that John Napier's "De Mirifici Logarithmorum Canonis Descriptio" appeared, although, according to Kepler, Napier had indicated his acquaintance with the properties of logarithms as early as 1594, in a letter to Tycho Brahe. Napier's logarithms were, of course, based on the sum of the series

$$1 + \frac{1}{1} + \frac{1}{1.2} + \frac{1}{1.2.3} + \cdots \frac{1}{1.2.3 \ldots \infty}$$

approximately equal to 2.718281828. It was not until 1624 that Briggs published his "Arithmetica Logarithmica," using the base 10. The appearance of Napier's "De Descriptio," supplemented by his posthumous, "De Mirifici Canonis Constructio" (1617), may be considered as an event but little less important than Newton's "Principia." John Napier was born in Merchiston, near Edinburgh, in 1550, and died there Apr. 4, 1617.

Archie L. Wisner, head of the stock brokerage concern of A. L. Wisner & Co., and John J. Meyers were placed on trial in New York City, Dec. 9, before Judge Julian W. Mack, of the Federal District Court, on indictments charging them with using the mails to defraud investors in mining stocks. The postal authorities charge that more than $2,000,000 was obtained fraudulently by the men under indictment and their associates. Inspector Mayhew says that a list containing 120,000 names was found in the Wisner office. One of the indictments contains eight counts and recites 73 overt acts between Feb. 1, 1905, and Dec. 29, 1910. Stocks specified in the complaint are those of the United Tonopah and the Goldfield Mines, Limited, but in addition, it is charged, A. L. Wisner & Co. had for a long time invited investment in such enterprises as the Empire Gold Mines, Ltd.; Murchie Gold Mines Consolidated; California & New York Oil Co., and the California Monarch Oil Co. This trial, like that of Scheftels & Co., and Freeman, Hawthorne and associates, now pending, promises to be a long drawn out affair.

The New York *Evening Post* tells this story of August Heckscher, capitalist, who was for many years the general manager of the New Jersey Zinc Co., and is still largely interested in mining. Mr. Heckscher is a self-disciplinarian, according to his Long Island neighbors. In summer months he makes the daily trip from Huntington to New York in his steam yacht "Anahma," which flies the flag of the Seawanhaka-Corinthian Yacht Club, of which he is commodore. Taking one's own boat is easy in comparison with train-catching—also one is apt to land late at the office. The skipper, therefore, has strict orders to sail at 7:30 a.m., owner aboard or not. So up comes the anchor at seven bells, and away she goes, while the commodore scrambles aboard as best he may. Occasionally, inhabitants of Huntington have the pleasure of seeing the owner, hat in hand, rush madly down the landing just as the tender is leaving the pier, stamp angrily and say to himself words to this effect: "Worse luck! Worse luck! I've missed her again."

An example of the pathetic cases in the selling of wildcat mining stocks to poor, helpless persons was brought out a few days ago in the trial of A. L. Wisner & Co. Urbano Derby, of Concord, Mass., and his wife were purchasers of stock. He was an old man with snow-white hair and beard; she looked almost as aged. Together they sat in the court room from the minute the trial started. Their eyes never left the defendants. "How much money did you give A. L. Wisner & Co.?" asked Mr. Arnold, the U. S. attorney. "More than $10,000 in all," said Mr. Derby, in a quavering voice. This was his entire fortune. Sometimes he got small dividends, he said, but as soon as he did he received an offer to sell him more stock. Sarah Derby, his wife, then took the stand. The questions had to be repeated to her several times, and when she answered, even the judge found it hard to hear. The statements of A. A. Butterfield, the Concord agent, had caused her and her husband to invest in the mining stocks, she said, with a sob in her voice. "We told him we couldn't afford to invest all our money unless it was safe, as we had to have something for our old age. When we had given the firm all we had, we tried to borrow from them on their stock. But they wouldn't let us have any money." Another witness who told much the same tale was Peter J. Bollinger, of Buffalo, a deaf and dumb man, who lost $1000. His testimony was interpreted by Dr. George Saven, of Buffalo. There are thousands of such cases along the trails of the mining sharks and swindlers, whose operations are as mean as the stealing of candy from a baby. The government has done no better work than its campaign for their extermination, which already has been crowned with brilliant success.

Readers of Julian Hawthorne's mining literature will recollect his *brochure* on "The Secret of Solomon." This was read in court a few days ago and commanded interested attention. The jury in this case is becoming so surfeited with interesting things that it will probably shun the vaudevilles during the remainder of the season. The New York *Sun's* version is the following: The story which appeared to impress the audience most favorably was "The Secret of Solomon," in which Mr. Hawthorne tells how the great king made millions in mining. King Solomon, so the story runs, was worth $330,000,000, most of it acquired in the operation of the mines of Ophir. To be sure, he had to wait seven years for a single shipment of ore, owing to the lack of uptodate transportation facilities, but the result was worth the trouble, according to Mr. Hawthorne. "How did Solomon make himself the richest of men?" asks the author of the tale. "By gambling," was the answer from the same source. The explanation followed that Solomon was not the kind of gambler who after having "deluded himself by the belief that something can be gotten for nothing in this world," goes out and puts a bullet through his brains; rather, the king was an intellectual gambler who took the wildest risks, yet with the full realization that he had a good chance of losing. The writer cited Columbus, Julius Cæsar, Alexander the Great and Cecil Rhodes as shining examples of successful gamblers. Rhodes, he said, realized that Africa had possibilities other than that of a game preserve, the ideas of "some big men" on the subject to the contrary notwithstanding. "The firm of Cæsar, Columbus, Rhodes & Co. will never lack living representatives," declared Mr. Hawthorne, and then mentioned the names of Morse, Edison, Vanderbilt, Harriman, Carnegie and Rockefeller.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Melting Point of Sulphur Trioxide

The statement made by Mr. Hawley, in his paper on the determination of sulphur trioxide in flue gas in the JOURNAL of Nov. 23, 1912, that at ordinary temperatures sulphur trioxide is a solid, calls attention to some of the peculiarities of this substance. There are two forms of this compound, the α-form, with a definite melting point, and the β, the latter probably not melting at atmospheric pressure, but subliming, the fumes on condensation giving the α-modification, which may later go over into the β.

According to D. M. Lichty (*Journ. Am. Chem. Soc.*, Nov., 1912), the melting point of the α-form is 62.2° F., and the boiling point 112.8° F. For the α-trioxide, Mr. Hawley's statement would often prove untrue. The α-trioxide goes over into the β, apparently merely from long standing or from small amounts of moisture. However it seems that both have the same molecular weight (80), so there can be no hypothesis that one is only the polymerization of the other.

New York, Nov. 25, 1912.

A. A. NASON.

Is Mining Languishing

Whatever be the cause, the languishing of the mining industry is certainly a fact insomuch as it pertains to precious-metal mining. The success attained in the promotion and development of the low-grade porphyry coppers has placed this branch upon a firmer basis than ever before with no diminution apparent in the near future. With gold and silver mining it is different. The greater part of the production today is from so called low-grade ores and tailings, not new discoveries, but ores that could not be handled at a profit in former years. No new bonanza camps have been discovered in the past 10 years and prospectors have been exceedingly busy, especially in the United States and Canada. All the waste and remote places have been invaded and carefully prospected. As several writers have recently said: "The day of the new mine with a prominent rich outcrop has passed. The protruding veins, dikes and rocks have been examined, some carefully, some casually, but in general enough to determine their value."

As a rule, the prospector of the past and even of the present day has never been much of a digger and it is only by new methods of prospecting and by digging that the new mines will be found. In some respects a mining boom such as the one Nevada experienced several years ago is a good thing. It causes much developing and prospecting work to be done that would not be done at any other time or under any other conditions and in opening this ground in a mineral territory, ore is found that otherwise would remain undiscovered.

Now with the surface of the earth fairly well known, explored and prospected, the chances of discovering new mines of merit are gradually becoming less. With the hopes of great reward gradually diminishing, the number of prospectors in the field is becoming smaller and smaller. Under the modern methods of mining and milling the present mines are rapidly becoming exhausted, much more so than formerly, so that instead of having more new mines to take their place, with the harder conditions of discovery we have less. We have reached the pinnacle and are now on the down grade.

Another item that has an influence, is the fact that the public in general is out of the market. Money formerly spent for the development of the country, and mining is included in this, is now used for other purposes, largely purchasing automobiles and accessories. Millions of dollars of surplus, with which the people outside of those directly in the mining business, formerly used to take an honest chance in the development of promising prospects, is now switched into the channels of the automobile industry, with the result that it is nearly impossible for owners of these prospects to secure funds for their development. About the only persons directly interested in the purchase of mines today are those in the large mining and developing companies, who never take a chance, and as a general rule want at least $4 in sight for every $1 invested. Personally I know of a promising prospect, adjoining a producing mine and containing the same veins, with good surface indications, and high-grade ore within a few feet of the line, yet the owners have been unable to dispose of enough stock at a small figure, to develop. It is not developed enough for the large operator to take hold of and the general public is not spending its money along these lines.

Agreeing with G. L. Sheldon in his article in the JOURNAL of Nov. 23, 1912, I know numbers of mining engineers and mining men that are quitting and taking up other lines of business. They are good men, too, with plenty of experience. And still the mining schools are turning out hundreds of new engineers every year. I suppose though the supply and demand will adjust itself in the future.

Referring again to Mr. Sheldon's article, I think he overestimates the influence of the conservation movement in killing the mining industry. It is a hindrance in a number of instances in a small way but not enough to deter prospectors from entering forest reserves to prospect if there is even a hint of mineral there. A forest reserve in Nevada, however, is rather a laughable matter. Acres and acres of ground are reserved without a stick of timber in sight and with no hopes of any ever growing. Bound up with red tape, they do create annoyances at times, but not serious enough to blame them entirely for the decadence of mining.

According to my idea the whole matter is caused by the lack of new discoveries caused by the lack of new territory to be explored and the more difficult methods necessary to prospect the present territory; by the diverting of money formerly used in the mining industry to other channels of industry; to the apathy of the investing public, due to causes too numerous to mention.

H. C. CUTLER.

Reno, Nev., Dec. 6, 1912.

Mechanical Efficiency in Crushing

While Mr. Del Mar's article in the JOURNAL of Dec. 14, 1912, seems to throw a certain amount of light on Mr. Stadler's work, I confess I do not yet see the derivation of the formula (p. 1133, col. 3),

$$N = -10 \log S.$$

Although Mr. Del Mar says he will explain this, I cannot find anything concerning it, until I fetch up against the solution of the equation, which is not a difficult one for a certain specific case.

I am willing to assert that I remember enough elementary algebra to solve linear equations all day, but how and where is this mystery $N = -10 \log S$. derived? Perhaps in asking this I am laying myself open to a reproof I heard in my college days: "Professor, I see everything except the last step." "Yes, you see all except the whole thing," but I hope Mr. Del Mar will make a short attempt to show this.

R. S. LEACH.

New York, Dec. 16, 1129.

Electric Power Testing Set

By James C. Bennett*

To determine the mechanical efficiency of certain crushing machines the amount of power consumed under various conditions was needed. The requirements were met by a portable electrical measuring set by which records of total consumption and the range and duration of fluctuations over a given period could be obtained with sufficient accuracy.

A modification in the design of a Blake-type crusher, which appeared to increase the capacity of the machine, made it desirable to make test runs for the purpose of comparing the modified design with the original. This was of particular importance in view of the fact that there were a number of other similar machines in service that should be changed if it were definitely known that the change meant an increased tonnage without a disproportionate increase in power consumption and decrease in the life of the wearing parts.

For the purpose of making this particular test run, representatives of one of the electrical manufacturing companies were engaged to make observations of the power consumption with measuring instruments furnished by themselves. While this arrangement gave the desired information in this particular instance, it would not cover the additional needs in the same direction, as it was intended to determine over considerable periods the power consumption of the different machines in the plants. The instruments used in the first tests were of the indicating type only, so that it was necessary to have someone constantly at the instruments, and someone at the machine on which measurements were being made in order that the exact conditions prevailing at the time readings were taken might be known.

Instruments for Power Consumption Tests

It was decided, therefore, to secure a set of instruments that would more nearly cover the individual needs of the plants and machines concerned. In arranging such a set, the principal points to be borne in mind were: (1) The observations might extend over considerable periods of time, ranging from one day to one or two weeks; (2) the records should show not only the total power consumption during the period of observation, but the range and duration of the fluctuations; (3) two voltages are in use, so the set must be adapted to secure readings on circuits of either 440 volts or 2200 volts, with a range in horsepower from five to 200. Further, as there are three plants somewhat widely separated, the set must be of at least a semi-portable nature.

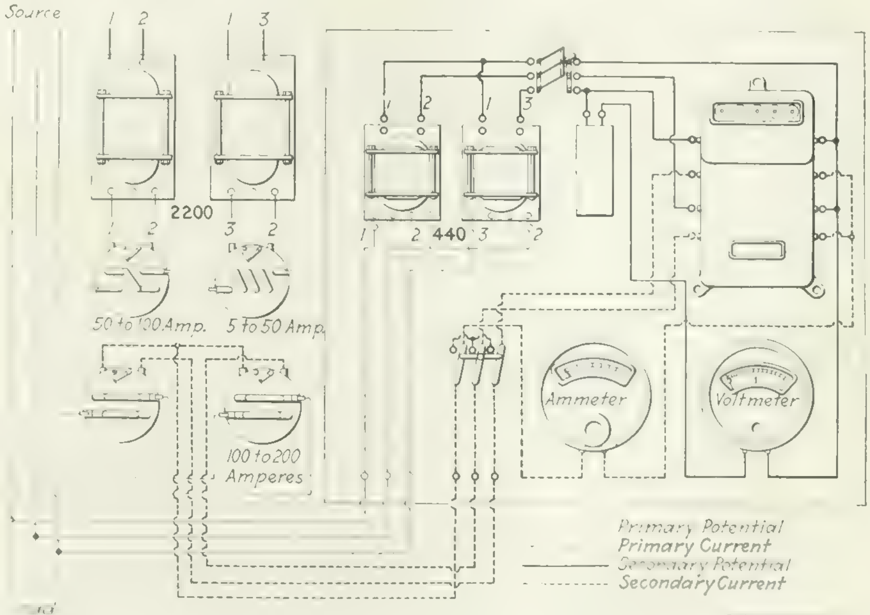
The set finally decided upon and purchased consisted of the following General Electric Co. instruments: Two potential transformers, 330-360-440 volts, primary 110 volts, secondary type P, form A, 50 watts, 25 to 60 cycles; two potential transformers, 1100-2200 volts, primary 110-112 volts, secondary type P, form B, 50 watts, 60 to 125 cycles; two current transformers, primary current 50-100-200 amperes, ratio, 10-20-40 to 1, type S, form P, 40 watts, 25 to 125 cycles; one watt-hour meter, Thomson recording, 100-110 volts, 60 cycles, type D3, 3 wire, three phase, 5 amperes; one ammeter, type CR, curve drawing, 60 cycles, 5 amperes, chart CR-110; one voltmeter, type CR, curve drawing, 60 cycles, 90-130 volts, chart CR-109; one resistance coil, included as a part of the voltmeter equipment.

As will be seen by the foregoing list, the watt-hour meter and voltmeter are designed for 110 volts. It would have been possible to get both of these instruments for 440 volts, thus eliminating the potential transformers for use in the 440-volt circuit. To do this, however, would have introduced complications in making provision for securing data on the 2200-volt circuit. As rated by the manufacturers, the range of power for which this set is suited ranges from 10 to 150 h.p. in a 440-volt circuit, and from 50 to 750 h.p. in a 2200-volt circuit.

Simple Wiring Diagram

The set was laid out on a board 2 ft. 7 in. by 3 ft., the accompanying diagram showing the arrangement and wiring connections.

It may be mentioned that this diagram is of a somewhat more elementary nature than is commonly used in electrical work. It was prepared for the use of the electricians with a view to enabling them to install the set in connection with any desired motor, and to select the ratio for the current transformers that best suited the needs of the motor in question. It serves the same purpose in relation to the selection of the right potential transformers.



Connections for Power-consumption Tests

It is desirable to secure as large ammeter readings as the meter will afford, in order that the fluctuations in current consumption may be the more pronounced and more easily read. Thus, on a motor of 2200 volts, with a normal current consumption of say 24 amp., the ammeter will register only 2.4 amp. with the current transformers set on the 10:1 ratio. Another motor of the same power, but of 440 volts, would mark a current consumption of 12 amp. with the same ratio on the current transformers. This is, of course, beyond the range of the ammeter, so it becomes necessary to use the 40:1 ratio, giving a reading of three amperes for the motor of 440 volts, but of the same capacity as that of 2200 volts.

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*Mechanical engineer, Natomas Consolidated of California, Sacramento, Calif.

Sturdy Construction Advisable

The board on which the instruments are mounted is made of a good grade of white pine, thoroughly seasoned and painted. All of the wiring is on the back of the board and is protected from injury by a frame 1½ in. deep, extending entirely around the edge. A back of ½-in. boards is then nailed to this strip, thus entirely inclosing the wiring. When it is desired to ship the set from one plant to another, it is only necessary to disconnect and dismount the instruments, for each of which a substantial shipping case is provided.

The front of the board is so arranged that all of the instruments can be mounted and connected after the board is hung to studding or post as the case may be. The only projections on the front of the board are the terminal wires for the various connections, and as these are all made of flexible wire sufficiently heavy to give mechanical strength, as well as current capacity, they may be lightly cleated to the board in shipping, and there is little likelihood of any mishap to them while in transit.

The two switches indicated on the board are to permit cutting out the measuring instruments momentarily, should it become necessary, without interfering with the operation of the motor. The switch in the potential circuit is used in the ordinary way, viz., opened to disconnect the instruments. The one in the current circuit, however, is closed to disconnect the instruments, the two contacts being connected, thus causing a short circuit on the secondary side of the current transformers when the switch is closed.

Results Not Precise

The following example will illustrate the use of the data obtained with the instruments: If the power factors under different conditions of loading are known, as they should be when tests are undertaken, the power consumption at any moment may be computed sufficiently closely for all average requirements as follows: Multiply ammeter reading by ratio to which current transformers are set, by voltmeter reading, by ratio to which potential transformers are set, by power factor, by 1.73. Divide the final product by 1000, and multiply the quotient by 1.34. The result will be in terms of horsepower. Should it be desired to obtain the results in terms of kilowatts, the omission of the final multiplication will give such information.

As will be inferred from the statement in the preceding paragraph, this result is not especially accurate. The error will range from 5 to 10%. Part of the inaccuracy is due to the instruments and part to the variation of the power factor. The information commonly furnished by the electrical manufacturers gives power factors for conditions of loading equivalent to ½ load, ¾ load, full load, and 1¼ load. Thus, if the load amounts to 60 or 65% of the full load, there will be a variation in power factor which will have an appreciable effect on the calculated result. Probably the manufacturers will supply power factor curves from the factory performance records if requested to do so.

A Method to Increase Accuracy

To avoid such inaccuracy as has just been pointed out, it will be necessary to take a direct reading at the moment that it is desired to know the power consumption. This may be done by observation of the speed at which the small disk in the lower part of the watt-hour meter revolves. Through the small glass in the lower part of the case, the speed may be easily observed, as the disk is marked for that purpose. Having observed the time required for the disk to make one, two, or more revolutions, depending on its speed at the time of observation and on the frequency and duration of fluctuations of the load, the power consumption may be calculated as follows:

Multiply the number of disk revolutions observed by the constant *K*, which is marked on the disk, by 3600 and divide the product by the number of seconds required to make the observed number of revolutions. Multiply this quotient by the product of the ratios of the current and potential transformers, divide by 1000 and multiply by 1.34. The result will be in terms of horsepower. As stated in connection with the computations based on ammeter and voltmeter readings, the omission of the final multiplication will give results in terms of kilowatts. A stop watch should be used in timing the disk in the watt-hour meter, as it is difficult to read an ordinary watch to within one or two seconds, and an error of this extent will have a marked effect when the consumption is rapid, and the observed number of revolutions but one or two.

While the second method should be a close check on the first, it will be the exception when such a check can be made, owing largely to the variation in power factor already mentioned. In the second method, the power factor is accounted for in the watt-hour meter, whatever the loading may be. It is advisable to make occasional calculations by the second method, as a means of securing a rough check on the data secured during the progress of the observations.

By reading the recording dials of the watt-hour meter at the beginning and completion of the observations and multiplying the difference by the combined ratios of the current and potential transformers, the total consumption in kilowatt hours over the entire time observed may be obtained. From this the average hourly consumption, or the consumption per ton may be determined by calculations which are obvious. An attempt, however, to check the total power consumption as recorded by the watt-hour meter with the momentary readings, either from voltmeter and ammeter, or from the disk of the watt-hour meter, will only lead to disappointment as the element of time, which is accurately accounted for in the watt-hour meter, is wholly neglected by the other meters and can only be approximated by eye in a study of the charts of these two meters.

Certain Precautions Necessary

A few words of caution regarding the care and use of such a set of instruments as has been described. It is not necessary that the set be installed by a graduate electrical engineer, though the electrician to whom the work is intrusted should be one who is painstaking and thoroughly reliable in his work. That the connections be made exactly as diagrammed is highly important, since a slight change in one of them will probably result in readings that are worse than useless for the reason that they will be misleading. The connections on the primary circuits should be substantial even though they are temporary, since those circuits are of such tension that defective work may possibly lead to fatal results. While this set was selected with a view to the sturdiness of the several instruments, and is probably as substantial as can be secured, in their very nature they are of delicate construction and it is important that they be handled with the utmost care.

Although the meters are understood to have been properly adjusted before leaving the factory, there is always the possibility of some derangement in shipping, so that a careful check should be made when first installed. The watt-hour meter in particular should be checked from time to time after being placed in service. Where a known motor load is available and is a steady one, so the power factor may be definitely determined, the watt-hour meter may be checked by means of the ammeter and voltmeter of the set. The preferred way, however, is by comparison with a standard meter. Where the power is purchased from a central power station, the distributing company will be fairly certain to have a standard meter so that the watt-hour meter may be checked by the regular meter tester.

The delivered cost of this particular set was $252. In many instances where a similar set may be desired, it will be possible to reduce the cost by reason of the fact that there will be but one voltage to deal with. This will permit the elimination of one set of potential transformers and should the service current be at 440 volts or less, both sets may be omitted as it is possible to secure meters designed to work on such voltages without the necessity of stepping down.

Hearing Concerning Metal Tariff Revision

WASHINGTON CORRESPONDENCE

The Ways and Means Committee has appointed Friday, Jan. 10, 1913, as the date for considering schedule C of the tariff bill which deals with metals and manufactures thereof. It is understood that the hearings on this subject will extend throughout January 10 and 11. The plan is to hear all those who may choose to present themselves, provided the number is not too great to cover the time set apart for that purpose. In the event that too many persons present themselves, the committee will probably find it necessary to designate representative persons to speak for the trade and in so doing to grant to those who are not heard the power to file with the committee briefs representing their views.

The following statement has been issued to those who are likely to ask to be heard:

> The hearings will be conducted in the hearings room of the committee, 321 House of Representatives Office Building. Sessions will begin at 10 a.m. and 2 p.m. unless otherwise ordered.
>
> Persons desiring to be heard should apply to the clerk of the committee previous to the date set for the hearing, to be assigned time on the program for that day. In making such application the following information should be given:
>
> Name; permanent address; temporary address in Washington; person, firm, or corporation represented; paragraphs of the Act concerning which testimony will be given; brief mention of attitude to revision of the tariff; and the amount of time desired.

In addition to this the person intending to give testimony should forward in advance to the clerk a copy of his brief and of any documents he desires to file with the committee. In preparing this brief it is desired that the following outline be observed:

> (1) State by items and paragraphs the changes in duties recommended, assigning in each instance reasons for recommendations. (2) Estimate the increase or decrease in imports by paragraphs and items, which would result from suggested modification of duties. (3) Explain methods or experience relied upon in making estimate. (4) Suggestions as to changes in phraseology of present tariff law. (5) Suggestions as to the betterment of the administrative features of the present law.

All briefs and other papers filed with the committee should have indorsed on them the name and address of the person submitting them and the numbers of the paragraphs of the present tariff law to which they relate.

California Miners Association

SAN FRANCISCO CORRESPONDENCE

The sixteenth annual convention of the California Miners Association was held at San Francisco on Dec. 9, 10, and 11. It was the first convention of the association since 1906. President W. C. Ralston presided.

M. H. de Young, vice-president of the Panama-Pacific Exposition, invited aid in the preparation of the mineral display. Upon his suggestion, the convention in 1915 will be held in San Francisco, and the mining men of the world will be invited to meet in a great mining congress.

Secretary of the Interior Fisher delegated Charles G. Yale, statistician of the U. S. Geological Survey at San Francisco, to represent him by the delivery of a paper prepared by W. C. Mendenhall, chief of the land classification board, defending the policy of the department regarding public-land administration. The paper stated that the Department of the Interior is an administrative organization and not a law-making body, but acts purely by the mandates of Congress; and that only in the administration of those statutes which grant discretionary powers or permit of various constructions, is there opportunity to develop and express a policy. So that whatever the officers of the department have done in matters relating to the land and water affecting the rights of the miners has been done under the provisions of the statutes or in the discretion of the Secretary of the Interior in the public interest. The withdrawal power, it was admitted, has been widely exercised by the President. The oil-land legislation in the last Congress, the Secretary holds, would have applied to California had there not been strong protest by some of the oil men of the state. The view of the Secretary, as expressed in the paper, respecting the withdrawal of lands valuable for water power, is that, like the oil and phosphate withdrawals, legislation is needed, as the statutes at present contain no law which provides adequately for the acquisition and use of these lands.

A. H. Ricketts, mining attorney of San Francisco, said that conservation as practiced by the government bureaus is opposed to the theory that the government holds the public land in trust for the people, to be disposed of so as to promote the settlement and ultimate prosperity of the states in which they are situated, and that the federal departments persistently exceed their limited lawful power over the public domain. Russell L. Dunn and Frank H. Short supported the position of Mr. Ricketts, while James F. Farraher supported the Secretary of the Interior.

Whitman Symmes submitted a resolution that the association is not in favor of the policy recently developed of maintaining the public lands to be leased or rented on such terms as Congress and and departments may prescribe, but that the government should hold such lands in trust for the purposes originally agreed upon between the federal government and the separate states, and that eventually the mines, forests and unnavigable streams of the nation may be administered by the states in which they are situated. This was substituted by a resolution, which was adopted unanimously and without discussion, calling attention of Congress to the persistent and harmful interference of federal bureau officials with the operation of prospectors and miners who go on the public land. That the association believes the remaining public lands in all the states should be disposed of consistent with the policy of the rule embodied in the early acts of Congress and in many decisions of the Supreme Court, and calling upon the governors and legislatures of the several states interested to see to it that the rights and interests of such states and people shall be properly guarded and fully protected. A similar resolution was adopted relating directly to the use of water by miners.

The conservation of flood waters by the operation of hydraulic mines was discussed by W. W. Waggoner. He presented a plan that induced the adoption of a resolution that a committee be appointed to consult and coöperate with the débris commission relative to the resumption of hydraulic mining.

The employers' liability act and industrial accident insurance were discussed by A. J. Pillsbury, chairman of the State Industrial Accident Board, and T. J. Nilon, the former supporting and the latter opposing the present law. The convention adopted a resolution expressing the belief that the present law imposes on mine owners and all other employers of labor an unjust burden of liability, and suggesting amendment providing for equal sharing by the employer, the employee, and the state of the cost of accident insurance. The convention also adopted a resolution suggesting legislative remedy of the hardship imposed on mine owners by the corporation tax law.

W. H. Storms, state mineralogist, delivered a paper on the disposal of quartz-mill tailings for filling underground stopes. Mr. Storms discussed the same subject in the JOURNAL of Sept. 23, 1911. Mr. Storms also presented a paper setting forth the history and work of the State Mining Bureau. The convention adopted resolutions asking for state appropriation of $25,000 for the investigation by the state mineralogist of fake mining companies, and also for an increased appropriation for the general and special work to be done by the bureau.

Walter W. Bradley, librarian of the State Mining Bureau, read a paper on "Federal Law and the Miner." Whitman Symmes, of Nevada, delivered a short address on the construction and operation of pumps on the Comstock.

Secretary Fisher on the Mineral Land Law

WASHINGTON CORRESPONDENCE

Secretary of the Interior Fisher, in a report to the President made public on Dec. 16, 1912, includes a discussion of the need of revising the mining legislation of the United States, and expresses interesting opinions with reference to the situation existing under recent court and administrative decisions. In part Mr. Fisher says:

> It is becoming increasingly evident that the lode-mining law needs change in one respect, at least. The law at present does not provide for the creation of any rights in supposedly mineral land, except by the issuance of patents, and in that regard Congress has provided that a patent can follow only on a legal location and has said "but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located." . . . The law tends fairly well to the development of mineral properties where ore can be discovered at or near the surface, but it seems to be ill calculated where, as is the case notably in some of the copper-mining districts, the ore lies at depths of hundreds and sometimes thousands of feet. Discovery of the vein within the limits of any particular claim in such cases involves deep exploration, either by drilling or by the sinking a shaft, or the extension of a tunnel into the claim. Either of these operations may involve great expense, and it has been repeatedly urged on the Department that investors are reluctant to spend the money required without further assurance than the law at present can give them.
>
> On this ground the Department has been strenuously pressed so to construe the law as not to require an actual discovery of the lode which is supposed to exist within each claim, but to patent the claims upon evidence of the existence of mineral at or near the surface wholly disconnected with the supposed lodes below and of no value in itself, it having been further urged that in these cases it was a matter of geological inference that orebodies did exist far below the surface. It is obviously the duty of the Department to carry into effect the intention of Congress expressed in statutory form. Congress having said that no lode claim should be patented without discovery of the vein or lode, within the limits of the claim, it would be an evident usurpation of power for this Department to patent lode-mining claims without proof of actual discovery. The frequently repeated assertions that the recent rulings of the Department have overturned interpretations placed upon the law for 30 years seem without foundation. On the contrary, had the Department decided that it could dispense with actual discovery it would have overturned the practically unanimous holdings both of courts and of the Department ever since the enactment of the lode-mining law. Doubtless in some cases claims have been patented where there was little or no proof of actual discovery, but the patenting of such claims is evidently to be laid to a misapprehension of the facts by employees of the Land Office, and not to a misconstruction of law by the Department.
>
> It seems, however, possible by a change in the law to keep in force the policy of the Government expressed in the mining law of rewarding the actual discoverer of valuable veins, while at the same time giving such protection during the work preliminary to actual discovery as would make it possible for capital to invest. I suggest that the law should be amended so as to give a prospector, for a term of years, an exclusive right of possession and of prospecting within a limited area of land. In case actual discovery were made within the time given, patent would issue. The prospector should be obliged to perform a reasonable amount of work during the existence of the permit in order to make evident his good faith. He should, however, be given the right, by proper proceedings, to settle disputed questions of intervening claims, both in case of conflict with other mineral claims and also cases of conflict with agricultural claimants, so that he might at the earliest possible moment know whether or not his title would be absolutely clear upon his making discovery.
>
> The only alternative suggested to this plan, apart from the evidently impossible one of accepting as evidence of discovery something which is clearly not such evidence, would be for Congress to amend the law so as to permit the issuance of patents to mining claims upon proof of the existence of valuable mineral within the claims by geological inference. The objections to this are many. In the first place, it is evident that no geological inference can be absolutely sure. This is particularly clear in the case of copper deposits at great depth, for it was admitted in a case where a large number of claims were applied for, that it was impossible for the claimants to state that there was in fact any copper ore under the surface of any particular claim; all that they asserted that they could be sure of was that somewhere beneath the surface of the large number of claims there was a large amount of such ore. Another objection of perhaps much greater weight is that to substitute geological inference for the actual discovery of the vein or lode as required by the present law is to give to the geologist, or the man financially able to employ skillful geologists, the reward which it has been the policy of the law up to now to extend to the prospector or actual discoverer. It would also follow that a wealthy man could, without any actual development of the mineral resources of the country, obtain patents for and thus monopolize large districts of valuable mineral land.

Humors of the Hawthorne Trial

The testimony in a case like that of the Government against Freeman, Quincy, Morton and Hawthorne is in the main prosaic and dreary, but now and then becomes amusing and even humorous, as, for example, on Dec. 10, when two young women stenographers in the offices of the Temagami-Cobalt Mining Co. testified that they had been elected directors "of something or other," but were not quite certain just what. Of course, they had never attended a meeting, they said, and were surprised that such a question should be asked.

Helen Rogers, private secretary and stenographer for Albert Freeman, testified:

"I was a director of—I forget just what. I think it was the Elk Lake Co. Oh, no; I never attended any meetings; but I was notified that I had been chosen director of something or other."

Rose Greeley, another stenographer, when asked if she, too, was a director of the Elk Lake Co., replied:

"I don't know just what the companies were that I was a director of, but I remember that I was told one day that I was a director of two of the companies."

"Did you ever attend a meeting?"

"Oh, no," she replied.

Herbert D. Sayre, professor of mathematics in the University of Alabama, testified that he never bought any shares of the Hawthorne Silver and Iron Mines Co., but that he was a member of the "advisory committee."

"Mr. Hawthorne asked me to serve," he explained, "and he sent me a certificate for 10,000 shares of stock in the Hawthorne Silver and Iron Mines Co. and a certificate for a $5 dividend on Temagami-Cobalt stock. I sent back the certificate of stock in November, 1911, after having had it since early in 1910. I never attended a meeting of the company and never was notified to attend any."

John McKinnon, of New York, formerly secretary and treasurer of the four mining companies named in the government indictment, testified regarding the connection of the Continental Syndicate, an underwriting concern of which he was also an officer, with the mining companies. He said that at the end of May, 1909, there remained approximately 200,000 shares of Montreal-James Mines, Ltd., stock unsold. A letter from Hawthorne to a prospective subscriber, written some time in May, 1909, which was read to the jury by Assistant United States Attorney Dorr, stated that there remained only about 1500 shares unsold.

The witness, refreshing his memory from the books of the mining companies, stated that by the terms of the agreement between the Continental Syndicate and the companies, the Elk Lake-Cobalt

Mines, Ltd., was entitled to hold back $10,000 from the sale of its stock, and the Montreal-James Mines, Ltd., $50,000 from the sale of its stock; the remainder was to be turned over to the syndicate.

The witness testified further that when he retired from the secretaryship on Dec. 9, 1910, there was on the books of the Temagami-Cobalt Mines, Ltd., a balance of $472; on the books of Elk Lake-Cobalt Mines, Ltd., a balance of $35.85, and on the books of Montreal-James Mines, Ltd., a balance of $26.81, all being on deposit with the Knickerbocker Trust Co.

The indebtedness of the Elk Lake Co. to the holding company, Temagami-Cobalt Mines, Ltd., at this time was $29,700; of the Montreal-James Co. to the Temagami-Cobalt Mines, Ltd., $1230, and of the Temagami company to the Hawthorne Silver and Iron Mines, Ltd., $24,500.

Mr. McKinnon also testified that as secretary and treasurer he had received no money from the sale or shipment of ore from the mines of any of the companies.

"How much money did the public subscribe to Temagami-Cobalt?" asked Assistant District Attorney Dorr.

"Upward of $400,000," said Mr. McKinnon.

"How much went to the Continental Syndicate?"

"Everything in excess of $190,000."

"Did Temagami-Cobalt get all this $190,000?"

"No, $100,000 went back to the Continental Syndicate, leaving $90,000 for Temagami-Cobalt."

Earlier in the day Mr. McKinnon had testified that Mr. Freeman was the sole stockholder and president of the Continental Syndicate. In explaining the reason why the Syndicate should get everything but $90,000 of the $400,000, Mr. McKinnon went into a long argument, the involution of which took the Court a considerable time to understand and digest.

"Did the entire $90,000 remain in the Temagami-Cobalt treasury?" went on Mr. Dorr.

"No, $14,000 was paid to Dr. Morton. The remaining $76,000 went, technically, for exploration and development."

On a following day, letters in Mr. Hawthorne's own handwriting, giving a rollicking account of his efforts to induce folks to "separate themselves from their money," in exchange for mining stock, were read. The defendants themselves, Mr. Hawthorne in particular, appeared to enjoy the reading, although Mr. Hawthorne at times looked embarrassed.

Under date of Feb. 27, 1909, Mr Hawthorne wrote from New York to Mr. Freeman in Canada, as follows:

> Speaking of that individual whom you fired off the directorate and then allowed to crawl back (I have forgotten his name) . . . . he told me that he was in touch with certain English capitalists whom he did not name, who would be disposed to invest in our companies to any extent up to all the stock issued, provided they could be satisfied that it was a sound business risk. He suggested that I supply him with data, local color, etc.—the promulgation whereof to said Britishers might tend to open these fathomless pocketbooks of theirs in our direction.
>
> Hereupon I endeavored to imagine myself to be a combination of the qualities of both you and Morton; your fire and resourcefulness, and his conservatism, together with my own innocence and virtue; and in this guise I conducted him into your room, set him down with his nose over the samples and the maps, and administered a lecture to him. He went off, at last, full; and I expect him back in a few days conveying a line of wagons loaded with British gold to exchange for our certificates.

Further on Mr. Hawthorne said:

> Faithful little Pignet paid his final installment of $100 for Temagami and another $50 on his Elk Lake. Pat McCabe, from the auld sod, engineer on North River ferries, separated himself from $75.
>
> For all I know we may be getting rich. I wish you would wire McKinnon (treasurer) to pay me $1000 or so for my lunches and carfares. I am stone broke, and in a mood to rob the till. You had better come back anyway. Why should you two fellows (speaking of Dr. Morton and Mr. Freeman) be off playing while I stick here with my nose to the grindstone, starving to death?

At another time, in January of 1909, Mr. Hawthorne wrote that "Brother Brown turned up on the fifth and paid his 5000 like a little man," but that "Colby's bankbook still lies unclaimed on the desk. However, I wrote Colby a love letter and expect him back tomorrow or on Monday. A certain "Hubbard, of Plainfield," was also mentioned. "Hubbard, of Plainfield, who looks rich," Mr. Hawthorne wrote, "talked for a space and seemed so well satisfied that he arranged to come again to see you, and I expect will swallow 5000 or 10,000." Professor Amen, of Phillips Exeter Academy, according to Mr. Hawthorne, "would buy Temagami about Jan. 25, when his salary is paid."

Bureau of Mines

Washington Correspondence

Congress has been asked to allow $250,000 for an investigation of the methods by which low-grade ores in the West which cannot possibly be worked under present conditions may be developed and made to pay by the use of more scientific methods of mining. The work would be done by the Bureau of Mines through an extension of its present scientific investigations. The Bureau also desires to enlarge the study of health conditions in lead, zinc, copper and other metal mines, and it reports that the percentage of deaths from tuberculosis among workers in such mines is higher than that among those employed in coal mines and other occupations.

It is also desired to have the Bureau investigate carefully the causes of accidents in the metal mines and to do it much more thoroughly next year than it has been heretofore done. The work already accomplished in investigating the cause of accidents in coal mines is said to be good evidence that the use of the funds asked for in these investigations will be well warranted. It is likely that some allowance will be made for the extension of this kind of inquiry.

The Copper Revelations

We were aware that the Pujo Committee, with the assistance of Samuel Untermyer, was investigating the "Money Trust," but we were unaware that this had anything to do with the copper market. Also we thought that we were well informed respecting copper corners, umbrellas, etc. Consequently we rubbed our eyes in amazement when we read in the papers of Dec. 12, headlines like these:

COPPER CORNERED

PUJO COMMITTEE HEARS HOW UNITED METALS COMPANY HELD BACK 93,000,000 POUNDS IN 1907,

Then Smashed the Market.

When our eyes caught the figure 1907, however, we began to suspect what was up. It appeared that the Pujo Committee had had Tobias Wolfson, assistant general manager of the United Metals Selling Co. on the stand. Mr. Wolfson testified that in his opinion his company never controlled more than 50 to 60% of the copper product of the country and the proportion was very much less now. Mr. Untermyer insisted that the company had controlled between 70 and 80%. In questioning about the alleged corner in copper in 1907, counsel for the committee drew from Mr. Wolfson an acknowledgement that for April, May and June, 1907, the total sales for the company had been only 70,000 lb., 409,964 lb. and 454,909 lb., respectively. The sales for the month of April were only 70,000 lb., as compared with 11,000,000 lb. in March, 21,000,000 in February and 7,000,000 in January, and the average sales were normally from 30,000,000 to 40,000,000 lb. a month.

The witness acknowledged that the company had accumulated copper for four or five months in 1907 and that it had advanced money to the producers amounting to between 80 and 90% of the value of the copper, which was being withheld from the market.

Mr. Untermyer wanted to know if the United Metals Selling Co. had not been obliged to borrow from the banks as much as $50,000,000 to make the advances and hold copper from the market. The witness replied that it had borrowed only $10,000,000 from the banks and had used its own resources for the balance. In four months it advanced over $42,000,000 on copper, in which time it put on the market only about 5,000,000 lb.

"They kept piling copper on you?" said Mr. Untermyer.

"Yes," replied the witness.

"And Amalgamated stock was being unloaded in those four months?" added counsel for the committee.

"I can't say as to that," said the witness.

"But soon after you began to sell, the price dropped from 25 to 13c. a pound?"

"Yes."

"You couldn't hold the market any longer, you had to let it go?"

"No, that is not accurate."

The witness went on to contend that the consumers of copper metal had been loading up for months at the high price; that they had laid by much more than they needed in the hope of making money on a further rise and that after the preliminary panic early in 1907 the entire market for copper had disappeared. He added that the United Metals Selling Co. regarded it as the company's duty to support the market and hold it up until the surplus stock that had been obtained by the consumers had been exhausted. Mr. Wolfson contended that if his company had not done this, many of his customers and the United Metals Selling Co. itself would have been forced into bankruptcy. He maintained stubbornly, however, that the company had not held up the price of copper by refusing demands for a supply. As he remembered the situation there was no demand.

"Then how was it," asked Mr. Untermyer, "that the price dropped from 25 to 13c. a pound when you began to sell if it is true, as you say, that the market was cleaned up when you stopped selling?"

Mr. Wolfson contended that the drop had been gradual. He acknowledged that the United Metals Selling Co. had accumulated 119,000,000 lb. of copper by Sept. 1, 1907. This was after all orders had been filled and represented a three months' supply. The figures submitted in evidence showed that while only trifling amounts had been sold for five months preceding October, 1907, about 93,000,000 lb. was taken as soon as the United Metals Selling Co. loosened its hold on the product.

> Q. And, although you say you were not able to interest buyers during those five months, they were suddenly interested to the extent of 5,637,000 lb. in September, 93,000,000 in October and 46,000,000 lb. in November and continued to show an interest for many million pounds every month after that? A. Yes.

Mr. Untermyer wanted to know how it had happened that when the United Metals Selling Co. released copper in October and sold 93,000,000 lb. that the Amalgamated stock had dropped from 121⅞ to 56¼.

"How can I answer that?" asked the witness impatiently.

In a subsequent interview, John D. Ryan, president of the United Metals Selling Co., said:

> The criticism I have to make as to some of the reports appearing in the morning papers is that the reporters seem to have taken Mr. Untermyer's questions as comprising the entire evidence, without any reference to the answers made by the witness. It is assumed in many of the questions that the company had accumulated an exceptional amount of copper which it was carrying for the purpose of sustaining high prices that prevailed in the early months of 1907. As a matter of fact the company had never in its history sold copper so freely nor so heavily as it did in the months preceding the March panic in 1907, it having sold copper several months in advance of production, owing to the unusual demand on the part of consumers and stocks of unsold copper had not for years been so low as they were at that time.
>
> So far from there being any unusual accumulation, the only copper accumulated in that year was during the summer months when the demand for it absolutely ceased and the total accumulation at any time in the hands of the United Metals Selling Co. did not exceed three months' output of the mining companies which it represented.
>
> Mr. Untermyer questioned Mr. Wolfson as to whether a large sum of money, naming $50,000,000, was not borrowed by the United Metals Selling Co. in order to meet the advances which it was under contract to make to the mining companies to carry the copper which was accumulating.
>
> The testimony shows that the total amount of money borrowed by the United Metals Selling Co. in the year 1907 was about $10,000,000 and, based upon the prices ruling at that time, the output handled by the United Metals Selling Co. was worth over $100,000,000 annually, so that the total amount of money borrowed to finance its copper business was about what was used to carry one month's production, and nearly all of this money was borrowed on copper bills negotiated abroad, so that the use of New York banking institutions by the United Metals Selling Co. was very slight.

The Anthracite Decision

The United States Supreme Court on Dec. 16 announced its decision on the appeal from the Circuit Court in the suits brought by the United States against the anthracite coal-carrying companies under the Sherman law. The decision of the lower court is set aside so far as the general charge of combination is concerned, but it is sustained so far as certain specific acts are pronounced illegal, such as the organization and management of the Temple Iron Co. as an agent of the anthracite companies, and the purchase of the coal mined by the independent operators. The question of the ownership of stock in certain carriers by other companies as an element of combination is not touched in the opinion.

In brief, the decision is given in substance in the following summary of the opinion read by Associate Justice Lawton:

THE QUESTION OF COMBINATION

(1)—That the general combination alleged by the government to exist between the defendant roads for an apportionment for total tonnage to the seaboard by an agreement in the nature of a pooling arrangement, has not been established, and, therefore, the relief sought by the government upon the assumption of such combination is denied.

(2)—The court finds, however, that the principal defendants did combine, for the purpose of shutting out from the anthracite coal field a projected independent line of railroad, the New York, Wyoming & Western R.R., and to accomplish that purpose it is found that the stock of the Temple Iron Co. and of the Simpson & Watkins collieries was acquired for the purpose of and with the intent, not of normally and lawfully developing trade, but of restraining interstate commerce and competition in transportation which would have presumably come about through the construction and operation of the proposed competing line of railroad, between the mines and tidewater.

THE CONTRACT WITH THE INDEPENDENTS

(3)—The court holds that certain contracts made with producers covering between 20 and 25% of the total annual supply of coal, known as the 65% contracts, by which such independent producers bound themselves to deliver the output of their mines or any other mine which they might acquire, to the railroad companies for 65% of the average market price at tidewater, were also void, because in violation of the anti-trust act as abnormal and illegal restraints upon interstate commerce.

REASONABLE AND ABNORMAL CONTRACTS

(4)—The court reiterates the declaration in the Standard Oil case, that an act of Congress does not forbid or restrain the power to make normal and usual contracts to further trade by resorting to all normal methods, whether by agreement or otherwise, to accomplish such purpose. Nevertheless, it holds that the acts which it finds in this case to be illegal, the Temple Iron and 65% contracts were not within such class, but, on the contrary, were abnormal in their character and directly tended to, and were intended to restrain trade and commerce illegally, and therefore came within the statute as illustrated by the rulings in St. Louis Terminal Association and Swift & Co. vs. United States.

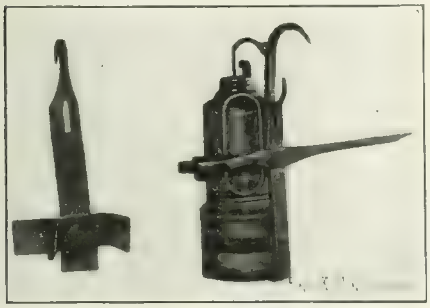
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

The Acetylene Lamp Underground

By L. O. Kellogg*

Engineers are finding that the acetylene lamp has become almost indispensable for technical work such as sampling, surveying and general examination; and this in spite of some defects. It can be carried in the hand, worn in the hat, or better in the second button-hole of the shirt, or hung from the shoulder. In any of the above positions it is out of the way, leaves both hands free and casts a brilliant light where it is needed. It can be improved by a small cross piece of wire or flat iron, fastened to the back to prevent side swing. A flat reflector or none at all is better in most cases, making the lamp more manageable and giving the more useful diffused light. But a bell reflector with the finish dulled gives a better fore or back sight for the transit than the conventional tracing cloth and candle.



Holder for Acetylene Lamp

The lamp, however, offers one real disadvantage for work around a transit. The intensely hot jet of flame, accidentally flicked across the plumb bob cord cuts it instantly. This helps neither the plumb bob nor the transit.

The accompanying illustration shows two holders designed by L. K. Terry for the Germany Mining & Development Co., of Kelly, N. M. They served the purpose admirably, making it possible to hang a lamp anywhere a miners' candlestick would hang. Another kink devised here consisted of a 6-in. length of cleaning wire tied in a buttonhole to give two free ends, instead of a short piece fastened to a tin disk and hung from the lamp. A sharper point was obtained by cutting the wire with the flame rather than with shears or by breaking.

The direct cost per ton of undergound illumination is no criterion of its importance. It runs between one and two cents. Its indirect effect on costs is tremendous. The normal state of semi-darkness in which underground mining is conducted is the feature most sharply distinguishing it from other industrial operations. It decreases speed and increases accidents and delays. It is a safe guess that the improvement of illumination would first receive the attention of an underground efficiency engineer.

Drill for Cutting Samples

Cutting samples in a mine where the ore is hard, tough, compact quartzite such as is the "banket" ore on the Rand, or similar material, is a laborious task, often requiring half an hour per foot of sample. Noel Griffen has described in the *Journal* of the Chemical, Metallurgical and Mining Society of South Africa, a method by which a small chipping hammer, not unlike a pneumatic riveter adapted for carrying a cutting bit, can be used, greatly facilitating the cutting of mine samples.

The chipping hammer recommended is an Imperial, Size B, No. 1, weighing 10½ lb. A rose bit 2 in. in diameter has been found preferable to any other shape. The clippings and dust are caught in a canvas bag, supported in an open position by a stiff-wire or round-iron frame, and measuring about 24x18 in., so arranged that the drill bit can be passed through a hole in the bottom of the bag, the opening being reinforced by two washers to prevent tearing at the edge. The bag is held against the face and the bit directed by the left hand while the handle of the drill is grasped by the right hand so that the controlling trigger can be operated by the right forefinger. The drill requires ½-in. air hose.

It is stated that at first the drill is difficult to control, but after a few days' practice the operator becomes proficient enough to cut a channel 2 in. wide and ½ in. deep across the face of a drift at the rate of 2 ft. in 10 min. in the hardest rock. The work requires much muscular exertion, but in tough ground far less exertion is required to cut a sample by machine than by hammer and moil.

The rock cut out by the rose bit ranges in size from powder to chips half the size of a pea, so that if any larger pieces flake off beyond the edges of the desired channel, they may be readily removed by screening. It is said that if the drill is held well up against the face the chips do not fly as much as when sampling is done by hammer and moil. It is the usual practice to turn the bag inside out after cutting a sample so as to avoid salting.

Improvised Aerial Tramway

A. L. Scott*

The problem of transporting six tons of lead ore from a hillside dump to a gulch road, about 325 ft. distant and 100 ft. below, is responsible for the design of an improvised aërial tram. Boulders and slide rock on the hillside made sledding impracticable. One end of a ½-in. rope was fastened to the bottom of a tree about 20 ft. up on the opposite side of the gulch from the dump. It was then run through a fork of a cedar just back of the dump, around the bottom of a pine just behind that, back through the fork and to the tree on the opposite side of the gulch. A ¼-in. rope was fastened to the ring of an iron double block which had been put upside down on the ½-in. rope and the small rope was run through an iron single block back of the dump. A hook was inserted in the ring of the double block, with the open side pointing uphill. The small piece of ½-in. rope used for a sling was fastened on the hook by one of its strands, twisted once around the double rope about a foot back of the block, then to the hook again. In that way, the weight and friction was just sufficient to hold the block in an upright position when it was drawn to the top of the hill with the ¼-in. rope. After the larger rope had been tightened as much as possible, the sling was put around one sack at a time (the heaviest

Attaching Sling to Sack of Ore on Improvised Aerial Tramway ones first while the rope was tight), and the block drawn down and hooked into the sling. The speed of the sack was then checked with the ¼-in. rope. Ninety sacks, weighing 12,567 lb., were transferred from the dump to the road in one day by two men; the heaviest sack weighed 186 lb. The cost of the labor was $6, of the 55 lb. of ½-in. rope required $7.50 and of the 10 lb. of ¼-in. rope $1. The rope was only slightly worn and was sold for $5, making the net cost of the operation $9.50, as the borrowed blocks were returned in good condition.

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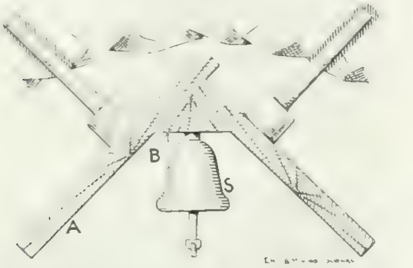
Hanging Troughs for Protecting Trolley Wires

By Allen H. Foster*

Supplementary to the article of this title, by Claude T. Rice, in the Journal of Nov. 2, the accompanying illustration shows a trough which is useful where there is little headroom available. The stringer boards *A* are one- or two-inch planks, depending on the span between supporting plugs. Blocks *B* are placed at the points where trolley ears are located, and wherever it is thought desirable for the purposes of stiffening the trough. Under comparatively dry conditions the petticoat insulator *S* can be omitted and the ear attached directly to the block *B*. In this case the blocks should be treated with an insulating compound.

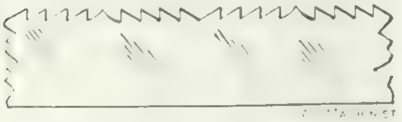


Trolley Trough for Underground Service

Double Acting Hacksaw Blade

The engraving shows the tooth arrangement of a new hacksaw which is being placed on the market by Alexander Reitlinger, 201 William St., New York.—(*American Machinist*, Nov. 21, 1912.)

The claims made by the manufacturer for these saws are that they will cut faster and cleaner than when made with the teeth all in one direction, and that they will cut iron pipe without breaking the teeth. When used in a power-driven frame, the machine must be one which does not lift on the back stroke, as with this saw both strokes are cutting strokes.

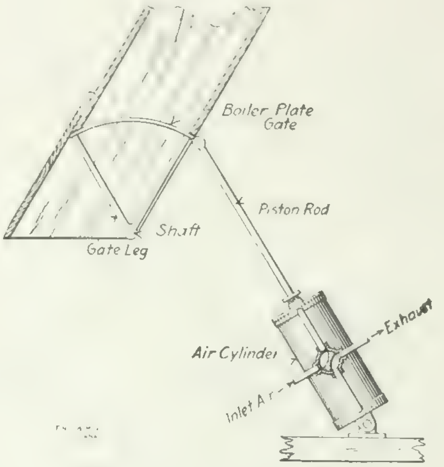


A Double-acting Hacksaw

Pneumatic Ore Chute Gate

By J. R. McFarland

At the Cactus mine of South Utah Mines and Smelters, Beaver County, Utah, a pneumatically operated ore-chute door is used. The door is operated by moving a lever controlling a four-way valve. The advantage of this gate is that the weight of the ore bears directly on the shaft so that the power required in opening and closing is less than in the old style of drop gate. The closing is positive and ore is not spilled on account of rock getting under the gate and preventing its total closure.



Pneumatic Ore-chute Gate

To the bottom corner of the chute is attached the supporting shaft. The door is constructed of a square sheet of boiler plate the width of the chute, bent in an arc with the face up, and supported on the shaft by two legs, so as to revolve about the shaft as an axis.

To the side of the door which is on the underside of the chute, is attached a piston working in a cylinder. The piston rod is hinged at top and the cylinder at bottom so as to allow the necessary play. The air pipe parts at a four-way valve and the air enters the cylinder from top and bottom.

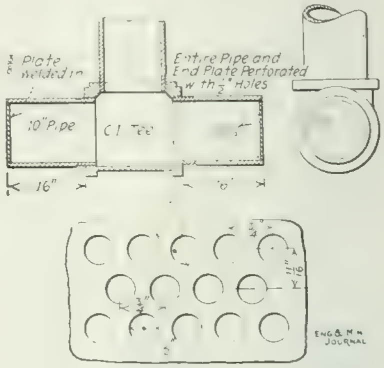
Handling Lubricants

Receiving, storing and distributing lubricants are important factors in economical operation. If the plant is a large one, where several thousand gallons of oil are used per year, it will pay to provide storage capacity so that oils can be bought in tank-car lots, said W. W. Davis, in part, before the Lake Superior Mining Institute. If only a few barrels of each kind of oil are used per month, the oil should be kept in tanks so arranged that the barrels can be emptied into them by gravity. Care should be taken to see that the barrels drain out thoroughly. As the empty barrels are worth from 75c. to $1 apiece, they are worth saving and should be kept in a cool place to prevent shrinking, until enough have accumulated to make a carload.

Suction for Underground Station Pump

By H. L. Botsford*

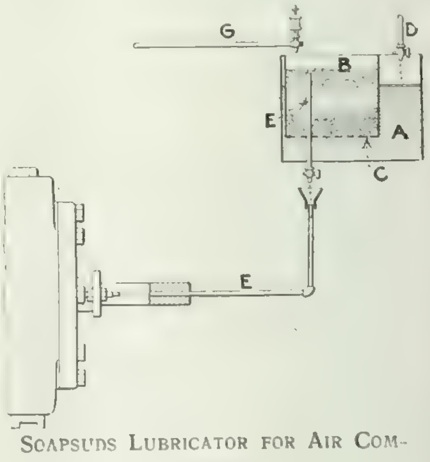
The sketch shows a suction for a 24-40-7x36-in. pumping engine. The area of the ½-in. holes is five times the area of the pipe. The capacity of the pump is 1200 gal. per min., or 600 gal. for each side. This requires a velocity of 150 ft. per min. in the section pipe, and of 30 ft. per min. through the ½-in. holes. It is good practice in the design of pump suction to limit the velocity to 200 ft. per min., and to make it less than that if the pipe is longer than 25 ft., or has many elbows.



Suction Inlet for Underground Pump

Soapsuds Lubricator for Air Compressor

When compressing air to 90 or 100 lb. gage pressure in one stage, the temperature after compression is frequently high. This results in carbon being deposited on the discharge valves and passages, and trouble is therefore experienced



Soapsuds Lubricator for Air Compressor

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*Mining engineer, Creighton Mine, Ont.

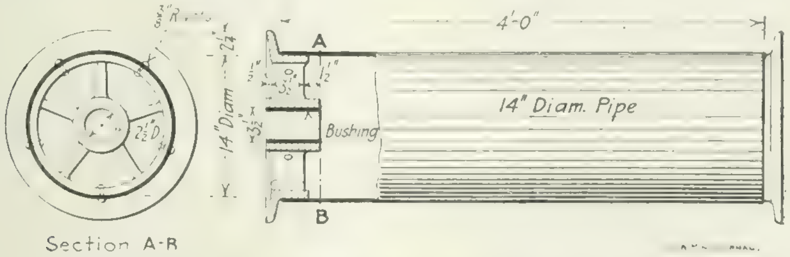
in properly lubricating the air cylinder, especially where compressors are run at high speeds and the temperature of the intake air exceeds 80° or where an inferior grade of oil is used. To overcome this trouble, soapsuds have been used as a lubricant with good results.

The lubricator shown in the accompanying illustration consists of a small galvanized-iron water tank *A*, about 7x6x12 in. Inside of it a smaller tank *B* is soldered to the large one with its bottom 2 in. above the bottom of the large tank. In the bottom of the small tank are a number of ⅛-in. holes at *C*. Soft brown soap, cut into small pieces, is put into tank *B*. Water is then fed into the large tank through a ¼-in. pipe *D*, and passing through the small holes at *C* dissolves the soap and rises to the top of the ¼-in. pipe *E*, through which it passes down into the inlet of the compressor, says Martin McGerry (*Power*, Nov. 26, 1912). The water is regulated by the valve in pipe *D*, the small cock under the tank being left wide open.

Just before shutting down the compressor the water is turned off at *D*, and oil is fed into the small tank *B* from a cup *G*, and the compressor is run with oil for a half hour to prevent rust formation. Soap is used that will sink in the water; otherwise small chips will float and pass down through the pipe *E*. This lubricator is used on a 14x18-in. compressor, and when running at 150 r.p.m. with an air pressure of 90 lb., the water is fed at about 45 drops per minute.

Improvised Rollers

Skip- and tram-car wheels discarded because of flange or tread wear may be utilized for rollers by driving the tread of the wheels into the ends of wrought-iron pipe of proper diameter and length. The pipe is then riveted to the tread of the wheels. This type of roller is particularly suited for rope carriers on inclined hoistways where the rope has some lateral travel, for knuckles and again for side rollers to guide the rope and skip around horizontal curves.



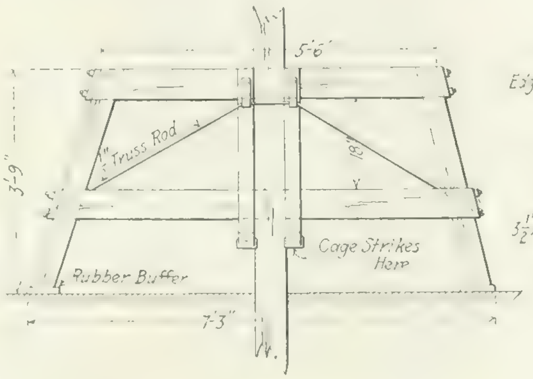
Guide Roller Made of Pipe and Old Skip Wheels

The adherence of paint to cement surfaces, and the duration of the film are said by *Revue des Produits Chemiques* to be greatly improved by treating the surface with zinc-chloride solution.

Guarding the Top of Shafts

In the lead district of southeastern Missouri, the ore lies directly on top of a water-bearing standstone in which deep sumps are not desirable owing to the difficulty in handling the water.

Due to the shallow sumps it is not possible to use cages having more than one deck. Thus in order to handle the production of the mine, relatively high hoisting speed must be used and all unnecessary delays in putting the cars on and off at the surface avoided. This fact is made clear when it is known as much as 400 to 500 tons are regularly hoisted in eight hours from a depth of approximately 450 ft. on a one-deck cage using one-ton cars, and that often as much as 800 tons are handled at some shafts using 1½-ton cars.



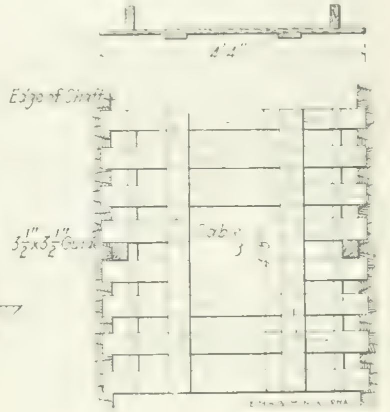
Guard Frame for Shaft

This necessity for cutting down delays has developed several types of automatic guards for shaft collars which are operated by the cage itself. Such a guard, whether it be a railing or a platform, must be made as light as consistent with strength in order to diminish the shock when it is picked up by the cage.

A common form of platform consists of 1x4-in. planks, made up as shown in the accompanying sketch. At the Desloge Consolidated shafts, a lifting guard railing or frame is used; it is no heavier than the platform and is regarded as much safer. The construction of the frame is shown in the accompaying sketch. The lower braces are notched clear into the corner posts, while the upper ones are notched in only about half way. A ½-in. steel truss rod is used to distribute properly the stress due to the sudden lifting of the frame. This rod passes through loops in the straps by which it is fastened to the top cross pieces of the framework. The corner posts are placed at an angle to give added strength as well as to decrease the weight of the top of the structure. Rubber bumpers are used to take up the jar of the frame when it drops back upon the landing floor.

An Unusual Mining Accident

An unusual accident in a Tennessee copper mine illustrates the importance of extreme care in using explosives. In prospecting at these mines, it is customary to put in diamond-drill holes often to a distance of 200 or 300 ft.; in the level in which this accident occurred, there were about 25 of them showing.



Platform Shaft Cover

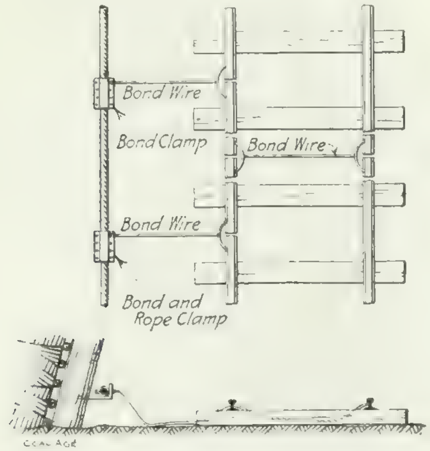
Upon examination of a particular face it was found that an old prospecting hole passed close to the place chosen for the blast, and the man in charge of the operation directed the miner to make use of this prospecting hole instead of drilling a new one, says the November *Travelers' Standard*. The miner, in preparing to fire the shot, put a ladder rung into the hole first, and thought that this would make a sufficient backing. It did not drive up tight, however, so he next put in a piece of pine, about six inches long and 1¼ in. in diameter. This he drove up solidly in the hole, until there was a clear space of perhaps three feet between it and the face of the rock. On top of this he put two "dooleys," or bags of tamping, after which he introduced two sticks of dynamite, and tamped the whole with two more dooleys.

Having made his preparations as described, he lighted the fuse and hastened to what he thought was a place of safety, going to a distance of perhaps 125 ft., and passing around one corner and through an S-shaped passageway. It happened, however, that he stopped exactly in front of the distant end of the very prospecting hole in which the charge was set, and when the explosion occurred, he was badly injured. The backing blew out underneath the dynamite, and a considerable part of the force of the shot was transmitted through the hole, as through a long gun barrel. It is thought that he was not struck by either of the pieces of wood that were placed under the charge, but small fragments of copper and a considerable quantity of dirt and pulverized rock were discharged against his back.

It is common to explode charges of dynamite in these prospecting holes, and accidents seldom happen from doing so, providing the backing underneath the explosive is put in properly. In some mines these prospecting holes are numerous and it is hard to remember where all of them lead. The hole that was shot in this case was drilled about 15 or 20 years ago, and was first noticed by the miners about a year before the accident.

Discarded Hoisting Rope as Electrical Conductors

Underground electric haulage systems are subject to great power losses, due to poor electrical connections in the return track. Where favorable conditions exist, as on the surface, or where tracks are new and the rails in first-class condition, a bond of high efficiency may be obtained and kept in good condition at a reasonable expense. In mine work, conditions are not in many cases so favorable and it is generally more difficult to do good bonding. Contacts must be smooth, clean and dry, and, even if the bonding is done right, it is hard to keep up the efficiency, since rails are frequently changed or bonds cut by cars getting off the track. For these reasons the results obtained are not what should be expected for the money invested, says Albert Leonarz (*Coal Age*, Nov. 16, 1912).



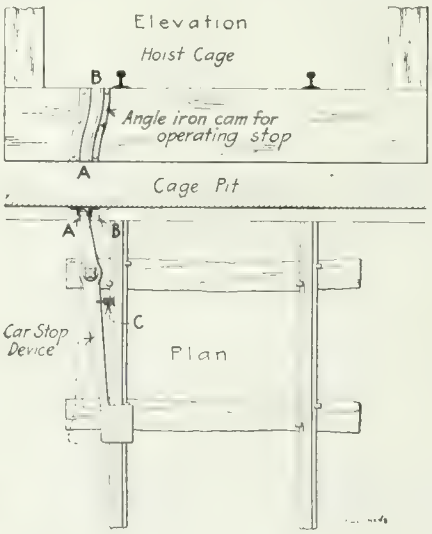
Sketch Showing Method of Bonding

The only way to overcome this unsatisfactory condition and to reduce the bad effects to a minimum is to put in ground wires along the track and to tap these, at suitable distances, to the rails; this insures the bonding and provides an uninterrupted metallic circuit. The high price of copper practically prohibits its use for this purpose in mining installations.

Wornout wire hoisting ropes, in lengths of 500 ft. and over, which makes few joints necessary, having a scrap value of approximately $8 per ton and a specific resistance of 8 to 1 as compared with copper, may be utilized for this purpose. It is a better conductor than rails and a rope of, say, 1½ in. diameter has about the same current-carrying capacity as a No. 000 B. & S. gage, or about a ⅜-in. copper wire. Smaller ropes may also be used, the size required depending upon the conditions.

Automatic Car Stop

The removal of excavated material from one section of the Catskill Aqueduct tunnel is accomplished by means of dump cars which are loaded with the broken rock at the face and then hauled by means of a storage-battery locomotive, to the shaft where they are run, one at a time, on the cage. (*Eng. News*, Nov. 21, 1912). Some difficulty was experienced by the cars running off the end of the track into the sump when the cage was not in position. To prevent this nuisance the simple car-stop device, shown in the accompanying drawing, was designed and installed at the shaft station.

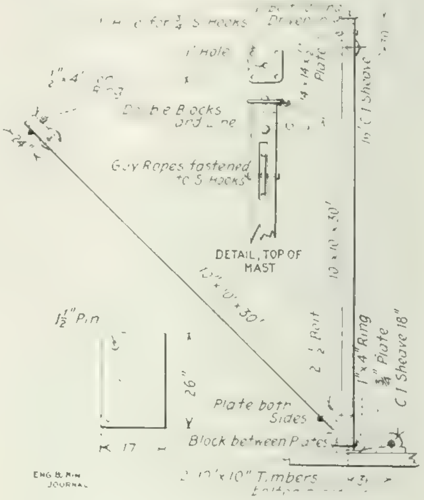


Automatic Car Stop

When the cage is out of the pit, the stopping device is held in position *A* by the spring at *C* and cars cannot run off the track into the pit. When the cage descends and is about to enter the pit, the lower end *A* of the angle-iron cam engages the stop lever at *A* and, as the cage continues to descend, the stop lever is forced over by the cam until the cage is at the bottom, when the stop is in the position *B* and cars can pass from the cage to the track or *vice versa*, as may be desired. When the cage rises again, the spring *C* pulls the stop from position *B* back to position *A*, as fast as the cam will allow.

A Simple Guyed Derrick

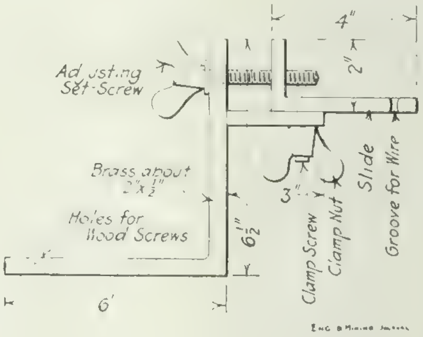
The derrick shown in the accompanying drawing is suggested by H. L. Botsford, Creighton Mine, Ont., as being readily constructed by a mine carpenter and blacksmith. It is useful for handling buckets at the beginning of shaft sinking operations, as well as for many other purposes about a mine.



Details of Simple Guyed Derrick

Bracket for Shaft Plumbing

For the support of plumb lines used for carrying a survey down a vertical shaft, special brackets will be found useful, says R. J. Donaldson (*Min. and Eng. Review*, Oct. 5, 1912). The brackets when in use are screwed to a heavy piece of timber thrown across the shaft. One of them is fitted with a screw adjustment, by means of which the wires can be brought in line with a transit set up over or under a permanent station, either on the surface or underground. The brackets are best made of brass. The clamp screw works in a slot in the bottom plate.



Bracket for Shaft Plumbing

After Jan. 1, 1913, the standard topographical maps of the U. S. Geological Survey will be increased in price to 10c. per copy retail, or 6c. per copy wholesale, an order of $3 or more entitles the purchaser to the reduced rate.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Charging Tanks by Conveyors

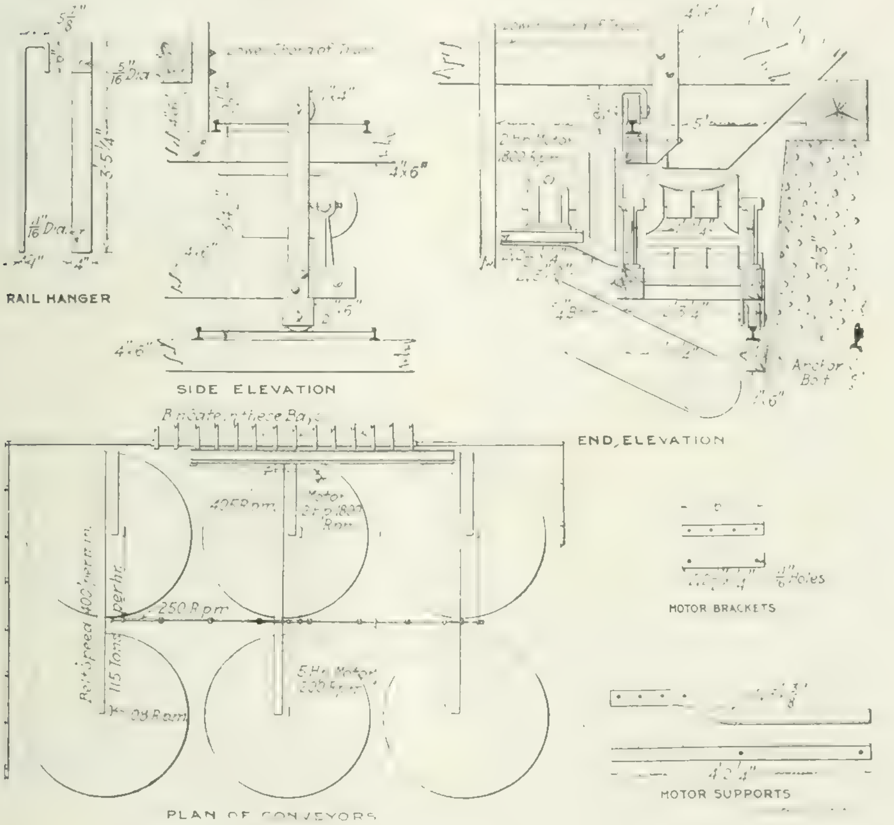
By Jesse Simmons*

At the Wasp No. 2 mill, at Flatiron, S. D., belt conveyors are used to charge the dry crushed ore to the leaching vats, as is shown by the drawings. The ore is reduced to approximately ⅛-in. particles by an equipment of two No. 6 and two No. 4 Gates crushers and four sets of 16x36-in. McFarlane rolls, the product passing to a 2x7-ft. screen set at an angle of 45°, from which the oversize is returned to the rolls. This screen has No. 6 wire, the opening being ¼x¾ in. The finished product drops to a bin of 700 tons capacity.

Parallel to the front of this bin is a conveyor, suspended on a carriage so that it can be moved in its entirety to discharge over its end to individual cross conveyors running to the tanks. Thus trips and sharp turns in the belt, which cause heavy wear on the belts, are eliminated. The ore is drawn through chutes from the bin, to the carriage conveyor, the latter being operated by a 2-hp. motor.

This carriage moves on cast-iron wheels which operate on 12-lb. steel rails; the upper or outside rail is suspended on 4x6 timber brackets from the lower chord of the tank-room truss, and the lower or inside rail is spiked to a 4x6 which is bolted to the concrete retaining wall under the front of the finished-ore bin. The carriage is constructed of 4x6-in. timbers, strengthened with angle iron and plates. Troughing pulleys are spaced 3 ft. 11 in. between centers and idlers 5 ft. 8 in. The length over all of this conveyor is 51 feet.

The conveyors to the tanks, which are six in number, or one for each tank, are operated from a line shaft driven by a 5-hp. motor. This set of conveyors rests upon ties laid on the lower chords of tank-room roof trusses, which gives the top of the belts an elevation of nine feet above the top of the tanks at point of discharge. The tanks are 32 ft. diameter by nine feet deep. A little shoveling is required to finish the charging of a tank, as the crushed ore when discharged from the conveyors piles up in a cone having a 45° slope. The mill handles 500 tons per day, or to be exact, 12 tanks in 10 days. The tanks have a capacity of 420 tons each. All of the conveyors have 18-in. belts, operated at 400 ft. per min., giving a capacity of 115 tons per hour.

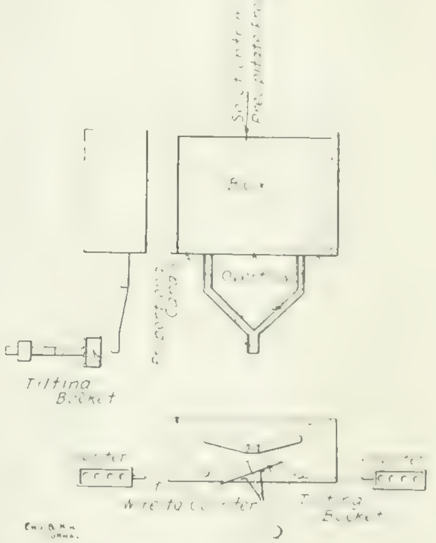


TANK-CHARGING SYSTEM AT WASP NO. 2

Solution Sampler and Weigher

At the mill of the Hollinger Gold Mines, Ltd., Porcupine district, Ontario, the cyanide solution from the Merrill precipitation presses is passed through a device known as a Black Hills sampler and weigher. This device, illustrated in the accompanying drawing, consists of a box, one side of which is slightly lower than the other three, and set exactly level, so that the flow of solution over it may be equal at all points. In front of this overflowing side are set two small canals which take out a determined proportion of the entire flow, and deliver it to a tripping bucket.

When this bucket is filled to a certain point the weight of the solution dumps it and at the same time presents the opposite bucket to be filled. A counter is arranged to count the number of times the bucket has tripped and, knowing the weight of each bucket of solution and its relation to the total flow, the total quantity of solution which has passed through the device can be calculated. It is calibrated from time to time, but the



ARRANGEMENT FOR SAMPLING AND WEIGHING SOLUTION AT HOLLINGER MILL data secured are practically constant. While the buckets are discharging, a part of their content is caught in a bottle, this serving as a sample of the precipitated solution.

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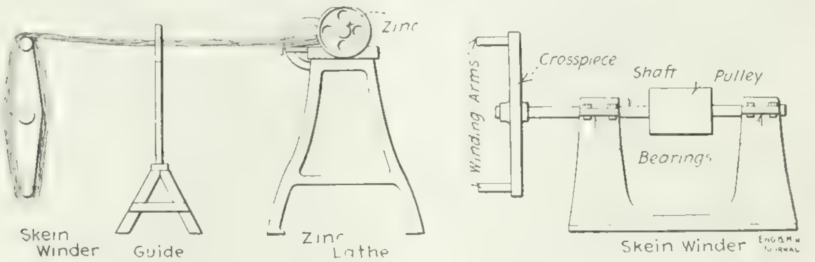
*Deadwood, S. D.

Device for Handling Zinc Shavings

The handling of zinc shavings used in precipitating gold and silver from cyanide solutions is a problem which has involved a great deal of annoyance and expense. The zinc thread, when cut, is usually piled away in a more or less tangled mass, and when it is desired for use, an appreciable expense is entailed in straightening it out and getting it ready. The great amount of handling causes a breakage of a goodly proportion of the thread, making a product that is not of much use in the boxes and which is usually wasted.

A method has been devised whereby this secondary handling may be entirely avoided, obviating both the annoyance and expense of the operation. This device consists, as is shown in the sketch, of a horizontal shaft carrying at its end a light cross piece of wood. From the ends of the latter two short pieces, which may be of small pipe or wood, are fastened. The whole virtue of the idea depends on the fact that the distance between these two projecting arms is equal to the width of the compartment into which the zinc has to be packed.



Device for Handling Zinc Shavings

The shaft is moved by a pulley, the speed of travel of the arms being made to equal exactly the velocity of the zinc thread as it comes from the lathe. The result is that when one end of the zinc thread is fastened to one of the traveling arms, the shaving is wound continuously into a skein which will fit into the compartment of the zinc box without further handling. When the skein is sufficiently thick it is slipped off the arms, the thread cut and another skein started.

The skeins of zinc are stored away and are ready for instant use when required without further trouble or expense. A movable guide directs the thread to the skein from any point on the lathe.

The device is installed at the Liberty Bell mill, near Telluride, Colo., where its use has been attended by economy and satisfaction. W. H. Staver, general superintendent of the Liberty Bell, is responsible for the idea and he suggests that the scheme might be adapted for winding skeins of various sizes by replacing the cross piece with a wooden disk having holes at various intervals into which wooden pins might be placed upon which the various lengths of skein might be wound.

Rand Tube Mill Practice

The most effective work in all crushing of hard grains is done by impact, and the falling pebbles in a tube mill are in this respect like the falling stamp in a stamp mill, says W. R. Dowling in "Rand Metallurgical Practice," Vol. I. The greater the number and the greater the height of drops the more crushing is done. Similarly the greater the diameter of the tube mill the greater will be the height of drop, and the higher the speed within certain limits the more drops per minute.

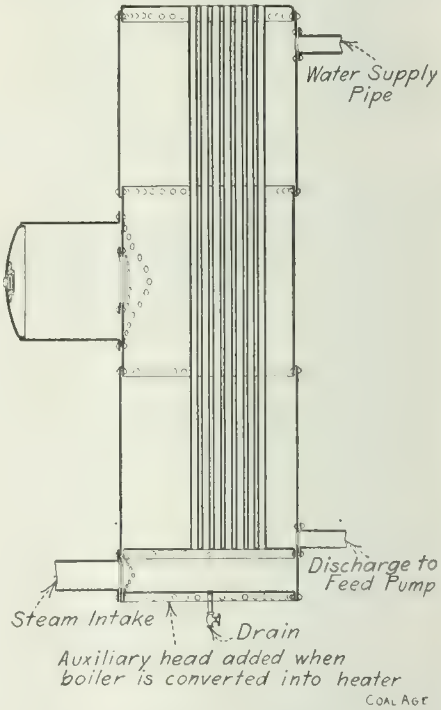
The style of liner is of importance in determining the speed necessary to obtain the maximum height of drop. Should the liner be smooth, as is the case when steel or iron plates are used, then the mass of pebbles tends to slip, especially with a light load, and the revolutions per minute must be increased as compared with the more irregular flint liners. The rapid wear of cast-iron or steel liners appears to be due to the slipping load of pebbles, mixed with sharp-edged sand grains, which grinds away the liner. The life of tube-mill liners on the Rand appears to be far shorter than is the case in other mining districts, such as Kalgoorlie, and the fact may be attributed to the hard abrasive nature of banket ore and to the high pressure at which tube mills are worked in these fields.

It is of utmost importance that tonnage and moisture of feed be maintained at correct standard. With a large dry feed of sand the mill appears to become overloaded at the feed end. The ideal pulp feed appears to be of that consistency which permits of the sand particles adhering to both pebbles and liner, so that whenever a pebble strikes other pebbles or the liner there are grains of sand to receive the impact and be crushed.

A series of tests by G. O. Smart led to the conclusion that, for Rand conditions with a 22x5½-ft. tube mill, 400 tons of sand containing 39% moisture by weight should be fed per 24 hr. With a small feed, 200 tons of solids per day, 27% moisture in the pulp was found to give the best crushing. The reason for this is believed to be that with a large tonnage of exceedingly thick pulp the mill cannot discharge at an adequate rate and becomes over-full, so that large masses of sand and pebbles are projected at once instead of the pebbles individually, as would be the case with a more dilute pulp feed. With a small thick feed, however, overcrowding in the mill does not take place, and more efficient crushing is obtained than with a small feed of solids as a diluted pulp.

Home Made Feed Water Heater

The proverbial "killing of two birds with one stone" is frequently a somewhat elusive problem around mines. The conversion of scrap material at small expense into useful and efficient cost-saving appliances may, however, be justly regarded as one of its successful solutions.



Home-made Heater

An improvised feed-water heater made from an old boiler is shown in the accompanying drawing. The operation of this device is so self-evident that it needs scarcely any explanation, says *Coal Age*, Nov. 23, 1912. It will be observed, however, that the exhaust steam flows upward through the boiler flues while the feed water moves downward outside of them. The direction of travel of the two being thus opposed, the transfer of heat from the one to the other will be the most efficient.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Tons per Man

The data in this article have been taken mostly from annual reports and have appeared in separate articles in the "Cost of Doing Things." No attempt has been made to give full details of working conditions or to group mines of similar working conditions. Tons per man, or in other words, labor efficiency, is the ruling factor in cost records; therefore a careful study of the following may prove interesting to the reader; it must be borne in mind, however, that these records are subject to various working conditions and intelligence of labor employed.

Gold Mines—At the Cinderella Consolidated Gold Mines, Transvaal, during 1911, an average of 324 tons of unsorted ore per annum was obtained per underground employee. The Robinson Gold Mining Co., South Africa, employed 3463 men during 1911, consisting of 423 whites, 66 Cape boys and Indians and 2974 natives; about 205 tons of unsorted ore or 171 tons of ore were mined and milled per man per year. At the West Rand Consolidated during the same year 2820.5 men were employed, of whom 2475 were natives and 345.5 Europeans. The tonnage mined and milled was equal to 115 tons of unsorted ore per man per annum; 11.01% of the ore was sorted out before milling.

In India the Nundydroog mines in 1911 employed 4294 men and mined and treated by milling and cyanidation about 36.2 tons per man per year. Of the employees only 143 were white men, and of the natives 2544 were employed underground. At the Ooregum Gold Mining Co. of India, during the same period, 4600 men were employed, all except 96 were coolies and about 66% of them worked underground. At this property 44.5 tons of unsorted ore were mined a year per underground employee and 29.4 tons of unsorted ore or 26.2 tons of ore were mined and treated during the year per man employed at the mine and mill. The Mount Boppy Gold Mining Co., New South Wales, secured 435 tons per annum for each man employed underground and mined and milled 151.3 tons per man per year. The milling operations consisted of stamping, amalgamation, concentration, cyanidation and retreatment of residue by roasting.

In Brazil, at the Ouro Preto Gold Mines, where the labor is practically all native, during 1910-1911, 105 tons were mined and treated per man per year. The monthly average per man stoping for three years has been 10.2 tons, 10.4 tons and 11.3 tons per month. At the Alaska-Treadwell during 1911, as indicated by figures reported, 1040 tons were mined and treated per man per annum. A record of one of the mines of Goldfield, Nev., indicated about 16 tons per day per man in stopes and 3.5 to 4 tons per day per man at the mines. The Erie Consolidated, Gaston, Calif., mining about 75% of its ore by the caving system and the remainder by stull stoping secures 5.59 tons of rock or 3.85 tons of ore per day per man employed underground. In stopes 6.18 tons of rock or 4.7 tons of ore are mined per day per man stoping.

COAL PRODUCED PER MAN PER DAY IN UNITED STATES IN 1909

	Tons per day per man	Per cent. by Machines
Alabama	2.72	15.57
Arkansas	2.69	none
Colorado	3.14	17.3
Georgia	1.51	none
Illinois	3.78	31
Indiana	3.85	45
Iowa	2.09	small
Kansas	2.46	1
Kentucky	3.23	51
Missouri	2.19	14.47
Ohio	3.44	75
Tennessee	2.51	12.7
Pennsylvania anthracite	2.31	?
Pennsylvania bituminous	3.53	41.48

The Pittsburgh-Silver Peak mine, Blair, Nev., operates through a tunnel. This mine secures about 7.5 tons of ore and waste or 6.22 tons of ore per day per man employed at the mines and 13.5 tons of ore and waste in stopes per man stoping. The ratio of waste to ore is about 1:37.5. H. C. Hoover, in his "Principles of Mining," selected a group of mines working under the same conditions with modern machinery and gives the following figures: Three mines in India, mostly colored labor, 69.3 tons per man per annum; three South African mines, mostly colored labor, 195.5 tons per annum; six Australian mines, white labor, 669.9 tons per annum; and five American mines, white labor, 713 tons per man per annum.

Copper Mines—The Copper Queen Consolidated in 1911 employed one man for every 330 tons mined per annum or one underground man for every 400 tons. The Calumet & Arizona at its Superior & Pittsburg mine secured 596 dry tons of ore per year per man and at the Calumet & Arizona mine 435 tons, an average of 496 for the two. The Cananea Consolidated hoisting about 30% of its ore and hauling the remainder through tunnels to the surface secured 88.5 tons of ore and waste or 61.5 tons of ore per month per man employed underground, and 163 tons of ore and waste or 145 tons of ore per month per man in stopes. The labor consisted of about 93% Mexicans and 60% of the ore was mined by top slicing.

The British Columbia Copper Co., at its Mother Lode mine, including no development and hoisting from 375 ft., secures 11 tons per day per man at the mines, 15 tons per man underground, 19.5 tons per man working in stopes and 30.9 tons per man breaking ore. All ore is mined by chamber and hollow-pillar system. The Mammoth Copper Mining Co., Shasta County, Calif., operating through tunnels, secures 998 tons of ore and waste or 895 tons of ore per annum for each man employed at the mines, 1220 tons of ore and waste or 1140 tons of ore per man underground and 1655 tons of ore per annum per man stoping. The Tennessee Copper Co. from 1905-1910, inclusive, has secured 910 tons, 936 tons, 959 tons, 870 tons, 834 tons and 830 tons, respectively, per annum per man employed at the mines. The average of this period is 882 tons. The North Butte mine secured 1.46 tons per day in 1910 and 1911 per man employed. The Mass Consolidated in Michigan in 1907 and 1908 secured 935 and 1147 tons, respectively, per man employed.

Iron Mines—The Republic Iron & Steel Co. has secured during the period 1907-1912, in the order named: 611 tons, 850 tons, 999 tons, 999 tons, 1049 tons and 1250 tons per annum per man employed in its iron mines. The United States Steel Corporation iron mines produced an average of 1435 tons per annum per man employed during 1910 and 1911. Figures for 1908 show production per man per year for some of the Michigan iron mines as follows: Hartford mine 1100 tons, Lake Shaft mine 1255 tons, Austin mine 1045 tons, Chapin mine 1250 tons, and the Norrie mine on the Gogebic range 868 tons per man per annum.

The Broken Hill Proprietary, Block 10, a zinc mine in Australia, secured about 442 tons per annum per man employed underground and mined and milled about 224 tons per man employed. At the Grace Zinc Co., Joplin, Mo., approximately 3.17 tons were secured per day for each man employed at the mine. The Broken Hill South Silver Mine, Australia, during the half-year ended June 30, 1912, mined 432 tons per annum per man underground and mined and treated about 229 tons per man employed..

In the accompanying table are given data concerning coal mining in the United States in 1909, taken from Government reports.

Summary of Iron Mining Costs in Michigan

A general summary of all districts of Michigan where iron is mined, viz., Gogebic Range, Iron River, Crystal Falls, Old Menominee Range, Western Marquette Range, Marquette hard ores and Marquette soft ores has been published separately in the "Cost of Doing Things."

The table given herewith was compiled to give these data in condensed form. It will be noticed in the table that a group of low-grade mines has been classified separately; these mines, as a whole, have lost on an average of 5% of the average value of the ore produced by them. The figures given in this table represent a five-year average of all the iron mines of Michigan and were obtained from data given in the report of J. R. Finlay to the State of Michigan for taxation purposes. They probably represent as elaborate a compilation of general costs on iron mining as has ever been compiled in the state, if not elsewhere. The tonnage shipped and accounted for in these data amounts to 52,895,459 tons, as follows: Gogebic Range, 15,393,642 tons; Iron River district, 3,820,308 tons; Crystal Falls district, 6,119,177 tons; Old Menominee Range, 9,335,812; Western Marquette, 657,370 tons; Marquette hard ore, 3,888,557 tons; Marquette soft ore, 10,830,611 tons; Swanzy district, 1,670,263 tons; sundry low-grade mines, 1,179,719 tons.

Rail freight from mines in the Marquette Range was as high as $3 per ton in 1855; in 1856 it was lowered to $1.27 per ton and to 87c. in 1858; from 1860 to 1870 it ranged from $1.09 to $1.10, and since 1870 the rate was as law as 25c. per ton, but since 1904 it has been 32c. per ton. Ores shipped from Marquette ranges by Escanaba have a charge of 40c. per ton for rail freight; the same rate applies to ores shipped from the Menominee Range and the Gogebic Range ores shipped to Ashland. The lake freights to lower lake ports have been as follows, from 1906 to 1911, respectively: From Marquette 70c., 70c., 60c., 60c., 65c. and 55c.; from Escanaba 60c., 60c., 50c., 50c., 55c. and 45c.; and from Ashland 76c., 76c., 65c., 65c., 70c. and 60c. per ton. According to the general average, as shown in the table, including low-grade mines, the average cost of Michigan iron ore at Cleveland is equal to 80.5% of its value, indicating an average profit of 19.5% to the mine operators; adding royalties, which have averaged 6.7%, the average profit to mine operators and fee owners has been 26.2% of the average value of the ore.

RATIO OF COSTS AND PROFITS TO VALUE OF ORE PER TON F.O.B. CLEVELAND, O., FOR IRON ORE MINED IN MICHIGAN

A Summary of Records from 1906-1910 inclusive	Gogebic Range	Iron River District	Crystal Falls District	Old Menominee Range	Western Marque'te Range	Marque'te Hard Ores	Marque'te Soft Ores	Swanzy District	Sundry Low-Grade Mines in Various Districts	Gen. Avg of All Iron Ore Mines of Michigan
Mining...	32.3	39.0	31.0%	33.0%	52.5%	39.5%	36.4%	49.4%	34.1%	34.9%
Exploration and development	2.3	19.0	1.1	2.64	8.2	2.4	2.1	2.2	3.8	3.4
Construction, shafts, machinery, etc	3.92	7.5	6.6	2.97	0.3	4.4	3.2	2.5	7.4	4.2
General expense, including administration, etc	2.36	2.6	2.6	2.83	2.5	3.3	3.3	2.5	2.4	2.7
Royalties	9.1	6.3	7.6	7.0	7.1	1.5	4.5	8.0	6.3	6.7
Taxes	1.51	0.55	0.5	2.34	0.3	2.8	2.1	1.5	0.8	1.7
Rail freights	9.15	11.5	11.5	11.0	12.5	8.9	8.3	10.0	19.0	9.9
Lake freights	16.0	15.3	16.5	15.40	23.2	13.4	16.8	16.2	28.4	16.1
Commissions	1.06	2.0	2.6	0.02	2.4	0.3	0.3		2.8	0.9
Total cost per ton	77.7	103.75	80.00	77.2	109.0	76.5	77.0	92.3	105.0	80.5
Average loss per ton		3.75%			9.0%				5.0%	
Average profit per ton	22.3%		20.0%	22.8%		23.5%	23.0%	7.7%		19.5
Total value of ore f.o.b. Cleveland	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Elkton Consolidated

The annual report for 1911 of the Elkton Consolidated Mining & Milling Co., Cripple Creek, Colo., gives some of its costs as follows: Tramming 53,136 mine cars of ore and waste, 14.6c. per car, a car being equal to about 0.7 ton; of the ore hoisted about 42% was discarded as waste. Labor for breaking ore costs 78.5c. per ton; waste $1.143 total cost of breaking for these two items or 81.4c. per ton for ore and waste; including a cost of 23.6c. for powder the was $1.05 per ton. Other partial costs were: For underground labor and powder, $1.36 per ton hoisted or $2.32 per ton shipped; sorting and sampling, 23.6c. per mine car of ore or 33.7c. per ton hoisted; based upon the tons of ore shipped, the cost of sorting, sampling and loading was 67c. per ton. The average cost of sinking a winze for 82 ft. was $12.51 per ft., consisting of $10.655 for labor and $1.845 for powder. The average cost of a raise for 82 ft. for labor was $3 and powder $1.62, a total of $4.62 per ft. Sinking 55 ft. of shaft averaged $12.46 for labor and $2.92 for powder, a total of $15.38 per ft. On the company's account 2684 ft. of drifting were done at a cost of $4.02 for labor and powder against a cost of $5.97 per ft. for 474 ft. let to contractors. The average cost of sharpening hand and machine steel was 2.7c. each. The average wage for men employed underground, including shift boss, was $3.51 per shift; entire mine, exclusive of management and office, $3.436 and including management and office $3.69 per shift.

Unloading Coal on Bonus

In some plants the chief engineer finds it rather expensive to unload coal from cars by hand and transport it by wheelbarrows to the coal pile or pit. To those having charge of such work, says W. L. Myles, in *Power*, the following should prove interesting:

The laborers unloading coal from cars usually work slowly and the cost per ton of unloading is often great. The cost per ton generally can be reduced by unloading the coal on a bonus system by which the men are amply compensated for the extra effort which they may exert in their work.

In some places the car is simply opened at the bottom and the coal dropped into the coal pit, in others the coal has to be shoveled into wheelbarrows, and wheeled to the coal pit. It was in one of the latter places, where the coal had to be wheeled 20 ft. from the car to the pit, that the bonus system was tried very successfully.

Before the men were put to work on a bonus it took three laborers from 1½ to two days to unload a 50-ton car. The cost to the company was about $10, or 20c. per ton, the men receiving 18c. per hour. Under the bonus system two men were given the job of unloading a 50-ton car. They shoveled out the coal and wheeled it 20 ft. to the coal pit in a total time of 19 hr., or about 26 min. per ton. The cost of unloading the coal was reduced to 14c. per ton and the men averaged about 30c. per hr. This speaks well for the bonus system when laborers can increase their pay from 18c. to 30c. per hour.

Hollinger Cyanide Mill, Porcupine

By Herbert A. Megraw

A new 400-ton cyanide mill in northern Ontario. The ore is easily crushed, but a large portion of it forms a heavy, granular product which is difficult to agitate and gives rise to filter troubles. The gold is easily dissolved and presents no metallurgical problems. Stamps and tube mills are used for crushing and grinding and a Moore vacuum filter separates the residues from solution. Concentration is practiced and the concentrate is amalgamated in pans. The Merrill system of zinc-dust precipitation is used. Good results are obtained and the mill is in steady operation.

The plant of the Hollinger Gold Mines, Ltd., is situated east of Miller Lake, near the town of Timmins in the Porcupine district of Ontario, Canada. The mill occupies a site on the side of a hill in proximity to the main shaft from which the ore is hoisted from the mine. The ore is broken to a size appropriate for stamp milling at the shaft head and is then conveyed by means of an inclined belt conveyor to the mill bins, where it begins the process of reduction. The accompanying engraving of an east view of the mill shows the conveyor which carries the broken ore to the mill bins.

Ore Soft and Easily Crushed

The ore, in which gold is the valuable content, is comparatively soft and is easily crushed, the crushing and grinding machinery having a high rate of efficiency, as will be shown. The mill run consists of about two-thirds sericitic schist and about one-third quartz, all the rock being highly schistose and for this reason easily crushed and ground. While a good proportion of slime is formed, there is also a large proportion of fine sand in the product which passes a 200-mesh screen. Thus a product for treatment is formed which is largely granular in character and which presents the difficulties usually encountered in a pulp of this character. The mineral is heavy, the dry slime having a specific gravity of about 2.85. A pulp of this character always is troublesome to handle on account of its tendency to settle at every opportunity, and the machinery for handling it has to be designed particularly with the idea of obviating, as far as possible, every chance for the heavy, granular solids to settle and give trouble in treatment.

The ore from the mine is first passed through a No. 7 Kennedy gyratory crusher, after which it goes through a trommel having 2½-in. openings, the undersize going directly to the 20-in. inclined belt conveyor, which carries it to the mill, while the oversize is passed through a 20x10-in. Allis-Chalmers Blake crusher, which reduces all the rock to 2½ in. The crushed ore joins the undersize from the trommel on the conveyor belt.

The incline conveyor delivers the ore to a cross conveyor which reaches over the top of the mill bin and, by means of a Robbins tripper, the ore can be delivered at any desired point in the bin. The bin is of wooden construction with flat bottom and has a capacity of 1000 tons of rock.

Suspended Challenge feeders deliver the ore to the stamps, of which there are 40 of 1500 lb. each, dropping in a narrow mortar of the type used for speed crushing. The height of drop is 6¼ in. and the frequency is 100 drops per minute.

East View of Hollinger Mill, Porcupine, Ont.

The screens used in the battery are of the slot form of wire cloth, the size used being about six mesh in width and about ¼ in. long.

Experiments made on crushing capacity show that through a 14-mesh screen of this type a capacity of eight tons per stamp per 24 hr. is obtained; with 6-mesh, 9½ tons and with 4-mesh, 12½ tons. The screen normally used at the present time is the 6-mesh and a regular crushing of 9½ tons, possibly a little in excess of this figure, is obtained.

Crushing is done in cyanide solution of 1½ lb. KCN per ton, the ratio being five of solution to one of ore. The mortars are arranged so that the height of discharge is two inches.

Classifiers and Tube Mills in Closed Circuit

From the stamps the ore is carried by gravity to four Dorr duplex classifiers of the Belmont type. This type of machine is fitted with a crank arrangement with which the rakes may be lifted above the bed of sand and the machine started. This is of great service when a large amount of sand has settled in the classifier after a shutdown, the rakes being gradually lowered into the settled sand and raking it out by degrees.

The sand from the classifiers is reground in four Allis-Chalmers tube mills each 5x20 ft. They are lined with silex brick, the brick being set on edge in the mill, thus giving thickness which aids in giving long life of the lining. At present no idea of the life of these linings can be obtained because the original linings are at work and do not show any great indications of wear.

The tube mills are fitted with special spiral scoop feeders, 22 in. in diameter. Through these feeders the daily addition of pebbles is also put into the mill. The pebble charge is about six tons to each mill and the consumption is approximately two pounds per ton of ore ground. The consumption of pebbles was higher at first, reaching four pounds per ton at one time, but is gradually becoming less and it is expected that the normal consumption will remain at about two pounds per ton.

The consistency of the pulp fed to the tube mills varies somewhat from that usually considered most efficient and is the result of experiments undertaken to determine the most efficient dilution. The weight of the solids in this case makes it most efficient to use a thick pulp, 33% moisture having proved to give the best results. The mills make 28 r.p.m., use No. 1 Danish pebbles and grind 90 tons per 24 hr. to a point such that 90% passes a 200-mesh screen. The illustration shows the arrangement of the stamps, classifiers and tube mills.

Note. This is the fourth of a series of articles on American cyanide practice by Mr. Megraw. The first article appeared Nov. 23 and Dec. 7, 1912.

Original Driving Device for Stamps and Tube Mills

At this mill an original device, by means of which a unit of 10 stamps and one tube mill is driven from one motor, is installed. The motor, of 100 h.p., is connected with a 3$\frac{15}{16}$-in. line shaft by means of a Reynolds silent-chain drive, and this shaft passes to stamp-mill line shaft, of 2$\frac{15}{16}$ in., at right angles, moving it by means of a miter gear. The motor shaft continues to the front of the batteries and is directly geared to the tube mill. The advantage claimed for this arrangement is that the full power of the motor may be utilized for starting the tube mill after a shutdown; the power is sufficient to overcome the inertia of the loaded mill, the stamps being hung up while this is done. The cam shaft for the 10 stamps, six inches in diameter, is in two parts and is driven by a pulley on each end. The arrangement of the driving motor and shafts is shown in the accompanying plan of the mill. This arrangement, while having the advantage claimed for it, has also the apparent disadvantage of being subject to breakage due to the crystallization of the metal of the gears from the constant vibration caused by the stamps. As a matter of fact some of these gears have already broken, but it is considered that the advantages of the system outweigh the disadvantages.

Removal of Coarse Gold by Concentration

The slime product from the classifiers is led to a series of wooden dewatering boxes, 20 in number, each 6x6x6 ft., having pointed bottom and goose-neck discharge. This dewatering plant is really two 10-compartment spitzkasten, and is used to obtain a pulp thick enough for efficient concentration. The underflow from the spitzkasten, at a dilution of three of solution to one of solids, is led to 40 No. 3 Deister slime concentrators. The concentrators are installed for the sole purpose of removing from the pulp the comparatively coarse particles of gold which would require a long time to dissolve in the cyanide solutions used. There is not a great deal of this gold that ever appears on the tables, most of it being retained in the tube mill and ground until it is dissolved in the solution.

Gold, even in fine state, does not show on the tables unless there has been an unusual quantity of extremely high-grade ore milled, which is exceptional. The expectation, when the mill was designed, was that there would be a large quantity of comparatively coarse gold, which would come out of the tube mill and would take such a long time to dissolve in cyanide solution that there would be danger of its being incompletely dissolved and discharged in the tailing. This idea has proved to be generally incorrect, the coarser particles of gold being ground up and dissolved to a great extent in the tube mill. The concentrate recovered, however, is high in gold and is treated separately on the ground.

Amalgamation of Concentrate

The concentrate from the tables drops directly into conduits in the floor, which are equipped with spiral steel conveyors by means of which it is conveyed to the end of the concentrator room, where it is received by a cross conveyor of the same type and delivered into the boot of a belt-and-bucket elevator. This spiral conveying system would seem to be a rather expensive way of conveying concentrate on account of the large amount of power usually consumed by machinery of that class. Screw conveyors are usually not considered altogether satisfactory on that account.

The concentrate is elevated to a launder which delivers it into four wooden, flat-bottom bins, each 4x7x5 ft., where it is stored and shoveled out as required in the amalgamation treatment.

There are installed four Chalmers & Williams standard Wheeler pans, five feet in diameter, and into each of these is charged 1.5 tons of concentrate, 100 lb. of mercury and some lye for keeping the mercury clean, the pan being filled up with solution. The mullers of the pan are let down and grinding is continued for one hour, after which three hours are devoted to amalgamation. The pulp is then pased to two 8-ft. settlers, where settling is completed in four hours, the amalgam being drawn off and cleaned up in a small cleanup pan. In this way about 97½% of the gold contained in the concentrate is recovered, the amalgam being sent to the refinery, where it is retorted and the resultant sponge added to the bullion obtained from the regular cyanide treatment.

As already mentioned, the original scheme of treatment included this concentration and amalgamation for the purpose of taking care of the expected quantity of coarse gold, but that has not been encountered in practice and it is altogether probable, according to the management, that this step in the process can be left out, the straight cyanide treatment being able to recover as much gold without it. Experiments toward this end are being undertaken and a decision will be made within a few months as to the course which will be pursued. The illustration shows the present installation of bins, pans and settlers, together with the elevator which brings the concentrate from the level of the concentrator room.

Dorr Thickeners Used before Treatment

The tailing from the concentrators is joined by the solution which was taken from it by the spitzkasten and goes to two Aldrich triplex slime pumps, each 10x12 in., which deliver to four Dorr thickeners. These thickener tanks are 30x12 ft. and the scraper arms make ⅙ revolutions per minute.

Each triplex pump is operated by a 10-hp. motor and lifts the slime in an 8-in. spiral-riveted pipe through 30 ft. to deliver into the thickeners. The pulp from the amalgamation treatment joins the concentrator tailing and goes through the regular cyanide treatment in the mill. The Dorr thickeners deliver an underflow containing 48% moisture which is elevated in two belt-and-bucket elevators with 10-in. buckets into the treatment tanks.

The pulp going into the Dorr thickeners receives the lime which is required for treatment. The dry lime in a fine state is put into a small pan and an emulsion is made, which is fed continuously into the pulp as it enters the thickeners. A portion of the lime is so coarse that it does not dissolve or float out of the emulsifying pan, and this portion is recovered and put into the mortars of the battery, where it is soon ground up and dissolved. The total quantity of lime added is at the rate of five pounds per ton of dry ore.

Heavy Solids Make Agitation Difficult

There are four agitating tanks each 30x15 ft. with flat bottoms which are equipped with Trent agitators operated by 6-in. Morris centrifugal pumps. The pulp is treated continuously through three of these tanks, the length of time of this passage being about 48 hr., experience having shown that this is sufficient time for treatment; the fourth tank is reserved as a spare. Due to the high specific gravity of the solids these agitators have been unsuccessful in handling the pulp in the agitation tanks. The pulp cannot be successfully agitated if this is thicker than 3:1, the power for moving the arms running as high as 18 hp. per tank.

At the 3:1 dilution the sand and granular slime settle in the tanks, stopping the agitator arms and giving an endless amount of trouble. This trouble extends to the filtration department where, on account of having to filter a dilute pulp, the operation cannot be performed in an efficient manner. On account of the difficulty experienced with these agitators it has been decided to remove them and install an agitator of a different type, which will be described. With the Trent agitators, in addition to the difficulty inside the tank, there is the difficulty experienced with the use of centrifugal pumps. With the pumps used this consists principally in the difficulty and time required to take them apart and examine the interior.

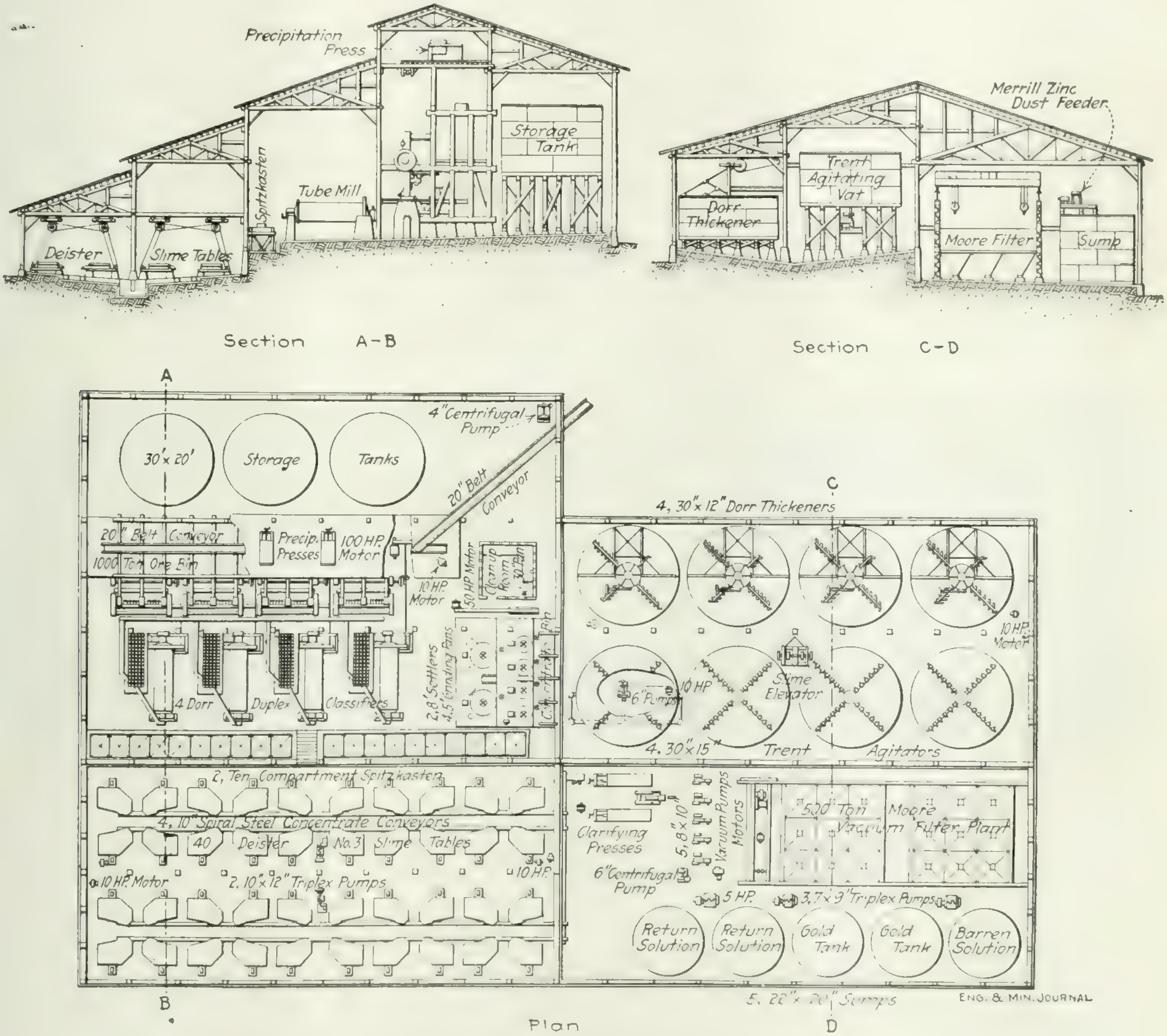
The agitators to be installed are the Dorr type, which is simply a mechanism with four revolving arms equipped with rakes exactly as in the Dorr thickener but revolving at a higher speed. The slime is raked down to the center of the tank and is then lifted by means of an air lift situated in the center of the tank, circulation being down through the tank and up through the air lift in the center. The system has been tried in an experimental way at this mill and there is now under way the equipment of the spare agitation tank, with the agitation mechanism which will be given a through trial on a working scale. The arms will make 12 r.p.m. The solution used in treatment is 1.5 lb. KCN per ton, as is all the solution used in the mill.

Moore Vacuum Filter Used

The pulp from the treatment tanks is sent to the filter plant by gravity. The filter plant consists of a Moore installation of four baskets of 60 leaves each, the leaves being 6x8 ft. each. There are six tanks in two units, each tank measuring 28 ft. 4 in. wide and 9 ft. 6 in. long, and having sides nine feet deep for the vertical part, beside hopper bottoms which have 7 ft. 6 in. additional depth. There are five 10x7-in. Buffalo vacuum pumps, one for each basket and one for the acid washing of the leaves. One crane handles the four baskets, having a capacity of 35 tons total load. The crane has two motors, one of 40 hp. for the lift and one of 15 hp. for the lateral travel. Some trouble has been experienced with the crane, it apparently having been designed somewhat light for the work it has to perform.

The cycle of operations is longer than should be necessary, one hour being allowed for loading, during which time a cake 1¼ in. thick is formed. One hour is allowed for solution wash and five minutes for the water wash. Transferring the basket takes about two minutes and discharging the cake, which is done in the water washing tank, about 15 min. The discharge is continuous, the tailing containing about 25% moisture.

It is extremely difficult to get efficient washing under the conditions obtaining with this filter because the slime is so dilute and the solids so heavy that they will not stay in suspension, the result being that there is a segregation in the cake, the lighter and more inpenetrable slime being at the top of the leaf, while

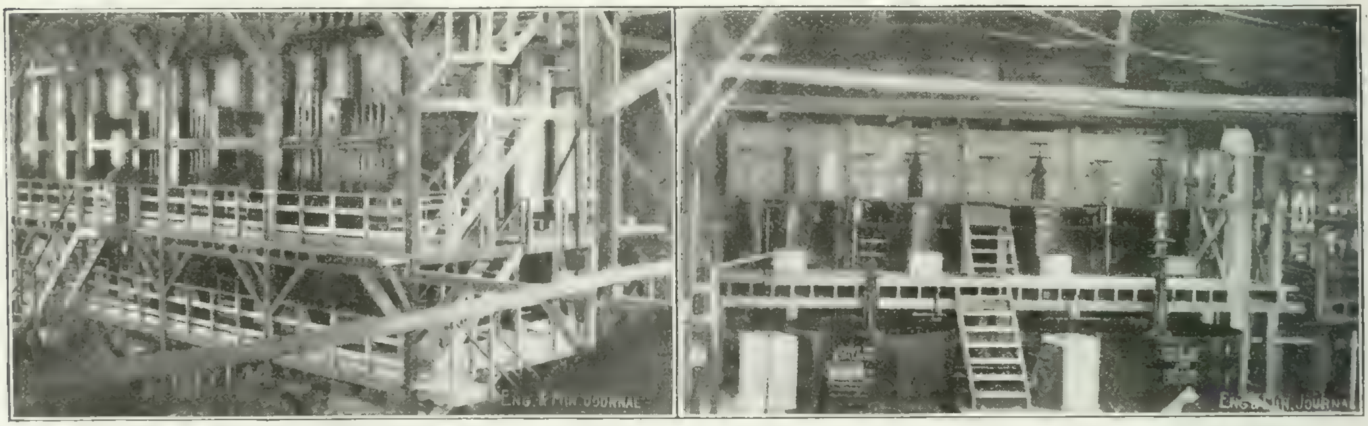


Plan and Sections of Hollinger Mill, Porcupine, Ont.

further down it is more and more mixed with granular product until the bottom of the leaf contains a porous, granulated material which is to all intents sand, and through which the wash solution will pass, leaving the upper part of the leaf, which contains the true slime, practically unwashed. The filter tanks are supplied with air lifts to assist in keeping the solids suspended, but they are not altogether efficient and are rather troublesome to take care of.

The major part of this filter difficulty is traceable to the inefficiency of the Trent agitators. With a properly thickened slime, as has been proven in this case, less trouble will be experienced in keeping the solids in suspension and the homogeneous cake thus formed can be washed with a 97½% efficiency. It is expected that with the installation of the new system of agitation a thick pulp, 1:1, will be maintained throughout the agitation and filtration system with beneficial results to both.

The loading solution from the filter plant, together with a part of the solution from the Dorr thickeners, is passed through two 20-leaf 36-in. Merrill clarifying filters and to the pregnant-solution sumps, of which there are two, each 22x20 ft. This solution is pumped out by means of a 7x9-in. Aldrich triplex solution pump, into which zinc dust is fed through a Merrill feeder at the rate of 0.2 lb. per ton of solution, into two 20-leaf 52-in. Merrill triangular precipitate presses, where the precipitate is recovered. The regular addition of cyanide is made to the gold solution before precipitation, the cyanide being ground up and dissolved in the flow of solution. No cyanide is added in any other way in this mill. The solution precipitated is about four tons to every ton of ore treated, the consumption of zinc being 0.8 lb. per ton of ore milled. The precipitated solution is sampled for tonnage and assay purposes by a tilting-bucket device.



Stamps, Tube Mills and Classifiers; Amalgamating Pans and Settlers at Hollinger Mill

The resulting precipitate from the cyanide treatment is fluxed in the following proportions: Precipitate, 100; borax, 20; soda, 7; and silica, 3. It is melted in a Monarch tilting furnace using oil fuel, in a No. 275 graphite crucible, the bullion being remelted in a No. 60 crucible. The resulting bullion is about 760 fine in gold. It is contemplated that later a lead stack will be installed for the purpose of melting down the precipitate with litharge and then cupelling it in an appropriate test. By this means a finer bullion will be produced.

A plant for sampling the ore going to the mill will be erected at some time in the near future. At present every car of ore is weighed and a sample of it taken so that some idea of the work done may be obtained. The new plant will contain Snyder and Vezin samplers and a proportion of the entire ore will be cut out, reduced in small rolls and crushers and the ensuing sample reserved for assay.

The total power required to operate the mill is about 500 hp., electrical current being used for all purposes. The mill is of wood construction, well built, and is covered with corrugated iron. It is sheathed inside with wood over a layer of tarred paper and is amply heated with steam, making a comfortable mill to work in during the winter season.

Metallurgical Difficulties Few

There are no great metallurgical difficulties, those that were expected before operations were commenced having failed to materialize. The ore is clean and contains no rebellious elements and the gold dissolves easily in the weak cyanide solutions used. The ore does not develop much acid as is shown by the small quantity of lime used during the treatment. It might be safely said that the only problems which have been encountered are the mechanical ones already mentioned as due to the high specific gravity and granular character of the solids in the pulp.

The recovery of gold is thoroughly satisfactory, a total extraction of 93% being obtained even under the present circumstances of mechanical imperfection. Of the gold recovered, about 85% is dissolved in the grinding operations, which are intended to include stamping, classifying and tube milling, and 15% in the agitation department. The high percentage of gold dissolved in grinding is worthy of note. It is usually true that a large proportion of metals is dissolved in the grinding department, but not much attention has been given to a study of the fact and utilization of the opportunity presented.

The dissolving rate is largely due to the efficiency of the tube mill as an agitating machine, the grinding action of pebbles liberating and cleaning the gold and getting it in contact with solution in a condition most conducive to prompt dissolution. For this reason it is good practice to make the most of the tube-mill action and do everything to assist the extraction of metal at this point. I believe it is a good thing to freshen up the solution just before going into the tube mill either by adding fresh cyanide, part or all of the addition that is regularly made, or by using a solution which has been freshly rejuvenated by means of some one of the accepted methods.

The general run of ore milled has a value of about $20 per ton, of which about 98% is recovered in the mill. The mill started operations in June of this year and the greater part of the elapsed time has been taken up in systematizing the operation, making necessary minor changes and in general tuning up the mill so that a normal basis of cost could be obtained. The mill is now running well and the cost is not excessive, but the management desire to establish the costs firmly before publishing any data.

The mill is well built, compact and convenient, and reflects credit on its constructing engineer, A. G. Kirby. The operations of the Hollinger Gold Mines, Ltd., are under the direction of P. A. Robbins, manager, and the mill is superintended by Noel Cunningham.

Mine Slope Economizing Hand Labor

By John J. Smith

A single-track mine slope designed to minimize hand shifting of cars; the operator has unobstructed view of the entire trip and as the rope runs in a straight line no guide sheaves are necessary. Provision is made for blocking all runaway cars.

I described in the Engineering and Mining Journal of Apr. 13, 1912, a design of self-acting plane, the central idea of which was the elimination of hand shifting and the introduction of safety features to prevent the escape of wild cars down the incline.

This brought to mind a slope built several years ago, the central idea of which was the same. Slopes, like inclines, are of several types, but the commonest and the only one considered here is that in which the mine cars are hitched to a cable and pulled up the slope, from the top of which they run to a bin or tipple

The remarks, which were made in the previous article as to the necessity of a complication of tracks in ordinary designs to take care of alternating loads and empties, the switches necessary to put these tracks alternately in connection with the incline track or tracks, and the level space necessary for the installation of these tracks, apply with about the same force to slopes as they do to gravity inclines, consequently they need not be repeated in detail here.

In the design of the incline it was desired also to have the trip under the continuous observation of the operator, the advantages of which were explained in the preceding article.

Considerations of safety are much more urgent in the case of a slope than they are in the case of an incline for the reason that there is open ground all about the lower end of the latter, and all parts of it are in broad daylight, so that if a wild car comes down the incline it is easy for workmen at the bottom to see it and to avoid it. But with the slope there is virtually no opportunity whatever to see a runaway car until a fraction of a second before it reaches the bottom, and even if seen, the amount of space available in which to escape from its destructive energy is limted. In spite of the greatest precaution, during the sinking of the slope in question, we have had the car break loose several times, and that no one was hurt was a matter of extreme good fortune and nothing else. Hence, the urgency of safety requirements in our mines.

Single Track Slope

The slope to be described was sunk parallel with the strike of an orebody having a dip of about 30°. The lower end of the slope was situated about 120 ft. from the orebody in the hanging wall, for the reason that in the particular ore deposits concerned the hanging wall is perfectly rigid and has never been known to give away to any extent, but the settlement due to the caving system employed in mining, takes place on the foot-wall side. The crosscut from the foot of the slope to the orebody was at right angles to both and was made wide enough for double track, the two tracks uniting at the entrance to the orebody, as the mine track proper, and also uniting just above the foot of the slope as the slope track proper.

The slope in this case was a single-track one. This is not as good practice as the double-track slope, but is much less indefensible than the single-compartment vertical shaft, especially in the practice to be described, because the mine cars were light in proportion to the load they carried; only about 1000 lb., as I remember it, to carry a load of two gross tons. Hence the proportion of dead to useful load is vastly less than with the car-carrying cage and the loss of power proportionately less.

One reason for making a single-track slope instead of a double was the saving in expense. The other was the fact that it was not then deemed possible to design a double-track slope, which would have the advantageous features for the elimination of shifting and for safety possessed by the present single-track design to be described.

The angle of the slope was chosen as that which would be possible for men and mules to mount readily, and this slope was determined to be one in three, or about 20 degrees.

Double-Track Slope Possible

Since the successful operation of the inclines which were described in the article above mentioned, I am inclined to believe that some of the features used in the design of the incline could be combined with the features of the present slope and so make a double-track slope with the same advantages as the single track. The belief in this possibility is one of the reasons for this article.

The slope was of the two-compartment type, the one next the orebody being for the track exclusively, the opposite one a pipe-way, man-way and air-way. Because the second compartment was used as an air-way and in order to strengthen the caps or collars of the timbering, a center row of posts was used, but this would not be the case if a double-track slope were used.

Owing to the position of the railroad tracks in relation with the top of the slope there was about 400 ft. of travel for the cars from the top of the slope to the bin, where they were dumped. It was desired to have the cars run freely by gravity to this bin loaded, and back from it empty. The grade necessary for this was 1½% in each case.

As the track ran with this grade from the top of the slope down to the bin, and from the bin down at the same grade to its intersection with the slope again, the latter was about 12 ft. lower than the top knuckle proper, and a switch was arranged in the slope track at a point about 36 ft. below the top knuckle to receive the empty cars.

The general arrangement of the head works of the slope is shown in Fig. 2, which shows a plan and elevation and also an inclined plan of a portion of the top of the slope. The entrance to the slope was situated near the bottom of a ravine, of which the slope of the hillside was a little less than that of the slope proper; therefore, to preserve the feature of having the rope run in an unbroken line down the slope and to have the operator's vision of the trip uninterrupted, it was necessary to put the hoisting engine on a rather high foundation, and the last few feet of the slope proper and the first few feet of the loaded track to the bin were set on low trestles, as shown. The engine house was supported on high posts running from the level of the ground, as shown. The situation on the hillside was such that the ground rose sharply on the left-hand side facing down the slope, and the boiler house was placed on solid ground just beyond the engine house in this direction at a level slightly lower than that of the engine house. The operation was a small one and one man was able to attend to both boiler and engine. It will be seen that a man standing in the operator's position just in the rear of the engine cylinders would have an absolutely uninterrupted view down the slope.

Loaded Cars Pass under Engine

There was another reason for setting the engine quite high in the air. In order for the car to reach the bin it was necessary for it to preserve virtually the direction of the vertical plane of the slope. Therefore, it must get past the engine house and foundation. This was accomplished by building the foundation in the form of two parallel walls entirely separated, as shown in the plan view, connected at the top by two stout girders anchored rigidly to the two piers.

The bottoms of these girders and of the floor beams were a trifle over six feet above the level of the loaded track. The loaded track was continued straight through between these two piers and the car, after reaching the top of the slope, ran directly under the engine, there being room enough for a man to pass under freely. There was a floor laid under the rails from the top of the knuckle back to solid ground behind the engine house; it was of sufficient extent to make a convenient working platform for the top men. Ugly curves at the top of the slope were thus entirely avoided.

Leaving out of account details the operation was as follows: The trip of one or two cars was hoisted over the knuckle, the top man then set the car brakes and unshackled the cars from the rope. It will be explained presently how the rope was kept taut and above his head, except for the piece of chain permanently fixed to the end of the rope to which the cars were shackled, as shown in Fig. 2. The lower end of this chain was thrown aside, the car brakes released and the top man then rode them to the bin. There he took two empty cars awaiting on the empty track and rode them back to a point near the intersection of this track with the incline, where they were again shackled to the rope and allowed to run on to the incline proper, then lowered to the bottom.

At the bottom, it may be well to state, the two tracks in the crosscut above described, sloped opposite ways from the switch near the orebody. The slope track proper curved into the first of these, which ran from this bottom point on a down grade of 1½% to the switch, and from this point the loaded track ran back parallel to the empty, but sloping in the opposite direction so that at a point in the central plane of the slope it was about two feet lower than the empty track. This track then made a curve parallel to and outside that of the empty track and came into the slope track proper at a point a short distance above the bottom through a spring switch, all as roughly illustrated in Fig. 1 of the accompanying drawings.

Loaded Cars Fed to Foot of Slope by Gravity

When the trip reached the bottom the cars were unshackled and allowed to run down on the empty track toward the orebody. Loaded cars on the outside curve were shackled on and hoisted to the top. A vertical pulley was situated so as to guide the rope in swinging out to the cars on the loaded track.

It will be seen, therefore, that the loaded cars were fed to the foot of the slope, the empty cars returned toward the mine, the loads run to and the empties returned from the bin at the top all by the means of gravity.

Those who have had to do with rope-operated means for handling cars will, I think, agree that one of the features easiest to overlook in making a design, and the hardest to escape in operation, is shifting the end of the empty rope from the point where the loads are unhooked to the point where the empties are shackled on, and *vice versa.*

In slopes this is not quite so serious as in inclines, because if properly designed the power of the engine is available for throwing slack in the rope and unwinding it from the drum, which is not the case with inclines, but even under these conditions it is frequently noticeable that it is heavy work to transfer the end of the rope from the loaded to the empty cars. It was desired in this design to eliminate this work as much as possible.

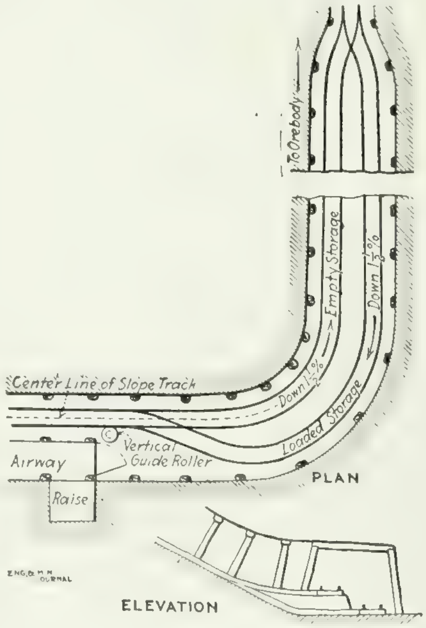


Fig. 1. Foot of Mine Slope, Showing Gravity Switching Arrangements

It is obvious that it is necessary to unwind about 35 ft. of rope from its position at the end of the hoisting trip in order to restore the empty to the slope track, after which the weight of the car is sufficient to overcome the rope and drum resistance. This would make such a design as that shown intolerable if some means were not taken to facilitate this transfer.

Safety Device for Runaway Cars

It will also be obvious to those familiar with such operations that the cars, after landing on the loaded track with its grade away from the top of the slope, might from time to time, by one means or another, be pushed back over the slope after unshackling and that empties might escape from the bin and return by the empty track to the line of the slope and plunge down it, causing death or injury to those at the bottom.

It may be stated here that a spring derail was introduced between the point where the empty was stopped for shackling to the rope, and the incline, and that this derail had to be held closed by hand in order to take the car on to the incline, but this was not considered a sufficient precaution. It was thought that if a whole section of the slope could be raised up so as to reverse the direction of its inclination and put it at a high angle with the proper line of the track, that this would act as a gate or barricade and that wild cars from either the loaded or empty tracks would strike it and be stopped before they had acquired sufficient energy to do serious harm, certainly before they could cause the loss of life or injury to those below.

In order to bring the end of the rope from the unshackling position of the loaded trip to the shackling position of the empty, it was thought that a gravity pull-back could be arranged of sufficient power to unwind the slack of the rope as soon as the drum brake was released. It seemed obvious to let the heavy weight of the elevating section of track serve to actuate such pull-back, and on the basis of these ideas the present design was made.

It may be said here that it was perfectly successful in operation for the entire life of the mine, and that no defects developed in the course of several years of operation, the features of safety and convenience both being secured in a high degree.

The elevating or "gate" section of the track is shown at *A* in Fig. 2, in its elevated position. This structure is shown in full detail in Fig. 3. Few comments are necessary except to call attention to the fact that the center of the hinge must be at or above the top face of the rails, so that the instant the structure starts to move from its normal position the rails will clear. For the same reason the bearing surface of the lower end is sloped so that there is no possibility of its jamming at either end in leaving or approaching the operating position. The hinge, or bearing, was made of a piece of 5x1-in. bar-iron, running completely under the bottom gate and up both its sides, the bar being twisted at right angles to the bottom section and again bent at right

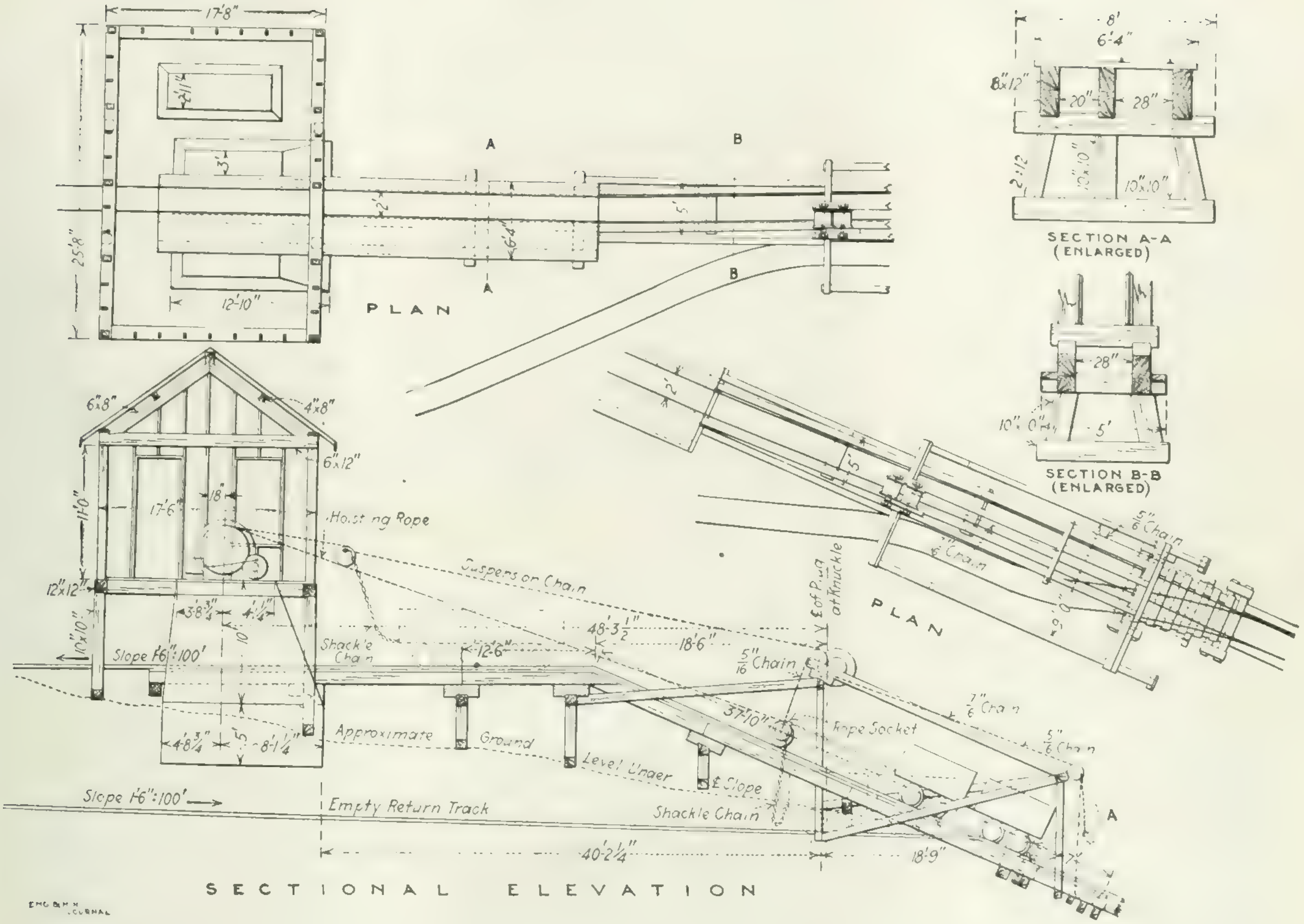


Fig. 2. General Arrangement of Slope, Showing Engine House, Pull Back and Loaded and Empty Tracks

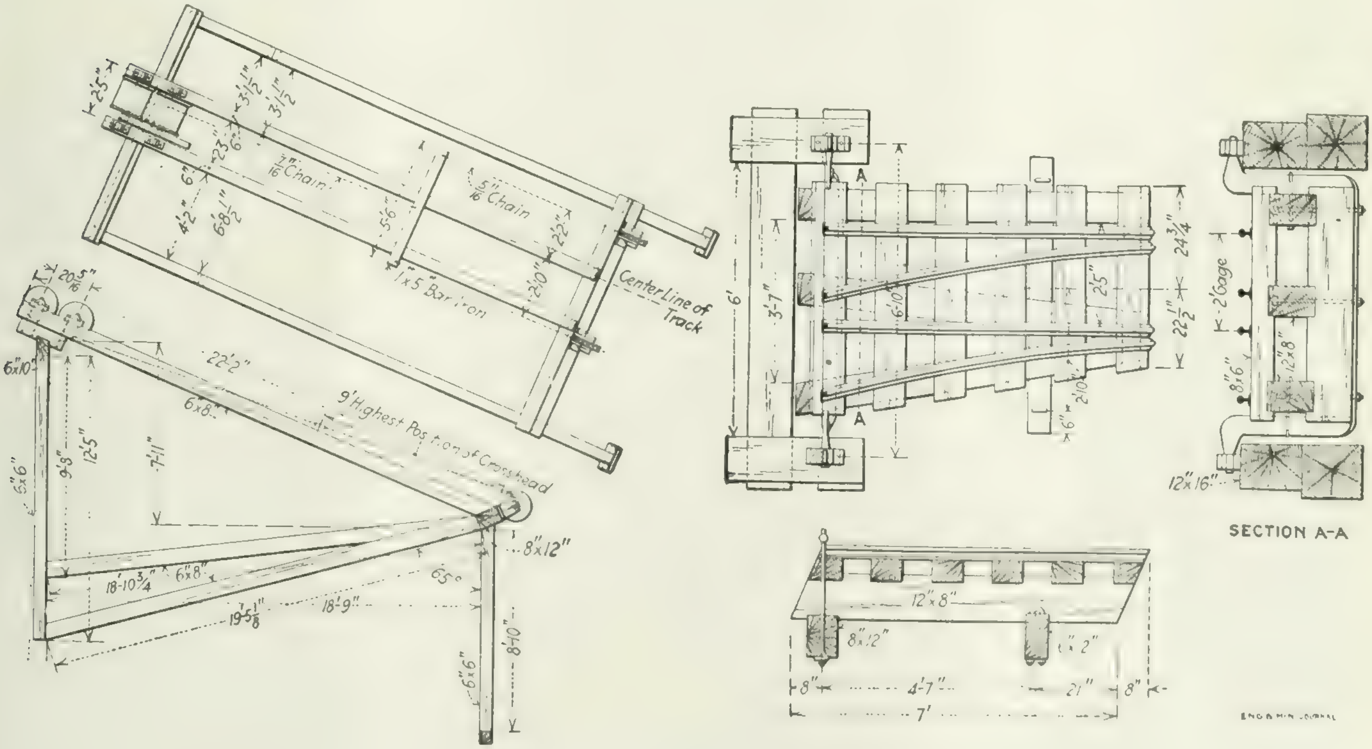


Fig. 3. Details of Pull Back and Lifting Track for Mine Slope

angles edgewise at the top and forged down into journals for the hinge. This supplied the necessary rigidity for the overhanging bearing and made a thoroughly satisfactory hinge from stock material at a minimum expense. The cross piece carrying the U-bolts for the attachment of the lifting chains, was made of 6 x 12-in. cast iron in order to supply the necessary weight for the pull-back to bring the gate down on its bed properly and secure a good alignment of the rails.

Gears Used in Pull-Back

It will be seen that the total elevation of the point of attachment of the suspension chains is only three or four feet, whereas, the distance through which the end of the hoisting rope required to be pulled back was, as above stated, about 35 ft., so that direct connection would not answer, but the motion of the pull-back had to be geared up about nine times. This was accomplished as follows:

The suspension chains from the gate passed up over sheaves mounted on the end of a timber framework to a sort of crosshead equalizing bar. These suspension chains were, of course, set far enough apart to clear the cars on either track. From the center of this equalizing bar (which was nothing more than a bar of 5 x 1-in. iron) ran a larger $\frac{7}{16}$-in. chain to the lower one of a pair of drums, shown quite plainly at the left of Fig. 3. This drum was geared to the upper one of the pair, as shown, in such a way that the motion of the latter was about nine times as great as that of the former. The $\frac{7}{16}$-in. chain was virtually all unwound from the lower drum when the gate was in its working position. On the other drum in this position were wound about 40 ft. of $\frac{5}{16}$-in. chain, the end of which hung down over the center of the incline and carried a frame in which ran a guide sheave for the hoisting rope. This sheave was made light and about one foot in diameter. The shackle chain which ran from the socket on the rope proper to the car coupling was eight or 10 ft. long. During the running of the rope on any portion of the trip below the gate, the swinging sheave acted as a most excellent guide and roller for the hoisting rope, but when the trip was past the gate, the socket on the end of the rope struck in the frame of the swinging sheave, which held it rigidly.

Thereafter the swinging sheave was pulled up the incline with the hoisting rope and as the normal position of the chain which held it was at right angles to the line of the hoisting rope, and therefore, at its shortest, this chain had to pay out as the rope socket pulled the swinging sheave up the incline. It will be noticed, however, that no shock occurred in starting the unwinding of the suspension chain, because in its normal position a given degree of movement up the incline required a minimum of unwinding at first, but a gradually increasing amount as the suspension chain was pulled further and further from a line normal to the hoisting rope and approaching the direction of the latter. The rotation of its drum caused by the unwinding of this chain operated the companion drum at a slower speed so that by the time the trip was over the knuckle the gate was raised to the position shown. It will be seen that the pull of the suspension chain against the end of the rope tended to bring these two into a straight line, with the shackle chain running therefrom down to the car standing on the track, as indicated in dotted lines.

Weight of Lifting Track Slacks Off the Hoisting Rope

Of course, as soon as the trip cleared the knuckle the engine was stopped and the downward grade toward the engine caused the trip to slack up on the shackle chain so that unshackling was easy. After unshackling the loads were run to the bin, as above described and empties returned. When the empties reached a position with their upper end about at the upper end of the overhead drum frame and were brought to rest, the engineer slacked off the drum brake and the weight of the heavy gate then caused the winding up of the suspension chain and the restoration of the swinging sheave to its normal position. The length of the shackle chain was then easily sufficient to reach the draw bar of the cars and was shackled on. The track was restored to its operating position simultaneously with the slacking off of the hoisting rope, and after releasing the car brakes and throwing the spring switch, the empty trip was free to return to the slope track and so to the bottom of the slope.

After several years of operation one car managed to escape on the slope when the gate was in its safety position. It jumped over the end of the gate and lit on the slope track below the gate and went from there to the bottom, fortunately without injury to person or property other than itself. Thereafter a heavy framework was erected just down the slope from the drum frame and immediately above the end of the gate, so that cars could clear when on the incline, but any car which tried to emulate this flying leap over the end of the safety gate would be absolutely blocked. This feature is not shown on the drawings, but will be readily understood.

Objects of the Design

I think it will now be evident that the objects of the design as set forth have been attained:

(1) The operator has the trip in plain view from top to botttom.

(2) The rope runs in a straight line from the trip to the hoisting drum without going around the innumerable guide sheaves between the engine and the shaft, or slope, so much in evidence at some mines.

(3) The slope is absolutely blocked for runaway cars, either from the loaded or empty tracks.

(4) The shackle chain is easily unhitched, without any pulling and hauling to get slack enough to permit its release, and is automatically carried back to a position where it can be shackled to the empty trip with equal ease.

It may be frankly stated now that no design, or attempt at one, has ever been made for a double-track slope embodying these features. But, as before stated, the successful design of a double track-gravity plane embodying them indicates that it might be done.

The first consideration would be that of taking care of all the horizontal traverse of the rope as it winds on the drum. This is done admirably in the present instance by the swinging sheave, but where the rope is wound and unwound from both top and bottom of the drum, as is the custom with the double-track slope, this could not be worked out so well, particularly in conjunction with an apparatus for reversing the ropes in order to keep the loads always on one track and the empties always on the other.

One reason for the difficulty is that if a reversing sheave or a pair of them were introduced as in the design of the gravity plane, the angle at which the rope ran from the drum to the reversing sheave would vary greatly in different portions of its travel, owing to the traverse along the drum.

"Figure 8" Drum Recommended for Double-Track Slope

The "figure 8" type of drums described in the previous article lends itself admirably to this condition, because there is no horizontal traverse of the ropes and because the plane of rotation of the drums is virtually the same as that of the incline. Therefore, the alteration in the angle of approach made by the reversing sheave accordingly as it is in one position or the other, affects nothing but the point at which the ropes make or leave contact with the drum, which, of course, is quite immaterial. No other style of drum seems to meet this condition quite so well, and if I were to attempt the design of the type of double-track slope above mentioned, I would be inclined to adopt the figure-8 type of drums set in the plane of the slope and gear them to the engine shaft with a single pair of bevel gears. A reversing sheave, either automatic or power driven, could then be used exactly as with the incline.

It is obvious, however, that the automatic pull-back as shown in the present design could not be made to work without being changed by hand from one rope to the other, which would be quite out of the question. Therefore, some other scheme for a pull-back of the empty rope would have to be devised, and with it, some means of operating a safety gate. These should present no insuperable obstacle.

My principal object in making these comments concerning the possibilities of such a design is to start mining superintendents and engineers to thinking along lines outside of the beaten tracks. No one wishes to make a new design so revolutionary that if it fails the whole apparatus must be scrapped. At the same time, if we do not occasionally take the chance of failure when we see the opportunity to make a considerable improvement over existing methods, the science of mining is not advanced and we miss the opportunity to make savings more considerable than any loss which can result from the failure of the scheme. For this reason too much conservatism and too close adherence to the known and tried is as fatal to success as is too much unsuccessful experimenting.

Fertilizer Supplies

WASHINGTON CORRESPONDENCE

Secretary of Agriculture Wilson refers to the subject of potash investigations in two places in his annual report, just made public. In connection with a description of the work of the Bureau of Soils, he says, in part:

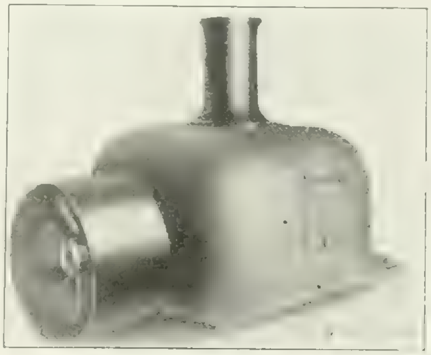
> It has been shown that the United States has ample supplies of the raw materials which experience has proved to be most useful as fertilizers.
>
> There is in this country enough high-grade phosphate rock to supply the present demands for 36 centuries or more. The giant kelps of the Pacific coast and Alaska, if cropped on scientific principles, can probably surpass in yield of potash salts the famous Stassfurt mines, and there is reason to expect that commercial production of potash from feldspar wil soon be a reality.
>
> In the meantime, an unremitting search has been maintained for potash salts in some of the desert basins. Theoretically, it seems probable that areas may be discovered where segregation of these salts has occurred, and one such deposit is now being exploited commercially. Examinations of our salt brines seem to show that there is little prospect of success here.
>
> With many sources of nitrogen yet to be utilized to their fullest extent and with practicable methods of "fixing" atmospheric nitrogen, the future may be faced with equanimity so far as problems of fertilizer supply are concerned.

Power Winch for Car Spotting

A power winch for car spotting has been placed on the market by the Stephens-Adamson Co., and, we are advised, has been adopted by one of the large copper companies for hauling small cars on and off scales, and in other places where short shifts have hitherto been made by hand, with excellent results.

As shown in the illustration, the winch externally usually shows only a pulley, the iron gear case, and the winding drum, but the machinery can be sunk in a pit and direct-connected with a motor, so that only the winding drum appears above the cover plate.

A train of planetary gears connects the driving shaft with the winding drum. The gearing is designed to give a large reduction between the winch and the driving shaft, so that a slow, powerful movement is obtained without the use of a large motor or large belt. In use, the rope attached to the car to be started is given two or three turns around the drum. Then by pulling on the free end of the rope, the operator can cause enough friction between the drum and rope to move the car. The release of the rope end instantly releases the pull of the winch.


WINCH FOR CAR SPOTTING

Although the illustration shows a machine with the winch on top and drive at right angles, it is also made with drive and winding drum in the same plane, for platform use in freight terminals.

Mineral Production of Tonkin

The exportation of ores from Tonkin for the first half of 1912 is given by *Echo des Mines*. Nov. 15, 1912, as follows: Zinc, 12,366 metric tons; antimony, 328; tin, 63; wolfram, 37 metric tons. The zinc ore, which forms the greater and most important part of this tonnage, is sent partly to the Auby works, at Dunkirk, and partly to Antwerp. Expensive exploration work is now being done both for zinc and tin by the Société de Recherches Minières en Indo-Chine.

In 1911 Tonkin produced 434,046 metric tons of coal, 28,241 metric tons of zinc ore, and 212 metric tons of tin and wolfram ores.

Louisiana Mineral Output

The value of the mineral production of Louisiana in 1911 was $12,710,958, according to the U. S. Geological Survey, which calls attention to the growing mineral output of that state. The principal products are petroleum, sulphur and rock salt.

After the sensational strike of oil at Beaumont, Tex., in 1901, prospecting for petroleum was actively carried on east of the Sabine River in Louisiana, resulting in the discovery and development of several pools in the vicinity of Jennings. Since that time productive areas have been developed in many parts of the state, and Louisiana now ranks eighth among the states in the production of petroleum. The Caddo district, opened in 1906, is stated to be the principal producer at present, and of greatest promise for the future. The petroleum production of Louisiana last year was 10,720,420 bbl., an increase of nearly 4,000,000 bbl. over the production of the previous year.

Louisiana stands preëminent among the states in the production of sulphur. In 1904 the Frasch process for the recovery of sulphur from beds lying under a heavy cover of quicksand was put into successful operation by the Union Sulphur Co., at Sulphur, La., 12 miles west of Lake Charles. Since that time approximately 2,000,000 tons of refined sulphur have been recovered. Previously nearly all the sulphur used in the United States was imported from Sicily.

Louisiana also ranks first as a producer of rock salt; in the total production of salt, including that evaporated from brine, Louisiana ranks sixth among the states.

Borax as a Fertilizer

What might serve as a use for crude borax is suggested by the paper of Henri Agulhon, before the International Congress of Applied Chemistry, who found small amounts of boric acid acted as what he termed a "catalytic fertilizer," producing a remarkable stimulation of plant growth, from 34 to 54%. The smallness of the dose is insisted upon; for instance, with grains fine results were apparently obtained with less than 2½ lb. per acre. Twenty to 36 lb. per acre proved too much for oats. About eight pounds per acre gave sensible increases of crop with almost every crop. The results persist into the second year on the same ground.

No. 5 Tunnel, Mammoth Mine, Calif.

By Robert E. Hanley*

The No. 5 tunnel at the Mammoth copper mine was driven below the existing workings to facilitate ore transportation and to provide drainage. The cross-section averaged 10 ft. wide by nine feet high, and a 0.6% grade favoring the load was maintained. The main tunnel has a total length of 3008½ ft., the average daily advance being 10.52 ft. at an average cost of $22.23 per foot.

The No. 5 tunnel, started Apr. 1, 1911, at the Mammoth mine, in Shasta County, Calif., was driven to afford an outlet for the ore known to be below the former lowest level of the mine, to provide drainage, and to cheapen the cost of transporting the entire mine output to the bins. The tunnel is about 170 ft. below the 300-ft. level, and was driven of large cross-section, to permit the use of the standard 25-ton electric locomotives in use on surface and 25-ton 3-ft. gage bogie-truck cars. These cars are to be run in six-car trains beneath the Main and Clark orebodies, where they will receive the ore from large loading stations fed from raises to the main tramming levels above. These raises will give from 800 to 1600 tons storage capacity to balance variations of output and haulage. By the use of this tunnel, over one mile of surface haul on heavy gradients will be avoided, and it will enable the surface railway to handle the mine output of 800 tons daily on one shift, where before two shifts were necessary. There are other economies in haulage in the mine effected at the same time.

GRADE OF TUNNEL 0.6%

The main tunnel and two branches have a total length of 3267 ft., and were finished Dec. 21, 1911. The cross-section of the tunnel is shown by Fig. 1, and is 9 ft. 6 in. wide and 8 ft. 6 in. high above the rails; this being the minimum dimension allowed. The actual ground broken averaged 10x9 ft., or 90 cu.ft. per foot of advance. The grade is 0.6%, and a ditch 18 in. wide and 12 in. deep was carried to the right of the ties.

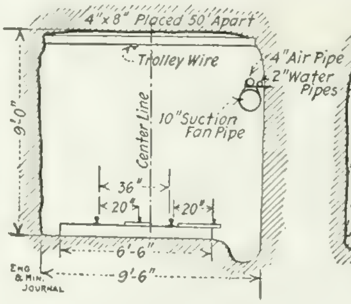


FIG. 1. CROSS-SECTION MAMMOTH NO. 5 TUNNEL

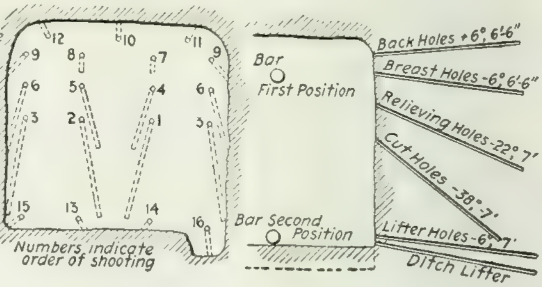


FIG. 2. ARRANGEMENT OF HOLES; DRIFT ROUND, NO. 5 TUNNEL

COST OF NO. 5 TUNNEL, MAMMOTH MINE, CALIF:—LENGTH 3008½ FT.

Operation	Labor	Material	Air	Power	Total	Cost per foot
Drilling	$14,355.99	$394 25	$3629.18	......	$18,379.42	$6.109
Mucking	10,451.82	1,172.92	......	......	11,624.74	3.864
Timbering	206.91	300.96	......	......	507.87	0.169
Piping	812.54	2,511.63	......	......	3,324.17	1.105
Explosives	....	12,034.07	......	......	12,034.07	4.000
Making drill tools	49.57	1,075.18	......	......	1,124.75	0 374
Repair burleighs	131 31	1,002.69	......	......	1,134.00	0 377
Sharpening steel	814.92		......	......	814.92	0 271
Track and wiring	516.33	3,811.25	...	......	4,327.58	1.438
Electric lights	78.25	114.68	....	......	192.93	0 064
Electric tramming	2,448.54	401.19	.	156.08	3,004.81	0 999
Repair cars and locomotive	153 40	627.36	......	.....	780.76	0 260
Foreman	3,506 30	....	......	......	3,506.30	1 165
Superintendence, engineering and office	1,594 55	....	......	......	1,594.55	0.530
Widening tunnel	133.50	....	....	......	133.50	0.044
Total actual work	$35,253.93	$23,446.18	$3629.18	$156.08	62,485.37	20 769
Pipeline to portal					556.80	0.118
Extension of tramroad					675.19	0 224
Grading for yards					1,573.11	0.523
Miscellaneous preliminary work					1,803.51	0.599
Total of all costs					$67,093.98	$22.23

Permanent 50-lb. rails were laid on 6x8-in. ties, spaced 2½ ft. centers, forming the 36-in. gage haulage line. Two 16-lb. rails were laid temporarily, forming, with the 50-lb. rails, two 20-in. gage tracks used for the narrow-gage 14-cu.ft. dump cars while driving the tunnel. Later it was found that by using the cross-over switch and "slick-sheet" device, as shown in Figs. 4 and 5, it was only necessary to lay one temporary 16-lb. rail between the permanent 36-in. gage, 50-lb. rail track, to handle the material as broken in the face, with the exception of the stretch between movable slick sheet and face, and near portal, where the four tracks were laid to facilitate switching the dump cars.

NO SPECIAL EQUIPMENT USED IN DRIVING TUNNEL

The tunnel was driven as an adjunct to the mine operation, and had no special equipment. The equipment used was:

Five 3-in. Ingersoll-Sergeant rock drills.

Twenty 14-cu.ft. side- or end-dump mine cars, 20-in. gage.

One 6-ton electric locomotive for 36-in. gage track.

One 10-in. exhaust fan driven by one 5-hp. three-phase 220-volt motor.

One 4x10-ft. air receiver.

Four 4x10-ft. slick sheets, ⅜ in. thick.

One 6x10-ft. movable slick sheet for switching cars.

One short movable cross-over 16-lb. track for switching.

Four sets of temporary 16-lb. track, 30 ft. long, used ahead of permanent track to face.

Air at 85-lb. pressure was furnished by the mine through a 4-in. pipe line about 700 ft. long. A 10-in. suction pipe, made of No. 18 iron, a 4-in. air line and a 1-in. water line were carried in the tunnel. The dump was of the usual type, one car at a time being dumped over the end.

During the earlier months of the work various plans of working were tried with different crews, but the one with which most of the tunnel was driven and which gave the cheapest results is given below:

7 A.M.-3 PM.

1 Foreman	@	$6.00
3 Machine men	@	3.50
2 Chuck tenders	@	3.25
3 Muckers	@	3.00
1 Trammer	@	3.00
1 Motorman	@	3.00
1 Pipeman	@	3.25
1 Single-hand miner	@	3.00

3 P.M.-11 P.M.

1 Shift boss	@	$4.00
3 Machine men	@	3.50
2 Chuck tenders	@	3.25
3 Muckers	@	3.00
1 Trammer	@	3.00
1 Motorman	@	3.00

11 P.M.-7 A.M.

1 Shift boss	@	$4.00
3 Machine men	@	3.50
2 Chuck tenders	@	3.25
3 Muckers	@	3.00
1 Trammer	@	3.00
1 Motorman	@	3 00

Total, 35 men, costing $116.25 per day

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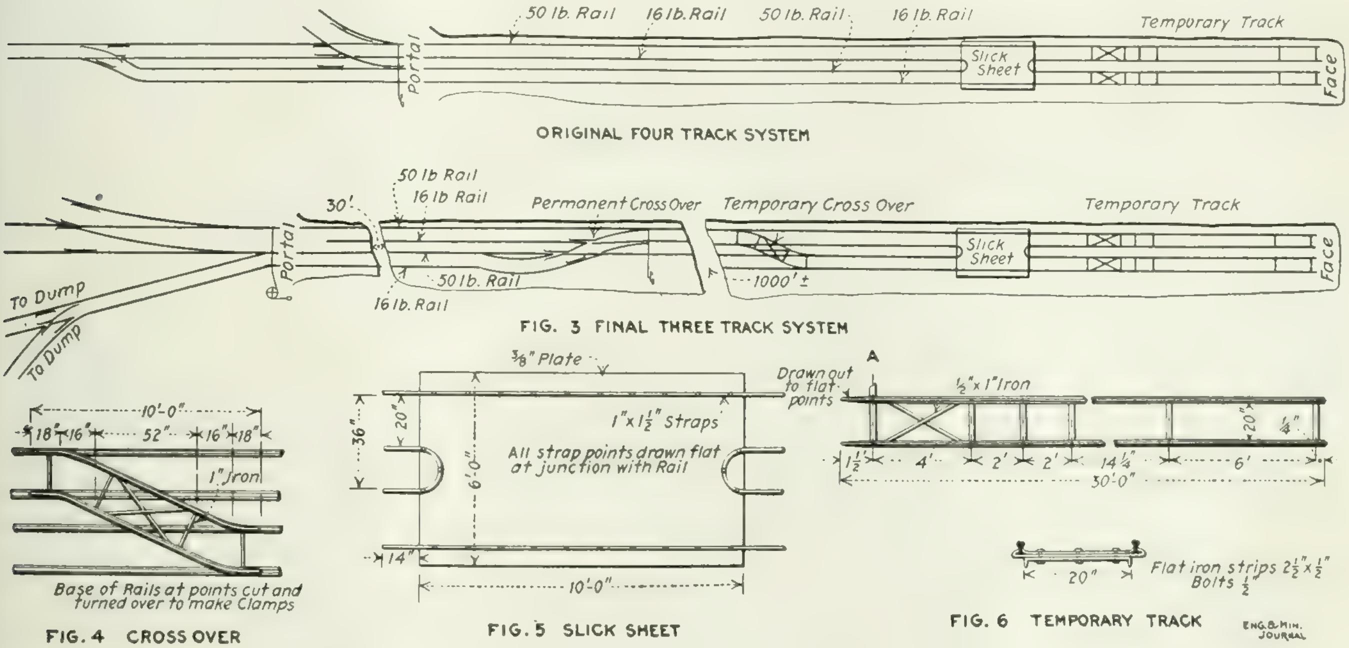
*Superintendent, Mammoth mine, Mammoth, Calif.

This force could drive and finish from 11 to 13 ft. daily in ordinary ground, the labor in the tunnel costing from $9 to $12 per ft. In the main heading, however, there were encountered many hard bars from 50 to 150 ft. thick, which necessitated a readjustment of the working force and retarded the progress greatly. These bars were difficult to drill. A machine which ordinarily could drill 11 ft. per hour in the usual porphyry could only drill from 2½ to 3½ ft. per hour in these stretches of silicified porphyries.

SUBDIVIDED COSTS PER FOOT, MAMMOTH TUNNEL

Labor	$11 718
Materials	7 793
Air	1 206
Electric power	0 052
Total average cost per foot	$20 769



ORIGINAL FOUR TRACK SYSTEM

FIG. 3 FINAL THREE TRACK SYSTEM

FIG. 4 CROSS OVER

FIG. 5 SLICK SHEET

FIG. 6 TEMPORARY TRACK

TRACK ARRANGEMENTS, MAMMOTH NO. 5 TUNNEL

After the blast the crew waited from 12 to 45 min. for the greater part of the gas to be drawn out; the variation in time being due to the grade of powder used; the 40% powder used in good breaking ground permitting a much speedier return than the combination containing 60% powder and 100% strength blasting gelatin used in tough ground. As the tunnel progressed and the suction pipe of the fan grew to be over 1000 ft. long, the fan's efficiency was noticeably decreased.

Ventilating Fan Moved Toward Face

To overcome this defect somewhat, the fan was moved in 1063 ft. from the portal to a point in the main heading where a crosscut began, and was then operated as a suction machine from face to fan, and as a blower from fan to portal.

A further change was also made, as the tunnel progressed, by taking out the 10-in. exhaust line for about 500 ft. back from portal and constructing in its place a wooden box, which was fitted over the new end of the 10-in. line and extended down into the tunnel drain, where it was covered tightly with plank and dirt packed over the plank. As the gas and smoke were forced out through the pipe to the wooden box, a spray shower attached to the 1-in. water line came in contact with the gas and smoke, causing instant absorption. The arrangement is shown in Fig. 8. By this means we could probably have taken up all of the 10-in. exhaust pipe by merely placing the box ahead in the tunnel as it progressed.

Removing the Last of the Fumes

The fan was operated alone until five minutes before the men were to return, when compressed air was blown against the face in quantity, all that a 1-in. outlet could deliver, thus driving the gas back from the face. When the men return, one man connects the water hose and sprays the muck, roof and walls of the tunnel, to absorb the remainder of the gas, while the other three miners, with the boss, carry up the machines and blocking, and commence to set up the bar.

A 5½-in. horizontal bar, nine feet long, was used and was set usually about four feet back from the face and 2 ft. 8 in. below the back. The time used in setting up the bar, placing the three machines and connecting air hose varied from 25 to 55 minutes.

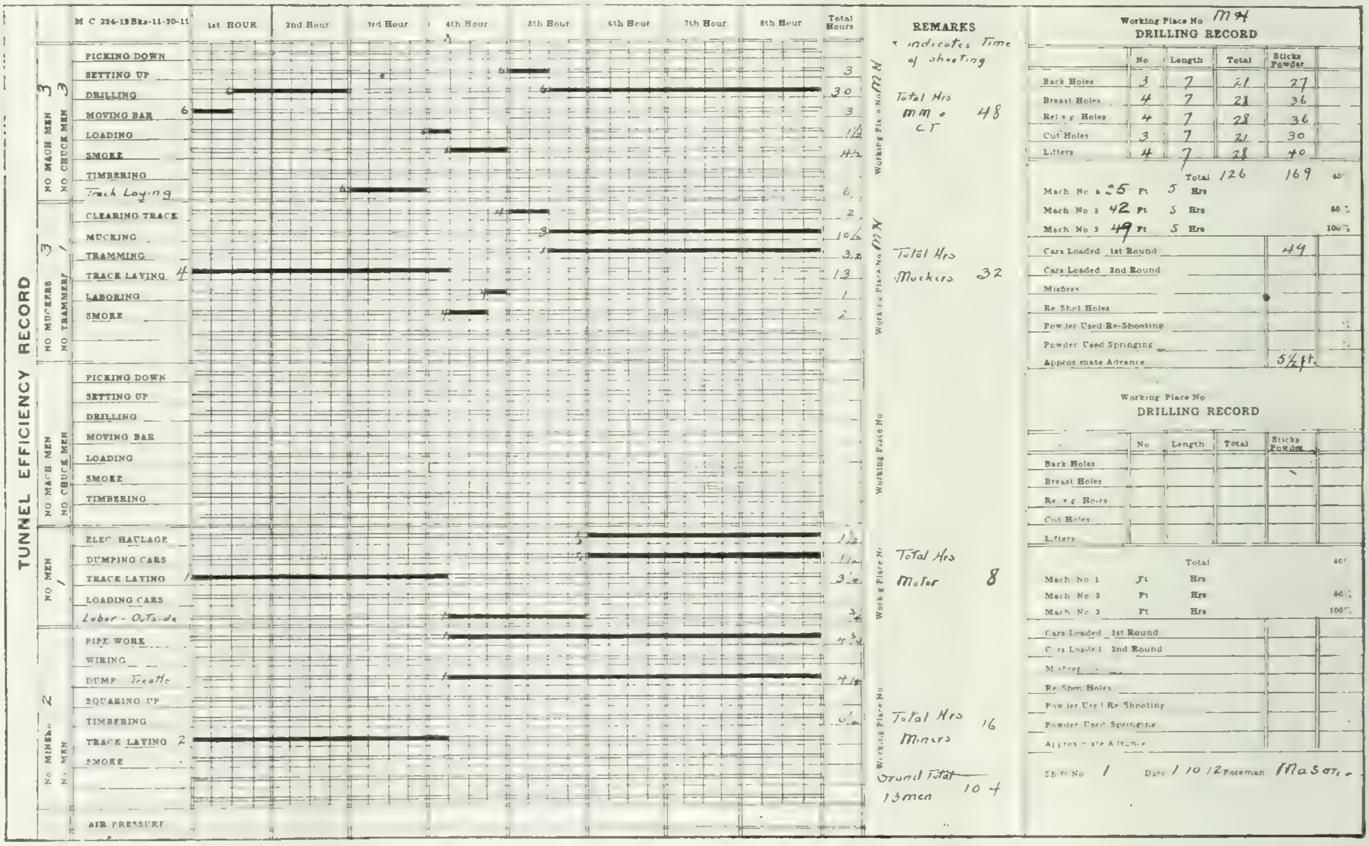
Meanwhile, the muckers cleared the track of débris, put temporary tracks in place and commenced mucking. This usually took from 20 to 30 minutes. Three men mucked while one man trammed the loaded cars to a point about 100 ft. back from the face to a slick sheet laid over the rails, as shown in Fig. 5. This slick sheet was movable, and was pushed ahead as the tunnel progressed. The train was made up here, the one man tramming back and forth from the face with the empty and filled cars. A train consisted of about eight cars, and was handled and dumped by the motorman on each shift. There was at all times at least one empty car at the face into which the muckers could shovel. The first 10 to 12 ft. of the muck heap was shoveled from off the tunnel bottom and was slower work than when the slick sheets were reached. These slick sheets were four in number, and were laid about 25 ft. back from the face. When mucking from the sheets an output of from 16 to 20 cars per hour was obtained. Removing the last portion of the pile was slow work as there were, of course, no sheets under the space occupied by the round just broken, and the muckers worked beneath a light scaffolding carrying the machine men. The time required for removing the muck varied from 4½ to 8½ hours, averaging about 6½ hours.

Air Hose Supported by Extension Rods

The air hose for the drills was held above the head of the muckers by two extension rods placed in hitches in the sides, and shown in Fig. 7. The cars used were ordinary mine cars of 14-cu.ft. capacity, much too small for effectiveness in this class of work. As the muckers removed the rock on which the machine men were standing, they set two ladders against the walls, and two or three planks set in these ladders formed the scaffold for the machine men to stand on while the muckers removed the last of the rock from beneath them.

DAILY AND MONTHLY PROGRESS, MAMMOTH TUNNEL

Month	Days worked	Feet per month	Feet per day
April, 1911	18	217	12.06
May.	31	309	9.97
June..	30	310	10.33
July	30	274	9.13
August	31	327	10.55
September..	30	347	11.57
October	31	395	12.74
November	30	347	11.57
December..	29	260.5	8.98
January, 1912	26	222	8.54
Totals	286	3008.5	
Average feet per day			10.52



M C 234-12 Bks-11-30-11	Total Hours
No. Mach Men 3 / No. Chuck Men 3	
PICKING DOWN	
SETTING UP	3
DRILLING	30
MOVING BAR 6	3
LOADING	1½
SMOKE	4½
TIMBERING	
Track Laying	6
No. Muckers 3 / No. Trammers 1	
CLEARING TRACK	2
MUCKING	10½
TRAMMING	3½
TRACK LAYING 4	13
LABORING	1
SMOKE	2
No. Mach Men / No. Chuck Men	
PICKING DOWN	
SETTING UP	
DRILLING	
MOVING BAR	
LOADING	
SMOKE	
TIMBERING	
No. Men 1	
ELEC HAULAGE	1½
DUMPING CARS	1½
TRACK LAYING 1	3½
LOADING CARS	
Labor - Outside	¾
No. Miners 2 / No. Men	
PIPE WORK	4¾
WIRING	
DUMP Trestle	4¼
SQUARING UP	
TIMBERING	½
TRACK LAYING 2	
SMOKE	
AIR PRESSURE	

REMARKS

* indicates Time of shooting

Working Place No MX — Total Hrs mm + CT 48

Working Place No MX — Total Hrs Muckers 32

Working Place No

Working Place No — Total Hrs Motor 8

Working Place No — Total Hrs Miners 16

Grand Total 13 men 104

Working Place No M4

DRILLING RECORD

	No	Length	Total	Sticks Powder	
Back Holes	3	7	21	27	
Breast Holes	4	7	28	36	
Relieving Holes	4	7	28	36	
Cut Holes	3	7	21	30	
Lifters	4	7	28	40	
		Total	126	169	40%

Mach No 1 25 Ft 5 Hrs

Mach No 2 42 Ft 5 Hrs 60%

Mach No 3 49 Ft 5 Hrs 100%

Cars Loaded 1st Round	49	
Cars Loaded 2nd Round		
Misfires		
Re Shot Holes		
Powder Used Re-Shooting		
Powder Used Springing		
Approximate Advance	5½ ft.	

Working Place No

DRILLING RECORD

	No	Length	Total	Sticks Powder	
Back Holes					
Breast Holes					
Relieving Holes					
Cut Holes					
Lifters					
		Total			40%

Mach No 1 Ft Hrs

Mach No 2 Ft Hrs 60%

Mach No 3 Ft Hrs 100%

Cars Loaded 1st Round		
Cars Loaded 2nd Round		
Misfires		
Re Shot Holes		
Powder Used Re-Shooting		
Powder Used Springing		
Approximate Advance		

Shift No 1 Date 1/10/12 Foreman Mason

FORM OF RECORDING LABOR DISTRIBUTION, MAMMOTH NO. 5 TUNNEL

In easy ground the machine men could finish the holes above the bar before the muckers had completely cleared the face; in this case the machine men shoveled the muck back on the slick sheets, where the muckers loaded it into cars. The muck cleared, except a few cars for covering the sheets, the muckers pulled the sheets ahead, covered them with loose dirt, and then carried back the temporary track and steel, etc., preparatory to blasting.

VARIOUS GRADES OF EXPLOSIVES USED

The machine men drilled 15 holes above the bar; three back holes looking up about six degrees, four breast holes looking down six degrees, four relievers looking down 21°, and four cut holes looking down 38°, as shown in Fig. 2. This took from 4½ to 12½ hr., averaging about 6½ hr. The bar was then taken down and set about 24 in. above the bottom, and four lifters drilled. It took from 12 to 25 min. to reset the bar and place the three machines on it. Drilling the lifters took from 1½ to 4½ hr., averaging about 1¾ hr. It took about 10 min. to remove the bar and machines.

The holes were the following lengths: Back, 6 ft. to 6½ ft.; breast, 6½ ft.; relievers, 7 to 7½ ft.; and lifters 7 ft. Two sticks of high-grade explosive (60%-100%) were placed in the bottom of the holes, followed by the primer also in high-grade powder. Then from three to seven sticks of 40% finished the charge. In no case was it found advisable, in point of cheapness or efficiency, to load a hole for more than three-quarters of its length.

ADVANCE PER ROUND ABOUT FIVE FEET

During several months clay tamping was used with beneficial results in tough ground. The primers were made up by the foreman using fuse cut to lengths varying from 6 ft. 3 in. to 10 ft. 3 in. by 3-in. graduations. The prepared primers were carried to the face in a pigeon-hole box, corresponding to the holes as drilled in the face, and were handed to the loaders by the boss as needed.

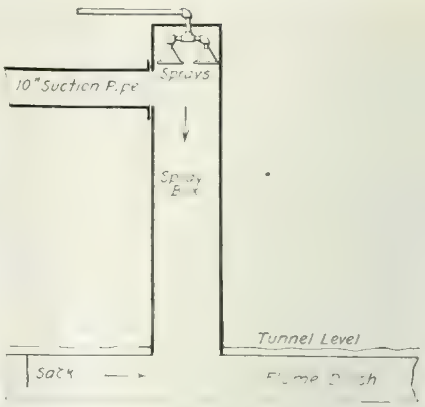


FIG. 8. ARRANGEMENT FOR SPRAYING POWDER SMOKE

Pacific fuse and 6-X caps were found most effective. The fuse was doubled only on the lifters, and the water-hole caps were "doped" with an armature compound. The fuse ends were split, gathered into four bunches, and spit by four miners simultaneously. Loading, including blowing out the holes, took about 40 min. In tough ground it proved ad-

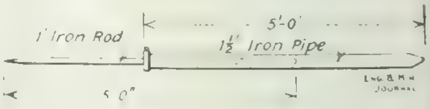


FIG. 7. TELESCOPIC BAR FOR SUPPORTING AIR HOSE

visable to shoot the cuts and lifters first, then to re-shoot these with the whole round. The advance per round obtained varied from 3½ to 6½ ft., averaging a little under 5 ft. The powder used per foot advanced varied from 16½ to 35 lb., averaging about 24 lb. The most effective combination of powder was found to be one-third 100% blasting gelatin and the balance 40% dynamite.

Movable Track Used Near Face

Permanent track laying was done two to three times per week on the day shift by the entire force, exclusive of the miners. It was commenced as soon as the face was cleared of muck and was nearly always completed while the miners were drilling the lifters. Two rails, weighing 50 lb. per yd. and 33 ft. long, together with the same length of 16-lb. temporary rails, were laid at one time; the 50-lb. rail being laid permanently, to grade and line given by the mine surveyor. Ahead of these rails, as the tunnel progressed, were laid the two sets of 16-lb. movable track 30 ft. long, as shown in Fig. 6. The laying of track took from 2½ to 3 hr., and usually delayed the machine men from ¾ to 1¼ hr. Had the track been of a lighter weight, faster progress could have been made in the tunnel.

COMPARISONS OF COST PER FOOT, MAMMOTH TUNNEL—BIWEEKLY PERIODS

	One Heading		Two Headings		
Operation.	Lowest June 11 to June 24	Highest June 25 to July 8	Lowest Oct. 1 to Oct. 14	Highest Nov. 26 to Dec. 9	Average cost per foot
Drilling	$4 780	$13 765	$5 519	$6 409	$6 109
Mucking	2 918	4 216	3 455	3 728	3 864
Timbering	0 121	0 257		0 217	0 169
Piping	1 076	0 800	0 206	0 778	1 105
Explosives	4 047	8.276	3.614	3 841	4 000
Making drill tools	0 381	0 697	0 038	0 021	0 374
Repairing burleighs	0 392	0 862	0 281	0 403	0 377
Sharpening steel	0 164	0 513	0 162	0 165	0 271
Track and wiring	1 123	2 662	0.840	3 027	1 438
Electric lights	0 025	0 002		0 020	0 064
Electric tramming	1 [illegible]	3 097	0 847	0 927	0 909
Repair cars and locomotive			0 115	0 153	0 260
Foreman........	1 178	1 532	1 094	1 206	1 165
Superintendence, engineering and other	0 472	0 974	0 469	0 511	0 330
Widening tunnel					0 044
Total	[illegible]	$37.653	$16 640	$21 406	$20 769
Feet of advance	[illegible]	79	164	151	3008 5

From Aug. 18 to Dec. 21 two headings were driven, but there was no increase in the working force. Two headings enabled the delay caused by waiting for smoke, and that due to setting up the bar, to be eliminated, and shortened the time per round from 1¼ to 1¾ hr. The rate of progress and the costs varied markedly, due to the extremely variable ground encountered.

A table of costs covering the entire period, as well as high and low periods, is given herewith. These include all labor and supplies used in the tunnel, together with cost of powder, repairs to equipment, first cost of equipment, and cost of supervision. A table is also given showing the average progress throughout, as well as by months.

Impurities in Tough Pitch Copper

At the September meeting of the Institute of Metals, Frederick Johnson, of the metallurgical department of Swansea Technical College, read a paper dealing with the influence of impurities in tough-pitch copper, chiefly with reference to antimony (*Engineering*, Oct. 25, 1912).

He concludes that with antimony present up to 0.3%, the copper has good hot-working properties, either when under or up to pitch. With more than 0.3% antimony the removal of oxygen by poling is synchronous with inferior hot-working properties. According to his experiments, although the influence of antimony is to render the copper red-short after the removal of oxygen, and thus "overpoled," according to one interpretation of the term, yet its effect is really to prevent overpoling, when the latter term is used to describe the physical phenomenon, the rising exhibited by an ingot during solidification.

The rising of the surface, or the ejection of molten copper through the top crust of the ingot, is due to the escape of gases which excessive poling has introduced into the copper; either the action of these gases is neutralized, or their action into the molten copper opposed by antimony. The author rather prefers the latter explanation. This latter property is of value in the refining of tough copper, since there is nothing so trying in a refinery as a charge which has gone over pitch. Any impurity in the copper will check this tendency to go over pitch, is therefore welcome.

Arsenic is such an impurity, and the author has shown that antimony is another. A little antimony even in arsenical copper should be beneficial. Lead has been also recognized as having a similar influence, but lead is wholly undesirable in wrought copper. Of course, the addition of antimony is not without its danger. This lies in having too much present, and so masking the true pitch of the copper. That is, the copper is hot-short before other signs of overpoling or going over the pitch have become apparent.

Another side of the question is that antimony hardens copper for rolling, and this becomes serious if it prolongs the breaking-down operation. For a normal, soft, tough, arsenical copper, however, the author considers that 0.1% of antimony would be a beneficial addition. The presence of other impurities, however, would modify this proportion, but such copper could not be used for making malleable alloys for brass. For high-conductivity copper, also, antimony must be rigidly excluded. Up to 0.5%, antimony has no detrimental effect on the hot-forging qualities of tough-pitch copper free from other impurities, and it is even possible to forge copper containing 1% of antimony, if sufficient oxygen be present in the metal.

The addition of lead to pure copper or arsenical copper causes the surface of a tough-pitch ingot to sink during solidification. Further poling, with the object of obtaining a level surface, is attended by the risk of rendering the metal red-short. Like antimony and arsenic, lead tends to check rising in the mold. The mechanical properties of arsenical copper (0.4% arsenic) at normal temperature are little affected by the addition of 0.2% of lead.

The addition of 0.2% of tin to tough-pitch arsenical copper is attended by an increase in hardness during hot- and cold-rolling, and an increase in tensile strength. The elongation is correspondingly lowered, but the toughness is unimpaired.

Of interest to American metallurgists working with electrolytic copper is the following rather emphatic statement by Mr. Johnson: "Incidentally, the author would like to dispose, once and for all time, of the fallacy that pure electrolytic copper is immune from overpoling. The statement has been made by well known metallurgists so often that it demands immediate refutation. Such copper has possibly a greater solvent power for gases than most less pure brands, and in addition to meeting with overpoled electrolytic copper in the refinery, it has been the author's experience that tough-pitch ingots of electrolytic copper are the most difficult of all to produce on an experimental scale. Such copper, although never becoming red-short, is just as liable to become porous or to 'spew' after overpoling, as any other kind, and more liable than many kinds."

Although previously considered insoluble in sulphuric acid, even when boiling, it has been shown that platinum is actually soluble in it to a slight degree (*Brass World*, November, 1912) and that boiling sulphuric acid will dissolve appreciable amounts from the vessels in which it is heated.

New Publications

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA, 1901-1911. G. H. Knibbs. 6½x9½, pp. 1275, illus., paper. Commonwealth Bureau of Census and Statistics, Melbourne, Australia.

MODERN MINE VALUATION. By M. Howard Burnham. 6¼x9, pp. 160; cloth, $3.75. J. B. Lippincott Co., Philadelphia.

This book is dull and uninteresting, and does not add anything valuable to the literature of its subject. It is written in a laborious style, and is largely a reiteration of petty advice and trite commonplaces, supported by much arithmetic.

MODERN COPPER SMELTING. By Donald M. Levy. 6½x9; pp. 259, illus.; cloth, $3.50. Charles Griffin & Co., Ltd., London; J. B. Lippincott Co.,

This book is based upon a series of lectures delivered at the University of Birmingham, and presents in a compact volume the various processes involved in the treatment of copper ore. The volume is excellent for its presentation of a comprehensive subject in such concise form, and it is most satisfactorily illustrated. The illustrations include the author's polychrome plates of the converter flame in its various stages; while these would not enable a student to "call" a copper charge, they nevertheless give him a more vivid conception of the converter-flame changes than he ordinarily gets. Some criticism may be made of the title selected for the book, both in its duplication of Doctor Peters' well known work and in its essentially ephemeral character. There are also some errors that might have been easily avoided, such as reference to the American Institution of Mining Engineers, Pierce-Smith (for Peirce-Smith) converters, and like most other British publications, it refers to Huntingdon-Heberlein and to Huntingdon mills. We do not understand the British objection to "t" in the name of Huntington.

MINERALOGY. By Alexander Hamilton Phillips. 5¾x9, pp. 639, illus.; $3.75. The MacMillan Co.

DANA'S MANUAL OF MINERALOGY. Thirteenth Edition, Revised. By William E. Ford. 5x7½, pp. 479, illus.; $2. John Wiley & Sons, New York.

Two new treatises on mineralogy have lately been published which may be reviewed in conjunction. Professor Phillips states the purpose of his book as follows:

> The object of this book is to bring together for the beginner, in concise form and under one cover, the facts and basic principles of the several branches of mineralogy, unadulterated by an excess of data. It is, therefore, not a book of reference, but it takes the student along the various branches of the subject to a point from which, if he wishes to continue, he will be in a position to appreciate and to use the advanced literature and books on the subject.

This book is different from some other mineralogies in that it comprises all branches of the science, including crystallography, descriptive mineralogy and determinative mineralogy. The section on crystallography is particularly full, amounting to 218 pp. It is a good exposition of its subject, but for the purposes of general treatise it might well have been condensed, we think. In the section on descriptive mineralogy such matters as the relation of minerals to the elements and the origin of minerals are taken up before the actual description of the species is begun. The section on determinative mineralogy is particularly good, comprising tables for the determination of the more common minerals by their physical properties and by their chemical tests; also a table for the determination of the principal rock-forming minerals in sections. Professor Phillips' book impresses us as being rather unbalanced, being too light on the side of descriptive mineralogy, and moreover conveys imperfect pictures in many cases. Thus, the pages devoted to sphalerite are distinctly unsatisfactory. We wish that the professors in colleges, when writing a scientific treatise, would carefully avoid references to commercial phases of their subject, which would not only save them much trouble and space, but also from falling into error. Thus, when Professor Phillips speaks of molybdenite ore as being valued at $1.50 per lb. in the market he provokes a smile and similarly by other remarks elsewhere in his book.

Professor Ford's book is a rewriting of Dana's Manual, the fourth and last revision of which was published in 1887. With a desire of keeping the book uptodate, Prof. Edward S. Dana asked Professor Ford to prepare a new and revised edition. Professor Ford found that it was desirable to rewrite the book, but he preserved the original scope and character as much as possible, except that the chapter on petrography was omitted. The book has been primarily designed to fill the ordinary needs of the elementary student of mineralogy, the mining engineer, the geologist, and anybody who may be interested in the subject.

Professor Ford, like Professor Phillips, gives a complete treatment of his subject, i.e., covering crystallography and both descriptive and determinative mineralogy. On the whole he made a better-balanced presentation. The section on crystallography is relatively brief and not too tiresome. The section on determinative mineralogy is fairly satisfactory, and that on descriptive mineralogy is better than in Professor Phillips' book. Professor Ford has the usual pedagogic tendency to make commercial references without a clear understanding of conditions, and occasionally is amusing in consequence thereof; for example, when he remarks that gold "ores are mined at a profit sometimes which contain only 0.001% of gold and yield but $6 to the ton."

It is a pity that Professor Ford considered it advisable to encumber his pages by a chapter on mineral statistics, an abstract from the "Mineral Resources of the United States." On the whole, his work does not interest us any more than the manual that we used to use in our youth, even if it be 25 years old.

We wish that Professor Phillips and Professor Ford and all other mineralogists would adopt a new name for the hydro-silicate of zinc, and cease to perpetuate confusion by the adoption of a name that had a different commercial signification long before mineralogy became an exact science.

THE DESIGN OF MINE STRUCTURES. By Milo S. Ketchum. 5x8 in., cloth; 459 pp. and 250 illus. $4. McGraw-Hill Book Co., New York.

This volumn explains the application of scientific methods to the solution of a class of problems which have, until recently, often been solved by rule of thumb, or by copying some other company's structures. Of course, designing engineers have long employed the principles of graphic statics in the several branches of their profession, but this book is the first that has come to our notice dealing in that manner with the special types of structures employed at mines, headframes and tipples, mill buildings and coal breakers, ore bins and rock houses. It is a particularly valuable book for mining students, containing as it does a wide variety of the kind of instruction that is usually given by lectures and wall diagrams. The illustrations and diagrams are excellent, and bear evidence of much painstaking labor.

The first two chapters describe in a general way the structures and appliances required for hoisting. Chapter III shows the graphic method for computing stresses due to live, dead and wind loads in a simple headframe of the A-pattern, in which the stresses in all members are determinate. Chapters IV and V apply the same method to the four-post frame, in which, owing to redundant members, not all stresses are determinate; here the theory of least work has to be invoked. Chapter VI applies the knowledge of stresses gained in the preceding chapters to the actual design of a headframe, in all its parts; it then proceeds to display numerous examples, illustrated by working drawings, of headframes and rock houses in all parts of the country. It is to be regretted that in this connection only one specimen of a wooden frame is exhibited. Chapter VII gives working drawings of a number of coal tipples.

Chapters VIII and IX discuss first the stresses and then the design of steel-framed and truss-roofed buildings. Much of this is similar to the same author's earlier book on steel mill buildings. Chapter X applies the principles of the retaining-wall to the determination of stresses in bins and works out a clear solution of this difficult problem. The selection of types of actual bin designs, however, is neither complete nor widely representative. Chapters XI and XII deal with coal washeries and breakers, and XIII with a few selected types of structures for other purposes.

Chapter XIV gives information concerning details of construction practice, dimensions and weights of steel, rivet data, etc., without, however, wasting space to reproduce tables which are easily available in the handbooks issued by the steel companies. Chapter XV is devoted to the cost of steel, of its fabrication, erection and painting, and is a valuable fund of information not usually easy to get; this chapter will be welcomed especially by students. Of course, prices are subject to change without notice, but the costs are stated in such a way as to be of great assistance. Appendix I contains specifications for the erection of steel buildings and mine structures, while appendix II relates in the same way to reinforced concrete.

HANDBOOK OF MINING DETAILS. Compiled from the Engineering and Mining Journal by the editorial staff. 6x9, pp. 372, ilus.; $4. McGraw-Hill Book Co., New York.

It is recorded that when Oliver Goldsmith started in Bohemian fashion to travel afoot through Europe, Doctor Johnson said of him that he was capable of traversing the entire continent and bringing home only the description of a wheelbarrow. Taking a wheelbarrow as the representative of those homely details of apparatus or practice which scientists and historians regard as beneath their notice, we can safely say that the dogmatic old doctor was clearly wrong in his depreciation of its importance. In that sense, "descriptions of wheelbarrows," past or present, are often the very things we seek most ardently and find it hardest to discover. This is true, not only in historical research, but also in technical practice. Our professional treatises often necessarily omit the details which we need to know, in order to apply their general instructions; and hints of practice, innumerable and invaluable, are lost in the confusion of periodical publications or professional "transactions." One great improvement has come since Doctor Johnson's dictum ruled the literary world: there is now an abundance of Oliver Goldsmiths, who note and describe particulars; and one may be almost certain, concerning a given bit of such information, that it exists somewhere in print. Indeed, one sometimes remembers having seen it "somewhere." But the need of it is usually immediate and imperative, while the search for it would be long and desperate.

To meet this situation, almost anything is better than nothing. Indexes, summaries, etc., abound and increase; and their number is proof of the demand which they aim to satisfy. Some books of this class are nothing more than indexed scrap-books, containing a mass of indiscriminate and unclassified material. Even these have often an unexpected value. But a greater boon is conferred upon the modern student when some competent critic sifts and arranges such a crude mass, and gives to him the trustworthy and useful part of it in such form as will not only serve his convenience, but also assist his judgment.

The editorial office of the Engineering and Mining Journal has issued, from time to time, volumes of this character, containing the articles upon given subjects which have appeared in its columns. The present work belongs in that class, and I think it possesses some elements of peculiar excellence.

In the first place, Mr. Ingalls, since he became the editor of the Journal, has realized a dream of my own, which remained a dream during my editorial régime, because, in those days, there was no means to make it more. He has sought, as I did, not merely to make the Journal a scientific and professional organ, but also to render it useful to the great multitude of practitioners, educated or uneducated, who could derive benefit from practical suggestions of any kind. My great difficulty was, that I had to depend, in this field, upon voluntary contributions, which were not always either entirely accurate or entirely disinterested. Mr. Ingalls, pursuing the same ideal with ampler means, has employed expert observers to collect such items of practice as were really worth collecting, and therefore his material passed one critical sifting before he had to deal with it at all.

The book is arranged under the general headings: Explosions; Rock Drills; Shaft Work; Driving Adits and Drifts; Stoping; Headframes, Chutes, Pockets, etc.; Hoisting and Transportation; Skips, Cages, Cars and Buckets; Safety Appliances for Hoisting and Tramming; Pumping and Drainage; Ventilation and Compressed Air. Some of these chapters are almost complete pictures of modern practice; but the book as a whole does not profess to be that. Mr. Ingalls himself describes is as "a more or less modern collection of useful information, being just what passes through the pages of the Engineering and Mining Journal in the course of a few years." The reader, in turning its pages, feels as if he were chatting with some well informed expert, who has traveled recently all over the country, and who remarks as to this or that problem of mining practice, "Speaking of so-and-so, let me tell you what I saw the other day, which struck me as a good thing in that line."

There is a preliminary chapter, entitled General Notes, and comprising miscellaneous items which do not belong in either of the others. This has proved to me the most fascinating of all. To take as a sample the passage which is apparently (though not really) the most remote from mining—I was delighted to find in it the description, by my old friend and field companion, W. H. Storms, of the "diamond hitch," that wonder of human ingenuity and skill, whereby Man establishes his supremacy over Horse and Mule. The diamond hitch was to primitive desert and mountain transportation what couplings and brakes are to railroading. Thirty-odd years ago, I knew all about it, and practiced it with success upon the most tricky and refractory pack animals; and I have casually mentioned it with a knowing air, ever since. Yet, the other day, I awoke with a start to realize that I had forgotten how to do it, and that my easy assumption of knowledge was a bluff that any tenderfoot might safely call. Now, thanks to Messrs. Ingalls and Storms, my self-respect is again invulnerable on that point! I have traversed more than once in a Pullman car the scenes where once I corded my baggage with the diamond hitch; and I shall probably never again make use of it; but I am sure it will be, for another generation, one of the things essential to explorers—and every mining engineer is likely to be at some time or other, an explorer. I heartily applaud, therefore, this "description of a wheelbarrow."

It would be unfair, however, to give the impression that this book contains chiefly accounts of such picturesque collateral things. On the contrary, it describes many machines and operations directly connected with mining. But I must confess that I have here given its effect upon me personally, rather than a cold and impartial judgment of it, as a contribution to technical literature. To me, it has been remarkably fascinating. I have found in it, not what I expected, but what I did not expect, yet consciously or unconsciously needed and desired; and I am inclined to think that any mining engineer who turns over its pages will be entertained and stimulated as he reads, and will be likely, at some point, to come upon an enlightening and helpful suggestion, "worth the whole price of admission." In smaller degree, one derives similar benefit from glancing over the weekly numbers of a good technical periodical. But this is a condensed Engineering and Mining Journal, from which the things to be skipped have been kindly removed, and the interesting things have been so grouped as to become still more interesting. A mining engineer could doubtless do without it; but he could do much more with it—and have a good time besides!

R. W. Raymond.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Applicants are requested to call in person.

L. Vogelstein has returned from Europe.

C. R. Corning sailed for Europe on Dec. 14.

Kirby Thomas was in Canada last week on professional business.

Harley A. Sill, of Los Angeles, is at Tumco, Calif., examining mines.

J. Parke Channing returned this week from Europe on the "Lusitania."

Baron von der Ropp has returned to New York after having been in California several weeks.

M. C. H. Little has been appointed superintendent of the Calumet Metals Co., at Larawls, Quebec.

M. S. Griffiths is underground mine foreman of the Ojuela mine, Mapimi, Durango, Mexico.

Sydney H. Ball left New York Dec. 12 for Belgium, and expects to remain abroad until March.

P. J. Kennedy, assistant superintendent of the Treadwell mine, Alaska, has been visiting San Francisco.

Frank M. Estes has returned to the City of Mexico, where his headquarters are at 525 Mutual Building.

B. F. Noehl has returned to Los Angeles, Calif., after completing examinations in Arizona and Nevada.

H. C. Hoover left New York for San Francisco on Dec. 12. He expects to be back in New York by the end of December.

T. Allison, of Galt, Ont., has accepted the position of manager of the Black Lake Consolidated Asbestos Co., at Black Lake, Quebec.

Harold C. E. Spence has returned to Montreal from an extended tour of Newfoundland, where he examined large mineral areas.

W. B. Buckminster, of Boston, principal owner of the Harvard mine, in Tuolumne County, Calif., visited Jamestown in November.

W. L. Cumings, of Bethlehem, Penn., has returned from a five months' trip along the west coast of Mexico and the west coast of South America.

John G. Berquist, works manager of the Universal Portland Cement Co., has resigned that position. He will hereafter act in the capacity of consulting engineer.

J. B. Goodhue, of Quebec, vice-president of the Craig and the Globe Consolidated Mining companies, in Trinity County, Calif., has been in San Francisco.

H. C. Hurd has resigned from the employ of the Nevada-California Power Co. and will go to Spain as engineer for an irrigation plant, operated by an English corporation.

E. S. Sheffield has resigned as superintendent of the Empire and Pennsylvania mines, in Nevada County, Calif. The position will be filled by George W. Starr, of Grass Valley.

James V. Peterka has been appointed chief mechanical engineer of the Indiana Harbor works of the Inland Steel Co., Indiana Harbor, Ind. He will be assisted by Ole Stenbakken, construction engineer; Benjamin Burrell, master mechanic; Frank Warner, assistant master mechanic.

Earl D. Blowers, formerly with the Natomas Consolidated and other W. P. Hammon interests, left San Francisco, on Dec. 4, for Siberia, as superintendent of drilling operations on placer lands to be prospected by Scott & Wiltsee. A Keystone drill will be employed. The drillers will be outfitted in London.

Dr. Alfred L. Thompson, member of the Canadian Parliament, Yukon district, stopped at San Francisco on his way from Dawson to Ottawa, and visited the Panama-Pacific Exposition site. He stated that the Yukon exhibit of the exposition will embrace specimens of all the minerals of the Canadian-Yukon, with a collection of prehistoric relics.

OBITUARY

Frederick S. Bagley died at Denver, Colo., Dec. 7, aged 60 years. He had been in Colorado since 1870 and a resident of Denver for 30 years. He was largely interested in mines in Colorado, Idaho and Mexico.

E. F. Daly died at Tulsa, Okla., Dec 9, aged 50 years. He was born in Washington County, Penn., and for nearly 25 years was an oil operator and oil-well contractor in western Pennsylvania. He went to Oklahoma in 1909 and engaged in the oil business there.

Capt. W. C. Rose, of San Francisco, died in New York, Dec. 11, aged 49 years. He was a mining engineer and had lived in California for a number of years. He was connected with several different mines in California and Nevada.

Humphreys Miller died at Warren, Penn., Dec. 11, aged 52 years. He was born in Pittsburgh, and at early age entered the iron trade. He was connected with the Keystone Rolling Mill Co., and later with the Pittsburgh Forge & Iron Co. In 1897 he went into business for himself as an iron broker, and was one of the best known men in the trade.

J. M. Bruck died at Houston, Tex., Dec. 11, aged 56 years. He was born at Kingston, N. Y., and for a number of years was connected with various oil and gas companies. About five years ago he went to Texas and had since been engaged in experimental and practical work in the manufacture of various products from petroleum. He was president of the Bruck Solidified Oil Co., of Houston.

D. D. Demarest, founder of the D. D. Demarest Co., manufacturers of mining machinery, with shops at Altaville, Calif., and offices at San Francisco, died at Berkeley, Nov. 22. He was 88 years old, and was born in Bergen, N. J. He went to California in 1849, and mined for 10 years, when he engaged in supplying water to the mines in Angels Camp and other mining sections in Calaveras County. In 1861 he established the Angels Iron Works, at Altaville, and conducted the business personally for nearly 40 years, when he was succeeded by his son Clarence D. Demarest. He resided in Calaveras County about 60 years.

Societies and Technical Schools

University of Wisconsin—This institution is now giving instruction by correspondence in many engineering studies; also in a number of other subjects of importance to engineers, such as mathematics, chemistry, geology and mineralogy. These courses include subjects which are usually given chiefly by lectures and recitations and others which are largely laboratory work. Recently a course has been added in microscopic petrography, given by Professor Winchell. In connection with work in mineralogy and economic geology as previously given, this should be of special value to mining engineers and others interested in rocks, minerals and ores. University credit may be obtained for many of these courses by properly qualified students. Full information may be obtained by addressing the Extension Division of the University of Wisconsin, Madison, Wisconsin.

American Society of Mechanical Engineers—The officers elected at the recent annual meeting were: President, W. F. M. Goss; vice-presidents, James Hartness, I. E. Moultrop, H. G. Stott; managers, W. B. Jackson, H. M. Leland, Alfred Noble; treasurer, William H. Wiley. Dr. Goss, the new president, was born in Masachusetts and studied at the Massachusetts Institute of Technology, Wabash University and the University of Illinois. He organized the department of practical mechanics at Purdue University in 1879, and was professor of experimental engineering, dean of the school of engineering and director of the experimental laboratory of that institution from 1890 to 1907, giving special attention to the testing of locomotives. Since 1907 he has been dean of the College of Engineering of the University of Illinois.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Dec. 12—The attitude of the sixteenth annual convention of the California Miners Association respecting the policy of the Department of the Interior in the withdrawal of mineral lands and the use of the waters of unnavigable streams will no doubt be accepted by the Prospectors Alliance of America, recently organized at Bishop, Inyo County. There is no doubt that the members of the alliance have been greatly hampered by the methods of the agents of the department, but they are not greater sufferers than other mining men who are less radical in their demands for restoration of sane conditions. The warning recently issued by the alliance recommending to its members that they decline to give information to federal bureau officials, and to exclude physically such officials from entry into shafts and tunnels, will only work a hardship upon themselves, and render the conservative and wiser effort toward the desired end more difficult. Miners and prospectors, whether of the alliance or members of the miners' association, will find their remedy, if at all, through legitimate and legislative channels and by sane and conservative methods indorsed by the entire community of mining men. It is the purpose of the California Miners Association, to ask the governor and the legislature to assist in guarding the interests of the miners and it makes no untoward attack upon the officials or the department, and its members will not in any way seek to prevent the officials of the department from carrying out the instructions of their chiefs, who are acting under the law, even if they may be exceeding their discretionary powers. The violent policy of the Prospectors Alliance will gain nothing but the ill will of the officials of the government and retard the progress of the California Miners Association. A representative of the alliance had his say in the convention, and to the credit of the better element in the alliance he presented the case of the prospectors without the least show of animosity which is apparent in the literature of the alliance.

Denver

Dec. 13—The fact that the supreme court of the state has ordered the Colorado & Southern Ry. to reopen and operate its line between Denver and Leadville, may be regarded as important to the mining industry. The South Park division, or that portion of the line between Como and Breckenridge has been closed for three years, the company claiming that the business was not great enough to justify its operation. In the opinion of the court, the duty of the railroads is to give the public service and they have no right to pick out a single branch of the system and refuse to operate it at a loss, when the system as a whole is paying handsome dividends, as the Colorado & Southern has for years. The case probably will be taken to the United States Supreme Court if a rehearing is not granted. The officials of the road believe that a federal question is involved inasmuch as the Interstate Commerce Commission holds that any line carrying interstate business even if its cars do not cross the state line is an interstate carrier. In the opinion written by Justice Gabbert, the power of the state railroad commission to control and regulate the railroads of the state is affirmed and all question of the constitutionality of that body is dispelled.

Governor-elect E. M. Ammons promises to be active in his efforts in behalf of the mining industry of the state, and will, it is excepted, in his first message to the legislature recommend laws to be enacted for its benefit. He has named some prominent mining engineers to act as a commission to make suggestions for his guidance.

Butte

Dec. 11—As improvements demanding a greater supply of water are added to the Washoe smeltery at Anaconda the supply from Warm Springs Creek is being found inadequate during certain seasons of the year. Recently one section of the concentrator building was remodeled and the new system, which requires the use of much more water than formerly, has been found so effective that it is probable that the remainder of the plant will soon be transformed in like manner. Several years ago borings to bedrock were made to determine underground water conditions in Warm Springs Cañon. It was ascertained that the largest part of the water supply escaped under the surface, the greatest flow being found at a depth of about 50 ft. For the purpose of adding to the supply for the smeltery the management has decided to make use of this information, and a force of 24 men is now engaged in sinking an 8x16 ft. shaft to intercept the subterranean flow. A depth of 20 ft. has already been reached, and when 50 ft., or whatever necessary depth, has been attained, a 7000-gal. electrically operated centrifugal pump will be installed, and the flow will be pumped into the flume now conveying the water from Warm Springs Creek to the smeltery. During the high-water period the supply will be sufficient without additional pumping, but during low water, particularly in March and April, the pumps will be operated steadily.

A short time ago the Anaconda company installed what is known as the "rustling-card" system. It is required that all laborers about to enter the employ of the company be provided with a card containing the history in writing of the individual; name, time, nature and place of previous employment, etc. The object of this is to more thoroughly familiarize the company with its employees, and to provide a more efficient method of keeping the time books. With the system in use it will be necessary for a prospective employee to provide himself with one of these cards in order to obtain work from the foreman of the mine where he may be looking for work, or "rustling" as it is called. In the case of miners newly arrived in the city, cards can be obtained at the clerical office. As was anticipated the innovation at once met with some opposition, and for the purpose of deciding the matter, a meeting of the local miners' union was held, Dec. 10. After a stormy session between the radical and conservative elements, the latter achieved a partial victory in causing the settlement of the question to be left to the future decision of the executive board of the Western Federation of Miners, the parent body of the Butte union. The matter is now resting pending this decision.

Salt Lake City

Dec. 12—The American Ozokerite Co. is developing claims covering ozokerite deposits about 100 miles southeast of Salt Lake City, partly in Wasatch and partly in Utah County. The deposits are found along the southern and western slope of the Wasatch range, over an area up to two miles wide and about 12 miles long, from west to southeast in a general direction, beginning one mile west of Media, and extending to within two miles of Colton on the southeast. The claims, patented and unpatented, comprise an area of about 1500 acres, practically paralleling the Denver & Rio Grande R.R. The mineral wax occurs in fissures cross ing a large fault extending throughout the entire length of the ozokerite zone, and the veins range from two to 30 ft. in width, carrying, with high-grade and low-grade material, an average of 3% wax. The deposits open up more extensively with deeper mining. So far, the claims have not been sufficiently developed to make possible an estimate of their probable productivity. The total area is, however, greatly in excess of that of the only other known field, the Austrian field, which has a production valued at $80,000,000. The geological conditions here and on the Austrian properties are practically identical. The company has a new 100-ton mill capable of treating ore carrying as little as ½% wax.

Negaunee, Mich.

Dec. 12—The last of an ambitious, but unsuccessful scheme to strip iron-ore lands was marked by the recent sale of the apparatus for scrap iron. The so called "grab" system was given a tryout several years ago by the Jones & Laughlin Ore Co. at its Grant mine on the Mesaba range. Two large steel towers, moved on tracks, were used, one on each side of the pit. They were connected by steel cables on which a grab-bucket was hung. The bucket when lowered to the ground was expected to grab up a load of earth and convey it to the sides of the pit where it was to drop the load into cars. The system did not work out well in practice, as breakdowns occurred at frequent intervals.

The Verona Mining Co., a subsidiary of Pickands, Mather & Co., operating the Caspian, Baltic, Fogarty and Bengal mines, in the Iron River district, has established a commendable practice of encouraging flower and vegetable gardens and well kept lawns at its mines. On Thanksgiving Day, there was a gathering in the company's club house for the distribution of prizes. In each of the table gardens and lawns, there were three table gardens and lawns there were three prizes, $15, $10 and $5. It was announced that in the Baltic location vegetables were grown last summer aggregating $1100 in value, or $30 per yard on an average; in the Caspian location the value was $1550, or $25 per yard.

Cobalt

Dec. 14—Sir Henry Pellatt, president of the Cobalt Lake Mining Co., has notified the shareholders that he has entered into an agreement with an English syndicate whereby he has granted them an option on his 1,000,000 shares of stock. He stated that the shareholders will be given an opportunity to join in the agreement and advises them to follow his example and accept the offer. The details of the offer have not been made public, but the purchasing syndicate will pay 20% of the purchase price in cash, the balance to be paid in certain fixed percentages and at fixed prices from time to time, spread over a period of a little more than one year. The intention of the syndicate is to incorporate a company in England and market the shares in London.

Sir Henry stated that he had estimated with care the position of the Cobalt Lake in comparison with other properties and had come to the conclusion that the offer was not only fair as to price and terms, but that it was highly advantageous to the shareholders. A meeting will be held, Dec. 20, when the shareholders will have the opportunity of considering this matter. Those who are satisfied with the prices and terms can hand over their shares to be dealt with under the agreement. Those who prefer that matters should remain as they are, can retain their shares and hold them as shareholders of the Canadian Cobalt Lake Mining Co.

Porcupine

Dec. 14—The strike situation remains practically unchanged, with the Dome and the Hollinger working at nearly full force, while practically all the other mines are closed down. While the union has not succeeded in stopping work at the two largest properties, it has been fairly successful in keeping good miners away from the camp. Although the mills are being kept in operation, the shortage of experienced miners is proving a serious handicap. It is likely that the situation will remain unchanged for some time.

Chihuahua

Dec. 6—Operations throughout the State of Chihuahua for the last three weeks have been and are just now hampered by shortage of fuel and ore-cars. The fuel shortage is affecting not only the mines and metallurgical works, but the railroads as well.

During the latter part of November the Chihuahua smeltery of the American Smelting & Refining Co. shut down all of its furnaces two days, and at this writing is on the verge of another and longer shutdown. Local industries, such as the foundry and electric-light plant are also in a precarious condition and the Northwestern Ry. Co., operating west, is running trains only irregularly on account of no coal. Wood is largely being used in the locomotives. The Rio Tinto smeltery at Terrazas has a fuel supply sufficient for about 30 days, as have the mines of Santa Eulalia, while the smelteries at Torreon, Velardeña and Mapimí have ample fuel for from 30 to 60 days, the absence of a reserve stock is causing some uneasiness. This fuel shortage is readily explained. The railroad lines north have been, until quite recently, out of commission for several months and hence no supply could be obtained from the United States. The output of the Mexican coal fields in the State of Coahuila has been greatly decreased during the last few months on account of revolutionary activities. Some of the large mines have been shut down and are now unable to reopen on account of scarcity of miners.

The shortage of ore cars is most serious on the line of the Mexico Northwestern Ry. and unless relief is shortly afforded, it is probable that a number of important shippers, notably in the Cusihuiriachic camp may be compelled to close down. This shortage is due partly to the destructive work of the revolutionary and robber bands and to the inability to move cars south from the Juarez division of the line.

No reports have come in recently of further molestation of foreign interests by the roving rebel bands, although it is the general belief that American mining companies in particular may as well as be prepared to pay forced contributions. This belief is based upon the frank statement of the leaders of these bands which are, that inasmuch as American hostility (such as preventing importation of arms and ammuintion) occasioned the failure of the recent revolutionary movement, the Americans in Mexico must pay. Whether or not this is an unanimous concerted action on the part of the revolutionists it is impossible now to state definitely. In any event American interests of all kinds have been less respected since the downfall of the Orozcista revolutionists.

Jena, Germany

Dec. 2—The draft of the bill proposing to create a monopoly of the sale of illuminating oil in the German Empire has at last been made public by the official organ of the government. The bill has been approved by the federal council and will be laid before the Reichstag to decide whether it will become a law or not. It is hard to predict the outcome of the decision. In the meantime the newspaper war between the Standard Oil Co. and the Deutsche Erdol A.-G. (Deutsche Bank) is going on with unabated vehemence.

The suit of the Standard Oil Co. against the German Petroleum Selling Association (Deutsche Bank) for breach of contract, has been decided in favor of the former by the appellate court at Hamburg, as far as the validity of the contract between the two companies is concerned. The decision does not enter into the question of whether or not the Deutsche Bank was justified in breaking the contract on account of the obnoxious clauses which the court declares invalid as contrary to existing laws. The case is going now on appeal to the supreme tribunal at Leipzig for final adjudication.

The Mining News

The Current History of Mining

Alaska

Alaska Gold Mines Co.—The Perseverance stamp mill, four miles up the Silver Bow Basin, was destroyed by fire, Dec. 3. The mine force of 150 men was able to save the powder house and adjoining buildings. The mill, which was an experimental one, will not be rebuilt.

Rhoads-Hall—This mine, on Bedrock Creek, is producing steadily. About 30 men are employed in mine and mill. Ore to supply the mill is being taken from the stopes above the working adit. The winze has been sunk 115 ft. below the adit, giving it a depth from the surface of about 290 ft. At the 100-ft. level of the winze a station has been cut and driving is in progress. A good shoot of ore has been found in the west drift.

Chatham Mining Co.—This company, composed of Fairbanks men, has enough ore of a good grade developed to keep the four-stamp mill busy for a year. At present the ore is hauled from the mine to the mill by horses, but it is probable that an aërial tram will be installed before long. At the mine, stoping and driving are in progress.

Homestake—Owing to bad air at the face, the work of driving the main adit was suspended during the summer. A gasoline-driven suction fan has been installed and driving has been resumed. The adit is now in a distance of 650 ft. and is expected soon to cut the vein shown on the surface. During the summer some work was done on the rich stringer cut by the adit about a year ago. At a distance of 100 ft. from the adit, the stringer has widened to 10 in. of good ore.

Teddy R.—This claim, adjoining the Helen S., on which Cutes & Feldman are developing a rich vein, has been bonded to George Wheeler, of Ester, for $100,000. A shaft will be sunk to develop the same vein shown in the Helen S., which has been traced across the Teddy R. for 500 feet.

Reliance Mining Co.—A two-stamp Joshua Hendy mill is being erected by Spalding & Letterman, who have the Soo claim of the Reliance Mining Co. under lease. The lessees have been operating the Fairbanks-built mill of three 250-lb. stamps during the summer when there was water. The ore crushed has averaged about $400 per ton. The new mill will be on Dome Creek, below the mine, and it is planned to run it continuously on low-grade ore. Martin Hanais has taken a lease on 500 ft. of the Waterbury claim, which adjoins the Soo. A 100-ft. shaft on the ground is said to show three feet of $25 ore.

Pioneer Mining Co.—The five-stamp mill on this property was started Nov. 3. The first ore to be crushed was taken from the Gladstone vein of the Jupiter-Mars claim, which is under lease to Willis, Giske, Larson & Rodsett. A 100-ft. shaft has been sunk and 150 ft. of tunnels driven. Five stopes have been opened, from which the lessees expect to keep the mill busy.

Arizona

Maricopa County

Ghost—Quartz containing much free gold has recently been found on this claim in the Picacho district. The quartz containing the gold is 5 or 6 in. wide. The property is owned by Harry J. Bennett.

Red Rover—Shipments of high-grade silver and copper ore continue to be made from this mine, near Phœnix. The mine is nearly 60 miles from the railroad and only the high-grade ore can be shipped at present.

Vulture—The mill at this mine, near Wickenburg, is now running full time since an abundant supply of water has been obtained from wells which were drilled near the mine. Regular shipments of concentrates are made from Wickenburg. The underground workings are being surveyed and development work continues. A large shoot of sulphide ore has recently been discovered below the old workings.

Mohave County

Pinkham—A bond on this property has been given to Charles Qualey and L. A. Dockery. It is expected that the shaft will be sunk to greater depth and that the 250-ft. level will be opened.

Rainbow—It is reported that the railroad extension to the Rainbow and Tennessee mines at Chloride is nearly completed.

Telluride Mining Co.—The property held by this company is an extension of the Tom Reed and has recently been equipped with a 40-hp. double electric hoist, a blower, blacksmith and machine shops and several houses for the employees. The sinking of the shaft, which was discontinued at a depth of 90 ft. pending the installation of the hoist, was resumed a few days ago. J. E. Rose is president.

Oro Plata—At a recent meeting of the stockholders a deal was made with O. B. Stanton whereby the latter is to assume the management of the property and raise funds for its development and initial operation.

Distaff—Harry Blackwell and associates have a lease on this old mine at Chloride. The winze from the tunnel level has reached a depth of 200 ft. and drifts are being driven on the vein. There is about a carload of ore on the dump ready for shipment. Several tons of the ore recovered during the sinking of the winze was jigged and the concentrates assayed about $200 per ton in gold and silver.

C. O. D.—This property has been bonded to Salt Lake City men and it is expected that work will be started on the property this month.

Alexander—An examination of this group of claims, near Mineral Park, held by James Dundon was recently made by R. P. Wheelock.

Union Pass—A promising discovery of a large gold-bearing vein was recently made near the summit of the Blue Ridge range, south of Union Pass, by Mike Coleman.

Ruth—It is reported that the drift near the bottom of the shaft has broken into ore, the position of which is indicative that it is the lower extension of the shoot encountered in the upper workings of the mine.

San Francisco—A rich strike was recently made on the 700-ft. level of this property. The ore streak encountered varies in width from 2 or 3 to 14 in. and some samples assay over $2000 per ton in gold. The ore also carries silver, lead, copper and some zinc. The drift has been driven along the vein for 30 ft. A compressor is *en route* to the property and as soon as it is installed the development work will be expedited. J. C. Goulding is in charge.

Santa Cruz County

Switzerland Group—This property is not under bond to Woodworth & Lane, as has been inferred from an item in the JOURNAL of Nov. 30. James Partridge, Dr. Noon and associates, sold the Austerlitz property to those men, but the adjoining Switzerland claims have not yet been sold or optioned.

California

AMADOR COUNTY

Hardenburg—The concrete foundations and the frame of the building for the new 20-stamp mill are completed; N. S. Kelsey, of Jackson, superintendent.

Bunker Hill—The new steel headframe is completed and in operation. The cleanup at the mill for November was greater than for the preceding month; E. Hampton, of Amador City, superintendent.

Plymouth Consolidated—At the Pacific shaft, 30 men are employed. Only two shifts are worked at present, while the work of continued exploration of the lower levels is in progress; J. F. Parks, of Plymouth, superintendent.

Fremont—A new steel headframe is being built at the mine near Drytown. There are two wooden hoists in operation, one of which will be dismantled when the new one is ready for operation; W. Palmer, of Drytown, superintendent.

CALAVERAS COUNTY

Calaveras Copper Co.—Twelve teams of 14 animals are hauling ore from the mine at Copperopolis to the railroad at Milton. Ground is being prepared for grain growing and vegetable garden on company lands for supplying the stables and the boarding house. The use of auto trucks for hauling ore, it is understood, will be resumed in the summer when the roads are in condition; J. H. Trerise, manager.

Reiner—The surface equipment of this gravel mine at Altaville was destroyed by fire on Dec. 7. The loss included the mill and pump house, and the damage is estimated at $75,000; John C. Benson, of Stockton, president.

HUMBOLDT COUNTY

W. H. Holcomb has been employed by N. C. Halliday, of Eureka, to make surveys for pipe line and mill site at or near Bonnieville, for the development of the recently located gold-mining claims on Willow Creek.

Red Cap Mining Co.—This mine, 80 miles northeast of Eureka, is developed by two tunnels, 275 and 75 ft. long; 75 tons of ore is in the bins ready for reduction. The surface equipment includes a crusher and concentrator. The ore is high grade; C. W. Hayden, of Eureka, president.

Horse Mountain Copper Mining Co.—A statement has been issued by the president, David Wilson, regarding the underground development and surface equipment. Six tunnels, aggregating 1500 ft., have been driven, the longer being 450 ft. and 500 ft. The surface equipment includes a 50-ton concentrating mill, costing $12,000; a wagon road 10 miles long, costing $10,000; necessary buildings, horses, wagons, sawmill, the cost of which is not stated. The money has all been secured by the sale of stock. The concentrating mill has not been started, but it is expected to be ready for operation during the winter. The concentrates will be shipped to the Tacoma smeltery.

Delhi Mining Co.—About one-fifth of the five-mile flume to carry water from Bloody Run to the mine has been completed under contract. The company will complete the flume. The flume and ditch will be completed in the spring of 1913. Sufficient water will be obtained for the generation of electric power. The mine is near Columbia.

Golden Gate—W. P. Martin has resigned, and E. R. Henick, of San Francisco, has been appointed superintendent. A large amount of money has been spent in development, and it is the purpose of the owners to continue development work.

INYO COUNTY

Railroad engineers are reported to be surveying a line between Searles and Borax Lake. The distance is 20 miles across desert land. Searles is on the Southern Pacific R.R., 15 miles north of Bakersfield. The Borax Lake lands are said to contain potash deposits, also borax and other like minerals. The ownership and operation have been in dispute and litigation for some time. It is reported that a settlement is about to be reached; Foreign Mines Development Co., owner.

KERN COUNTY

Potash is reported to have been shown at China Borax Lake by investigations made by Edward Teagle and Charles Churchill who have extensive holdings in the lands north of Randsburg.

A discovery of wolframite is reported about 25 miles west of Randsburg, in Jawbone Cañon. The vein is said to be small, and it is considered an unusual find, as the tungsten in the vicinity of Randsburg and Atolia is found as scheelite.

Colorado

CLEAR CREEK COUNTY

Pioneer—This property, at Empire, is being provided with a concentrating mill to treat low-grade ores. The structure is rapidly nearing completion; Sherman L. Work, manager.

Castle Rock—This property, in the Freeland district, is being systematically developed by R. D. Blair.

Stanley—During November the fifth-level-west heading was advanced 129 ft. to a total length of 1699 ft. from the main shaft. The vein is 2½ ft. wide.

Gem—During November, lessees Shaffer and King produced 1000 tons of $15 ore.

West Bellman—This property has been leased to Galligan & Co., who have commenced sinking a shaft on the vein from the Central tunnel level.

Lamartine—The development and operation of this property will be resumed in the near future. George K. Kimball has recently been appointed manager.

LAKE COUNTY-LEADVILLE

Large shoots of iron-silver ore have been opened on Carbonate Hill, as well as zinc-carbonate ores and occasionally veins of lead ore though the bulk of the lead carbonates has been extracted. From the Stars Consolidated properties about 5000 tons per month of different classes of ore continue to be shipped, principally from the lower and middle part of the hill, while in the upper portions are the big zinc-carbonate orebodies of the Wolftone Castle vein and others.

It is now stated that the Leadville district mill in lower California Gulch, which changed hands lately, has been supplied with crushers, tables, and magnetic separators and as soon as contracts have been signed with owners of low-grade sulphide ores, it will be started at 100 tons daily capacity. The new owners of the American zinc-extraction mill, better known as the Yak mill, are expected to start with their new process shortly and treat 200 tons per day.

Yankee Doodle—The drifts from the shaft having been cleaned out and repaired, the lessees are now able to get at the lead-oxide ore, from which shipments were originally made through the shaft.

Amie—It is reported that the lessees have opened a big shoot of siliceous ore at the 200 level and will start shipments at once.

Little Giant—This mine, on Carbonate Hill, is employing 14 men and producing about 25 tons per diem of iron ore. There is also zinc-carbonate ore in the mine but test shipments show under 18%, which is too low for profit.

Boston—This mine, in Mayflower Gulch, Ten Mile district, opened ore lately and development now shows it to be 40 ft. wide and about 4 ft. thick, containing gold, silver and lead; 30 men are employed.

TELLER COUNTY-CRIPPLE CRREK

On Dec. 1 the deep-drainage tunnel showed an average flow of 8650 gal. per min. The recession in the Gold Coin shaft at the east end of the district was 4 ft. 9 in. for November and in the Mary McKinney and Elkton, which are nearest the tunnel, about 8 ft. for the same period; total recession since drainage through this tunnel commenced about 200 feet.

Vindicator—The output of this Bull Hill mine for November is estimated at 100 carloads, 60 of which ran about $35 per ton and 40 about $25 per ton.

Ajax—It is stated that the Colburn-Clancy mill on Battle Mountain is treating 78 tons of dump ore per day, averaging $3.25 per ton. From the mine, of which A. E. Colburn is owner, the output for November was 40 carloads of $25 ore.

Elkton—The November production was 2500 tons, carrying about 1 oz. gold per ton. This same from the 10th and 11th levels rendered accessible by the water recession.

Idaho

IDAHO COUNTY

South Fork—A new strike of high-grade ore was made recently in a new tunnel on the upper part of the property. The vein is six feet wide.

American Eagle—The raise connecting the tunnel level with the surface has been completed and sinking has commenced on the new 500-ft. shaft.

Lawrence—All the machinery for the 50-ton plant has been installed and the mill will be started this week.

OWYHEE COUNTY

Ontario—The Ontario and Stenden groups have been purchased by Idaho operators and work has been resumed.

SHOSHONE COUNTY

Tamdrack—Eight feet of ore has been encountered in driving the Custer tunnel. An aërial tramway has been built to the Rex mill, which was recently remodeled to treat the Tamarack and Custer ores.

Interstate-Callahan Consolidated Mining Co.—This company has acquired the Amazon-Manhattan group and will begin extending the tunnel through the north side-line into Amazon ground. Ores from both properties will be treated in the new Interstate mill.

Silver Cable—The vein opened on the intermediate tunnel level shows ore of quality and quantity to justify continuation of work all winter.

North Bunker Hill—An assessment has been levied for the purpose of completing the long crosscut, which will have a total length of 1800 ft., of which approximately 1500 ft. has been driven.

Snowstorm—The second unit of the plant has been placed in commission, increasing the capacity to 250 tons daily. The number of tables has been increased to thirty-eight.

Nabob—Work preliminary to the resumption of operations on a large scale has been begun in advance of the arrival of the power line being built by the Washington water-power company, to serve the property.

Idora Hill—Grading for the new concentrator which the company proposes to build this winter has already been begun. The tramway right-of-way has been cleared and construction has been begun on the ore bins at the head end.

Black Horse—Recently 40 tons of concentrates were shipped.

Black Bear—Work has been resumed at this property and it is expected to be shipping at an early date.

Roanoke—Work has been resumed in the east drift from the shaft which will be driven 350 ft. to cut the main ore-shoot.

Stemwinder—The first shipment of ore from these abandoned workings of the Bunker Hill & Sullivan mine was made recently. The ground is under lease to Blocker & Penfield.

Liston—Work has been resumed after a suspension of several weeks and will probably continue all winter.

Hector—The Mayflower tunnel has entered Hector ground and has yet to go 600 ft. before it will cut the vein at a depth of 1300 feet.

Indiana

International Lead Refining Co.—This plant, in East Chicago, was started the last week in September with George Hulst, formerly of the Omaha plant of the American Smelting & Refining Co., as superintendent. The Parkes' process is used, not the Betts', as has been reported. A new baghouse, office building and laboratory are being erected. The output is estimated at about 300 tons per day, with 150 men employed. The plant is so situated that it will have both rail and water transportation facilities when the new canal is opened.

Michigan

COPPER

Ahmeek—The structural steel for the new rock houses at Nos. 3 and 4 shafts is being rapidly assembled and the work on the other buildings of the surface equipment is progressing satisfactorily. Underground conditions continue most favorable. Another feature that is receiving a good deal of attention and which will yield considerable revenue is the fissure-vein system tributary to No. 2 shaft at the 10th and 12th levels, which is highly mineralized. Considerable mohawkite has been developed and it will be treated at the Lake Superior smeltery at Dollar Bay.

Hancock—Further developments on the lode opened at the 1800-ft. level continue opening a formation of uniform character and as well mineralized as anything exposed in the mine. The work of extending the other openings preparatory to putting the property on a producing basis is progressing satisfactorily and shipments to the mill will in all probability be started early in the new year.

St. Louis—This company's shaft is down about 500 ft. and drifts are being extended from the four levels above. Results are very encouraging.

La Salle—The work of moving the surface equipment from Nos. 5 and 6 shafts to the site of Nos. 1 and 2 shafts has been completed and the equipment will soon be ready to do duty in its new position, so that the property will be in shape to resume operations at an early date.

South Lake—This company's shaft is to be supplied with the hoisting equipment that was in commission at the No. 3 shaft of the Franklin company. It has a capacity of about 1500 ft. The shaft is down over 100 ft. and good progress is being made in sinking.

Wyandot—Operations at this property are centered in sinking a winze on the No. 8 lode, which was exposed in the long crosscut at the 750-ft. level of the exploratory shaft. This lode at the point of intersection showed considerable copper, so that the opening at a greater depth will be watched with interest.

IRON

Brule Mining Co.—Word has been received from Oglebay, Norton & Co. to resume work at the Berkshire mine in the Iron River district. This mine was closed a year and a half ago. The stockpile of 30,000 tons which remained at that time was purchased by the Wickwire Steel Co. and has now been cleaned up.

Wickwire—A fireproof change house has been completed.

Hilltop—At this exploration in the Crystal Falls district, recently abandoned by the Oliver Iron Mining Co., the Roberts Ore Co., to which the property reverted, is sinking a shaft. The tax commission valued the Hilltop at $15,000 last month.

Corrigan, McKinney & Co.—At Crystal Falls, this company cleaned up the stockpiles at its Dunn and Tobin mines, but did not touch the big pile at the Great Western mine. The Armenia shipped all its No. 1 grade and nearly all its No. 2 grade.

Mansfield—This mine of the Oliver Iron Mining Co., the only one in the Crystal Falls district which has shipped bessemer ore, made no shipments of any kind in 1912.

Armenia—A new shaft has been started at this mine, about 150 ft. east of the present working shaft. It will be used for ventilation and later to remove the ore near the other shaft.

Cascade Mining Co.—This company has named its new mine at Palmer, where a shaft is being sunk, the "Isabella." The shaft has been concrete lined for 40 ft. below the collar and sinking is now progressing in eight-hour shifts. It will be over a year before the shaft is completed.

Missouri

JOPLIN DISTRICT

A three-ton auto truck will soon be put in operation by S. M. Short to haul supplies to his Pocahontas and Sitting Bull mines at Thoms Station. It will take the place of two teams.

Enochs & Co.—A 10-ft. face of ore has been developed by this company on a 40-acre lease of the Spencer land on Turkey Creek at a depth of 95 ft. Plans are being made for a concentrating plant. Former developments in this vicinity have been confined to surface diggings.

Webb City-Lehigh—Seven feet of good ore is showing in the new shaft of this company on a sublease of United Zinc Co. land at Carl Junction, and the shaft is still in ore. The shaft will be continued through the ore before drifting is started and if indications warrant a concentrating plant will be erected.

Chicago-Lehigh—Steady production is being made by this mine on the Knight land at Carl Junction. Two shifts will be worked in the near future, which will bring the output to two carloads of concentrates per week. Ore is found at 130 ft. and is being mined from two shafts.

Weaver Mining Co.—Forty-two acres of mineral land has just been purchased by this company for $20,000. The land is 3½ miles north of Carl Junction. The company was one of the heavy new producers in the Carl Junction district, but caving ground has materially curtailed the output.

Martha Ball Mining Co.—This company, operating in West Joplin, is completing a 300-ton mill, equipped with electric power throughout. The old Maltese shaft has been opened and drifting started at 200 ft. after having prospected the ground with drill holes.

Montana

BUTTE DISTRICT

West Stewart—Fire was discovered in this mine of the Anaconda Copper Mining Co., Dec. 10, in a raise between the 1500- and 1700-ft. levels. The shift of 300 men was hoisted, 60 men were put to work to subdue the blaze. In a short time several streams of water were playing upon the fire, resulting in effectively confining it to the original area. It was believed that it would be under control within 24 hours at the most, but bulkheading material was lowered and held in readiness to wall in the fire zone, should the flames prove more stubborn than anticipated. Since a connection was made between the West Stewart and Little Minah properties, some time ago, the shaft has been downcast, which makes fire fighting much easier than with an upcast shaft. The mine is isolated from the Anaconda fire area. While the cause of the fire has not been ascertained, it is probable that it was started by the carelessness of a miner in leaving a lighted candle near the dry timber in the raise.

DEER LODGE COUNTY

Butte & Georgetown—Efforts are being made by the directors, who own several hundred acres of placer ground in the Georgetown district, to interest French men in the property with a view to financing the installation of a dredge. As a result, a mining engineer from France is expected to make an inspection. Shafts have established the fact that that bedrock lies about 75 ft. below the surface, and at present pay dirt is being mined for a depth of 5 ft. above bedrock and hoisted to the surface, where it is run through a sluice box.

Nevada

COMSTOCK LODE

Mexican—The annual report of Superintendent Symmes shows that the production for the last year was 19,999 tons of ore milled, and shipped to smeltery, the gross assay value of which was $521,495, and the gross yield to the company was $471,786. The average extraction at the mill for the year was 92%, but during the last 5½ months of the year, it averaged 93.6%. The bullion shipped from the mill contained 13,667 oz. of gold and 229,825 oz. of silver, giving a gross assay value at the smeltery of $426,004, for which the company received in settlement $422,937. The cost of milling per ton was $2.81 per ton and of mining $8.97 per ton, not including cost of pumping. The total cost of the new mill was $104,214.

Sierra Nevada—The north drift on the 2500-ft. level has picked up the vein.

CLARK COUNTY

Bullion—Yount & Fayle, of Goodsprings, have made the final payment of $10,000 on this and the Accident claim, both situated about seven miles south of Goodsprings. They have held the property under lease and bond for the last year, during which time, ore taken out in development netted them over $10,000, the ore being a lead-carbonate carrying silver. The force of men now at work will be increased, and new equipment will be added.

Frederickson—R. Munzberg, now operating this property, of which he is part owner, has opened a 4-ft. vein of zinc-carbonate ore. One car has been shipped, and further shipments will go forward regularly.

HUMBOLDT COUNTY

National Mining Co.—This company has won the apex suit which was fought so bitterly this year by the Mammoth Mining Co., which owns the adjoining ground.

NYE COUNTY

Shipments in tons from Tonopah mines to date and for the week ended Dec. 7 are as follows:

Mines	Week	Year to Date
Tonopah Mining	3400	164,619
Tonopah Belmont	3060	123,878
Montana-Tonopah	913	50,068
Tonopah Extension	1055	49,468
West End	1100	38,127
Midway	45	865
MacNamara	576	18,732
North Star		401
Mizpah Extension		40
Jim Butler	300	5,000
Tonopah Merger	205	505
Totals	10,654	451,703
Estimated value ..	$201,800	

WHITE PINE COUNTY

Nevada Consolidated—Operations are being continued at about normal capacity, the weather so far not having interfered with operations. The Veteran mine is producing 750 tons of ore per day. The ore is being followed to the south and west.

Giroux—This company is shipping about 500 tons of ore per day to the Steptoe smeltery. Surface improvements, which have been made to reduce shipping costs, are nearly completed.

Smoky Development Co.—In this company's mine, just above Lane City, commercial ore is showing in several drifts driven out from the development tunnel.

New Mexico

SOCORRO COUNTY

Ernestine—During a recent week, 745 tons of ore were milled, producing 57 sacks of high-grade concentrate, in addition to the zinc-box precipitates. The last 10-day cleanup in November yielded 9350 oz. of gold and silver bullion and 8450 lb. of concentrate. December promises to be a good month and the year 1912 will record the largest production in the history of the mine.

Mogollon Gold & Copper Co.—The electric hoist recently installed at the Little Charlie mine is giving satisfaction, and this property is producing about 40 tons per day. Annual assessments are being conducted on the various claims adjacent to Mineral Creek.

Oaks Co.—Shipments to the custom mills are being made regularly from the various developments being conducted by this company.

Deadwood—Developments in the lower levels continue to open a higher-grade ore than was mined from the upper zones; 350 tons were milled during a recent week.

Socorro—The mill handled 1100 tons of ore during the week, taken principally from the lower levels

Trilby Group—Work on the 200-ft. level continues in ore both east and west.

Apache Group—A drift is being driven north from the crosscut.

Oregon

Governor West has appointed the following delegates to attend the sixteenth annual convention of the California Miners' Association, at San Francisco, Dec. 9, 10 and 11: B. O. Kempfer, Baker; J. K. Romig, Baker; W. J. Hughes, Prairie City; H. E. Hendryx, Sumpter; Robert M. Betts, Cornucopia; R. R. McGaughey, Baker; C. B. Watson, Ashland; A. H. Gunnell, Grants Pass; O. L. Young, Ashland, and G. W. McQueen, Cottage Grove.

JOSEPHINE COUNTY

Waldo—The management of these copper mines has offered $10 per ton for hauling ore from the mine to Grants Pass, from where it is to be shipped to the smeltery, at Kennett, Calif. About five days are required to make the trip from Grants Pass and return.

Jack's Creek—The owners of this mine are installing a gasoline engine and hoist to lift the heavy boulders out of the way of placer operations.

Sexton—The giants are at work at this placer property.

Swastika—The three large giants recently installed on this property will be in operation in a short time.

LANE COUNTY

Combination—Clark Bros., owners, state that work will be resumed on this property near Bohemia. Men will be kept busy all winter in the drifts and it is the intention of the management to install more machinery in the spring. Sherman Clark has charge of the work.

Oklahoma

OTTAWA COUNTY

Carson Dodson Mining Co.—Work on a new 400-ton mill was begun recently. The mill was moved from the Joplin district. With a few improvements, it will be one of the largest mills in the district. It will be driven by a gas engine. Two 4x5-in. shafts are being sunk. The drill holes show that the ore will be reached at a depth of 210 ft. and that the face will be about 25 ft. high. A joint power plant is being built on the Oklahoma Lead & Zinc property, by the Oklahoma, the Carson Dodson and the Thirty Acre Mining Co., each company furnishing an air compressor and a gas engine.

Oklahoma Lead & Zinc Co.—The mill shaft is being sunk to a depth of 225 ft., at which level drill cuttings show that there is a face of lead and zinc ore about 25 ft. high. This mine is now producing about 70 tons of ore per week. About 60 men are employed.

Mizpah Mining Co.—This company, one of the new developments of the Miami Royalty Co., began work recently and has just shipped the first car of ore. The ore is of a medium grade, most of which is zinc. The ground has not been opened so that the 250-ton mill can be supplied to its full capacity.

Prairie Mining Co.—A steam plant and compressor are being installed and the mill will be ready to run within a short time. A prospecting drill has been started on the north end of the lease.

Utah

BEAVER COUNTY

Moscow—A new hoist and compressor are being installed.

Majestic—This company in November shipped the largest monthly tonnage in its history, 53 cars coming from the Hickory, and one car from the Harrington-Hickory.

Horn Silver—The monthly rate of shipment for this company is given at 2500 tons; November shipments were about 1500 tons in excess of this amount. The ore is about equally divided between lead and zinc. The dumps are yielding a considerable tonnage of low-grade ore, and the better grade comes from the 300-, 500-, 700- and 900-ft. levels. The company has added to its ore reserves by finding the extension of several faults. The shaft is to be retimbered from the 500- to the 700-ft. levels, and during the two weeks required for this work, operations will be suspended on all except the 300-ft. level.

JUAB COUNTY

Tintic shipments for the week ended Dec. 6 amounted to 215 cars.

Victoria—The concrete foundations for the new machinery, which is expected early in December, has been completed.

Swansea—It is reported that operations are to be suspended.

Gold Chain—An average daily output of about two cars is being made. The drift on the 500 level is 100 ft. long, with the face still in ore.

Grand Central—Copper ore is being mined on the 2300, and a winze is to be sunk below this level.

Michigan-Utah—Preparations are being made for sinking near the raise between the Solitude and City Rocks tunnels. Shipments are being made.

Chief Consolidated—A drift is being driven to connect this property with the Gemini, the immediate object being to prospect the ground formerly owned by the Eureka City Mining Co. It is stated that a contract has been let for carrying on this work from the Gemini side also. The connection will probably be completed within a few months.

Scranton—The contract under which zinc ores have been shipped during the last few years has expired, and the working forces at this mine have been put on development. Shipments have been temporarily suspended. The older workings are in good condition, with promising indications on the deeper levels. Preparations are being made to install new electrical equipment.

Victor Consolidated—Lessees are working at this property near Mammoth, and a car of copper ore was mined recently.

May Day—There are two faces of silver-lead ore on the 1100, or deepest level on which ore has been opened. Shipments of zinc ore are being continued.

SALT LAKE COUNTY

Bingham-New Haven—This company has completed underground connections with the Utah Consolidated, which tramline will be used to transport Bingham-New Haven ores to the Tooele smeltery. The use of this line and the convenient ore bins recently built will, it is estimated, reduce transportation costs from 60c. to 40c. per ton.

Ohio Copper—The first and third sections of the mill are treating from 1700 to 2000 tons of ore daily. The second section is idle, and the company is said to be considering replacing the Wall rolls. Colonel Wall is suing the company for $36,000 in payment for the rolls.

Michigan-Utah—Now that the tramway is running, and the company financed, more extensive work is planned. The company owns the City Rocks, the Grizzly, Copper Prince, Utah Mines Coalition, and other claims in Little Cottonwood, covering an area of about 1000 acres in all, the entire length of which is traversed by the Lavinia and Grizzly veins, productive of much ore in the past. The City Rocks, worked by lessees, has been making steady shipments, and high-grade ore has been opened in the neighboring Utah Mines Coalition, 500 ft. below the City Rocks workings. It is estimated, from the present showing in various parts of the property, that production for the entire group can be brought up to a steady daily output of 100 tons.

South Hecla—Arrangements are nearly completed for continuing the shaft, which will probably be sunk to the 300-ft. level, before crosscutting for the vein.

TOOELE COUNTY

The November output from the Stockton district amounted to 59 cars, divided as follows: Bullion Coalition, 17 cars on company account, and four cars from lessees; 25 cars shipped from old dumps by John Connor; Galena King, one car; Eagle & Mills lease on the Ben Harrison, nine cars, and the Cyclone, three cars. No ore was shipped from Dry Cañon, owing to snow storms, and 300 to 400 tons of ore are awaiting shipment. Shippers here are Eureka-Ophir, Mona, Hidden Treasure, Thad Stevens, etc.

Eureka-Ophir — No shipments were made in November, owing to bad weather; 60 tons of silver ore are now on the way to the market.

Washington

Ferry County

Rathfon Reduction—This plant, which has been closed down for the installation of additional machinery, is to be put in commission again in the near future. The property is near Republic.

White Elephant—A mill having a capacity of 50 tons is to be erected on this property at Orient in the spring. Frank W. Ainsley has charge of the work.

Stevens County

Amazon—Copper ore has been found in the tunnel on this property at Chewelah, and operations will be continued.

Apache—Operations at this property, in the Kettle Falls district, are proving satisfactory, smelter returns amounting to as much as $285 per ton. The mine is under lease to Hoyt & Miller.

Wisconsin

Platteville District

Wisconsin Zinc Co.—A range carrying lead and zinc ore was struck by drill on the William Field land, near Shullsburg; the Freeport Mining & Milling Co. did some prospect work by shaft on this land, but abandoned it.

Vinegar Hill Zinc Co.—This company has taken over the Lucky Hit mine on the Meloy land near Shullsburg.

Murray—The first drill hole bored on this lease showed 40 ft. of jack cuttings from 105 to 145 ft.; the land lies between the Midway and Henrietta mines at Cuba.

Indianapolis Lead & Zinc Co.—A milling plant has been completed on the Weinschenk land, three miles southwest of Galena. J. H. Billingsley, of Galena, Ill., general manager.

Optimo—This company is building a concentrating mill on the Optimo No. 2 at Linden.

Canada

Ontario—Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for November, 1912, were as follows:

Bailey	
Beaver	64.37
Buffalo	
Casey Cobalt	
Chambers-Ferland	
City of Cobalt	42.00
Cobalt Lake	151.13
Cobalt Townsite	87.63
Colonial	
Coniagas	215.38
Crown Reserve	19.61
Dominion Reduction Co.	
Drummond	
Hudson Bay	93.26
Kerr Lake	92.00
La Rose	260.62
Lost and Found	
McKinley-Darragh	135.11
Nipissing	31.62
O'Brien	64.79
Penn-Canadian	34.16
Provincial	
Right of Way	
Seneca Superior	191.63
Temiskaming	66.22
Trethewey	58.00
Wettlaufer	
Totals	1608.48

Claim No. 950-Gillies Limit—A vein of ruby silver has been struck at the contact between the diabase and Keewatin formations.

Island Smelting & Refining Co.—A meeting of shareholders, held Dec. 5, ratified the agreement under which the company will take over from the Cobalt Smelter, Ltd., the smeltery at Trout Lake, near North Bay, paying therefor 300,000 shares of Island Smelting stock. The reorganized company will issue $100,000 in bonds which bear no interest the first year, 2½% the second year, and 5% for the third and fourth years, and are redeemable after five years for 200,000 shares of Island Smelting stock. Work will shortly be begun to put the smeltery in condition to smelt high-grade ores, and a plant will also be installed for the treatment of low-grade ores by the Island process.

King Edward—This property has been reopened by a new company known as the York Ontario Silver Mines, Ltd. The property has been taken over on a five-year lease.

Nipissing—The estimated net production for November is valued at $175,266. The high-grade mill treated 134 tons of ore and shipped bullion worth $168,707. During the latter part of the month, the low-grade mill commenced operations, dropping from 10 to 15 stamps. The results of development at shafts 73, 80 and 83 were favorable. The production for the month was not up to the average, due to the main washing plant not being in operation until the second week in November. With the payment of the regular quarterly dividend on Jan. 20, 1913, this company will have returned 159% to its stockholders.

Cobalt Lake—A special meeting of the shareholders has been called for Dec. 20 for the purpose of considering, among other things, a by-law respecting the payment of regular dividends and a by-law authorizing the directors to delegate their powers to an executive committee to be elected by them from the board.

Peterson Lake—This company will commence diamond drilling in an attempt to find the vein recently found on the Seneca Superior.

Little Nipissing—On this property, which is being operated by the Peterson Lake company, a good body of milling ore has been encountered.

Coniagas—At the annual meeting to be held Dec. 23, the shareholders will be asked to approve a by-law authorizing the purchase of $6305 shares of the Mines Water Supply Co., Ltd., and also a by-law authorizing the purchase of $5000 shares in the Wabi Iron Works.

Jajola—The combined plant of this company and the Twentieth Century was burned to the ground Dec. 12, entailing a loss of $3500.

Ontario-Porcupine

Swastika—The 10-stamp mill will be put in commission Jan. 1, 1913. Manager John Redington states that there is enough ore in sight to cover the cost of the property and pay a substantial dividend.

Lindsay-McCluskey—These properties will be drilled.

Dome Extension—It is probable that this property will be closed down for some time irrespective of conditions arising out of the strike.

Plenaurum—It has been decided to pull the pumps and let the mine fill with water until the strike is definitely settled.

Burns—This property will be drilled.

Crown Chartered—At a meeting held in Toronto, Dec. 12, a committee was appointed to raise funds necessary to extricate the company from its difficulties. Twenty thousand dollars was raised, but an additional $40,000 is necessary. A compromise has been effected with the creditors to accept stock in the reorganized company for their claims. The cash is necessary to pay off the $60,000 of the purchase price which is still due.

Ontario—Sudbury District

Dominion Nickel-Copper Co.—At a meeting of this company at Ottawa, Dec. 11, it was decided to begin at once the erection of a smeltery in the Sudbury district to treat the nickel-copper ore from the company's properties. The smeltery will be in Snider township, about five miles northwest of Sudbury and near the Murray mines, now owned by the company. J. A. Holmes is general manager.

Canadian Copper Co.—This company is completing extensive improvements and additions to its smeltery, at Copper Cliff, and will shortly increase the capacity, which is now about 2500 tons of nickel-copper ore daily, yielding about 125 tons of 80% nickel-copper matte.

Mond Nickel Co.—Recent developments in the Victoria mines of this company have disclosed additional ore and again prolonged the life of the mine, which has been reported about to be closed for more than two years. The company is still operating its old smeltery at Victoria Mines, but by spring will have the new smeltery at Conniston, of 1000 tons daily capacity, completed.

American Smelting & Refining Co.—This company has taken several options in the Sudbury district recently, and is now conducting drilling operations in McKim township, near the Murray mine.

Mexico

Mexico

El Oro Mining & R.R. Co., Ltd.—During November, 20,870 tons of ore and 15,160 tons of tailings yielded bullion worth $95,320, at a net profit of $60,850.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

COAL TRADE REVIEW

New York, Dec. 18—Continued mild weather over a large part of the country has helped the coal situation by lessening demand, and also by the absence of obstructions to transportation. Otherwise the bituminous trade, both East and West, shows little change. Scarcity of cars is still a source of trouble, but is hardly as bad as it was.

The United States Supreme Court has, in part, sustained and in part reversed the Circuit Court decision in the government suit against the anthracite companies. It holds that no general combination has been proved. The decision is given on another page. Anthracite supplies are improving and trade is quieter.

German Coal Output—Coal production of German Empire, 10 months ended Oct. 31, metric tons:

	1911	1912	Changes
Coal	133,470,434	147,404,184	I. 13,933,750
Brown coal	60,292,946	67,659,847	I. 7,366,901
Total mined	193,763,380	215,064,031	I. 21,300,651
Coke made	20,887,181	23,838,693	I. 2,951,512
Briquettes m'de	18,056,758	20,174,509	I. 2,117,751

Of the briquettes reported this year 15,748,884 tons were made of brown coal or lignite.

IRON TRADE REVIEW

New York, Dec. 18—Notwithstanding the near approach of the end of the year, the iron and steel trades continue exceedingly active and there is no material change in conditions.

The volume of contract business placed in the finished-steel trade has continued to decrease, and has now become relatively light. There has also been in the past week or two a diminution in specifications, which represents in large part the working out of old contracts at prices considerably lower than the current market prices. As the mills had fallen far behind in deliveries, buyers have been free to specify against these contracts as there was no danger of too much material being forced upon them.

The opinion is expressed in some quarters that after the first of the year business will become active again, but this is somewhat doubtful. As contracts which will be in force after Jan. 1 will be on a materially higher basis than those which are now being specified against it is likely that specifications will be of smaller volume than shipments, permitting the mills to catch up somewhat in deliveries. As an average of the entire finished-steel trade it may be estimated that the steel mills have specifications on books for fully three months of production at capacity.

Under date of Dec. 14 the American Steel Wire Co. advanced its prices on wire products $1 per ton, the advance becoming generally effective Monday, Dec. 16, with nails at $1.75 per keg. The advance was anticipated Oct. 10 by one independent seller, and it was thought then that it would probably become general, but the leading interest has held off until now. The wire mills are unusually well filled with specifications for this time of year, which is normally dull. A part of this business was secured by certain large jobbers being allowed to specify, up to Dec. 1, on their contracts written at $1.60 for nails. Specifications are now expected on later contracts, written at $1.65 and $1.70 per keg.

The pig-iron market does not seem to have gained any strength in the past week, and such a development, after so long a period of almost constant stiffening, might be interpreted as virtually a weakness, were the end of the year not so close, the market usually growing quieter at this time. It should be noted, however, that for some weeks past prompt Southern iron in small resale lots has been available at $13.50, Birmingham, when the open market was $14, while some furnaces are ready to sell for first quarter, and occasionally even for second quarter, at $14, when an effort had been made to establish $14.50 for such delivery. Experience has shown that Southern iron, in movements either upwards or downwards, is likely to foreshadow movements in the pig-iron market of the country as a whole.

Baltimore

Jan. 16—Exports for the week included 990 lb. selenium to Hamburg; 395,750 lb. pig iron to Leith, Scotland. Imports included 5700 tons manganese ore from Brazil; 10,770 tons iron ore from Cuba.

Birmingham

Dec. 16—Southern manufacturers of pig iron are not in any position to complain at the market conditions, though sales right now are not as active as they have been. There is considerable iron to be shipped out during the first six months of the coming year and the make for several months at least will have to be kept at a high rate. The probable make for the first three months of the year will be required to fill orders on hand. Pig iron for delivery during the first six months of 1913 is quoted at $14.50@15 per ton. For immediate delivery, iron is selling at not less than $14.50 per ton. Considerable iron is still moving on export orders, Italy, Austria and England having made some purchases in this country lately. This iron was sold on the same basis as in the domestic market.

Steps are being taken for the reorganization of the Southern Iron & Steel Co. The referee in bankruptcy in Birmingham has ordered a sale of the properties of the company on Jan. 31 next.

J. J. Shannon and associates are making preparations to begin deep mining for ore in the Birmingham district. A company with a capitalization of $100,000 has been organized to take up the work.

Chicago

Dec. 17—The iron market remains quiet, but firm in every line. Sales of pig iron are light, for a few hundred tons at most, as regards the individual order, but this brings no complaint from the furnace interests. Most of them are glad of the customary December lull, since readjustment for their own as well as the smelters' interests can be made to apply to the coming year. Local furnaces are well sold up toward the end of the first half; beyond the first half no sales are yet being made and none are expected until after the first of the year. Prices hold to $14@14.50, Birmingham, which means $18.35@18.85 on No. 2 Southern foundry iron, and $18@18.50 on No. 2 Northern foundry iron at furnace, which means about 50c. more delivered. Lake Superior charcoal iron sells at a minimum of $18.75, with some lots at as much as $2 higher. The foundrymen are preparing for inventory and holding their stocks to a minimum.

Finished products continue in slightly lessened but large demand, especially railroad supplies. For structural material, aside from railroad needs, there is still a good demand for deliveries four to six months hence. Bars are very firm and this applies to bar iron, soft and hard steel bars, with local mills out of the market for the needs of the near future because of their crowded condition. Plates, sheets and minor lines are sought beyond the capacity of the producers and some contracts for second half are being made, prices being secondary to delivery.

Cleveland

Dec. 16—The weather has been stormy and late vessels coming down have had much trouble. Iron-ore sales continue on a large scale.

Pig Iron—Most large consumers are well supplied over first quarter, some of them over first half. Small orders are still coming in. Bessemer pig is quoted \$18.25@18.50, basic \$17@17.50, No. 2 foundry \$17.75@18, all Cleveland delivery.

Finished Materials—New orders are fewer, but the pressure for deliveries continues. Quotations from warehouse have been advanced to 2.10c. for bars and 2.25c. for plates.

Philadelphia

Dec. 18—A somewhat unexpected falling off in demand for crude and finished products has taken producers with surprise. Stocks of pig at Eastern furnaces are about a nonentity and supplies at other points are very low. A constantly hardening tendency prevails in all lines of pig iron. Bessemer is still held firmly at \$17.50 at furnace, and basic has reached a minimum of \$17, according to latest inquiries. Foundry is holding its own and forge is strong with an improving demand. The entire pig-iron industry is in an exceptionally vigorous condition. Considerable Southern iron is being negotiated for, especially for pipe foundries, and next week is expected to show large purchases. Quotations may be fairly given at \$18.50 for No. 2 foundry, \$17.75 for gray forge, \$18.25 for basic and in some cases there are higher prices asked. Southern gray forge has been offered for first-quarter delivery at \$16 per ton.

Steel Billets—The large transactions in steel billets have been reflected in firmer prices in the East without corresponding sales.

Bars—The bar mills have sold most of their products up to April, and the small buyers who are sneaking in the back way are obliged to pay prices they regarded as improbable not later than a month ago. All bar-iron makers are quoting prices materially higher for late delivery and are asking 1.75@1.90c., and from store and distributing points from 2.25@2.40 cents.

Sheets—The actual business in sheet iron, excepting for galvanized sheets has been rather light, but this is due to hesitancy of a few large Eastern consumers.

Pipes and Tubes—This branch of the industry is exceptionally strong, but purchasers for remote delivery are showing less interest.

Plates—The bulk of the business placed during the past week has been the final closing of contracts that have been kicked backward and forward between the mills and buyers for two or three weeks.

Structural Material — Several large blocks of material for Philadelphia delivery have been placed this week, most of it being wanted at the earliest possible date. A great deal of business made up of small lots for local requirements, and in some cities within 40 miles, will also go through, but from present signs there will be no large transactions until after the holidays. Even this is not a safe prediction.

Scrap—Some large blocks of scrap have been taken up for foundry purposes and heavy melting steel as well as No. 1 yard scrap and No. 1 railroad scrap. There were several good sales of heavy cast scrap. There is very little stock on hand to choose from and there are quite a number of standing contracts calling for heavy melting, old steel rails and old steel axles.

Pittsburgh

Dec. 17—The local iron and steel market has shown no material change in the past week, outside of the diminution in specifications and the advance in wire products, which is now general. Specifications for steel products have not uniformly decreased. The leading interest in sheets and tinplates, for instance, reports an increase in specifications for both products. In sheets it has fallen farther behind in deliveries, its promises against new specifications ranging from 10 to 12 weeks in the case of ordinary black and galvanized sheets up to 22 to 24 weeks in the case of automobile stock.

The wire advance announced this week is the fifth successive advance of \$1 a ton in wire products since the general market began to stiffen toward the close of November, 1911. The dates of these advances were Dec. 11, Jan. 22, July 22, Aug. 26 and Dec. 16. While wire products have advanced a total of \$5 a ton, other finished-steel products outside of standard section rails have advanced an average of \$7 a ton. There was an advance in the extra for galvanizing plain and barb wire from 30 to 40c. per 100 lb. on Oct. 14. The new wire prices are: Plain wire, 1.55c.; galvanized, 1.95c.; wire nails, base, \$1.75; painted barb wire, 1.75c.; galvanized, 2.15c. per pound.

Pig Iron—The pig-iron market has been generally quiet the past week and indeed for a fortnight or more, the only features being the scarcity of prompt foundry iron and the Pittsburgh Steel Co.'s purchases of basic iron. This company took 30,000 tons of basic from the Brier Hill Steel Co., delivery 5000 tons a month over the first half, at \$16.35, Valley. This was a cut of 15c. from the regularly quoted market. The seller is now reported sold up on basic to July 1 next. The same steel interest purchased 5000 tons of prompt basic from E. W. Mudge & Co., the iron to come from Steubenville, at substantially the market price, delivered. Reports widely circulated that \$17, Valley, has been secured for basic iron for prompt shipment are altogether erroneous. No such basis has been reached. Foundry iron has proved very scarce; and while no important sales have been effected, it does not seem possible to find any No. 2 foundry at less than \$18, Valley, and an equivalent price has been paid for a number of small lots from the Ironton district, at \$17, furnace, equal to \$18.90, delivered Pittsburgh. We quote: Bessemer, \$17.25; basic, \$16.50; forge, \$17.25@17.50; No. 2 foundry, \$18; malleable, \$17.25@17.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The ferromanganese market has been relatively quiet as to actual transactions, but the material is scarce and prices are firmly maintained. We quote: Prompt carloads, \$75@80; contracts, first half, \$70@75; second half, \$65, f.o.b. Baltimore.

Steel—The Carnegie Steel Co. has named prices for first-quarter sheet bars against its regular long-term contracts, these prices being at considerably less than what is considered the minimum of the open market. There has been a very large advance in the open market and the company is endeavoring to protect its regular customers. It is not a regular seller in the market and on account of the limited tonnage of steel it has available it is not seeking business. Its deliveries of sheet bars to its brother subsidiary in the Steel Corporation, the American Sheet & Tin Plate Co., have been below the mill requirements for many weeks. There are no regular sellers of either billets or sheet bars, and former quotations are repeated, although they have become largely nominal: Bessemer billets, \$27; sheet bars, \$27.50; openhearth billets, \$28; sheet bars, \$28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods have been selling at \$30, Pittsburgh, but there are few, if any, regular sellers now at this figure.

Sheets—As noted, the American Sheet & Tin Plate Co. has fallen farther behind in its promises of sheet deliveries against new specifications, as its specifications have been greatly exceeding shipments. The independents on an average have slightly less specifications than they had a fortnight ago, which arises from the fact that some of their contracts are running out and they have all been reserved about making fresh contracts of late. Some of them are not well covered on steel for first quarter. For anything like early delivery premiums are readily secured, so that the market is quotable as follows: Blue annealed, 10 gage, 1.65@1.80c.; black, 28 gage, 2.25@2.40c.; galvanized, 3.40@3.60c.;

painted corrugated, 2.45@2.50c.; galvanized corrugated, 3.45@3.50c. per pound.

St. Louis

Dec. 16—The market in pig iron is quieter. Sales agents have not been soliciting business and melters, owing to the coming season of inventory, have not been as active. This little lull in the trade is quite a relief to producers as it gives them a chance to catch up. Producers all have enough business to keep them going for the next four months full and a number of them are well sold up until after June next. Current prices remain unchanged at $14@14.50, Birmingham, or $17.75@18.25, St. Louis, on No. 2 Southern foundry iron. There is a light demand for Northern iron at around $19, St. Louis, for No. 2 foundry.

The demand for finished products of all kinds is still excellent and shows no signs of slacking up.

Coke remains about the same, very high and firm, Connellsville foundry bringing $6.80@7, St. Louis; byproduct is bringing around $6, St. Louis. So many are turning to byproduct coke this season and becoming accustomed to using and handling it that a large tonnage of Connellsville coke will undoubtedly be permanently displaced.

Iron Ore Market

Sellers of Eastern iron ores are generally holding out for 8½c. per unit of iron, delivered. Foreign ores are quiet, high ocean freights making the prices above what furnaces are willing to pay. The consequence is that more Lake ores are being placed in the East than for several years past. Some odd lots of Wabana ore have been placed at 7¾c. per unit, at tidewater.

Lake shipments of iron ore from the Lake Superior region in November were 4,072,674 tons. In December, up to the close of navigation, they were 14,579 tons. The total water shipments for the season, by ports, were as follows:

Port	1911	1912	Changes
Escanaba........ ..	4,278,445	5,234,655	I. 956,210
Marquette.........	2,200,380	3,296,761	I. 1,096,381
Ashland	2,429,290	4,797,101	I. 2,367,911
Superior..........	9,920,490	14,240,714	I. 4,320,224
Duluth......... ...	6,934,269	10,495,577	I 3,561,308
Two Harbors. ...	6,367,537	9,370,969	I. 3,003,432
Total....... ...	32,130,411	47,435,777	I. 15,305,366

Receipts at Lake Erie ports were 3,677,200 tons in November and 144,330 tons in December.

German Foreign Trade—Imports and exports of iron and manganese ores in the German Empire, nine months ended Sept. 30, in metric tons:

	Imports	Exports	Excess
Iron ores ..	9,149,017	1,664,687	Imp 7,484,330
Manganese	383,778	4,825	Imp. 378,953

The larger imports of ores are from Spain, Sweden and Russia.

METAL MARKETS

New York, Dec. 18—The metal markets have not been especially active, and have shown no important changes for the week.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Oct. 1912..	$ 330,270	$ 11,887,492	Imp $11,557,222
1911..	3,983,994	4,102,427	Imp. 118,433
Year 1912	44,058,544	50,677,285	Imp 6,618,741
" 1911	22,247,304	49,279,533	Imp 27,032,229
Silver			
Oct. 1912.	6,171,820	4,683,784	Exp. 1,488,036
" 1911	5,087,087	3,404,458	Exp 1,682,629
Year 1912..	58,519,766	40,985,536	Exp. 17,534,230
" 1911..	54,615,048	37,100,888	Exp. 17,514,160

Exports from the port of New York, week ended Dec. 14: Gold, $24,789, silver, $1,196,878. Imports. Gold, $881,402, chiefly from London and Mexico, silver, $289,085, largely from Central and South America

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Most of the supplies went to the Bank of England, and nothing was taken for New York account.

Iridium—The metal is scarce just now, and there has been a sharp advance, $73@75 per oz. being asked.

Platinum—The market is fair and unchanged, both here and abroad. Prices are unchanged, at $45@46 per oz. for refined platinum, according to quantity; $47.50@48.50 per oz. for hard metal, up to 10% iridium.

Silver—The market has declined the past week on completion of the heavy orders from Bombay for prompt shipment; so that the premium for spot silver has disappeared, and silver closes at $29\frac{3}{16}$d. for spot and $29\frac{5}{16}$d. for worward delivery. The position of silver, however, is considered good and likely to improve shortly on renewed buying for the Indian Mint.

SILVER AND STERLING EXCHANGE

Dec.	12	13	14	16	17	18
New York....	63⅞	64	63⅞	63⅜	63½	63¼
London ...	$29\frac{9}{16}$	$29\frac{9}{16}$	29½	29¼	$29\frac{5}{16}$	$29\frac{3}{16}$
Sterling Ex.	4.8500	4.8520	4.8525	4.8535	4.8535	4.8550

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to Dec. 5, reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.. ...	£8,356,500	£10,229,000	I. £1,872,500
China .	990,300	1,674,500	I 684,200
Total	£9,346,800	£11,903,500	I. £2,556,700

Imports of gold into India for the nine months ended Sept. 30, were £26,346,314. This compares with £10,077,472 for the full year 1909; £18,028,008 in 1910; and £23,366,814 in 1911.

Copper, Tin, Lead and Zinc

NEW YORK

	Copper		Tin	Lead		Zinc	
Dec.	Lake Cts. per lb.	Electrolytic Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
12	17½ @17⅝	17.35 @17.40	49⅝	4.27½ @4.32½	4.12½ @4.17½	7.10 @7.20	7.05 @7.10
13	17½ @17⅝	17.35 @17.40	49¼	4.25 @4.27½	4.10 @4.12½	7.10 @7.20	7.05 @7.10
14	17½ @17⅝	17.35 @17.40	49¼	4.25 @4.27½	4.10 @4.12½	7.10 @7.20	7.05 @7.10
16	17½ @17⅝	17.25 @17.35	49¼	4.25 @4.27½	4.10 @4.12½	7.10 @7.20	7.05 @7.10
17	17½ @17⅝	17.25 @17.35	50	4.25 @4.27	4.10 @4.12	7.10 @7.20	7.05 @7.10
18	17½ @17⅝	17.25 @17.35	50	4.25 @4.27	4.10 @4.12	7.10 @7.20	7.05 @7.10

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries, and represent, to the best of our judgment, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Dec.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
12	74⅛	75⅝	81	225¼	225½	$18\frac{1}{16}$	26½
13	74⅝	75¾	81	225¼	225	$18\frac{1}{16}$	26½
14	..	...	..	....	.....	....	....
16	73⅛	74½	80	225⅝	225¼	$18\frac{1}{16}$	26½
17	74⅜	$75\frac{7}{16}$	80	227½	227½	18⅛	26½
18	74⅜	75½	80	227½	227½	18⅛	26½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb, with American prices in cents per pound the following approximate ratios are given £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Copper—The market has been disturbed by cheap offerings of copper by several dealers, who may have supplies put in their hands for resale, or by some of the smaller producers, or their own importations of crude material refined here on toll. Anyway, electrolytic copper from these sources has been sold as low as 17¼c., while contracts for forward delivery have been taken at materially lower figures, evidently representing arbitrage transactions against the London market. Some first hands have offered to sell around 17.35c. The market is very irregular and nominal. The large agencies continue to stand pat for their pegged price of 17¾c., delivered, usual terms, and express the same confidence that consumers will be starved into paying it. Some small sales of Lake copper were made at about 17.55@17.60c. Casting copper was rather pressed for sale by certain hands.

The irregularities in the copper market this week are clearly due to the fact that the London standard market has declined to a point at which furnace material can be purchased on a parity that will produce electrolytic copper at low figures. It is reported that considerable shipments from the other side are being made, and as the stocks over there have been decreasing for some time past and the copper cannot well be spared, these shipments are likely to have a decided influence on the position in Europe. It is reported that considerable bear selling has been going on in the London market of late, and that a large bear account has accumulated.

We quote Lake copper at 17½@17⅝c., and electrolytic in cakes, wirebars or ingots, 17.25@17.35c. Casting copper is quoted at 17@17.10c. as an average for the week.

The London standard market, which closed on Dec. 12 at £74 12s. 6d. for spot and £75 12s. 6d. for three months, declined on Dec. 16 under persistent bear selling to £73 10s. for spot and £74 10s. for three months. On Dec. 17 and 18, the market was slightly better, the bears being somewhat disconcerted by the reports that considerable quantities were being taken out of warehouse and shipped to smelters. The market closes at £74 7s. 6d. spot and £75 10s., three months. The European statistics for the first half of December show a decrease in European warehouses of 169 tons, and a decrease in the visible supply of 1494 tons.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for large quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Visible stocks of copper in Europe, Dec. 15, are reported as follows: Great Britain, 27,440; France, 4160; Rotterdam, 350; Hamburg, 2140; afloat from Chile, 2500; afloat from Australia, 5300; total, 41,890 long tons, or 93,833,000 lb. This is a decrease of 1390 tons from the Nov. 30 report.

Tin—The past week witnessed a firmer market than we have had for some time. American sellers, who had all along been meeting European competition or underquoting prices cabled from abroad, obtained so large a business that they changed their policy completely. Consumers have been buying very freely, not only for near-by, but also for future deliveries. The market closes firm at £227 10s. for spot and three months and about 50c. here.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in November at 2166 tons, all from Bolivia.

Lead—There has been a little more business done at somewhat lower prices, the demand being freely met by most producers. At the close lead at St. Louis is quoted 4.10@4.12½c., and New York 4.25@4.27½ cents.

The London market is slightly firmer, Spanish lead being quoted £18 2s. 6 d., and English lead 7s. 6d. higher.

The average price of lead for the week ended Dec. 11 was 4.269c., New York.

Spelter—The market is unchanged. There is some business doing from day to day at around last prices, 7.05@7.10c., St. Louis, and 7.10@7.20c., New York. Consumption, both in the galvanizing and brass trades continues excellent.

The European market is firm. Good ordinaries are unchanged at £26 10s.; specials 15s. higher.

Zinc dust is quoted at 7⅝c. per lb., New York.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—The market has been again rather quiet, but with more inquiries, and may be quoted as rather firmer. The current price is 25½@26c. per lb. for No. 1 ingots, New York.

The latest quotations for ingots in London are £85@88 per long ton—equal to 18.46@19.12c. per pound.

Antimony—The market is rather quiet, and has been a little disturbed by sales from second hands. Cookson's is easier, at 10@10.25c. per lb. Hallett's is nominally still 9.45@9.75c. For Chinese, Hungarian and other outside brands 9@9.25c. per lb. is asked.

Quicksilver—The market is inclined to be dull and prices are easier. The New York quotation is $40 per flask of 75 lb., with 58@59c. per pound asked for retail lots. San Francisco, $40 for domestic and $37.50 for export orders. London price is £7 7s. 6d. per flask, with £7 5s. named from second hands.

Zinc and Lead Ore Mareets

Platteville, Wis., Dec. 14—The report for the week ended Dec. 7, received too late for publication last week, shows base prices of $56@59 for zinc ore and $57 for lead ore. Shipments were 3,574,030 lb. zinc ore, 251,980 lb. lead ore and 962,780 lb. sulphur ore; deliveries to the separating plants, 1,304,570 lb. zinc ore. The report for Dec. 14 follows.

The base price paid this week for 60% zinc ore was weaker at $56@57. The base price paid for 80% lead ore was $50 per ton.

SHIPMENTS WEEK ENDED DEC. 14

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	746,520	....	212,000
Mineral Point	626,890	....	...
Benton	622,100	......	1,053,200
Shullsburg	404,000	56,800	. .
Galena	398,700	....	...
Cuba City	302,600	..	.. ....
Highland	228,300	....	.. .
Hazel Green	220,000	60,000	.. ...
Harker	188,730	......	. ....
Linden	132,300	.. .	. ..
Rewey	86,000	.... .	. ..
Montfort	60,000	.... .	.....
Total	4,016,140	116,800	1,265,200
Year to date	192,470,060	7,859,940	38,062,430

Shipped in previous week from Benton, not then reported, 497,700 lb. zinc. Shipped during the week to separating plants, 1,864,870 lb. zinc ore.

Joplin, Mo., Dec. 14—The high price of zinc sulphide is $60, the base price per ton of 60% zinc $52@57. Zinc silicate sold at $28@32 per ton of 40% zinc; the average price, all grades, of zinc ore is $52.02. Lead sold at $53 base per ton of 80% metal content and the average for all grades is $51.66 per ton.

SHIPMENTS WEEK ENDED DEC. 14

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,366,060	.	1,293,360	$178,039
Joplin	2,515,650	.	289,300	78,524
Galena	793,110	......	117,450	24,527
Miami	712,600	. ...	265,830	23,310
Duenweg	587,410	.	242,370	22,160
Oronogo	824,710	. .	. . . .	18,763
Carl Junction	620,730	.....	. .	18,000
Granby	117,900	726,650	18,330	15,220
Alba-Neck	385,680	....	......	10,798
Spurgeon	168,960	281,820	61,130	10,577
Cave Springs	361,310	. ...	. ...	9,936
Carthage	345,240	......	. ...	8,975
Jackson	240,570	.. ..	13,690	6,730
Aurora	153,140	......	.....	3,980
Wentworth	81,290	59,970	.	3,080
Quapaw	121 200	... ..	.....	3,030
Lawton	64,550	......	......	1,810
Seneca	......	. . .	53,950	1,350
Totals	13,460,110	1,068,440	2,355,410	$438,809
50 weeks	552,526,260	35,276,650	90,207,670	$17,955,593

Blende val., the week, $360,511; 50 weeks, $14,831,216
Calamine, the week, 17,448; 50 weeks, 562,450
Lead value, the week, 60,850; 50 weeks, 2,561,927

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	57.00	40.89	55.97	54.72	63.22
November	45.40	55.69	43.25	53.98	57.19	56.55
December	44.13	..	40.76	..	62.03	..
Year	$41.45		$39.90	. . .	$56.76	......

NOTE Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Molybdenum Ore—Recent quotations are $25 per ton for molybdenite, carrying 25% MoS_2; $100 per ton for wulfenite carrying 25% or over MoO_3; both delivered at railroad.

Vanadium Ore—A recent quotation for vanadinite at mine is 75c. per lb. for the V_2O_5 contained, for ore carrying 10% or over.

Chemicals

New York, Dec. 18—John C. Wiarda & Co., Brooklyn, N. Y., are erecting on the ground which was occupied by their buildings, destroyed by fire in March last, nine buildings devoted to the manufacture of hydrofluoric acid, metallic oxides and various other chemicals. At the time of the fire they were able to continue business, owing to the possession of a storage warehouse some distance from the plant, which was filled with a large stock of finished materials. The new buildings will be equipped with the best appliances, and have been planned and arranged to secure the best results.

Arsenic—Trade has fallen into a pretty dull condition, and prices are unchanged. The quotations are $4.87½ per 100 lb. for both spot and futures.

Copper Sulphate—Trade is pretty quiet and prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Guano—The Peruvian Corporation, which has the sole right to export guano from Peru, exported 83,000 tons of guano in 1911, as against 61,000 tons in 1910. In the latter year, the latest for which detailed figures are available, the distribution of guano exports was as follows: Belgium, 28,000 tons; United States, 15,500; Germany, 8000; Great Britain, 7000, and France, 2500 tons.

Nitrate of Soda—Trade is quiet. Quotations remain at 2.60c. per lb. for spot and futures up to Apr. 30. Futures are 2.57½c. for May, 2.55c. for June and 2.52½c. for July and later deliveries.

Petroleum

The buyers for the Standard Oil companies have advanced prices 5c. per bbl., making the present quotations $2 per bbl. on standard Pennsylvania grades.

MINING STOCKS

New York, Dec. 18—On Dec. 12 the Exchange was active, but rather weak. Mining stocks on the Curb showed fair dealings at irregular prices.

Dec. 13 the Exchange tended upward but on smaller business. On the Curb there were gains in Yukon Gold, Tonopah Merger and Nipissing on good trading. Braden Copper led a general rise in the copper stocks.

Dec. 14 the Exchange was dull and depressed, feeling the effect of high money rates and the disturbed condition of the European markets. On the Curb mining stocks were active, but generally at lower prices.

Dec. 16 the Exchange was irregular and without definite tendency. The coal decision boosted some stocks, but others were weaker. On the Curb mining stocks were active and generally stronger.

Dec. 17 and 18 there was rather more steadiness on the Exchange and some tendency to recovery. On the Curb trading in mining stocks, especially the coppers, was good and prices were firm, with fractional advances on many stocks.

It is reported that at Pittsburgh, over 400,000 shares of mining stocks were sold on account of P. V. Rovnianek & Co., bankrupts, for $104; also 9900 of Pittsburgh Silver Peak at 61c. per share and 2000 at 63c. per share.

At auction in New York, Dec. 12, the following prices are noted: North Butte Extension Copper Co., 1000 shares, $5 par, $21 for the lot and 500 shares, $6 for the lot; 2000 shares Ontario Mining & Smelting Co., $1 par, $54 for the lot; Consolidation Coal Co., 50 shares, $100 par, $100.25 per share; Alabama Mineral Land Co., 57 shares, $100 par, $75 per share; New York, Susquehanna & Western Coal Co., 500 shares, $50 par, $11 per share; United States Tungsten Co., 97,000 shares, $1 par, $810 for the lot; Dover White Marble Co., $100,000 bonds, May interest unpaid, $100; lot including 5 shares Stewart Mining Co., $1 each; 5 shares National Monument Co., $100 each; 50 shares Cobalt Silver Queen, Ltd., $1 each, and 100 shares Consolidated Arizona Smelting Co., $10 each, $34 for the lot.

Boston, Dec. 17—As might be expected, the market for mining shares has been demoralized and many prices reached the lowest level for the year. Values were not considered, so urgent was some of the selling. There has been but little news, but what there was has been of a favorable nature. The decline in prices was caused by the weakness of Amalgamated and other Wall Street stocks, and might be said to be technical rather than from any other cause. Some $150,000,000 has been taken off the market value of copper shares from the high of the year, and it is argued that present prices are about the equivalent of a 14-cent copper metal market.

Two more copper mining dividends have been declared during the week, these being the North Butte and Shannon. Both are at the same rates as declared three months ago, namely, 50c. each.

Pond Creek has been an active and strong feature. After going off a little, it recovered to $26.50 tonight.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Sept.	October	Nov.
Alaska shipments	1,726,715	1,435,235	....
Anaconda	24,500,000	25,250,000	24,250,000
Arizona Ltd.	3,340,000	3,200,000	3,000,000
Copper Queen.	9,103,861	8,184,575	8,807,940
Calumet & Ariz....	4,462,000	4,404,000	4,918,000
Chino....	3,217,369	3,638,500	3,911,169
Detroit...	1,881,068	1,934,828	1,968,620
East Butte.	1,250,000	.. .	... . ..
Mammoth.........	1,834,937	1,883,283	.. ..
Giroux.	1,005,208	....	... ...
Mason Valley... .	1,200,000	1,563,700	.. ..
Nevada Con... .	5,607,578	850,741	.
Ohio	635,000	.	. .
Old Dominion ...	2,204,000	2,523,000	2,758,000
Ray	2,978,404	.	3,201,500
Shannon	1,142,000	1,210,000	1,436,000
South Utah	225,568	.	. .
United Verde*	2,750,000	2,750,000	. ....
Utah Coppor Co....	6,616,887	2,022,352	.....
Lake Superior*....	19,250,000	21,500,000	20,400,000
Non-rep. mines*..	8,094,792	8,250,000	8,250,000
Total production.	103,025,987	. . ..	. ...
Imports, bars, etc..	25,149,329	. ..	.
Total blister	128,175,316	... ...	. ..
Imp. in ore & matte	7,142,232	... .	. . ..
Total American..	135,317,548	....	. . ..
Miami†	2,949,150	2,577,750	2,972,000
Brit. Col. Cos.:			
British Col. Copper	....	1,022,904	
Granby	2,083,118	2,018,424	. . .
Mexican Cos.:			
Boleo†	....	2,612,400	2,316,040
Cananea	3,500,000	4,248,000	5,064,000
Moctezuma . ..	771,844	3,045,667	2,112,377
Other Foreign:			
Cape Cop., S. Africa	678,720	757,120	907,200
Kyshtim, Russia...	1,750,000	.	.... ..
Spassky, Russia..	981,120	974,400	. ..
Tilt Cove, Newf'd	... . .	86,785	. .
Exports from:			
Chile...............	6,048,000	8,512,000	4,816,000
Australia	7,616,000	9,520,000	10,752,000
Arrivals in Europe‡	8,518,720	13,771,520	12,976,320

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
XI, 1911.....	111,876,601	68,039,776	67,049,279
XII..........	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912...... ..	119,337,753	62,343,901	80,167,904
II.......... .	116,035,809	56,228,368	63,148,096
III......... ..	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V.......... .	126,737,836	72,702,277	69,485,945
VI........... .	122,315,240	66,146,229	61,449,650
VII........	137,161,129	71,094,381	60,121,331
VIII.......	145,628,521	78,722,418	70,485,150
IX..........	140,089,819	63,460,810	60,264,796
X..............	145,405,453	84,104,734	47,621,342
XI....	134,695,400	69,369,795	55,906,550

VISIBLE STOCKS

	United States	Europe	Total
XII, 1911.....	111,785,188	164,281,600	276,066,788
I, 1912... .	89,454,695	158,323,200	247,777,895
II.......	66,280,643	154,851,200	221,131,843
III	62,939,987	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V........... ..	65,066,029	134,176,000	199,242,029
VI.........	49,615,643	117,801,600	167,417,243
VII...........	44,335,004	108,186,000	152,521,004
VIII ...	50,280,421	113,299,200	163,579,621
IX......... ..	46,701,374	113,568,000	160,269,374
X..........	63,065,587	107,408,000	170,473,587
XI..........	76,744,964	103,801,600	180,546,564
XII........	86,164,059	96,947,200	183,111,259

Trading on the Curb has been active and strong for specialties, notably Alaska Gold, which is selling at a record price of $12.75, and Mexican Metals, which has been very active and is up to $2.18¾. Butte Central has steadied to ju ' under $7 per share.

Assessments

Company	Delinq	Sale	Amt.
Butte & Anaconda, Mont...	Jan. 1	Feb. 1	$0 01
Challenge Con., Nev	Dec. 4	Dec. 27	0.05
Consolidated Imperial, Nev.	Jan. 8	Jan. 29	0 01
Copper Hill, Ida...... ..	Jan. 5	Feb. 5	0.002
East Crown Point, Utah....	......	Dec. 30	0 0¼
East Hercules Ext., Ida.....	Dec. 15	Jan. 3	0 001½
Echo, Ida.....	Dec. 11	Jan. 8	0 001
Hider Nevada, Utah ...	Dec. 20	Jan. 11	0 0½
Hypotheek, Ida.....	Dec. 18	Jan. 10	0 005
Leroy Gold & Copper, Ida..	Nov. 28	Dec. 28	0 002
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Moon Creek, Ida.....	Dec. 4	Jan. 4	0 002
Moonlight, Ida...............	Nov. 2	Jan. 2	0 005
Nabob, Ida.....	Dec. 2	Dec. 23	0 005
North Star, Ida..............	Nov. 30	Dec. 30	0 001
N Y Bonanza, Utah.......	Dec. 7	Dec. 28	0 02
Overman, Nev....	Dec. 5	Dec. 24	0 05
Royal, Ida	Dec. 16	Jan. 26	0 00½
Seg. Belcher & Midas, Nev..	Jan. 7	Jan. 31	0 02
Seven Troughs Mon., Utah..	Dec. 15	Jan. 6	0.0¼
Sierra Nevada, Nev........	Dec. 2	Dec. 23	0.10
Sunrise, Ida..	Nov. 26	Dec. 26	0.002
Superior & Boston, Mont..	Jan. 4	....	1 00
Tarbox, Ida...	Nov. 19	Jan. 28	0 002
Union Consolidated, Nev..	Jan. 8	Jan. 30	0 15
Wilbur, Ida.................	Dec. 23	Jan. 23	0 00½

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January.....	52.375	53.795	56.260	24.154	24.865	25.887
February ..	51.534	52.222	59 043	23.794	24.081	27.190
March	51.454	52.745	58.375	23 690	24.324	26.875
April	53.221	53 325	59 207	24 483	24 595	27.284
May.	53 870	53.308	60 880	24 797	24 583	28 038
June.........	53 462	53.043	61.290	24.651	24.486	28 215
July	54.150	52 630	60 654	25 034	24 286	27 919
August ...	52.912	52.171	61 606	24 428	24 082	28.375
September ..	53 295	52.440	63 078	24 567	24 209	29 088
October	55.490	53.340	63.471	25 596	24 594	29 299
November...	55.635	55.719	62.792	25 680	25 649	29 012
December...	54.428	54 905	..	25.160	25.349	.....
Year	53.486	53.304	...	24.670	24 592	..

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January.....	12 295	14.094	12.680	14.337	55.600	62.760
February....	12.256	14.084	12.611	14.329	54.974	62 893
March. ..	12.139	14.698	12.447	14.868	54.704	65.884
April....	12 019	15 741	12.275	15.930	54.034	70.294
May.	11.989	16.031	12.214	16 245	54.313	72 352
June	12 385	17 234	12.611	17 443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August ...	12 405	17.498	12 634	17.644	56 266	78 670
September ..	12.201	17 508	12.508	17.698	55.253	78.762
October......	12.189	17.314	12.370	17.661	55.170	76.389
November.	12.616	17.326	12.769	17.617	57.253	76 890
December...	13 552	...	13.768	......	62.068	. . .
Year ...	12 376		12.634	...	55.973	....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January .	41 255	42 529	July .	42 400	44 519
February	41 614	42 962	August.....	43 319	45 857
March....	40 157	42.577	September.	39 755	49 135
April.......	42 185	43 923	October	41 185	50 077
May . .	43.115	46 053	November..	43 125	49 891
June......	44 606	45 815	December..	44 655	.
			Av. Year..	42 281	.. .

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4 483	4 435	4 334	4 327	13 009	15.597
February..	4 440	4 026	4 266	3 946	13 043	15 738
March	4 394	4.073	4 238	4.046	13 122	15.997
April .	4 412	4 200	4 262	4 118	12 889	16 331
May ...	4 373	4 194	4 223	4 072	12 984	16 509
June.... ..	4 435	4 392	4 292	4 321	13 260	17 588
July	4 499	4 720	4 397	4 603	13 530	18 544
August	4 500	4 569	4 406	4 452	14.260	19 655
September	4 485	5.048	4 356	4.924	14 744	22.292
October	4 265	5.071	4 139	4.894	15.332	20 630
November ..	4 298	4.615	4.181	4.463	15.821	18 193
December...	4.450	..	4.332	......	15.648	.
Year... ...	4.420	..	4 286	.....	13.970	. .

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January.....	5 452	6.442	5 302	6.292	23.887	26.642
February....	5 518	6.499	5 368	6.349	23 276	26 661
March........	5 563	6.626	5.413	6.476	23 016	26.048
April	5 399	6.633	5.249	6 483	23 743	25 644
May.........	5 348	6.679	5.198	6.529	24.375	25.790
June .	5 520	6.877	5 370	6 727	24 612	25 763
July	5 695	7.116	5 545	6 966	25 006	26 174
August	5 953	7.028	5 803	6 878	26 801	26 443
September ..	5 869	7.454	5 719	7 313	27 750	27.048
October......	6.102	7.426	5.951	7.276	27.256	27.543
November...	6 380	7 371	6.223	7.221	26 795	26.804
December...	6.301	.. ..	6.151	......	26 849	.
Year	5.758	.....	5.608	......	25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No 2 Foundry	
	1911	1912	1911	1912	1911	1912
January.....	$15 90	$15.12	$14.40	$13.32	$14.75	$14.00
February...	15 90	15.03	14 50	13 28	14 81	14.01
March	15.90	14.95	14 65	13 66	14 96	14.10
April	15 90	15.13	14 65	13 90	15 00	14 15
May.	15 90	15.14	14 30	13 90	14 72	14.12
June...	15 90	15.15	14 06	14 11	14 56	14.22
July	15 90	15.15	14 03	14 38	14 53	14 38
August	15 90	15.43	14 00	14 90	14 47	14 85
September	15 90	16.86	13 57	16 03	14 40	15.63
October.....	15.43	17 90	13.44	17 18	14 34	17 22
November..	14.92	18 07	13.30	17 09	14 25	18.00
December.	15.15	....	13.10	....	13.90	... ..
Year.	$15 72	...	$13 94	....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Dec. 17 Name of Comp.	Bid.	SALT LAKE Dec. 17 Name of Comp.	Bid.
Acacia.............	.03½	Beck Tunnel... .	.08
Cripple Cr'k Con	.01½	Black Jack.......	.10
C. K & N	.17	Cedar Talisman..	.01
Doctor Jack Pot..	.06¾	Colorado Mining.	.19
Elkton Con	.62	Columbus Con..	.12
El Paso...........	5.80	Crown Point....	.04
Findlay............	.03	Daly-Judge......	‡6.15
Gold Dollar.......	.16	Grand Central...	.75
Gold Sovereign...	.02¼	Iron Blossom....	1 25
Isabella......	.15	Little Bell..... ..	‡ 25
Jack Pot..........	.05	Lower Mammoth.	.03
Jennie Sample ...	.05	Mason Valley...	10 50
Lexington	.005	May Day..... .	.23
Moon Anchor.....	‡ 1	Nevada Hills	1.30
Old Gold .	.03	New York	.01½
Mary McKinney..	.55	Prince Con	1 60
Pharmacist.......	.01	Silver King Coal'n	3 40
Portland .. .	1 02	Sioux Con........	.03
Vindicator..	.08	Uncle Sam. .	.11
Work..	‡ 01	Yankee	.16

TORONTO Name of Comp.	Bid	Dec. 16 Name of Comp.	Bid
Coniagas	7 40	Foley O'Brien .	.20
T. & Hudson Bay	‡60 00	Hollinger . .	14 75
Temiskaming	.41	Imperial	‡.03
Wettlaufer-Lor...	.24	Pearl Lake....	.21
Am Goldfield.. .	‡ 40	Porcu. Gold.....	.18
Apex. .	‡ 00½	Preston E. D.....	.03
Crown Chartered.	.02	Rea....	.25
Dobie...............	.25	Standard.........	‡ 00½
Dome......	‡19 00	Swastika	.09
Dome Exten	.06	West Dome...	.10

SAN FRANCISCO Name of Comp.	Clg.	Dec. 17 Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta........	.04	Belmont.........	7.70
Belcher...	.23	Jim Butler.......	.62
Best & Belcher...	.06	MacNamara.....	.17
Caledonia.........	.79	Midway	.34
Challenge Con....	.06	Mont.-Tonopah ..	1 62½
Chollar............	.02	North Star.......	.22
Confidence	.31	West End Con...	1 27½
Con. Virginia.....	.37	Atlanta....	.20
Crown Point......	.35	Booth....	.05
Gould & Curry...	.01	C.O.D. Con........	.06
Hale & Norcross..	.11	Comb. Frac......	.09
Mexican...	1 60	Jumbo Extension	.26
Occidental........	.70	Pitts.-Silver Peak	.75
Ophir....	.28	Silver Pick.	.06
Overman.........	.40	St. Ives....	‡.30
Potosi	.03	Tramp Con.	‡.02
Savage............	.07	Argonaut....	‡2 00
Sierra Nevada....	.30	Bunker Hill......	‡4 50
Union Con........	.07	Central Eureka	.30
Yellow Jacket....	.30	So. Eureka	2.50

N. Y. EXCH. Dec. 17 Name of Comp.	Clg.
Amalgamated....	73¼
Am. Agri. Chem ..	55
Am.Sm.&Ref.,com	69⅛
Am.Sm.&Ref.,pf.	104½
Am.Sm. Sec., pf. B	83
Anaconda.........	38
Batopilas Min....	1⅛
BethlehemSteelpf	66
Chino..............	41⅞
Federal M. & S., pf.	37½
Goldfield Con.....	2
GreatNor.,ore..ctf.	41½
Guggen. Exp....	49⅜
Homestake.......	106
Inspiration Con..	17⅛
Miami Copper....	25⅝
Nat'nalLead,com	55½
National Lead, pf.	104
Nev. Consol.......	19
Phelps Dodge....	210
Pittsburg Coal. pf.	87
Ray Con..........	20⅜
Republic I&S,com.	25½
Republic I & S, pf.	85¼
SlossSheffi'd,com.	40
Sloss Sheffield, pf.	95
Tennessee Copper	37
Utah Copper......	56¼
U. S. Steel, com ..	65½
U. S. Steel, pf.....	109⅛
Va. Car. Chem....	42¾

N. Y. CURB Dec. 17 Name of Comp.	Clg.
Barnes King.	54
Beaver Con	.41
Braden Copper...	9¾
B. C. Copper......	4⅝
Buffalo Mines....	1¾
Caledonia	‡ 40
Con. Ariz. Sm.....	½
Davis-Daly.......	1¼
Diam'field-Daisy	‡4
Ely Con...........	10
Florence	65
Giroux . .	4⅛
Gold Hill Con....	‡5/16
Greene Cananea.	9
Greenwater	‡ 04
Internat. S. & R.	‡124
Kerr Lake. ...	2½
Keystone . ..	‡2
La Rose...	2⅝
McKinley-Dar-Sa	2
Min. Co. of A. new	3½
Motherlode Gold.	‡ 60
Nev. Utah M. & S	‡ 04
Nipissing Mines..	8½
Ohio Copper......	1 3/16
Pacific Sm. & M.	‡ 3/16
Puebla S. & R.....	‡2 3/16
South Live Oak.	2
South Utah M. & S.	‡⅜
Standard Oil (Old)	1110
Stand'd Oil of N.J	394
Stewart	2
Tonopah..........	6⅛
Tonopah Ex...	2 3/16
Tonopah Merger..	.81
Tri-Bullion.... ..	½
Tularosa	15/16
Union Mines	‡ 3/16
United Cop., pfd..	10
Yukon Gold .	3¼

LONDON Dec. 18 Name of Com	Clg.
Camp Bird..	£1 2s 0d
Dolores.....	‡1 10 0
El Oro........	0 17 0
Esperanza ...	1 18 6
Mexico Mines	7 2 6
Oroville	0 6 3
Stratton'sInd.	‡0 3 1½
Tomboy	1 8 3

BOSTON EXCH. Dec. 17 Name of Comp.	Clg.
Adventure...... .	5⅛
Ahmeek......	325
Algomah	‡2⅝
Allouez	37
Am. Zinc	27½
Ariz. Com., ctfs..	3½
Bonanza	‡ 30
Boston & Corbin	4 13/16
Butte & Balak....	3¾
Calumet & Ariz .	68
Calumet & Hecla.	517
Centennial	17
Cliff..............	‡3
Copper Range...	50
Daly West........	3½
East Butte	14¼
Franklin.........	8⅜
Granby...........	62
Hancock	22½
Hedley Gold.....	27
Helvetia..........	80
Indiana	15½
Island Cr'k, com.	54
Island Cr'k, pfd..	‡85½
Isle Royale.......	31
Keweenaw	‡2
Lake	24½
La Salle	5
Mass	‡5
Michigan.........	‡2
Mohawk..........	58
New Arcadian...	‡2¼
New Idria Quick.	‡7
North Butte......	31¾
North Lake	2¾
Ojibway..........	2⅝
Old Dominion....	51½
Osceola...........	104½
Quincy	75
Shannon	13
Shattuck-Ariz....	28⅞
Superior	35½
Superior & Bost..	1 3/16
Tamarack.......	33
Trinity	‡4¼
Tuolumne.......	‡2¾
U. S. Smelting....	41¼
U. S. Smelt'g, pf.	49
Utah Apex.....	‡1⅞
Utah Con........	10½
Victoria	1¾
Winona	‡3½
Wolverine........	66½
Wyandot	‡1

BOSTON CURB Dec. 17 Name of Comp.	Last
Alaska Gold M....	12
Bingham Mines...	4¾
Boston Ely.......	1 1/16
Boswyocolo . ..	.01
Butte Central.....	6⅝
Cactus.............	.07
Calaveras	2⅛
Chief Cons	1¾
Corbin............	.08
Cortez	.40
Crown Reserve..	3½
First Nat. Ccp....	1 9/16
Majestic..........	.48
Mazatan	‡½
Moneta Porc......	‡ 03
Nevada-Douglas.	3 7/16
New Baltic	1⅛
Oneco	1¾
Raven Copper...	.20
Portsmouth Coal.	‡ 05
San Antonio......	‡3⅛
Smokey Dev......	2⅛
S. W. Miami.....	4
South Lake.......	6
Trethewey........	.32
United Verde Ext.	.64

†Last quotation.

Issued Weekly by the
Hill Publishing Company
John A. Hill, Pres. Robt. McKean, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E.C.
Unter den Linden 71—Berlin N. W. 7.

Walter Renton Ingalls, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94 DECEMBER 28, 1912 No. 26

Blast Furnace Capacity

A good deal has been said from time to time of the great increase in iron-making capacity in the last five years, and some rather extravagant estimates of the possible make of pig iron in this country. These may be corrected by the definite figures presented by the American Iron & Steel Association in its final report. According to these there were on the lists of the Association on Nov. 30, blast furnaces having a total rated capacity to make 42,893,000 tons of pig iron yearly; but of these 43 stacks, rated at 1,766,000 tons, have been long idle, and it may be fairly assumed that few, if any, of these will ever go into blast again. Most of them are unable to operate at a profit—some not at all—owing to antiquated construction and equipment, unsuitable location or other causes. Deducting these, we have left furnaces with a total yearly capacity of 41,127,000 tons yearly.

Assuming this figure as our total present limit, it does not follow that we can turn out 41,000,000 tons of pig iron in a year. The rating of a furnace is usually based on its highest possible or actual output in a day or a week. But no furnace can run at this highest rate for a year continuously, and a deduction of somewhere between 5 and 10% must be made from the maximum daily make × 365 to get at the real capacity. Moreover, a blast furnace cannot run indefinitely, and in practice a certain number must always be out of blast for relining or other repairs. The time for blowing out is usually postponed as long as possible, but it is sure to come. It is probably safe to assume that from 15 to 20% of the stacks must be under repair, even when demand for iron is heavy and there is a motive for making the idle time as short as possible. Putting these two together, it would seem that the actual make of iron at the present time could not exceed 32,000,000 to 33,000,000 tons a year. According to the most reliable figures, we were running at the rate of 32,000,000 tons of iron yearly on Dec. 1; and our make for 1912 will not be far from 29,600,000 tons. It may be added that the new furnaces now under construction will have, when completed, a capacity of about 1,500,000 tons, so that the capacity next year will be approximately 34,000,000 tons.

A different cause limits at the present time the increase of active furnace capacity, and that is the supply of coke. The quantity of iron made with anthracite and raw bituminous coal is very small; adding that made with charcoal and we find that coke is the fuel used for fully 95% of the iron made. The coke plants at present are being worked very nearly to their full capacity with the labor attainable, and no early increase is in sight. Next year several large byproduct plants will go into operation, but until that time no large increase in ironmaking is possible.

"Blue Sky" Legislation

At a recent meeting of an association of investment bankers in New York, there was considerable discussion of the so called "blue sky" legislation for the protection of investors against wildcat promoters, and the opinion was expressed that laws imitating that of Kansas will probably be passed, sooner or later, in most of the states. While it is recognized that the intention of such legislation is beneficent, there is a feeling that the plan that is now being commonly pursued is not only inadequate, but also may become as great an evil as that which it is sought to correct.

The matter of preventing swindling stock-selling schemes is extraordinarily difficult, as the Government has found out in its actions against the gentry engaged in that business who have been arrested and put on trial. The defense is always, of course, that their promoters "thought" their schemes were good and would turn out to be bonanzas and would pay the big dividends promised. In other words, they were not pickpockets, but simply members of the Col. Sellers' family.

The prosecution has to prove a wilful attempt to defraud. In the cases of the gold-brick man who gilds a bar of lead and sells it to the hayseed, or of a Jernegan who dons a diver's suit and salts his submarine gold collecting plates, there is, of course, a *prima facie* intention of fraud. But in the ninety and nine cases of wildcat-company promoters, the guilty knowledge is buried in their own brains, many of their figureheads are dupes, and legal proof is often difficult to obtain. The suckers and gudgeons bite, and the lawyers for the defense try to make out with straight faces that they had a run for their money, while everybody of expert knowledge knows that the schemes were fraudulently conceived and never had any legitimate chance. In this connection, let us suggest to judges and lawyers that they exercise a little common sense; so far the juries have displayed that quality in an admirable way. The jurors are not responsible for the long-drawn out trials.

Candle Fires

The fire recently started in the Stewart mine of the Anaconda company, which fortunately is well under control and will not result in any great damage, is supposed to have been caused by a careless miner leaving a burning candle when he went off shift, although there is no positive proof that this was the cause. However, fires frequently are started in this way in the Anaconda mines and the company tries to prevent them by sending inspectors, commonly referred to as "fire bugs," through the stopes after the men have left.

This experience draws renewed attention to the danger in leaving burning candles in a mine, especially one that is timbered and is dry, although there may be the danger of igniting combustible rubbish and creating a suffocating fire in almost any mine. That terrible fire in the Belmont mine, at Tonopah, Nev., on Feb. 23, 1911, which caused the death of 17 men, was undoubtedly started by a lighted candle being left on a pile of mine timber in a winze. Mining rules covering this particular kind of carelessness cannot be made too strict, nor should any inspectoral precautions be neglected.

Reforming the Patent System

In view of the extensive agitation for radical changes in the patent system of the United States, in connection with which several bills affecting and greatly modifying the patent system are now pending in Congress, the board of directors of the American Institute of Electrical Engineers has adopted resolutions urging that Congress provide for a commission, composed of independent, competent men of such national standing as will command the respect of the whole country, to hold public hearings, to make a thorough and careful study of the patent situation, and to report about it to Congress. It is further urged that the present system be let alone until such a commission has been appointed and has reported.

These recommendations, we think, embody common sense. Unfortunately, that is a commodity that Congress does not like. The attitude of Congress toward commissions of experts is very much like that of the devil toward holy water. Congress infinitely prefers committees of its own, headed by a Stanley or a Pujo. Should members of Congress be deprived of the opportunity to sit in the spotlight? Oh, never!

The Geological Survey Wants a Building

Director George Otis Smith recently appeared before the house committee on public buildings and grounds at Washington and made a vigorous argument for a new building to house the Geological Survey and the Bureau of Mines. The work of both of these organizations is seriously handicapped by inadequate quarters, and as we have previously urged, they should be granted a building fitting their needs and commensurate with the importance of the mineral resources of this country. The valuable records of the Survey should not be left in their present unsafe repository, nor the Survey further hampered in its work by inadequate facilities.

We hope that Congress will give earnest consideration to this reasonable request. There is more legitimate need for a proper geological and mining building in Washington than there is for many of the ornate post-office buildings that are erected in the several congressional districts.

The Steel Statistics

The service which the American Iron & Steel Association has for many years rendered to the iron and steel trades ends this week with its transfer to the new Statistical Bureau of the American Iron & Steel Institute. The institute management has wisely decided to retain the experienced statistical staff of the association in the new bureau, and will also take over all the records and documents.

The year that is about to close has been a prosperous one for the mining industry. The shipments of iron ore from the Lake Superior region have been the largest on record. The coal miners have been pressed hard to meet the demand for their product. The prices for copper and zinc have ruled high. Silver has also been high, according to recent standards for that metal. Lead is the only metal for which a high price has failed to rule throughout the year.

New methods of mining, the employment of new mechanical agents, etc., have introduced new hazards to life and limb. For example, there are now numerous fatalities resulting from men coming into contact with electrical wires. The most prolific single cause of mining accidents is still, however, "falls of roof," and this is the hardest thing to guard against by written rules. The only safeguards are good foremen, eternal vigilance and common sense. In the exercise of the last the miner must participate as well as his superiors.

The German government plan for a state controlled company to monopolize the sale of oil in the Empire seems to be meeting with strong opposition in the Reichstag. Recent advices are that it is attacked by some strong interests and may not be adopted at all, unless in a much modified form.

In its next issue, the first of 1913, the Journal will appear in a new dress. The type will be larger and more easy to read and we shall return to the two-column measure, which was the form of our pages previous to 1902.

The annual statistical number of the Journal, reviewing 1912, will be the issue of Jan. 11, 1913.

By the Way

At the last meeting of the stockholders of the Cape Copper Co., it was stated by the chairman that the Tilt Cove mine, Newfoundland, is now practically exhausted. Thus passes a famous old mine, never a large producer but always an interesting one.

Among the witnesses recently called in the case of A. L. Wisner & Co. was "A. T. Van Sickle, a mining expert and stock salesman, formerly in the employ of that firm." At first glance this combination of avocations struck us as peculiar, but after a little reflection we thought that it might exist even in the halls of the mighty.

To the Minesota mine, Ontonagon County, Michigan, belongs the credit for having produced the largest mass of native copper found in the Lake Superior copper country. Its greatest length was 46 ft., the greatest breadth 18½ ft. and its greatest thickness 8½ ft. Its weight was over 500 tons, says A. H. Meuche, in a publication of the Michigan Geological Survey. To cut up this one mass took 20 men over 23 months.

Now we are beginning to hear the reiteration of the old, old remarks of a certain school of economists that a reduction in the price of copper would be of no interest to consumers; that the latter would as lief pay a high price as a lower one, etc. Also there comes the gossip that the Department of Justice is investigating copper conditions, that it plans to ascertain whether there is a conspiracy on the part of producers to hold metal off the market and keep prices at a level which acts virtually as a restraint of trade. Of course, the Attorney-General cannot prove anything of this sort any more than he can about anthracite. Yet in both cases, the unanimity with which it is considered that the price of the commodity ought to be a certain specific thing is interesting. Also interesting are the explanations of the copper producers. A few weeks ago there was no open market, no copper obtainable at anything less than the pegged price except from "second hands," junk dealers and other guerrilas. Now, we are gravely offered the news that "There has been no concerted action on the part of the producers to maintain any price. In fact, sellers of more than 200,000,000 lb. annually have been cutting under the higher price level and securing some small business"!

The "Luminator" process applied to cyanidation appears to be covered by the patent of Gaston Jacquier. As we understand it, aluminum sheets are suspended in a tank at right angles to the magnetic needle, and immediately after a clean-up the precipitated solution is run into the tank. It must be verified each day by compass that the aluminum sheets are at right angles to the earth's magnetic field, and there must be sunlight present. In 24 hr., "all the gold and silver contained in dissolution are precipitated on the sheets in a pure state." The plates are taken out and cleaned, then put back. In three or four days more the zinc or copper present deposits "on the sheets as a white and chemically pure crystal" (what salt of copper is this?). The aluminum is not corroded. We understand Mme. Curie is unable to explain what part the orientation of the plates plays; Madame Curie is miles ahead of us, as we are in the dark on at least five other points.

During the fire in the Homestake mine, in the Black Hills of South Dakota, all possible data bearing on the subject of fires and gases were collected with the hope of utilizing some of them which would aid in mastering the flames. About the large opencut in Lead, it was noticed that smoke and gases were filtering out of a great number of seams and cracks, and in order to determine the nature of these fumes, two chemists from the Homestake assay office appeared one day on the scene armed with bottles, rubber hose, etc., and a small suction pump. They proceeded to rig up the pump, connecting the suction through a piece of rubber hose into one of the cracks from which fumes were arising, and began to pump the gas into the bottles. Two Cornishmen were standing near, interested spectators of the proceeding. As the operation of pumping commenced, one of them turned to his companion and said, disgustedly: "'Ell, I wonder if 'em blewddy fools theenk 'ee can poot out fire with that 'ing."

That a chemical process should undergo five distinct evolutionary steps was claimed by Jasper Whiting, in a paper before the Congress of Applied Chemistry. These steps (which might well apply to any new process or device) are: The beaker or laboratory stage; the small-sized unit; the life-sized unit; the semi-commercial plant; the commercial plant. In the first stage only the technical side of the problem should be attacked, but this should include a study of competing conditions of one's own process, whether the raw materials can be had at a reasonable price in large quantities, and whether there is a permanent market. In the small-sized-model stage, the process should be worked in a variety of ways and an attempt made to learn the best conditions of operation. In the third stage the chemist should call an engineer into consultation, and neglect of this has wrecked many processes. The temptation is to hurry too greatly in this stage, and the first life-sized unit should be worked with for months, until all its troubles, both cumulative and otherwise, are known. When this stage is about 80% complete is the time to apply for a patent. In the step to the semi-commercial plant will come the change from skilled labor to ordinary, and the foolproofness of the apparatus will be tested, also the relationship of the separate operating units. Financing must also be considered at this stage. The commercial plant should, as far as possible, be laid out in sectional units, and one built and operated first. If this goes well the rest is easy.

The Temiscaming & Hudson Bay company, at Cobalt, has just paid its 43d dividend. The history of this mining company is little short of romantic. Few companies in fiction or on the stage have been more successful. It has returned to date $1,684,137 on an investment of $7761. During the last three or four years, the company has been paying 2400% per year, the returns during the last fiscal year being 2700%. In 1903 the Temiscaming & Hudson Bay Mining Co., Ltd., was formed by a number of New Liskeard townsmen who believed from reports brought down from the north by Indians, fur traders, and lumbermen, that there were valuable mineral deposits in the then unexplored Larder Lake district; a number of claims were staked and some work done. With the advent of the railroad in 1904, came the discovery of silver at Cobalt, and the company's prospectors were immediately sent south to the new field where they staked eleven claims. The first valuable vein was opened on what later became the Cobalt Silver Queen property, and in 1905 the company was able to declare a dividend of 200% from shipments of ore made on this property. This portion of the company's property was sold the next year for $810,000. Meantime, development work was actively conducted on other claims owned by the company, and in the spring of 1907 a rich shipment of high-grade ore was made from the North claim on the shore of Sasaginaga Lake; from this property the company has been shipping ever since. When the company was first formed it was capitalized at 25,000 shares at $1 each, of which 7761 shares were issued and paid up. Owing to the richness of the ore found in these properties, no further capital subscriptions were ever required. Thus on less than an initial expenditure of $8000, nearly $2,000,000 have been returned to its stockholders, and the company still has important reserves. Originally all this stock was held in New Liskeard, but as its value was recognized, it became scattered and though more than one-half the stock is still held by the original New Liskeard subscribers, shares are now held in all parts of Canada and the United States, and even in England, France and Belgium. The company still holds nine claims at Cobalt and has since acquired five at Gowganda.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Canadian Feldspar Shipments

In the JOURNAL of Dec. 14, 1912, p. 1148, in connection with the announcement of a shipment of ground feldspar from the Parham feldspar mine, in Frontenac County, Ont., occurs the statement that this is said to be the first feldspar mined in Canada. This is, of course, merely a case of Homeric nodding. The error is presumably that of your correspondent, for the fact is quite to the contrary.

Feldspar has not only been mined for many years in Canada, but one of the moving causes of the extended reconnaissance of Maine's feldspar deposits conducted by the Federal Bureau of Mines during the last summer was a desire to extend the domestic production, if possible, so that local producers might supply the demand now filled by comparatively heavy importations from Canada. Bedford, Ont., has been a heavy producer for years, its shipments to Trenton, N. J., consumers as long ago as 1901, running as high as 4000 tons in a single quarter. The Bedford spar is a red orthoclase, containing little or no iron, despite its color, and calcining to perfect whiteness.

C. VEY HOLMAN.

Rockland, Maine, Dec. 16, 1912.

Who Is a Mining Engineer?

Mark R. Lamb's formula for determining the Relative Location of a mining engineer has been tested by application to the life lines of a number of my acquaintances. Some of the cases worked out well, but others were found which could not be made to check with the known conditions, and I have finally discovered the reason. Before going farther I will state that I am prepared to furnish the affidavit required by Mr. Lamb that I have not yet determined my own Relative Location.

A QUICK ACTING TONGUE THE ENGINEERS' FRIEND

The chart still lacks one vital factor: namely, a scale of the Use of Language. It may be called by several different names, as the Scale of Eloquence, the Gift of Gab, or the scale of Verbal Persuasion. A little study will soon convince the observing student that this factor is not covered by either Publicity or Tact or Specialization or by any combination of these scales. Moreover, it is distinguished by being a native endowment; while, as Mr. Lamb admits, Publicity may be attained by extra work, and Specialization is largely dependent on outside influences. And Tact can only go as far as making a man keep silent and does not alone help him to put up a good talk when that is the particular thing needed. Good talkers, even more than poets and singers, are born, not made. The Social scale suggested by your correspondent from Missouri (ENG. AND MIN. JOURN., Nov. 30, 1912). would come nearer covering this factor than any line on the chart and yet that does not reach this all important factor.

Without a well developed gift of gab what benefits could be derived from a Boston or a London experience? And I never heard of an engineer reaching the "Private Car" without ample endowment in the line of the use of language. Referring to the frequently heard saying that if you have anything to say you can always find words to express it, we should remind ourselves that it is only smooth talkers who make that remark. It is useless to object that the success of a smooth talker is not "as an engineer." It certainly belongs to his rating in a more vital way than does Publicity.

"GOLD BRICKING" A PAYING ART

Actual examples will serve to make the case clear. A mining engineer that I knew was employed to make a survey for an important underground connection. The work did not connect. The mistake cost the mine about $6000. An ordinary engineer would have been fired instanter or made to pay the loss. Everyone in that community knew of the general carelessness and unreliability of this engineer—everyone excepting the employer. He was a little suspicious at first but our good talker engineer kept close to his ear and not only persuaded him that someone else was to blame but that the distorted work would eventually benefit the mine. Marvelous, but true!

Another case: A well known high-priced engineer made a mine examination. One of the features of the elaborate report was a lengthy assay list accompanied by charts showing the location of the samples; but there was nowhere, either in the text or on the plat, a figure to show the width of the ore taken for a sample. A subsequent examination of the engineer's field notebook showed that he had never measured the widths of his samples. Impossible! you say; how could he have made up his report? But he did; and afterward he talked with his client so fluently that he forgot all the little details of the written report and believed that he had received one of the most valuable reports ever made.

Another case showing the effect of a lack of conversational power: A competent young mining engineer sampled a mine, taking cuts of the vein at the backs of the drifts and also from the floors. His report was disappointing to the vendor, who was a fluent talker and went to the client and explained that his engineer was incompetent because he had not cut the samples in a complete ring around the drift, including the walls as well as the vein. In vain the engineer tried to explain that samples thus taken would have given even lower values than shown by the returns. He was a slow talker, poor fellow, the vendor won the day. Unheard of you say, that any man with the good judgment to employ an engineer would not take his advice! But truth is stranger than fiction!

We call upon Mr. Lamb to put the new scale on that chart. To illustrate the absolute necessity and unquestionable application of this factor it may be observed that the line, properly placed, will be so adjusted that a high value on this scale when coördinated with even one of the lower numbers on the Specialization scale, "Machinery Salesman," for example, will give a high result on the "Money" scale. And so on. It is evident that this scale must have a below zero graduation to accommodate those who talk too much.

H. W. B.

Denver, Colo., Dec. 14, 1912.

Overload Alarm for Dorr Thickeners

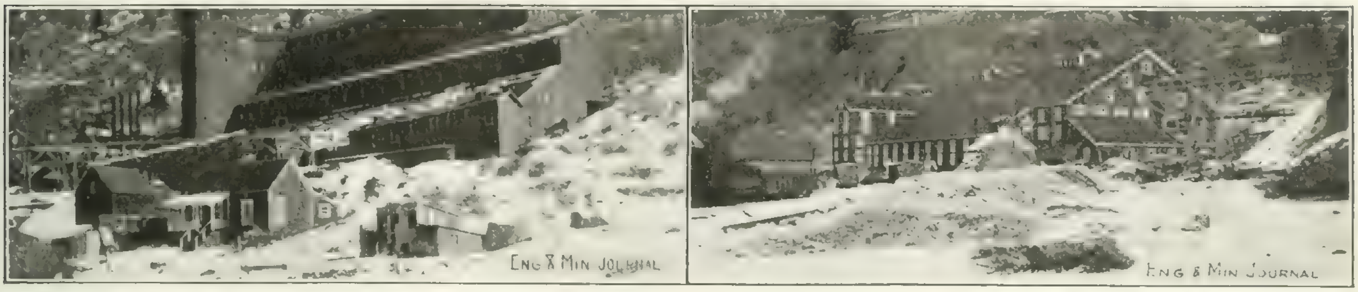
The spring-alarm connection on Dorr thickeners, described in the JOURNAL of Dec. 14, 1912, p. 1123, is furnished by us regularly when desired and was not put on by the Blue Flag company, as might be inferred from the article.

We have now changed our method somewhat and instead of this device are using the pressure of the worm shaft on the button at the end of the shaft to indicate the overload in the same way. This allows the alarm bell to be placed in any part of the mill desired; also a number of thickeners may be connected up with one bell.

THE DORR CYANIDE MACHINERY CO.

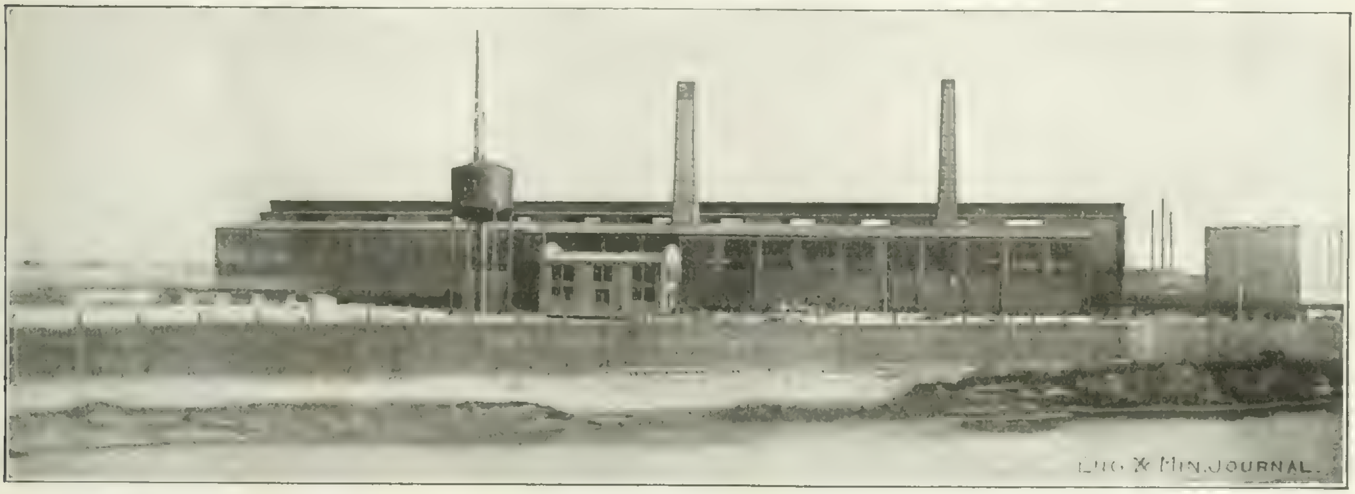
Denver, Colo., Dec. 19, 1912.

Photographs from the Field



Smuggler-Union Stamp and Concentration Mill and Cyanide Plant at Pandora, Near Telluride, Colo.

Smuggler-Union Mine in the San Juan District, Colorado



New Plant of International Lead Refining Co., at East Chicago, Ind.,—The Parkes' Process is Used

Concerning the Patenting of Borax Claims

WASHINGTON CORRESPONDENCE

Senator Massey, of the Committee on Mines and Mining, has submitted to the Senate a report in favor of his bill proposing to change the laws regarding patenting claims for borax on public lands. He said that, owing to the nature of the deposits of borax, uncertainty as to titles has resulted because of the doubt as to whether the land should be or should have been acquired as a placer or as a lode. This uncertainty has already led to litigation.

Originally the ruling of the Land Office was that a mineral deposit not metalliferous could only be acquired under the placer laws. This construction has in recent years been reversed by the Land Department, and the weight of the opinion of text writers on mineral law has been given against this ruling and some of the courts have rendered decisions contrary to it. It has not been finally determined, however, by the United States Supreme Court which of these constructions was right. The earlier interpretations may be the final interpretations of the law. In every instance where Congress has specifically determined as to any particular character of mineral deposit it has specified the placer law as applicable to nonmetalliferous minerals.

New York Section, A. I. M. E.

One of the most successful meetings of the New York Section of the American Institute of Mining Engineers was held in the Engineering Societies Building on Dec. 20, when Dr. Alfred E. Barlow, president of the Canadian Mining Institute, presented a paper on "The Silver-Nickel-Cobalt Deposits of Cobalt, Ont." Doctor Barlow's paper was a comprehensive review of the mineralogy and geology of this famous silver district, and the statistics of production and present treatment methods were also reviewed. Numerous maps and lantern slides were offered, illustrating the features of the district; also typical specimens of the ores.

The discussion following the lecture was especially interesting and was participated in by Prof. William Campbell, George M. Colvocoresses, Louis V. Emanuel, John Wellington Finch and John M. Clark, K. C. Professor Campbell presented a series of slides illustrating the order of mineral formation, which in the ores examined was as follows: smaltite, niccolite, chloanthite, calcite, argentite, native silver and native bismuth. One of the curious facts illustrated in several of these slides was a "rosette" of smaltite surrounding a kernel of native silver. Mr. Colvocoresses discussed Gowganda, Montreal River and other neighboring districts comprising the same general geological formations as exist at Cobalt; in this area of 2000 square miles, about 500 veins have been discovered, but only six were important producers. The production from Cobalt has been about 150,000,000 oz. of silver, while the remainder of the area has produced only about 5,000,000 oz., he said; most of the productive veins were in the diabase. Mr. Clark wittily discussed legal matters relating to the Cobalt district and pointed out the differences between the Provincial legislative powers and those of the states. He also referred incidentally to the discovery of nickel in the Cobalt district in 1892 and to the investigation made to determine if "another Sudbury" had been discovered.

At the close of the formal part of the meeting, President Kemp moved a vote of thanks be extended to Doctor Barlow for his illuminating discussion of the genesis of the Cobalt ores; he said, however, that a neighbor at dinner the previous evening had commented on the fact that he had heard a great deal about the Genesis of veins, but that his experience had been principally concerned with the Exodus of veins.

Cobalt Steel to be Studied

SPECIAL CORRESPONDENCE

The Mines Branch of the Canadian Department of Mines has undertaken an important investigation with a view of utilizing the cobalt contained in the ores mined for silver in the Cobalt area, much of which now goes to waste on account of the limited market for this metal. Cobalt resembles nickel in many of its properties, and it is thought that it may perhaps be substituted for nickel in steel alloys.

The services of Dr. Herbert T. Kalmus, formerly of the Massachusetts Institute of Technology, have been secured to conduct an exhaustive investigation as to the availability of cobalt as a steel alloy in place of nickel, arrangements having been effected with the Kingston School of Mining.

Pyrene Fire Extinguisher

The installation of 300 Pyrene fire extinguishers at the Anaconda mines in Butte recently, led to the JOURNAL's representatives being present at some demonstrations of the machine. The extinguisher consists of a small brass body holding one quart of the extinguishing fluid, and fitted with a small interior force pump, capable of throwing the contents about 30 ft., but usually most advantageously used at distances of six to 10 ft. The fluid contained boils at about 197° F., forming a blanket of incombustible gas over four times as heavy as air. The liquid and the gas are both nonconductors of electricity, so that it is possible to strike and break an arc of any magnitude, without danger to the operator.

The tests witnessed were: Gasoline spilled on a floor and iginted; gasoline burning in buckets; burning acetylene generated from carbide and water; acetylene and gasoline; cotton waste saturated with oil; excelsior wet with gasoline; and fires made with excelsior, waste and kindling inside wooden boxes. In every case the fire was extinguished by a portion of the contents of a one-quart extinguisher in a few seconds. The application to carbide, gasoline and electric short-circuit fires, which are either spread or intensified by water, is especially important.

Of course, Pyrene, or any other extinguisher will not replace the fire department. A big fire needs big apparatus. But there are a few critical seconds when every fire is small, and during this period Pyrene will put it out.

Brazilian Iron Negotiation

An international corporation with a capital of $100,000,000, having for its object the acquisition and exploitation of coal and iron deposits in Brazil is projected, according to London advices. The Rothschilds, the Barings, Sir Ernest Cassel and a group of American bankers are reported interested in the combination.

The Itabira Iron Ore Co., Ltd., which owns mines in the district of Itabira in Minas Geraes, Brazil, is closely connected with the operation. The Itabira company owns the mines while the railroad and port are controlled by other interests. So far mining has not been practicable, owing to the heavy shipment costs, but with the mines, railroad and port all under one management, the outlook would be changed.

Price of Boron Suboxide

It is announced in *The Brass World*, October, 1912, that boron suboxide, to use in making sound copper castings, is obtainable from the General Electric Co. at $2.50 per lb., and that one pound will deoxidize 100 lb. of metallic copper. As remarked earlier in the JOURNAL, the process seems to be a long way from supplanting the old wood poles in cathode melting, whatever may be its merits in the production of small castings for electrical purposes.

Magnetic Permeability of Iron Minerals

According to a table given in *Echo des Mines*, Nov. 11, 1912, the iron minerals have the following magnetic permeability: Metallic iron, 2.163; magnetite, 1.467; ilmenite, 1.287; pyrrhotite, 1.078; hematite (red), 1.025; spathic iron ore, 1.022; brown hematite, 1.010; iron pyrites, 1.002. Only magnetite and ilmenite of the ores are truly magnetic in the ordinary sense.

Obtaining Efficiency in Mining

By Andre Formis*

Mining costs are 70% labor and 30% supplies, making necessary close attention to the labor problem. Attention to drilling, shoveling, pumping, etc., will greatly reduce costs.

It is a noteworthy fact that the manufacturing enterprises of the world at large have assumed enormous proportions in the last decade. Aside from purely economic conditions this state of affairs is mainly due to the elimination of destructive competition, the standardization of output and the use of efficient power and labor-saving devices.

Indeed the latter two factors claimed our greatest interest, because through employment of skilled labor in its broadest sense, from the college-bred manager and his engineering staff to the workman who keeps a special machine tool supplied to its capacity of output, the great savings in cost of production are effected. This fact is so well recognized that today the mining industry, which has been so notoriously marching in the rear, is beginning to appreciate the effect of technical management in decreased costs, increased production and improved labor conditions.

MINING COSTS ARE 70% LABOR

When it is considered that in mining operations proper, the cost of labor is about 70% of the total cost, it is evident that every progressive company must make intelligent efforts to reduce this cost to a minimum. This end may be attained through several methods, some or all of which will lead to better results, according to local conditions.

The simplest unit of cost comparisons may be stated to be the cost per ton of rock hoisted. This factor depends only on two variables: Efficiency of labor, and cost of supplies which includes power. It may be proper to base costs on the refined output which is sold and on which the profit or loss directly depends. This cost includes three variables, the third being the physical condition of the raw material to be extracted and the variations in selling price.

Mine costs in their fundamental form may be classified as follows: Cost equals labor, 70%, plus supplies (power etc.) 30%. Evidently the largest saving can be effected in the largest item of cost, labor. In the majority of mines the labor required underground may be stated to be: Breaking of ore and rock; handling of broken ore and rock; tramming and storing of broken material; loading into pockets and hoisting devices. All other items of labor, such as track extensions, repairs to tracks, pumping, timbering, handling of supplies, underground superintendence, etc., are quite constant and depend on the character of the rocks, position of orebodies and method of mining.

As an example the analysis of the labor required to operate a development proposition, employing five drills, the Ojibway Mining Co.'s property may be quoted. Development is being carried on in two shafts, No. 1 shaft is being sunk at a depth of about 2050 ft. from surface on the angle of the lode which is 33° from the horizontal, and in the foot-wall trap. Two machines are employed on two nine-hour shifts per day. In this shaft two drifts are being driven on the lode at the 1600- and 1700-ft. levels respectively, also on two nine-hour shifts. In No. 2 shaft a crosscut is being driven on the 1900-ft. level in the foot-wall trap.

LABOR REQUIRED FOR SMALL MINE

Office	
Superintendent, clerk, stenographer and supply clerk	$ 400
Underground	
1 mining captain	135
1 Night boss	90
20 Miners (5 machines, two shifts) at say $70 per mo	1400
10 Trammers $60 per mo	600
6 Landers (includes two puffer boys)	270
1 Pump boy	35
2 Timbermen and tracklayers	125
1 Changehouse man	45
42	3100
Surface	
½ Foreman and ½ master mechanic	115
2 Surface labor	100
1 Team (hired on contract)	125
1 Carpenter	80
2 Machinists	120
1 Blacksmith boss	68
1 Blacksmith helper	48
2 Hoist engineers	112
2 Compressor engineer (electric plant)	140
3 Firemen (eight-hour shift)	189
1 Coal passer and ash wheeler	50
17	1147
Total labor	$4247
Average rate	$2.59

The Ojibway cost sheet for the month of June shows the number of men employed was 61, at an average rate of $2.51, the total labor cost being $4185.42 which is sufficiently near the estimated cost of labor required. It further shows that in this case only the actually necessary labor is being employed, that the rates paid are the average prevalent in the district. There is no undue favoritism shown in any department and there are no superfluous positions filled, as for instance mining engineer, timekeeper, day-shift boss or trammer boss. The amount of labor being a readily determined quantity in every case the next step is the investigation of the methods wherein labor is used. By far the most important is the method of breaking the product in place. In other words the miners are the chief item of expense.

DRILL RECORDS AT OJIBWAY

With the minimum amount of labor given, methods are devised by which the miners' product can be increased. This factor is receiving considerable study at this time; thus far good results have been shown. The miners' machine drills are being improved materially. In medium hard and soft rock a one-man piston drill, made by the Ingersoll-Rand Co., is being considered favorably by some. The piston is 2¾ in. in diam. The drill weighs 156 lb. It operates with about 90-lb. air pressure, delivering about 600 blows per min. In certain favorable stopes two or three machines are used with as many miners and one helper between them. He assists in setting up and removing the posts and whatever scaffolding is necessary. In certain localities the hammer stoping drill is used, but its application is confined to upward holes and the twisting of the steel must be done by the miner, sometimes a tedious operation. The Ingersoll-Rand Co. is marketing such a drill which rotates automatically. Water or dry holes are drilled to a depth of six to eight feet by one man with good speed in medium hard rock. The drill steel is the hollow kind with a hexagon rosette bit.

My experience at the Ojibway has shown that in the Kearsarge lode at this point a fair day's drilling with a 3⅛-in. machine is about 34 ft. per shift. The machine is the well known Ingersoll-Rand R-3 drill, weight about 295 lb. 400 blows per minute. The one-man drill with only one man averages 22 ft. per shift and the same drill with one miner and boy increased the footage to 30 ft. per shift. The small drill needs a pressure of 90 lb. air, the larger drill works well with 75 lb. of air. With the smaller machine a certain increased air loss is experienced due to the heavier pressure carried, also the compressor works at less efficiency. Among the comparative drill records now extending over 16 months a No. 10-A Fort Wayne electric drill has made a good showing. The average drilling speed is about 34 ft. in medium hard ground and with two men. The power cost is only about 15% of the air cost. In excessively hard ground the drill is not effectively used, but compares well with the one-man drill. These drill tests are not definitely closed. The drill manufacturers appreciate the importance of this matter and they make strong efforts to improve their apparatus embodying the various principles now in use. The progressive policy of the drill manufacturers deserves every aid that a mine management can give.

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*Superintendent, Ojibway Mining Co., Ojibway, Mich.

As a matter of fact the air drill is used so extensively that it seems a waste of time to call attention to one of the main features of the machines. That is the comparatively greater drilling speed in wet or water holes, pointed on a downward angle if the water supply is intermittent and introduced by hand, or at any angle if the water is forced into the hole mechanically. It can be demonstrated, however, that the downward pointed holes do not break the same amount of rock as a dry horizontal hole.

In fact a material difference in the tonnage broken is the direct result of changing the dip of the hole to a horizontal position. This is very apparent in overhang stoping as illustrated in the accompanying diagrams.

The electric drill makes greater speed in horizontal holes, which are self cleaning, dry and practically dustless. In order to take advantage of this characteristic in drifting, instead of the usual downward cutting-in holes, horizontal holes were drilled with one set-up of the post, a three-foot arm being used on the post. The depth of the cut was thereby increased from about 4½ ft. (downward air-drilled holes), to about seven feet (horizontal holes) and the rock broken was blown beyond the face of the drift, allowing the men to set up immediately after the smoke cleared. With downward air-drill holes the tendency is for the broken material to pack down in front of the face and it must be picked and removed by the miners before the post can be set up again. The average drifting per month was thus increased from 53 to 70 ft. The cut is blasted at one firing with electric fuses. The square is then drilled and blasted in two rounds with the du Pont first- and second-delay fuses, breaking the lifters last. The 3-ft. arm was tried with the air drills, but the post cannot be clamped rigidly enough to withstand the great leverage of the heavy moving parts.

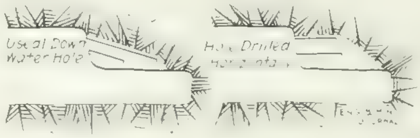
Higher Efficiency to Be Sought by Faster Drilling

It is apparent that higher efficiency of the most costly part of underground expense, namely miners' labor, must be sought through increased product, which is derived from increased drilling speed and the proper placing of holes in the face of stope or drift. It is understood that in order to make any material improvements here the labor element must be handled with justice and fairness. It is only proper that the miners receive a share of the increased profit, be it either as bonus or sliding-scale contract.

This point is well worth the consideration of any engineer or superintendent who actually spends a few hours underground each day in an effort to increase the output per man and to tune up the various operations to their maximum of useful effort, aside from creating a greater spirit of loyalty to the company's interests by being seen actively interested in the welfare of the men.

Requisites in Economical Tramming

The next item of importance is tramming. Without respect to the method used for tramming, power, animal or man, the prime requisite is a good well graded track, rails of sufficient section to stand the load with but few ties under them. Rails should have smooth joints, be connected with tieplates and bolted. Cars should never leave the track on account of a poor track. This condition is frequently met with and is quite inexcusable. Cars are often loaded at the heading with the shovel; this is greatly facilitated by laying a steel plate on the floor before blasting.



Effect of Different Drilling Methods

When any considerable amount of loosening up of the dirt is necessary two men tram about 15 two-ton net loads to the pocket or hoisting skip. Forty tons is considered a fair day's work where not much selection is necessary. Therefore the total cost of tramming by hand should not exceed 15c. per ton. A mule can haul four cars and the cost, including the high depreciation, is about 10 to 12c. per ton. Motive power, air or electric, reduces the cost to about 5c. per ton. The installation of electric haulage depends largely on distance and quantity of material to be hauled per level, in other words, permanence, cost of power and adaptability. Whatever system may be used, loading from pockets or shoveling from the floor, a greater quantity is handled over good tracks.

The cost of timbering is next in importance in many mines. It depends on the method of mining, the base of supplies and the deterioration.

Determining the Method of Mining

It is important to determine early in the life of a mine what system of mining will be the most economical, considering a reasonable extraction with low mining costs and safety of openings, necessity of filling mined-out portions or caving, etc. An important consideration is the possibility of mining out the ores from the boundary lines first and then back toward the shafts, thus saving perhaps heavy timbering costs. The caving of worked-out portions relieves the hanging over adjoining stopes, avoids maintenance of heavy ground and adds to the safety of other openings.

There is another method of mining which has been used in one of the mines on the Marquette range. It consists of raising in ore on the foot wall, widening the raise fan-shaped, drilling long holes into the ore in the hanging and thus blasting vast masses of ore with but little drilling. The falling ore breaks itself up on reaching the foot wall and is then handled into cars at the mouth of the raise. Low costs were obtained with satisfactory safety to the men. It may be well to state that intermediate raises were left untouched and thus formed traveling roads for the men to the heads of these stopes. The ore in these pillars was the last to be removed.

Pumping Economies

Costs of pumping are large in many mines, owing to depth and heavy flow of water. Steam-driven crank-and-flywheel, compound pumps are used with good economy; the steam pipes in shafts must be well protected from water. I recollect a Western mine where I was told that the pumping costs were high, the steam lines to the pumps in the shaft were unprotected from water as well in the drifts down to a winze. It was difficult to see on account of the steam vapor and in the winze the heat was stifling. In this case a motor-driven unit would have saved nearly one-half of the steam cost and probably increased the efficiency of the men one-third.

For discontinuous pumping of small amounts of water the electric motor is not surpassed. There is no peak load, no freezing air valves or extravagant use of compressed air. At the Ojibway ordinary triplex pumps belted to motors are installed certain distances apart which correspond to about 200 lb. pressure per sq.in. at the pistons. Seventy-five gal. per minute are pumped from sump to sump, the lowest drift having a temporary air pump which collects the water below the last permanent electric pump. One boy on day shift pumps out sump after sump.

It would take considerable time to follow the lesser steps of operations that make up the total cost of production. In each case the treatment of every item should be thorough. The resulting economies will amply repay any effort made in this direction. Last but not least, a system of cost records should be used on which a clear statement of results can be read. A comparative cost sheet with enough divisions of operations is quite comprehensive. Each class of operations is divided into labor, supplies, total cost, cost per ton, decrease or increase per ton as compared to the previous month. Explanations of one cent difference or over should be made by the engineer in charge. Any undue variation perhaps in methods or tonnage production will be apparent at once.

Under the head of supplies a close check on the materials on hand in the warehouse should be kept in order to eliminate leaks. A classification on loose cards showing each item in stock, with purchase price, freight and cost of handling, can be kept continuously up to date and thus forms an inventory always up to date. This record is valuable in case of fire as on this record, insurance may be adjusted.

The foregoing should be an argument for the employment of technically educated, practical mining men, either in permanent positions or as consulting efficiency engineers. Such men should have had varied actual underground work for a number of years, they should be qualified to direct operations and they should be still in the habit of keeping in actual touch with the miners, the working faces of drifts, stopes and shafts.

Developments at Santa Gertrudis

During the last year The Santa Gertrudis Co. vigorously carried on the work of thoroughly preparing the mine for the economic production of ore. As a result there remain, according to the annual report, only the completion of the new San Francisco shaft No. 2 and the finishing of the new main pump station on the 18th level to place the property in excellent condition for cheap work. The principal problem, thereafter, will be an improvement in labor efficiency. The success of the plan of establishing a well housed laboring community for this purpose was fully proved.

The development of the 18th level from the eastern boundary line westward to the San Francisco shaft was completed during the last fiscal year, exposing a pay shoot for practically the entire length of 1800 ft. In direct contrast to the conditions found on the 17th level, the west face on the 18th level opposite the San Francisco shaft shows good pay ore, indicating strongly a westward extension of the oreshoot with depth. The development of the 19th level is in its initial stage, work being carried on at present by drifts east and west from the San Guillermo or main hoisting shaft and the counter shaft.

To obtain the best economic results, it is the present policy of the management to extract all low-grade ore on any one level with the high-grade, thereby not only making available a large extra tonnage, but also decreasing the cost of maintaining the level open over a longer period of time.

Report on the Sudbury Nickel Field

TORONTO CORRESPONDENCE

The summary report of the Mines Branch of the Canadian Department of Mines for 1911 contains a report by Prof. A. P. Coleman on the Sudbury nickel field, which, owing to the increase in the world's demand for nickel, of which Sudbury furnishes more than 60%, is now receiving an unusual amount of attention. The older companies are extending their operations and increasing their known ore reserves and new operators are entering the field. As all the known deposits are more or less directly connected with the basic edge of a great synclinal sheet of norite, merging into micropegmatite, Prof. Coleman's examination was principally concerned with this basic edge.

VICTORIA MINE THE DEEPEST IN ONTARIO

The work was begun at the Trillabelle mine at the southwest end of the boat-shaped syncline and carried southwest past the Chicago and Sultana mines to the Victoria mines of the Mond Nickel Co. The mine is working upon two orebodies of comparatively small horizontal dimensions, but of astonishing continuity since they have been followed downward for 1600 ft. without a break and promise to go on indefinitely. Victoria mine is by far the deepest mine in Ontario and is overpassed by only one or two in British Columbia.

From this point the basic edge was followed to the Crean Hill mine belonging to the Canadian Copper Co., where interesting relationships are found, since the country rock to the south has been thrust over the norite along a gently inclined fault plane. In this process the greenstone of the country rock was greatly shattered and ores from beneath penetrated all the fissures. It is probably owing to this fact that more copper than nickel is produced by this mine, an unusual feature not observed elsewhere in the region except at the old Copper Cliff mine. The small, but wonderfully rich Vermilion mine lies a short distance southwest of Crean Hill. Northeast of this point the basic edge has disclosed no large orebodies for six miles, at which point the Gertrude mine, the property of the Lake Superior Corporation, was worked some years ago.

CREIGHTON MINE FURNISHES ABOUT HALF THE WORLD'S NICKEL

A mile and a half further east is the Creighton mine, where a bay of the norite projects southeast into the country rock of granitoid gneiss. The Creighton has the richest ore of any large mine of the region, and now furnishes about half of the nickel of the world. The diamond drill has proved that the orebody continues for a long distance beyond the present workings so that there are large reserves of ore.

The next important group of mines is on the Copper Cliff offset, including the famous Copper Cliff mine. It is more than 1000 ft. deep. No. 2, a larger pipe-like orebody, was being worked a little to the north. Farther to the northeast the Garson mine, 12 miles from Copper Cliff, opened up by the Mond company, was producing more ore than the Victoria, and shafts were being sunk on the Frood, or No. 3 mine, by the Canadian Copper Co., and on the Frood extension by the Mond Co. Diamond drilling has proved that this long outcrop of ore dips toward the basic edge of the norite and that the deposit is much the largest in the district, surpassing the Creighton in quantity, though not equaling it in grade of ore. A great fault has shifted and fractured the norite and greenstone, breaking them into large irregular blocks, between which the ore has been deposited, the fault plane being nearly vertical. Copper ore is unusually abundant, about equaling the nickel in amount. Diamond drilling at the Mount Nickel mine north of the Frood shows the presence of a good orebody.

OLD PROPERTIES MAY BECOME PRODUCTIVE

On what may be called the Eastern Nickel Range, two good finds have been made and diamond drilling has shown that some old properties are worth more than was suspected. The Whistle mine at the north end of the range now being developed, has been proved to contain a good amount of ore. It has been connected by the Nickel Range Ry. with the Canadian Northern system. The Dominion Nickel and Copper Co. has undertaken much diamond drilling and development on its properties on the Northern Nickel Range with encouraging results, to insure a plentiful supply before the erection of a smeltery. Following the basic edge of the norite from Bowell Township to the region of the Trillabelle mine completes the circuit of the nickel-bearing eruptive. Along the latter portion, ore has been found at four points, but there has been little advance in development. The work of the year has resulted in a number of changes in the map of the nickel ranges, but most of them of small extent.

The results confirm the opinion held by geologists and most mining men, that the ore deposits are the result of magmatic segregation from the norite-micropegmatite sheet with which they are connected. Almost all the development work now being done, especially the diamond drilling, is closely checked in accordance with the geological principles resulting from this theory, illustrating the practical value of the work of the geologists who mapped the region.

SMELTERS INCREASE PROPORTION OF GREEN TO ROASTED ORE

Advances in the metallurgy of the ores are made by the Canadian Copper Co. in increasing the proportion of green to roasted ore smelted, giving an approach to pyritic smelting, in the construction of a reverberatory furnace to treat fines and flue dust, and in the introduction of immense converters with a basic lining to replace the small acid-lined converters.

The Mond company was constructing a new and much enlarged smelter at Coniston, conveniently placed with good railway connections with their mines. The report concludes with the statement that the Sudbury mining district is making rapid yet solid advances and bids fair to be the most steadily prosperous metal-mining region of Canada. The peculiar character of the orebodies, which follow the margin of a great mass of eruptive rock, dipping away to unknown depths, suggests that mining may follow them also to great depths, giving a permanency to the camp which cannot be hoped for in most other mining regions.

Detection of Nitric Acid in Sulphuric Acid

The use of diphenylamine in testing sulphuric anhydride and fuming sulphuric acid for nitric acid is unreliable under ordinary conditions, according to W. N. Iwanow (*Chem.-Zeit.*, p. 1170, 1912; *Journ. Soc. Chem. Ind.*, Nov. 15, 1912), since an acid containing over 20% of free anhydride gives a pink to blue coloration with this reagent. To test an acid containing, say, 30% of free anhydride, it should be first diluted with about twice its volume of pure sulphuric acid of sp.gr. 1.84, so as to produce approximately the monohydrate, which gives no coloration in the absence of nitric acid. The diphenylamine test may be used in the absence of nitric acid to give a rough estimate of the percentage of anhydride in fuming sulphuric acid.

Rand Mining Notes

JOHANNESBURG CORRESPONDENCE

The new 100-stamp mill of the Consolidated Langlaagte mine was started on Oct. 1. It has a capacity of 45,000 tons per month. The ore reserves in the new mine are over 1,500,000 milling tons, assaying 8.4 dwt., and in the old mine about 400,000 tons, assaying 6 dwt. The share market is depressed, owing to the Balkan war, and the stocks in several mines now stand at a figure offering attraction to the investor. The general public, however, appears to have a vague idea of the short life remaining to several of the largest producers and the local mining journal has recently published some optimistic estimates on the subject.

The Simmer & Jack East mine is one of the group of unfortunate deep-level mines near Germiston, where the falling-off of the grade of ore in depth has been so pronounced. It was taken over by the holders of about £800,000 first-mortgage debentures, and the original shareholders and the second-mortgage debenture holders have lost all. The mine has been sold to the Knights Deep Gold Mining Co., which adjoins it and which has a joint milling plant of 400 stamps. The Simmer East has about a million tons developed, worth about £1 per ton. The unworked ore in the mine, if it can be made to yield a fair profit by working the two companies together, will be useful in prolonging the life of the Knights Deep, which by itself has a life much under the 15 years stated by the *Rand Mining Journal*.

The Consolidated Langlaagte mill has to work under the Sunday observance law, which prohibits any new mills from working for 24 hours on Sunday. It has been found that great trouble and loss of time are experienced, as the classifiers have to be run down clear of sand and then filled up again after starting before the tube mills get a proper supply of sands, making the stoppage a much longer one than was anticipated.

Despite the Balkan war, the government is calling for tenders for working an area of 2235 claims, or over 1900 acres lying on the dip of the Brakpan mines. The government insists that the capital shall consist of £1,200,000 in £1 shares, of which £650,000 is estimated as required for shaft sinking and development, and £550,000 for equipment.

The royalty required varies as the ratio working profit bears to the amount recovered per ton. If profit is 10% of recovery, the royalty is 10%; if 15%, royalty 15%; 25%, royalty 25%; 30%, royalty 30%; 40%, royalty 37.5%; 50%, royalty, 42%. The area lies deeper than the Brakpan mines and sinking will be more troublesome and costly, owing to the presence of interbedded diabase sheets coming eastward from the Rand Collieries, Ltd., where they caused expense and trouble in sinking.

For the year ended June 30, 1912, the Nourse mines crushed 609,250 tons, valued at 30s. 6d. with a working cost of 22s. 6d. and a total working profit of £253,233. Ore reserves are 1,969,000 tons of 6.6 dwt. The total working profits of the Witwatersrand mines were £11,415,000 in 1911, and for the first nine months of 1912, £9,409,825, so that the probable profits for 1912 will reach £13,000,000.

The only sign of progress on the West Rand is shown at the West Rand Consolidated, where richer ore has been developed on the Kimberley or Battery line of reef, and profits have been raised from £3000 to £8000 per month. The milling plant is to be increased from a capacity of 30,000 to 60,000 tons per month.

The Johannesburg Consolidated Investment Co. now has £400,000 invested in De Beers Consolidated, Jagersfontein and the Premier mine, and holds two seats on the Premier board. It is undoubtedly using its influence with success to create an agreement between all these producers to control the production and sale of diamonds. It is reported that a valuable diamond pipe has been discovered near Klerksdorp, on the line from Kimberley to Johannesburg, and several other promising discoveries are reported, including large areas of volcanic breccia near the Premier mine, which carry diamonds and which may prove payable.

At the recent annual meeting of the Johannesburg Consolidated Investment Co., it was stated that as during the next three years there would be no greatly enhanced demand from new mines for native labor, the present supply, owing to increased efficiency and the greater use of rock drills should prove sufficient with the natural increase.

Carbonate of Soda in South Africa

A discovery of carbonate of soda is reported at the Salt Pan, near Hamans Kraal, about 20 miles from Pretoria (*Chem. Tr. Journ.*, Dec. 7, 1912). A Johannesburg syndicate has leased the farm from the government and is putting down bore holes, which so far have proved the deposit to extend to millions of tons and with increased value in depth.

Reduction of Sodium from Sulphate

According to P. A. Emanuel (Brit. pat. 20,046, of Aug. 27, 1910), sodium can be reduced from the sulphate by heating it in a carbon-lined retort, with free carbon, then adding lime and more carbon:

$$Na_2SO_4 + 4C = Na_2S + 4CO$$

$$Na_2S + CaO + C = 2\,Na + CaS + CO$$

The temperature is then raised until the metal distills over at 250° Centigrade.

Details of Practical Mining

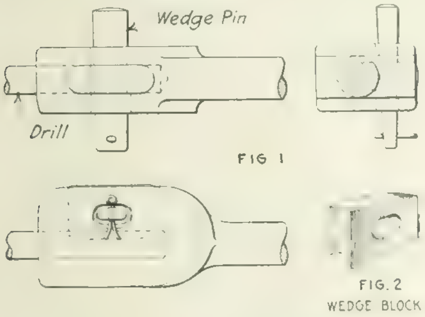
Accounts of Useful Ways of Doing Many Things in the Day's Work

Taylor and Rule Drill Chuck

By R. A. Rule*

The Taylor and Rule chuck for rock drills holds the drill steel by a system of wedges. It is quickly adjusted and released by one blow of the hammer for each operation. As the wedge pin itself does not come in contact with the drill it does not jar loose and the drill steel is held tightly all the time the machine is in operation. This chuck permits about one-third faster work than the usual U-bolt type, as there are no bolts to tighten or loosen. Furthermore the maintenance charges are lighter, there being no threads to strip or wear out, and U-bolts and nuts to replace.

The drill steel is placed in the hole in the end of the chuck, as shown in Fig. 1 of the accompanying drawing. The wedge block, Fig. 2, is inserted in the slot in the top of the chuck and the wedge pin is passed through the hole shown in the side of the chuck and through the hole in the wedge block. A stroke from a hammer on the end of the wedge pin, which bears on top of the hole in the chuck and on the bottom of the hole in the wedge block, presses the wedge block down tight on the drill and holds it securely all the time the machine is in operation.



Taylor and Rule Drill Chuck

It is not necessary to remove the wedge pin every time a drill is changed as a spring cotter pin at the end of the wedge pin holds it loosely and prevents it from falling out, after it has been driven back by a blow from the hammer, and the drill released.

It is also unnecessary to shank the drill steel when this design of chuck is used, as the hole in the chuck may be drilled the correct size so as to take the steel in use.

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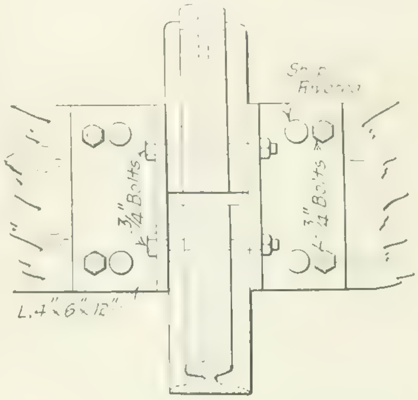
*Osceola, Mich.

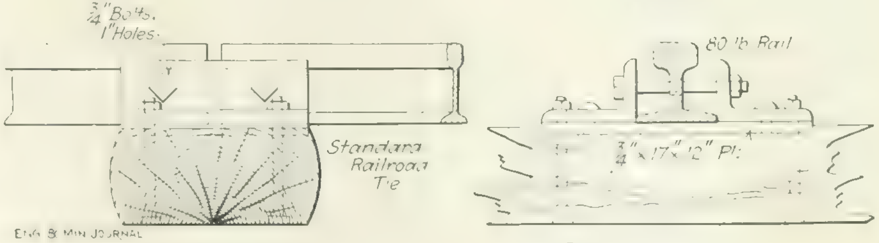
Steam Shovel Track Connections

Much time is lost in steam-shovel work in "moving up." This loss is usually due either to derailment on account of poor track laying or to the slowness with which the crew makes the connections. In order to save time the following method of connecting track sections has been devised and used in many pits on the Mesabi iron range. Not only does it save time in laying the track, but insures a connection that the wheels will pass over without danger of derailment.

It consists of two 4x6-in. angles, shop riveted to a ¾-in. plate, which is as wide as the tie used and long enough to accommodate the size rail used in the sections. The angles are spaced ¼ in. wider than the width of the base of the rail. The holes for connecting the rails are spaced and bored as in ordinary angle bars, except that there is but one hole for each rail, which is ¼ in. larger in diameter than the bolts in order to lessen the difficulty in making the joint. Two plates, with their upright angles, are bolted to a good tie, as shown in the accompanying drawing.

It is customary to bolt the connecting tie to the front section, while the steam shovel is at work. As soon as the whistle blows to move up, the rear section is carried forward; and it is only necessary to pass a bolt through each plate to make the connection instead of having trouble with two pairs of angle bars.





Angle-bar, Steam-shovel Track Connections

If diamond-drill rods are greased with melted tallow or other suitable lubricant and then coated with Stockholm tar, it will be found that the tar will make a smooth lining in the hole which tends to prevent caving, says W. H. Trewartha-James (*Bull.* No. 95, I. M. M.). In some cases, particularly where there is sulphur in the strata, the casing thus formed is almost as hard as cement.

Sand Filling at Cinderella Consolidated

The system of sand filling, devised by Mr. Girdler-Brown, of the Cinderella Consolidated mine, in the Transvaal, was described by R. E. Sawyer before the Institution of Mining and Metallurgy, Oct. 17, 1912. In first cost it compares favorably with any other method, no dewatering cones or neutralization process being necessary, and it shows to greatest advantage when employed in shafts of great depth and under circumstances such that continuous filling is not necessary, as interruptions are almost certain to occur from time to time in wet weather, due to an excess of moisture in the sand.

Air and Sun Best Cyanicides

The sand used should not contain over 5 to 6% of moisture, and should have been exposed to the sun and air for at least two days before being used. It will then be practically free from cyanide and neutral in character. Sand taken directly from the cyanide tanks was tried for this process, but even after it had been treated with potassium permanganate, considerable quantities of cyanogen were evolved when the sands became mixed with acid mine water. This action was, however, entirely obviated by ex-

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Note—Abstract of a paper "A System of Sand Filling on the Rand," Bull. No. 97, I. M. M.

posing the sand to the sun and air, as already mentioned. Plans were originally laid out to follow the usual practice in sand filling of running the sand down the shaft mixed with water, but this idea was found to be impracticable, owing chiefly to the excessive wear of the pipe caused by the great depth to which the mixed sand fell and the cost of pumping entailed. When the column first installed was worn out, it was replaced by a square wooden-box launder, down which the sand fell unmixed with water. The launder measured 11x12 in. in cross-section, and its cost was approximately 61c. per running foot. Observation doors were cut at distances of about 100 feet.

Sand with under 4% Moisture Runs Freely

The piping and launder from the surface bins were replaced by a belt which conveyed the sand to the top of the box launder. It was found that sand containing not over 4% of moisture would run freely from the bins to the belt without handling. On arriving at the head of the launder, the sand falls down the box to a steeply inclined iron plate, over which a stream of water is made to play.

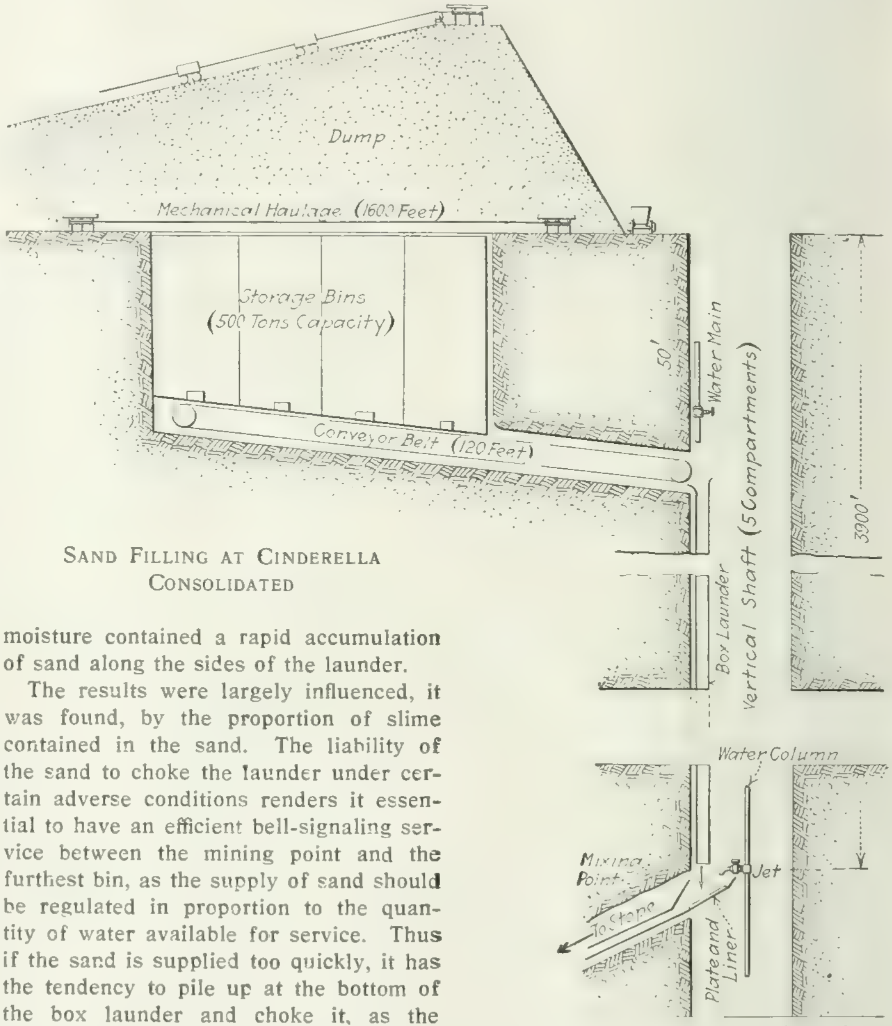
The plate should be provided with a liner of the hardest white cast iron to counteract the excessive wear at the point. After being mixed the sand and water flow into a steeply inclined launder, where they undergo further mixture before being conveyed by pipes or launders to the part of the mine requiring filling. The effective capacity of the plant is controlled by the quantity of water available, as it is found that the delivery of the sand to the vertical box is practically without limit. In the Cinderella plant, experience shows that the box launder has not appreciably worn, the reason for this being the conduct of the sand, which travels normally down the center of the box with little or no impingement on the side.

This was proved by examination through the observation doors alluded to. The sand could be seen falling in a steady stream, the bare hand could be held in the corner of the box, but it was difficult to hold an iron bar across the falling sand at the middle of the launder and the metal was quickly polished by the rapidly moving particles. It was noticed that the falling stream of sand created a suction down the launder, thus, on opening an observation door, no sand escaped, but air was drawn in.

Effect of Too Much Water

From time to time trouble was caused by the sand containing too great a percentage of moisture. This caused it to adhere to the sides of the launder in gradually increasing quantities, until at last the flow was seriously impeded. Under such circumstances the remedy was to flush out the box with water from the surface until the adhering sand was washed away. In this connection, experiments were conducted with a view to determining the maximum percentage of moisture which would allow the sand to run down "dry." The following were the results:

Up to 5% moisture the sand fell freely, leaving the sides of the box clear and dry. From 5% to 7%, the moisture did not affect the fall, provided that the sides of the box were themselves dry. From 7% to 9% the sand gradually became adhering to the sides of the launder where it accumulated slowly. From 9% up of moisture contained a rapid accumulation of sand along the sides of the launder.



Sand Filling at Cinderella Consolidated

The results were largely influenced, it was found, by the proportion of slime contained in the sand. The liability of the sand to choke the launder under certain adverse conditions renders it essential to have an efficient bell-signaling service between the mining point and the furthest bin, as the supply of sand should be regulated in proportion to the quantity of water available for service. Thus if the sand is supplied too quickly, it has the tendency to pile up at the bottom of the box launder and choke it, as the water is not in that case sufficient to flush it away. On the other hand, if the sand appears to be coming down slowly, it may be that a certain proportion is sticking to the sides of the launder on account of there being too great a percentage of moisture. When this is found to be the case, flushing must be resorted to, as mentioned previously, and must be repeated from time to time as the occasion warrants.

Numerous efforts were made to use the current sand production direct from the cyanide tank with a view of saving transportation from the dumps. It was found, however, that this sand, which contains from 12 to 15% of moisture, gave constant trouble by adhering to the sides of the launder, forming an accumulation. These accumulations happened at various points down the launder, but principally at one point about 600 ft. down.

Jets of compressed air were introduced with a view of increasing the velocity of the falling stream, and thus preventing the adhesion of the sand. The box launder was, furthermore, connected with the intake of the ventilating fan near the bottom, and to a Roots blower at the top, the idea being to dry the sides of the box and thus prevent the sand from sticking. These devices undoubtedly permitted the use of damper sand than could otherwise have been employed, but they were practically of no avail when the sand carried over 10% of moisture, and were consequently abandoned after prolonged trial.

Launders Should Be in Downcast Compartments

It was found necessary to place the box launder in the upcast side of the shaft and in the same compartment with the pump column, consequently the box was always wet on the outside and water constantly reached the interior. The sand containing not over 4% moisture does not give rise to any considerable trouble, especially if the launder has its interior surface plain and smooth and the outside tarred. With sand containing up to a maximum of 8% of moisture, the launder should be placed in the driest compartment available on the downcast side.

There is actually a saving in the quantity of water required to be pumped out of the mine when the sand-filling plan is in operation. The sand in the stope probably retains at least 10% of water, the sand as sent down contains on an average 3%, and it is calculated that in the course of a good day's run the water saved from being pumped 4000 ft. to the surface will amount to about 8000 gallons.

The labor required to operate the plant is small, a subforeman in charge of three boys will look after the belt and surface bins, and the underground part, including the mixing point and the stope to be filled, is in charge of the timberman. The sand is brought from the dump to the surface bin by means of mechanical haulage, the actual shoveling and tipping necessary being done by unskilled labor. On an average of 400 tons per shift, the cost was 5.23c. per ton.

COST OF SAND FILLING

	Per Shift	Per Ton
Surface 25 unskilled laborers	$9 11	$0 0228
One white laborer	1 22	0 0031
Three natives	1 09	0 0027
Underground, 1 timber man	4 86	0 0122
Three boys	1 46	0 0036
Total labor..................	$17.74	0.0444
Power for haulage, belt, pumps, 23 kw per hr @ 1 13c	3 16	0 0079
Total labor and power	$20 90	$0 0523

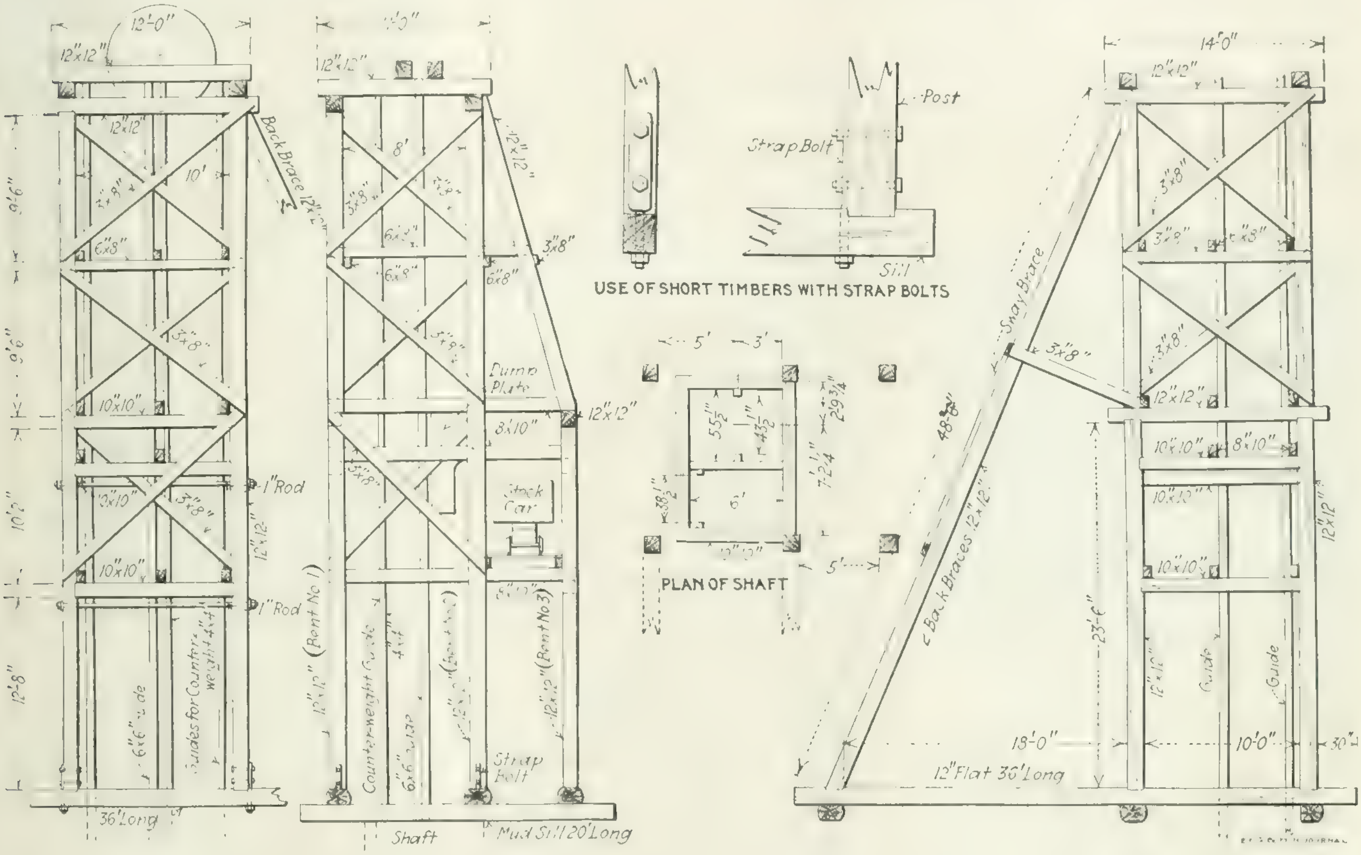
In discussing Mr. Sawyer's paper, H F. Marriott said that probably Mr. Sawyer's method was limited in its usefulness to the Rand, and then only to certain of the smaller mines. First, because it is necessary for the success of the operations that they should be conducted in an atmosphere capable of drying the daily supply of tailings with extreme rapidity, and, secondly, because of the necessarily limited tonnage available for delivery into the mine, even under favorable atmospheric conditions.

As against the intermittent working of the dry delivery and the insecurity of the dry sand supply, there must be reckoned the saving of cost of pumping water from the bottom of the shaft to the surface; but on the other hand, one of the reasons for adopting the wet process of sand transportation was that there was known to be a large amount of gold contained in the dumps, from which the stock of filling material was to be taken, and it was considered that by washing this down with water and keeping the water separate from the rest of the pumping operations on the mine, it might be found possible to recover a profitable portion of this gold on the return of the water to the surface, or alternatively that the material extracted from the dumps for sending below might be treated *en route* by cyanide, and that the portion of the contained gold still amenable to further treatment might be extracted, before the sands were finally carried to the depths from which they originally came. Either of these courses necessitates wet treatment, and other requirements have to be considered before one's faith can be definitely pinned either to the wet or dry process.

Small Timber Headframe

By H. L. Botsford*

The accompanying drawings illustrate a small timber headframe. It was designed for use at an exploratory shaft, from which it was desired to ship ore from time to time as the work of development progressed.



A Small Timber Headframe

Where long timbers are not obtainable, or are too expensive, the headframe may be built in sections, with intermediate caps, and holding-down bolts between the sections. Strap-bolts answer this purpose and cost less than long rods running the full length of the section, from cap to sill.

According to the report of the Burma Mines, Ltd., which operates lead mines in Burma, India, the following percentages of fluxes were used during 1911 in smelting the total charge: Coke, 13.108%; iron ore, 26.198; limestone, 13.435; scrap iron, 0.99; a total of about 54% of the entire charge at the works of this company.

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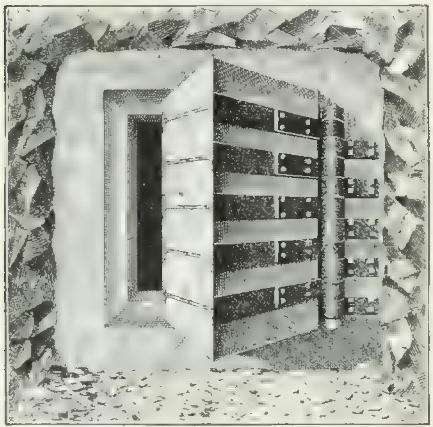
*Creighton mine, Ontario.

Reinforced Concrete Door for Powder Chamber

For storing the dynamite used for blasting in the Catskill Aqueduct Tunnel, a dynamite room has been cut in the rock, 250 ft. underground, and connected to the tunnel by a low, narrow drift about 20 ft. long. At the end of this drift nearest the storeroom there is keyed into the rock walls a massive concrete frame, beveled at an angle of about 20°, to receive a heavy, reinforced-concrete door, similarly beveled, as shown in the accompanying drawing. This door is built up around five 15-in. I-beams, with reinforcing rods passing through and between them; it swings on a 3-in. steel pin and weighs two tons.

The door swings inward toward the dynamite chamber and is arranged so that it can only open about two-thirds of the full way, or to an angle of about 60° or 70° with the plane of the frame (*Eng. News*, Nov. 21, 1912). Its objects are to reduce the force of the shock in the tunnel in case there should be an explosion of the stored dynamite, and to protect the dynamite chamber from excessive shocks from blasts in the tunnel, as it is claimed that in either case the door would be closed by the difference between the air pressures on the two sides. An explosion of dynamite in the chamber would, of course, force the door shut by direct pressure. Should an especially heavy charge be fired in the tunnel, the blast of air rushing past the entrance to the drift, connecting with the powder chamber, produces a partial vacuum in the drift and thereby causes the concrete door to swing shut. This frequently happens and it has been necessary to open the door with crowbars in order to release workmen who were imprisoned in the chamber because of the great weight of the door.


Reinforced Concrete Door for Catskill Aqueduct Powder Chamber

It is interesting to note in this connection that concrete construction is being used for fire doors at the Anaconda copper mines.

Chain Sling for Removing Cylinder Heads

The illustrations show a chain sling described by James McClure (*Power*, Nov. 26, 1912) which have been used with success for removing cylinder heads. Fig. 1 shows the sling when ready to put around the edge of the cylinder head. Fig. 2 is a piece of flat iron bent into a U-shape and fastened to a link of the chain with a bolt. Three such pieces are used as shown at *AAA*, Fig. 1.

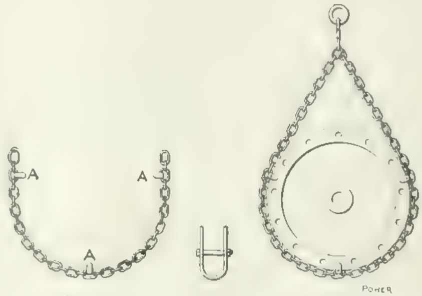


FIG. 1 FIG. 2 FIG. 3

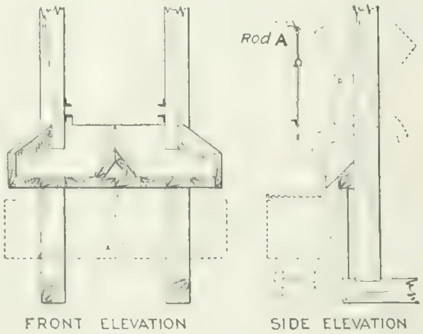
Chain Sling and Clips for Removing Cylinder Heads

To use this sling, the nuts are taken off the studs and then the head is pried forward sufficiently to allow the three U-shaped pieces to slip over the edge of the cylinder head. Then by proper tension on the sling, the head can be taken off easily without injury to the threads of the stud bolts. Fig. 3 shows the application of the sling.

Dump Arrangement for Underground Hoisting

By W. W. Shelby*

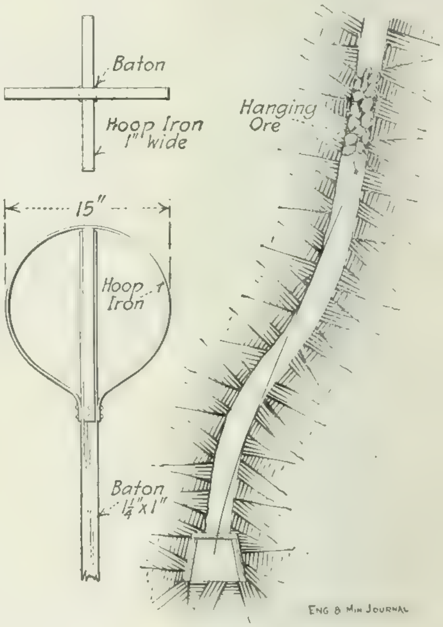
When conditions are such that it is desirable to have a skip dump directly into cars the accompanying sketch shows a satisfactory arrangement for an underground dump. The width of chute is one foot less than the length of car. The middle partition serves two purposes: to distribute the ore so as to utilize as much car capacity as possible, and to protect the chain across the top of the "middle dump" cars. A ⅜-in. iron plate, stiffened by a 1x1x¼-in. angle iron is suspended in front of the chute. This plate, the dimensions and position of which depend upon local conditions, swings freely about the rod *A*, and deflects the few stray pieces of rock which might otherwise go over the car in too rapid dumping.



Dump Arrangement for Underground Hoist

Opening Ore Passes

One of the common and most dangerous methods of opening "hung-up" ore passes is to go up the pass under the hanging ore, fix and light a charge of explosives and get down before anything happens. To avoid all danger the appliance shown in the accompanying drawing has been in use at the Lord Nelson mine for about four years, says W. J. Nicol in *Min. and Eng. Review*, Oct. 5, 1912. The apparatus consists of a flexible baton of any convenient section (1x1¼-in. hardwood is suitable) with two pieces of stout hoop iron bent to form a curve and nailed over the end of the baton. The curved pieces of hoop iron keep the end of the baton from coming in contact with, and being held up by, the timbering of the pass. The device can easily be pushed up an irregular pass, and by lashing on other batons with beveled ends as required, any height may be reached. When the top end, with the hoops attached, reaches the hanging ore the batons are used to poke the ore and it is generally possible to start it running again without the use of explosives. Mr. Nicol says that it has been possible to start a pass which had been hung up 100 ft. above the level and in no case has it been impossible to start the ore by simply poking it. This device could also be used in conjunction with electric detonators to fire a charge of explosives under the hanging ore.



Device for Starting "Hung Up" Ore Passes

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*Smuggler, Colo.

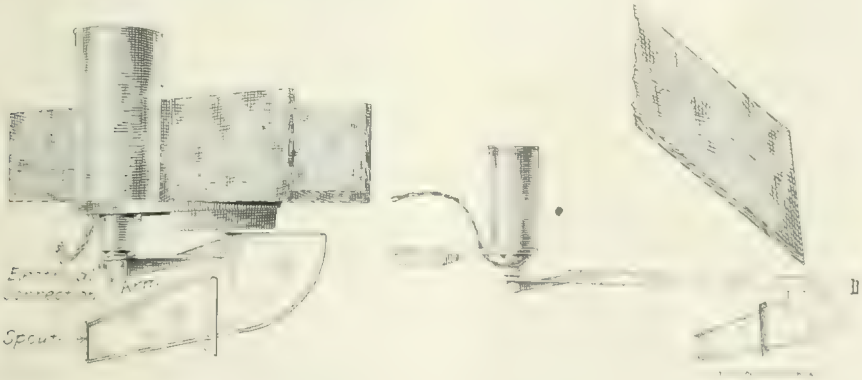
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Flood Automatic Sampler

The Flood automatic sampler is being much used in Colorado mills at the present time and, as the device is simple and easily placed and cared for, its use seems to be on the increase.

It consists of a sheet-metal spout by means of which the sample is cut from the stream of pulp or ore and directed into a proper receptacle. This spout is sustained and moved by an arm which is actuated by a solenoid. An eight-day clock controls the movement of the sampler by closing a knife switch at desired intervals, the switch remaining closed for from one to five seconds as required. When the switch is closed the current reaching the solenoid moves the arm and sample spout into position under the stream to be sampled and keeps it there for the required time. When the switch is opened the spout returns immediately to its normal position.



FLOOD AUTOMATIC SAMPLER

The cut showing the device is explanatory. In Fig. 1 the hole in the bottom of the launder is encircled by the casting which is part of the sampler, the whole being self contained and needing no adjustment. The stream passes through this hole at all times and is sampled at the desired intervals as explained. One clock will control any number of machines and can be installed in the office or any other place where it can be under guard. The machine can be made in the long-arm style, and is appropriate for sampling dry-crushed ore or pulp.

A defect in the machine, which may, however, be easily remedied, is that the receiving part of the spout is generally made too narrow. When the spout is in the stream of material it can receive only a portion of the fall, whereas to be most satisfactory the whole stream should be taken for the given space of time.

Due to the fact that the machine is governed by clockwork and electric current, assuring that a sample be taken at stated intervals, and that the time during which the sample is taken is always the same, a correct sample should result. It may be so accurate that the total tonnage of ore or pulp passing per day could, with suitable checking, be calculated from the weight of the sample, the intervals and time of taking sample being known. The machine is patented and is made by Hendrie & Bolthoff Mfg. & Supply Co., of Denver.

How to Cover a Pulley

It is an easy matter to cover a pulley, if the covering is prepared in the proper manner. The first thing to do is to remove all the old covering and pull out the nails and, if necessary, remove the wedges and replace them with new ones, says the November *Pemberthy Engineer and Fireman*. The leather to be used for the covering should be wider than the pulley to be covered and about three or four inches longer than is necessary to reach around the pulley. Soak the leather in a pan of warm water for almost one hour. Square one end of the leather and nail it to the wedge, using nails that will just reach through and clinch on the side next to the pulley.

Stretch the leather as tight as possible and nail to the next wedge and continue until the last wedge is reached. Nail the leather to the last wedge before cutting it off. Trim the leather down to the rim of the pulley.

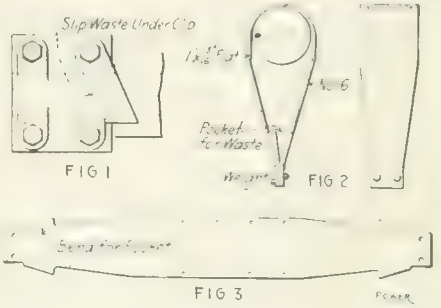
Allow the pulley to dry a short time, say 15 min., before putting it in service. If the leather is riveted to the pulley instead of being fast to the wedges, proceed in the same manner, punching the holes after the leather has been stretched.

Keeping Stray Oil Off Belts

Considerable trouble has been experienced in power transmission from the oil which would work out of the bearings and follow the shaft to a pulley hub, to be thrown off by centrifugal force and land on the inside of the wheel rim. From there it would creep to the outside and get on the belts, says James Clark (*Power*, Dec. 3, 1912). Oil would also work out between the tight and loose pulleys and get on the belts in the same manner.

To overcome the trouble caused by the oil from the bearings, some clips of No. 16 sheet steel were made and fastened between the two nuts which held the bearing cap, as in Fig. 1. The end of the clip was bent for holding a small bunch of waste against the end of the hub to wipe off the oil continually.

To take care of the oil from the loose pulley, oil catches were made as shown in Fig. 2; Fig. 3 is a development in the flat. These were made of No. 16 sheet steel. The curved end which fits the hub was bent to a radius about ½ in. larger than the hub and fitted with a strip of 1x$\frac{3}{16}$-in. flat on each side. These strips are to prevent the catcher from coming in contact with the hub at the point where the oil works out; otherwise the oil would creep between the catcher and the hub to the spokes and down to the belts. The width of the curved end should be about ½ in. less than the distance between the spokes of the tight and loose pulleys, and the length from the center of the shaft to the end about 12 to 18 in., depending on the size of the pulleys. The other end of the catcher is fitted with a weight to prevent it from turning with the wheels; it also has a pocket to hold the waste. These devices are simple to make and completely cured the oil trouble.

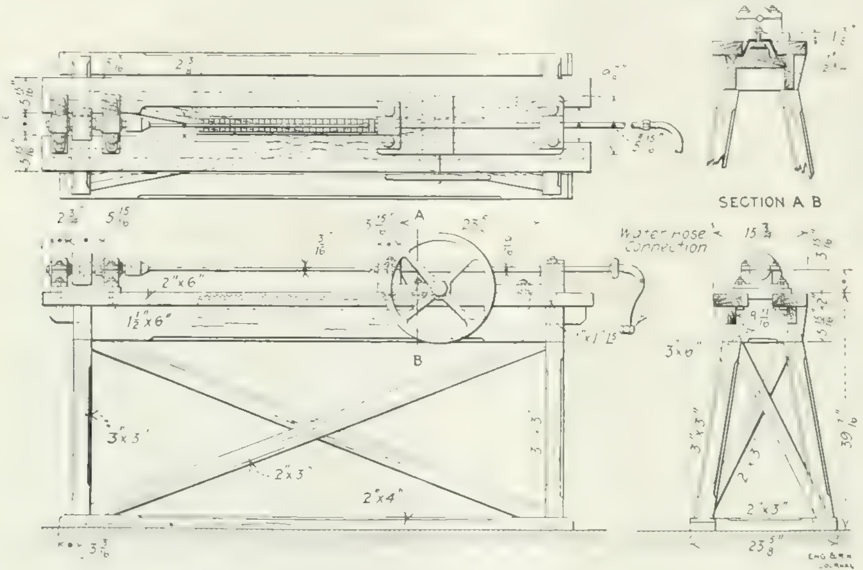


DEVICES FOR KEEPING STRAY OIL OFF BELTS

Lathe for Cleaning Condenser Tubes

By Mark R. Lamb*

It frequently occurs that the condenser tubes become clogged with lime and much trouble is experienced in cleaning them and in keeping them clean. The accompanying engraving shows a working drawing for the construction of a lathe. This device has been satisfactory in cleaning condenser tubes which are used with a heavily lime-charged cooling water.



Lathe for Cleaning Condenser Tubes

A point to be particularly noted is that the water hose is attached to one end of the tube and water turned on before the drill is started. The drill is made somewhat longer than half the length of the tube and the latter is reversed after half of it has been drilled clean. The drill is made by welding to a short piece of ordinary drill a sufficient length of shank of less diameter.

The wooden blocks for clamping the tube in position must be carefully tightened so as to avoid distorting the tube.

A Centrifugal Pump of Large Capacity

A steam-turbine-driven centrifugal pump of 100,000,000-gal. per day capacity, driven by a steam turbine, is to be installed in the Ross pumping station of the Pittsburgh water-works by the DeLaval Steam Turbine Co., of Trenton, N. J., which reports that this will be the largest steam-turbine-driven centrifugal pump ever built in this country; the rated capacity is 100,000,000 gal. per day against a total head of 56 ft. The pump is guaranteed to show a duty of 115,000,000 ft.-lb. per 1000 lb. of dry steam, all steam used by the condensing equipment being charged to the main unit.

Pulp Distribution at Homestake

The methods of dividing and distributing pulp at the Homestake mills are described by A. J. Clark and W. J. Sharwood in *Bull.* 98, I. M. M. Wherever a large stream of pulp has to be divided into equal parts for distribution to a number of parallel units, the principle adopted is to make the divisions at a single point in the wide launder and carry the fractions together in parallel streams, rather than to split off a number of successive laterals at various points from the main stream. In many cases the finer adjustment is made by tongues of cast iron. These have sharp sloping edges to meet the currents, the other ends being pivoted and the tops provided with means for clamping them in any position; the parallel divisions are of wood.

Where streams unite or branch, or make sudden turns, a sump of wood or concrete (or for extremely small streams of cast iron) is placed at the angle, sufficiently deep to accumulate a thick bed at the bottom, which prevents wear of the material. At points where it is occasionally necessary to divert or bypass a stream from one launder to a lower one, a "tipple" is used, made of sheet or cast iron. With the tipple in its normal flat position, the stream passes over it nearly horizontally, but when the tipple is thrown up the stream drops abruptly to a lower level.

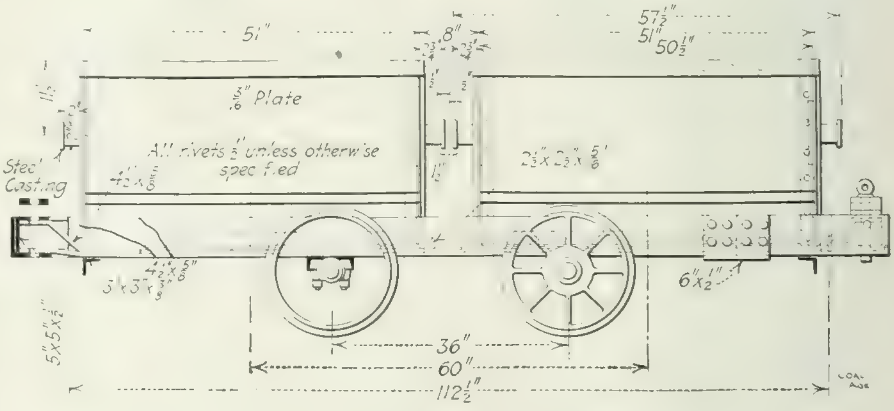
The amalgamation tailings are carried in launders variously constructed, the most satisfactory being of wood, lined with hard paving brick set closely, but without mortar or cement; the grade is 1.5 per cent.

After passing the first set of cones, tailings are conveyed for the most part in cast-iron pipes. The present construction is to cast the pipe in a simple cylindrical form, 1 in. thick and 12 ft. long, making a butt joint covered by a loose-fitting sleeve, the space being packed with jute.

With sandy tailing there is appreciable wear on the bottom, the pipe running partially full; it is customary to turn the pipe through an arc of 120° when wear has progressed to a certain extent, and a pipe will thus be turned twice before being rejected as worn out. The turning of a pipe may be accomplished rapidly and without shutting off the flow of pulp. In general it may be stated that pipe will last longest on the flattest grades.

Combined Car and Bucket

The Spring Cañon Coal Co., which is developing near Helper, Utah, is introducing a novelty hitherto untried in the Western field. After careful consideration, in place of constructing a long and crooked surface haulage road, the coal will be taken from the mine opening to the tipple by an aërial tramway (*Coal Age*, Nov. 30, 1912).



Side View of Combination Car

The mine cars, as shown in the accompanying illustration, consist of a steel truck designed like that of the usual mine car, but the body will be made up of two steel buckets, each holding 3000 lb. of coal, and having trunnions on the ends to receive the yoke of an aërial tram.

The results of this experiment are being watched closely, as its success will permit the opening of large bodies of coal which would otherwise be practically inaccessible.

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*Manager in South America for Allis-Chalmers Co., Santiago, Chile.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Needed Changes in Rand Mining Methods

Notwithstanding the fact that some Rand mines have attained a vertical depth of over 5000 ft., the modifications made in the system of mining have been few and on the whole inadequate to meet the altered conditions, says the *South African Mining Journal,* Nov. 16, 1912. Depths are now being reached on the Rand in stoping operations when not only the size, but also the shape and proportions of the pillars, must be taken into more consideration.

If mining operations on the Rand are to be conducted with an ample margin of safety from air blasts, even under ordinary circumstances, it is necessary that a third of the area should be occupied by pillars in the first working even at such a shallow depth as 2000 ft. from the surface. At a depth of 3000 ft. it might be advisable to leave one-half in pillars, and, if the same reasoning be continued, it will be urged that at a vertical depth of 6000 ft. the leaving of pillars would be useless, and if mining is to be carried on at that depth with safety a different method of mining will become necessary from any yet practiced on the Rand, that is if air blasts, with all their attendant evils, are to be avoided.

Reactions with Fused Potassium Hydroxide

Tests were made on various elements when fused with potassium hydroxide (*Ber.*, p. 2300, 1912; abstr. *Journ.* Soc. Chem. Ind., Nov. 15, 1912). The various substances were heated in crucibles of nickel or gold in a vertical tube in an electric furnace. A slow stream of nitrogen could be passed through the tube, and the issuing gas passed a calcium-chloride tube to absorb any water, then a tube of red-hot copper oxide, finally a calcium-chloride tube to absorb water formed by the combustion of any hydrogen evolved. It was found that a temperature of 400° C. was sufficient to drive off all extraneous water from the hydroxide, which then corresponded in composition with the formula, KOH, and that up to 660° C. no dissociation into oxide and water occurred, though the hydroxide very sensibly volatilized. At temperatures between 550° and 660° C., gold, aluminum, manganese, and potassium showed no sensible action on the hydroxide. Iron, cobalt, and nickel were sensibly attacked, though no evolution of water, hydrogen, or potassium could be detected. Chromium, molybdenum, and tungsten were also very slightly attacked but free potassium and hydrogen were in these cases evolved. The reaction with carbon or magnesium was similar but much more marked, and silicon reacted violently even at 400° C., evolving hydrogen. The reaction of sodium was remarkable: in all probability the first stage was a condition of equilibrium of the reversible reaction $Na + KOH = K + NaOH$; and the sodium then reacted with the sodium hydroxide, forming sodium oxide and hydrogen, while the potassium volatilized.

Morse-Sargent Feldspar-Potash Process

Harry W. Morse and Ledyard W. Sargent, of Cambridge, Mass., have patented (U. S. pat. 1,041,327) a process for the production of potash from feldspar. The process consists in subjecting orthoclase feldspar at a high temperature, first to the action of calcium sulphate (gypsum), and then to the action of a chloride of an alkali, or alkaline earth. The products are sulphuric and sulphurous oxides, which are to be used in acid manufacture, potassium salts, and a residue suitable for making portland cement.

In the first stage a temperature of about 1000° C. is recommended, i.e., low enough to avoid fusion, and heating is continued until the oxides of sulphur cease to come off. In the second stage a temperature of about 600° C. is recommended, i.e., below the point at which quick volatilization of potassium chloride takes place. The two stages may be combined, but the results are not so good. The potash salts are extracted from the product of the second stage, and the leached mass burned for cement.

Pure Titanium

The attention of scientists has been engaged for a long time upon the problem of obtaining the metal titanium in a pure state, says the *Chemical Trade Journal*, Dec. 7, 1912. Experiments have been carried out in the Rensselaer Polytechnic Institute, Troy, N. Y., by Matthew A. Hunter. Titanium chloride, $TiCl_4$, was inclosed with pure sodium in a metallic bomb. The capacity of the bomb was about 1000 c.c., and was built up out of machined steel parts. It is said that the reaction inside the bomb takes place so rapidly as to be practically instantaneous, and it should be noted that chemical action only takes place after the steel inclosure has been heated to a certain temperature. Tests made on the metal after it has been obtained in a pure form by this method show that it is hard and extremely brittle in the cold, but when heated to a dull-red heat, it is almost as easily forged as ordinary cast iron. It resembles polished steel in appearance, but does not break with the crystalline structure which is characteristic of the latter metal. All attempts made to draw it into wire have so far failed. The melting point of titanium is approximately 1800° C., while the specific gravity is about 4.5 and the specific heat 0.1462.

Air Blasts in Rand Mines

In discussing a paper by Tom Johnson on the subject of air blasts, J. Chilton stated (*Journ.* Chem., Met. and Min. Soc. of So. Africa, October, 1911), that but few mining districts are entirely free from this puzzling phenomenon.

That roof pressure is primarily the cause of air blasts, few will deny, but that they are only produced by pressure, demands further proof. In mining operations, with some area excavated, the pillars when first cut carry little weight. As the worked-out area increases, the hanging walls slowly bend until their weight is supported on the edge of the pillars and face; these after a time become overloaded, and like any hard rock under pressure, the walls suddenly fail and large masses of rock often fly from the face with a velocity almost approaching that of a projectile from a gun. When this outburst occurs near a large worked-out area, the result may be put down to pressure, but as these often occur in tunnels and drives in virgin ground, it will be apparent that the pressure theory does not quite meet the case.

Many mining engineers consider that these outbursts are the result of stresses and strains set up by rock movement in the upper strata of the earth's crust. Such phenomena as the earth-tide at Kimberley, South Africa, where the surface of the ground rises and falls as much as three inches in a single day, and the great earth movement of the Witwatersrand which is causing the strata south of the reef outcrops slowly to move northward, afford some evidence of the stress and tension, the contraction, and the expansion that the upper beds are undergoing, and it seems not unlikely that these forces may produce marked effects upon mining at great depths.

Probably this air-blast action is sometimes set up by molecular tension, due to the cooling of the outer rocks when exposed to the chilling effects of the mine atmosphere, and the compressed air from rock drills. When radiation begins the outer layers of rock cool rapidly and attempt to contract on the still heated and therefore expanded interior. Thus stresses are set up that the rock cannot resist and large slabs are often detached with great violence often accompanied by a sharp report like a gunshot.

Many competent observers seem inclined to the opinion that these disruptions are entirely due to earth movements and that roof pressure plays only a secondary part in their production. A well known German mining engineer contends that these outbursts are due to sudden release of tension in a rock mass.

In a Central Rand mine many accidents from flying fragments of rock occurred in a particular working place. The zone of danger existed at a depth of 2000 ft. and in the neighborhood of a large fault with a throw of over 100 ft. The strata in the locality were much folded, and numerous sympathetic faults ran parallel to the main one. It was noticed that the disruptions took place near a large symmetrical fold, and it seemed evident from their long continuance that the force that produced the fold was still in operation, for these outbursts continued for a period of over two years.

The idea that occluded gases may produce some of these outbursts should by no means be overlooked. When it is remembered that gas at a pressure of 900 lb. per sq.in. has been known to exist in many coal mines, it is not astonishing if this enormous pressure sometimes forces out large masses of coal and exhibits effects very similar to those shown by so called "air blasts." May not some of the air blasts in metal mines be produced by occluded gas? That gas does exist in the pores or fissures of rocks in metal mines, even at great depths, has been proved by outbursts of methane at some of the Rand mines.

Mr. Chilton states that the system of working two reefs outlined by Mr. Johnson is probably the one that will be found to show the greatest efficiency. Working out the top reef first causes the hanging of the lower stopes to break up. In one of the mines where this system was worked the machine men constantly experienced difficulty in rigging up as the tightening up of the machine bars often forced up the foot wall of the upper stope even when this was six feet thick.

If the drives in a mine are situated in the foot wall there should be little difficulty in working without leaving pillars, provided some sorting and packing is done underground, any roof pressure would be supported on packs, and even if the roof collapsed little damage would be done, as the drives would remain open. One of the mines on the Central Rand tried the system of working without leaving pillars some years ago, but the results were not such as to encourage imitators. The faster moving of faces would probably do something to prevent collapse from roof pressure, but would cause great loss in efficiency, and one could anticipate some grade trouble if a large advancing face struck a poor zone or shoot.

The assertion that too much timber is used in our mines is somewhat astounding; when it is remembered that in 1911, 835 casualties from falls of ground occurred in the Transvaal mines, 95% of which could probably have been prevented by a more generous use of timber.

Utilization of Peat Fuel

A recent report of the Canadian Department of Mines on the "Utilization of Peat Fuel for the Production of Power," covers the work during 1910 and 1911 at the peat gas-producer plant at Ottawa, the only plant of its kind in America. The experiments showed that with the plant supplied by the manufacturers it was impossible to obtain a gas sufficiently free from tar to permit the engine to operate many hours without cleaning the cylinder and valves. Efforts were made to correct this defect and after many trials by the technical staff of the fuel-testing station, some changes in the construction of the producer were made, full details of which are given in the report. With the plant as remodeled, running may be continuous for a week or more without having to shut down for the purpose of cleaning the valves of the engine.

The operation of the producer is uniform and the gas delivered to the engine varies only slightly during a 10-hour run. The services of only one man are required to run this plant when operated on day-shift work only. The consumption of fuel per brake-horsepower-hour—including standby losses—is for full load, 1.7 lb. of dry peat, or 2.3 lb. of peat containing 25% moisture. In estimating fuel costs the assumption is made that peat with moisture content of 25% can be delivered to the producer at $2 per ton, but to take advantage of this low cost of fuel, the power plant will have to be located near the bog where the peat fuel is manufactured. On this basis the fuel costs of a plant run with a power factor of 75% for 3000 hr. would be $8.40 per brake-horsepower-year, including standby losses. The saving will be most apparent in those places removed some distance from coal mines but situated near large areas of bog which can be rendered available for the production of a supply of peat fuel.

New Thermit Treatment of Steel Ingots

The troubles arising in the cooling of steel ingots are mainly as follows: A segregation of phosphorus and sulphur to the top of the ingot, giving that portion undesirable mechanical properties. The sides and bottom of the ingot set first, the molten portions as they solidify attach themselves to the part already set with diminution of volume, eventually leaving a hollow at the center (piping). The gases (H, CO, N) given out during solidification are unable, toward the last, to escape, but are retained in the metal, forming blow-holes.

The first method of thermit treatment to avoid piping was to plunge a thermit cartridge into the pipe, in order to remelt the surrounding parts. As soon as this remelting was effected, the hole was filled by pouring in fresh liquid steel from the ladle. Success was attained, however, only in exceptional cases, and the method was soon discredited.

At the September, 1912, meeting of the Iron & Steel Institute, Dr. Hans Goldschmidt described a new process, which has proved very effective, particularly in nonsiliconized steel. In this new method the thermit cartridge is plunged to the bottom of the ingot, before any solidification has begun to set in. The reaction causes an energetic ebullition of the liquid contents of the ingot mold, and gases which have just begun to separate are violently expelled, or if the charge has not been siliconized, the bubbling of the metal due to the disengagement of gas is incidentally checked.

The most noticeable feature, however, is the sinking down of liquid metal in the mold of three or four inches, the density of the metal being increased by an amount corresponding to this reduction in volume. Further metal is then poured from the ladle, until the level of the ingot is restored, and the ingot is then, if nonsiliconized, covered with an iron plate in the usual way.

The violent frothing up, due to the action of the thermit, has another good effect, for the impurities which have already begun to accumulate in the center are driven upward and their further accumulation prevented.

At the Shulz-Knaudt A. G. where 17,891 ingots had been treated in this matter, the percentage of rejected plates, due to imperfections in the ingot, was reduced to 0.3%, and the weight of the ingots to produce the same weight of plates was reduced by 5%. The net saving is computed at $0.37 per ton of plates rolled, assuming scrap costs $14.50 per ton, and rough finished plates are worth $29 per ton.

Cyanide Practice in the Black Hills

By Herbert A. Megraw

A resumé of cyanidation as practiced in an old and famous mining district. The prominent features are roll crushing, either wet or dry, milling in cyanide solution, separate treatment of sand and slime with filtration of the latter by many of the principal systems. Unusual plants use a system including coarse, dry crushing and leaching of the entire product. Acid treatment of precipitate is general and sometimes roasting in addition. The district is especially interesting as being the first important district in America to make use of cyanidation to solve the problem of treating extremely low-grade ores.

Note—This is the fifth of a series of articles on American cyanide practice by Mr. Megraw. Previous articles appeared in the issues of Nov. 2, Nov. 23, Dec. 4 and Dec. 21, 1912.

The mineral district of the Black Hills, in South Dakota, has long occupied a prominent position in the mining world, due to the extent of its deposits and their original richness. In the early days ores of high grade were obtained and as these gradually disappeared, ores of lower grade had to be depended upon to keep up production. The ingenuity of the metallurgical world was taxed to the utmost in devising methods by means of which profits might be obtained from rebellious ores containing only small quantities of gold and silver. The whole gamut of metallurgical methods has been played upon in the effort to treat the ores economically.

CYANIDATION VICTORIOUS OVER OTHER PROCESSES

Such processes as smelting, pan amalgamation, bromination, chlorination, plate amalgamation, all had their day and were thoroughly tried, but nothing made any noteworthy success until cyanidation was tried, proved available, and applied on a large scale to the treatment of the ores. Cyanidation has been the means by which enormous quantities of low-grade ores have been made economically available and millions of dollars have been taken from ores which by no other means could be beneficiated at a profit. It is probable that in no other mining district has cyanidation had a greater beneficial effect.

The first application of cyanide in the Black Hills was at the Rossiter plant in 1892, but great and decided success was not demonstrated until 1900, since which time the applications of the process have increased, until at present there is no successful installation which does not make use of the process in some form.

The ores are in the main siliceous, containing silica in the form of quartz and in proportions varying between 75 and 90%. The unaltered blue ores contain less than the red oxidized mineral. The blue ores contain also an average of from 6 to 8% of pyrites, fine and evenly distributed, though some of them contain as high as 20%. In the red ores the pyrite has been oxidized to form the iron oxides which give the ore its color. Tellurium has been found in some minerals and the existence of tellurides of gold and silver is maintained by some authorities. Copper occurs in minute proportions in many of the minerals. At some of the larger mills, notably the Homestake, copper is always present in the precipitate, but this is believed to be due principally to the caps used in detonating the charges of explosives and from other similar sources, although copper does exist in the ore. The gold is in an extremely fine state and is rarely found free. The ores are fairly hard, in some instances extremely so, but there is also much clayey material which produces a large amount of colloid slime. All grades of hardness are found between the extremes of clay and extremely hard and close-grained rock. In most cases the mineral is heavy, the specific gravity of the solids in mill pulp often running as high as 3, while there are many graduations under that figure, all however, being comparatively heavy.

DRY CRUSHING AT WASP NO. 2

One of the most interesting installations in the Black Hills is that of the Wasp No. 2 Mining Co., where a flat quartzite deposit carrying extremely small quantities of gold is being milled at a substantial profit. The ore, after passing the usual crusher system, is broken through four sets of rolls, two of which are used for roughing and two for finishing. This crushing is all performed on the dry ore. After passing the finishing roll the material will all pass a screen having ¼-in. openings. A large proportion of the material is, of course, much finer, varying between fine sand, there being little slime, and the maximum size of ¼ in. The crushing is carried no farther, the ore being treated in this condition. This finished product is stored in bins and is drawn out as required to charge the treatment tanks. The tanks are charged from these bins by means of a system of belt conveyors which receive the material at the bins and deliver it at about the center of the treatment tanks, where it is distributed by hand. The leaching tanks are six in number, each 32x12 ft., and hold a little over 400 tons of ore.

TREATMENT BY LEACHING

The cyanide treatment of this ore is entirely by leaching. The practice is to add first a bath of solution carrying five pounds KCN per ton in sufficient quantity to impregnate the charge thoroughly and leave a solution covering of about an inch over it. This bath remains in contact with the charge for 12 hours, when it is drained off. The mixture of fine and coarse material offers little resistance to the passage of solutions and the leaching rate is exceptionally high, which facilitates the treatment to no small degree. It will be seen that this condition of porosity of the charge also facilitates treatment, for the reason that air for aëration of the charge readily penetrates the entire charge, following the solution through the mass.

After the strong solution has been drained off, a weaker solution is added, the strength being 2½ lb. KCN per ton, and this treatment is continued for 48 hours, there being seven separate additions of the solution during this time. A subsequent water wash is given in quantity only sufficient to displace the solution held by the ore. The gold-bearing solutions from this treatment are passed over zinc shavings, the resulting precipitate being dried and melted in a crucible furnace using oil fuel in the usual way.

TONNAGE ESTIMATIONS MADE IN TANKS

No attempt is made to sample or estimate the quantity of ore handled before it enters treatment, all calculations being made on the filled tanks before the cyanide solutions are added. In the general run of mills this would be considered faulty practice, but in this case where the ore is crushed dry and loaded into treatment tanks without any preliminary treatment or separation of any kind, it is probably as accurate as any way could be and is extremely simple. The tanks can be sampled satisfactorily by means of the pipe sampler, taking a large number of tests in different portions of the tank, and a good estimate of the weight can be made from it as well as a satisfactory sample for determining the content of the charge in gold and silver.

The cost of discharging the tanks is low, approximating only about five cents per ton. The work is accomplished by seven men, four of whom are employed inside the tank shoveling out the charge through bottom doors, and three employed in tramming out the cars, which are loaded directly under the discharge gates. The men inside the tank do not have to lift the charge at all, the process being simply to scrape the material to the discharge gates. The proportion of moisture is small and the material runs readily enough and gives no trouble. Due to this facility the tanks may be emptied in about seven hours. The tanks are charged at a rate which gives the mill a daily capacity of 500 tons.

LIME ADDED AT THE CRUSHERS

Lime at the rate of six pounds per ton of dry ore is added at the crushers, and is carried through the crushing system with the ore, being thus thoroughly mixed with it. The treatment solutions carry about one pound dissolved CaO, which is sufficient to protect them against any small amount of acid which the ore might develop.

The method of adding lime seems to me to be somewhat wasteful in this instance, as the ore is not entirely reduced to a fine state and it is reasonable to suppose that the lime, at least in part, will be in coarse particles. The time of treatment is not sufficient to dissolve the coarser pieces of lime entirely and it is likely that an appreciable percentage of it is discharged undissolved, occasioning a slight loss. I am of the opinion that some method of adding the lime in emulsion in the quantity actually required for protection might result in a slight reduction of the cost of lime used. A hint would be to consider the method used at the Homestake mills for adding lime to the leaching tanks. While this method might not be applicable in exactly the same form, some simple variation of it might be productive of good results.

GOOD EXTRACTION AT LOW COST

The extraction averages about 70% of the precious metals contained, sometimes a little more and occasionally a little less, depending on the grade of the ore handled. The cost of the treatment is exceptionally low. The entire costs of the operations are: Mining, 53.48c. per ton; milling, 66.82c.; general expense, 4.35c. The principal items in the milling cost are: Labor, 21.3c. per ton; cyanide, 6.3c.; zinc, 3.3c.; lime, 1.2c.; power, 8.4c., and supplies and repairs, 12.6c. per ton milled.

UNUSUALLY SIMPLE TREATMENT AT WASP MILL

It will be seen that the metallurgy of the Wasp ore is extremely simple. The simplicity is probably due, in a great measure, to the fact that the gold is contained in cleavage planes which are fractured and opened by the coarse crushing, thus exposing a maximum quantity to the action of cyanide solutions. Besides, the rock itself is porous and the solutions can readily enter and act upon a large portion of the gold, bringing it out without entailing the expense of fine crushing.

A large number of experiments have been made on this ore by competent metallurgists in order to determine whether an economical higher extraction could be obtained by grinding finer, but the conclusion has been that the maximum profit is being obtained by the system now followed. The ore carries only about $2 per ton and will not stand a higher operation expense. It is likely that there are few examples of a similar nature in existence where a profit ranging from 50 to 75c. per ton can be obtained on ore of this low gold content. I have seen one other example, a Mexican mine which contained an ore having a good gold content. The ore was so porous that pieces ½ in. in size would readily surrender their content to weak cyanide solutions, but this ore was in the surface zone of a vein and was soon exhausted.

WET CRUSHING IN CHILEAN MILLS AT GOLDEN REWARD

An example of conditions differing from those obtaining at the Wasp is found at the mill of the Golden Reward Mining Co. at Deadwood. This company owns mines in different districts and the ores delivered at the mill for treatment differ widely in character. Some of them are hard, while others are at the other extreme of the scale, being soft and clayey, many variations between the two being submitted for treatment. The ore is delivered to the mill in railway ore cars and is always carefully weighed before being put into the mill bins. The ore is crushed dry through a series of crushers and rolls, an automatic sample being taken during the process which is reduced in a small crushing roll, put through several quartering samplers, and finally divided in a small hand sampling machine, which delivers a sample appropriate for assaying purposes. The reject from the sampling all goes into the mill bins with the milling ore.

From the mill bins the ore is taken to Chilean mills of the modern, high-speed type, making 30 r.p.m., and is milled in cyanide solution. The feeders for these mills are similar to the Challenge feeders used for feeding stamps, but are continuously moved by power, belt and pulley, and the feed is arranged so that a practically continous stream of ore is fed into the mills. The ore is milled to pass a 16-mesh screen.

DRAG CLASSIFIERS USED

From the Chilean mills the pulp goes to drag classifiers of the so called Esperanza type, which differ from the Dorr machines in that the series of scrapers is connected to a link belt, which moves continuously over sprockets, large at the slime-discharge end of the machine and smaller at the sand end. These machines are more or less efficient, but the general consensus of opinion among those who use them is that the absence of the reciprocal motion, which is obtained in the Dorr machine, allows more slime to be carried over with sand product. The reciprocal motion of the latter seems to turn over the sand, loosen it and offer facilities for washing out the greater portion of the slime mixed with it.

The separation of slime and sand is about half and half, the sand being delivered into leaching tanks, each 20x 10 ft., where it is treated in the usual way by successive solution washes, followed by a final water wash. The slime is passed through Dorr thickeners and pumped into slime-storage tanks, the simple passage through the thickeners being sufficient to dissolve the economical maximum of the contained gold.

MOORE VACUUM FILTER USED

From the slime-storage tanks the pulp is drawn by gravity into the Moore filter at an average dilution of about one of solid to 1½ of solution, this rate varying with the exigencies of the occasion. The Moore plant contains two 40-leaf baskets, each leaf measuring 6x8 ft. A 1-in. cake is formed on the leaf in from 40 to 60 minutes, depending on the condition of the leaves. The cake is washed with solution and water and discharged following the usual practice, the application presenting no novelties.

The proportion of colloid slime existing in the pulp makes it particularly applicable to filtration by this system and efficient results are procured with comparative ease. The problem of filtration is not a simple one in any case and it cannot be said that any of the processes in use at the present time approximate perfection to any great extent, but by applying the machine and method best adapted to any particular ore fairly satisfactory results may be obtained.

The ores treated at this mill vary widely in grade, running from a minimum of about $5 per ton to a maximum of about $12. An average extraction of slightly under 80% is obtained at a cost of less than $1.50 per ton milled. The lime used in treatment, the quantity varying with the ore at hand, is added at the crushers and amounts usually to four to six pounds per ton milled. The milling capacity is about 275 tons per day.

The practice at the Golden Reward mill is typical of the modern tendency to mill in cyanide solutions, in this case the strength being about 1½ lb. KCN per ton, and although the mill is old and not particularly well adapted for securing low operation costs, the work is nevertheless efficiently done and the costs, under the circumstances, do not seem to be exorbitant.

Experimenting with Roasting Process

The Golden Reward company possesses a large quantity of ore which has resisted the efforts of metallurgists to treat it by any of the straight milling processes and an effort is now being made to render it amenable to cyanidation by giving it a preliminary roast. Experiments have shown that after being roasted the ore is amenable to cyanidation and high extractions can be obtained without excessive consumption of cyanide or other chemicals. The cost of roasting will not be excessive as it is proposed to utilize the sulphur content as fuel as far as possible, thus reducing the consumption of extraneous fuel.

A roasting furnace is now in course of erection and will be in operation in the near future. The results obtained by this departure in metallurgical practice will be awaited with interest.

Wet Crushing through Rolls at Trojan Mill

Another mill employing a wet crushing process and using cyanide solutions throughout is that of the Trojan Mining Company at Portland, probably one of the most modern installations in the Black Hills. This mill formerly was the property of the American Eagle company, but was acquired by the Trojan company and remodeled to suit modern practice. The ore from the mines is dumped into bins at the crusher house and from these bins is drawn over grizzlies, the undersize going to a belt conveyor, the oversize passing through gyratory crushers and then joining the undersize on the belt conveyor. This conveyor has a slope of about 16° and delivers ore into mill bins having a capacity of about 450 tons. An automatic sampling arrangement was at first installed to cut a sample from the ore stream falling into the bins, but the arrangement did not give a representative sample and was dismantled.

The ore is drawn from the mill bins and fed by disk feeders into two sets of crushing rolls, strong cyanide solution being added at this point. These rolls were probably not intended for wet crushing, for the housing leaks a good deal and the almost constant attention of an attendant is necessary to keep the leaks stopped up.

The product of the rolls flows through a launder to two Monadnock chilean mills, each seven feet in diameter. These mills gave some trouble due to slight mechanical imperfections, but these have been remedied so that the mills now give good results. The product of the mills is elevated to Dorr classifiers where the sand and slime are separated. The sand is delivered to 200-ton leaching tanks, 28x8 ft., through automatic revolving-arm distributors. The sand treatment presents no novelties, being the same as that usually followed in the district.

Air Agitation of Slime

The slime from the classifiers is taken to three tanks for air agitation, these tanks being said to be of the Pachuca type. They measure 17 ft. 6 in. in diameter and 16 ft. in height, and it will be readily seen that they differ a great deal from the Pachuca idea in their proportions. A true Pachuca tank should have about 40 ft. of height for a diameter of 15 ft. and the Trojan tanks have a greater diameter with much less height. They are, however, doing excellent work. The dilution of the slime under treatment is about 1 or 1½: 1, the object being to maintain a fairly thick pulp suitable for subsequent filtering.

A detail of these tanks which is of interest is the central air-agitation tube, which is not a tube at all, but a succession of cone sections set one above

Deadwood, S. D., Showing Homestake Slime Plant in Center Background

another through the entire height of the tank. The idea is that, whatever the height of the pulp in the tank, it can be sucessfully agitated because the central tube will discharge itself at almost any point.

The slime treatment is continuous through two of the agitation tanks, the slime from the first one being transferred either to the second or third tank, as desired, by air lifts, and from these secondary plants it is drawn off into the filter plant. The average agitation time of the slime is five to six hours, no solution being decanted but the entire pulp going to the filter.

The solution fed into the primary crushing rolls with the ore averages three pounds of KCN per ton and is added in the proportion of four to six tons of solution to one of ore. The sand in the leaching tanks is treated with this same solution for about three days, and this treatment is followed by treating two days with weak solution, which has been precipitated, containing about one pound of KCN per ton. A light water wash is given before discharging the sand, the treatment usually extending over about five days.

The filter is the ordinary Butters stationary, semi-gravity type which, while more or less satisfactory, entails a high cost for pumping pulp and solutions. From the filter the solution effluent from making cake is sent to the precipitation department, the weak barren-solution wash and the water wash not being precipitated.

Precipitation is accomplished in the usual way, using zinc shavings and the ordinary form of steel box. The boxes have a total capacity of 384 cu.ft. of zinc. At the cleanup the precipitate is run into an acid-treatment tank where the sulphuric-acid process, customary in the Black Hills plants, is carried out. The precipitate is collected, dried, partly roasted, fluxed and melted in crucibles in a coke furnace.

The capacity of the Trojan mill is about 175 to 180 tons per day, but steps are being taken to increase this tonnage materially. The extraction secured by the combined slime and sand treatment is in the neighborhood of 75%, somewhat more on the slime than on the sand product.

Crushing Practice Is Unusual

The practice of crushing with cyanide solution through rolls is not usual, although it is practiced in a few cases and in one other instance in this district, as will be noted. It has been productive of good results, probably due to the increased time of contact between the ore and cyanide solutions, and the agitation secured in the rolls and chilean mills.

The chilean mills are efficient crushing machines and are capable of handling large quantities of ore, but being high-speed machines they naturally incur a maintenance cost which is high compared to the results obtained with slow-speed mills. In this connection it might be mentioned that the Minnesota mill, at Maitland, is equipped with slow-speed mills of the Lane type, and it is claimed that these mills have demonstrated their ability to crush an equal or greater quantity of ore with less expense both for operation and maintenance.

The chilean mill is said to have been introduced into Black Hills practice by J. V. N. Dorr, who first installed them at the Lundberg, Dorr & Wilson mill and afterward included them in the design of the Mogul mill, where they gave good results. The Mogul mill was recently destroyed by fire and rebuilding is now under consideration, but the new plant will probably be built on a site more convenient to the mining properties owned by the company.

Dry Crushing of Hard Ores at Victoria Mill

As an example of extremely hard ores found in the Black Hills district, the material handled by the Victoria mill in the Spearfish Cañon region may be mentioned. The ore here is extremely hard and the mill equipment has been designed with this characteristic in view. The ore is delivered into the mill bins by a tramway and from these bins is passed through a gyratory crusher which delivers a product that will pass a 1¼-in. ring. This crusher product is passed through a set of rolls which delivers a product having a maximum size of ⅜ in.; the crushed ore drops into a 100-ton bin.

From this bin the ore passes a set of fine-crushing rolls and through a trommel, carrying 6-mesh, No. 14-wire screen. The oversize from the trommel passes to a second set of fine-crushing rolls, and through another trommel like that already mentioned. The oversize from this trommel goes back to the same rolls and the screened product from both trommels drops into a finished-product bin having a capacity of 200 tons.

The ore is so hard that its passage through the rolls is accompanied by a great deal of noise which sounds much like cannon shots, but the rolls handle the material in a satisfactory manner without undue wear.

The finished product is drawn from the bin and taken to leaching tanks by means of a belt-conveyor system. The conveyor deposits the ore into the center of the leaching tanks, each 27½ ft. in diameter by eight feet deep, with a capacity of about 200 tons, and the distribution is by hand.

Leaching is practiced in the ordinary way by first treating with a 3-lb. cyanide solution, for 72 hr. During this treatment about 70% of the gold content is dissolved. An additional 10 or 12% is obtained by leaching for a further period of 48 hr. with cyanide solution containing 1½ lb. KCN per ton, the latter being finally displaced with a minimum water wash.

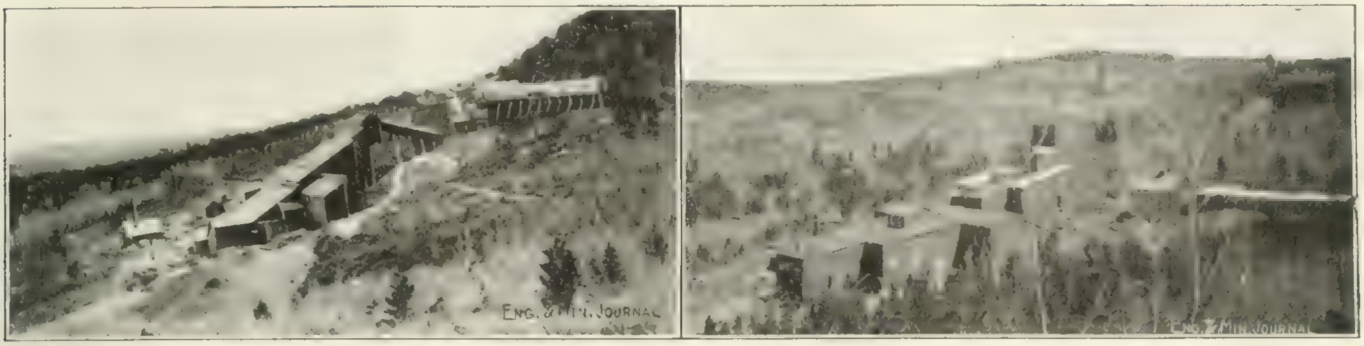
Precipitation on Zinc Shavings

Precipitation is accomplished in the usual way, using zinc boxes of the ordinary type made of sheet steel. There are two six-compartment boxes, each compartment measuring two by three feet. Each compartment is connected by a pipe to a main which leads into the acid-treatment tank. At the cleanup the zinc is thoroughly washed and the precipitate, after settlement, is drawn through the pipes directly to the acid tank without further handling. The acid tank is lead lined and furnished with a hood by means of which the gases generated are carried off. The acid-treated product is pumped through a filter press and washed. This precipitate, after being partially dried and mixed with the usual borax-soda flux, is melted in graphite crucibles. The resulting bullion is a little more than 900 fine, of which 50 is silver.

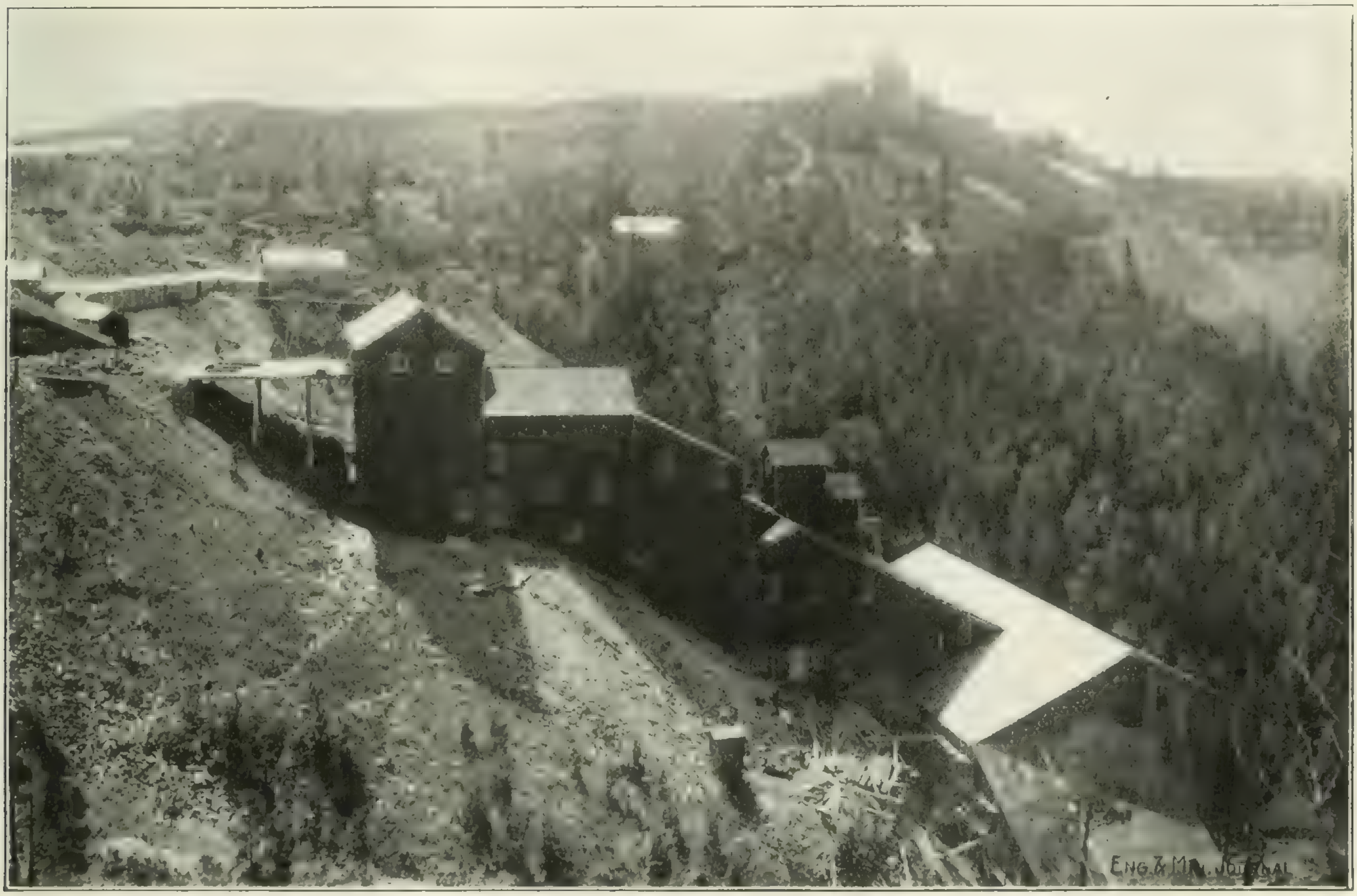
The ore treated at this mill varies in value from $4 to $7 per ton. The mill has not been in operation for a sufficient time to standardize the costs, but it is expected that these will not average higher than those obtained at other similar mills in the district. The mill is at present treating about 200 tons per day, perhaps the average being a little under that figure.

A Mill of Historical Interest

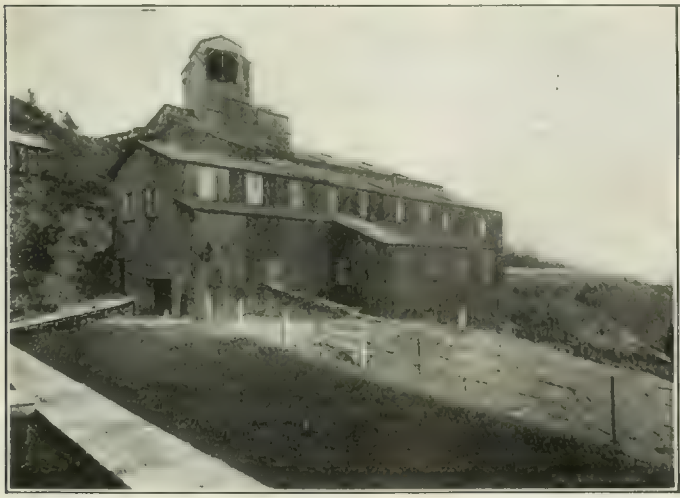
At Terry is situated the Lundberg, Dorr & Wilson wet-crushing cyanide mill, owned by a partnership composed of John Lundberg, J. V. N. Dorr and A. D. Wilson. For several reasons this plant is unique. It was started in January, 1904, and was the first mill in the world to operate continuously and successfully a leaf-filter plant. It was in this plant that the first filter plant designed by George Moore was installed, its difficulties encountered and overcome; the original plant is today operating and doing good work. In this plant also the well known Dorr classifier and the equally well known Dorr thickener were developed. In addition this was the first plant in the Black Hills to use the improved chilean mill for crushing in cyanide solution. The plant has operated steadily since January, 1904, except during the labor troubles of 1907 and 1910, and it has the best record for continuous operation of all the Black Hills cyan-



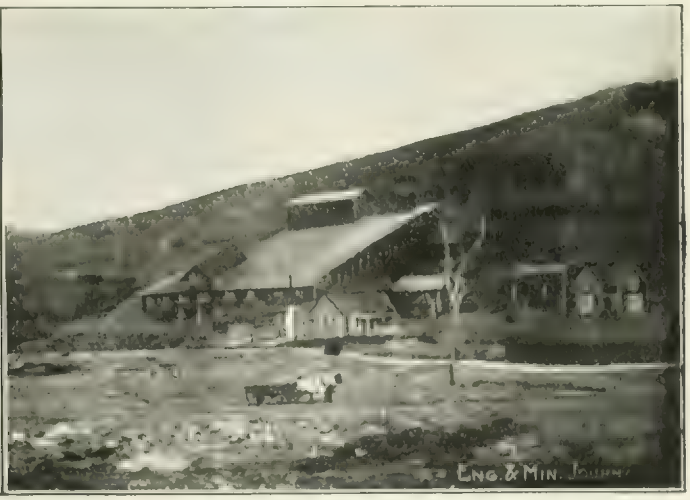
Trojan and Reliance Mills in Black Hills District, South Dakota



Bismark Mill, with Wasp No. 2 in Background



Lundberg, Dorr & Wilson Mill, Terraville, S. D.



Golden Reward Mill, Deadwood, S. D.

ide plants. The mill has a capacity of 110 tons per day and, due to the fact that it is treating custom ores as well as ores belonging to the partnership, few details of the practice have been made public and no information as to costs has been given out.

The ore from the mines belonging to the company is held in three bins having a capacity of 135 tons and the custom ore is dumped from mining cars on the Chicago & Northwestern railroad tracks in the rear of the mill into bins holding 80 tons, from which point it is trammed to the crushers. After passing over grizzlies with openings of 1½ in. the ore passes through a Gates gyratory crusher and thence to a 12-in. vertical belt elevator which delivers it into a 75-ton crushed-ore bin. As the ore drops into this bin an automatic sample is cut from the stream.

WET CRUSHING ROLLS USED

From the crushed-ore bin the material is fed by a cam feeder into a Carterville geared roll together with solution carrying 1½ lb. KCN per ton. The solution is run in sufficient quantity to sluice the product satisfactorily through a launder into the chilean mill. This product, which will average about ¾ in. in size, passes to a 6-ft. Monadnock chilean mill, and is reduced so that practically all of it passes a 30-mesh screen. At this point sufficient clear overflow from the thickeners and cones is added to bring the quantity up to three or 3½ tons of solution to one of ore.

The ground product from this mill is taken to a standard Dorr classifier, the sand product of which passes to one of four leaching tanks, each 18 ft. in diameter by 11 ft. deep, holding 105 tons of sand. In addition to the 32 hours required to fill each tank, the charge is given a further 12-hr. treatment with mill solution. The balance of the five-day treatment is with barren solution carrying 1½ lb. cyanide per ton, followed by a weak-solution treatment and finally a minimum water wash. The leaching rate starts at five tons per hour and gradually diminishes toward the end of treatment at which time it is one to 1½ tons per hour.

SLIME TREATMENT SIMPLE

Slime from the classifier, which amounts to 50 to 55% of the dry weight of the ore, is divided between two cones, one 18 ft. in diameter and the other 22 ft., and one standard 18-ft. continuous Dorr thickener. The two cones are so placed as to give a gravity flow of clear solution to the roll supply tank while the overflow of the thickener goes to the chilean mill. The thickened slime containing about 55% moisture is transferred by air lifts from the thickener and the 18-ft. cone to the 22-ft. cone. From the latter it goes to a small cone agitator and into the loading vat of the Moore filter, usually carrying about 55% moisture and containing from five to 10% of —200-mesh material.

FIRST MOORE FILTER

This original Moore filter plant was designed in the beginning to handle 30 tons of slime per day, but it has been crowded until it now handles 60 tons daily, using two baskets. With minor changes in the construction of the plant and a change in the bottom of one tank the installation is practically the same today as when it was designed in 1903.

The crane for the transfer of the basket is operated by water at 105-lb. pressure, the water being pumped into an accumulator. It gives little trouble and costs almost nothing for maintenance. The mill solution and most of the barren-solution wash from the filter process and sand leaching go to the gold tanks and are precipitated. Solutions assaying less than $1 per ton are not precipitated unless the treatment happens to demand additional barren-solution, or the supply of high-grade solution is insufficient to keep the precipitation department busy.

USUAL PRECIPITATION BY ZINC SHAVINGS

The solutions are precipitated by means of zinc shavings. In this plant barrels have always been used instead of zinc boxes, the plant having a total of 30 barrels in 10 rows of three each. They are cleaned up twice a month, the rule being to take all the contents of the head barrel, part from the second barrel and still less from the third barrel, sorting all the coarse zinc and returning it to the second barrel. The fine zinc and precipitate thus sorted out are placed directly in the acid tank. The barrels are all moved up one step, the second barrel before cleaning up becoming the first and the first barrel moved down to the foot. The second barrel, now the head of the series, is repacked, the next partially repacked; all of the fine material taken out is put in the acid tank. As the cleanup usually consists of about 100 lb. of dry product, all the figures which follow apply to a cleanup of that size.

To the product in the acid tank 415 lb. of commercial sulphuric acid are added and allowed to remain in contact for six to seven hours, or until chemical action has nearly ceased. Water in equal volume is then added and the contents are heated with live steam and allowed to stand 10 or 12 hr., usually over night. The following morning the solution is siphoned into a settling tank where any flocculent matter is settled. Another water wash is added and live steam again introduced to heat the charge thoroughly. The charge is then allowed to stand about an hour. The clear solution is drawn off into a vacuum tank and filtered. When the acid tank is nearly empty the contents are energetically stirred to bring all of the product into suspension and the charge is transferred to a vacuum tank and filtered.

When the moisture contained is brought down to 4 or 5% the product is taken from the tank, broken so that no piece is larger than a 1-in cube and placed in flat, iron roasting pans. These pans are placed in a soft-coal furnace and the fire is started. The furnace has a total capacity of four 18x3-in. pans in two layers; 1½ to two hours' time is sufficient to drive off nearly all the zinc, and the resulting bullion is comparatively clean. The product in the pans is not touched or stirred during the roasting and experiments have proved that mechanical losses are thereby eliminated. The size to which the product is broken is small enough to insure a good clean roast.

The roasted precipitate is placed in a No. 100 graphite crucible in a coke furnace together with five to seven pounds of flux composed of ⅔ borax glass and ⅓ sodium carbonate. Melting is usually completed in about 1½ hr., using 80 to 100 lb. of coke. The bar is poured into a bullion mold as it is not necessary to remelt. The resulting bullion is 950 to 970 fine. Bars have been made as high as 984 fine, but the average is as stated above.

Although the mill was built seven years ago it is kept in the best repair and is still uptodate in most of its features. The machinery is driven by electricity throughout, using alternating current at 440 volts; a total of 104 hp. is used.

OTHER MILLS IN THE DISTRICT

Among the mills now operating in the Black Hills district may be mentioned the new Reliance, which has just been remodeled and has started operation along lines unusual in the camp, treating slime by a continuous decantation process and making use of Dorr thickeners for the purpose. This mill has also installed a Portland continuous filter for filtering the slime tailing. The mill has been in operation only a short time, remodeling is not yet complete and no information is available for publication.

The Bismark Mining Co. is building a mill near the Wasp No. 2 in which the system of treatment will be identical with that of the latter. The mill is approaching completion and should be in operation in the near future.

In this paper no mention has been made of the metallurgy of the Homestake installations. This is a matter which is so extensive that it should be treated alone and I hope, in a later paper to discuss that practice. The Homestake is treating ores on a scale which is not equaled at the present time and has attained an astonishingly low cost for mining and milling. An ore of low grade is being treated and the methods, original in many instances as they are efficient, are a lasting credit to the energy of the technical men who are responsible for their devising.

There are many mills in the Black Hills which are not now operating, but it would serve no useful purpose to speak of these at the present time in spite of the fact that some of them may resume operations in the near future.

Conclusions

It is with no little hesitation that one ventures to call attention to details in the practice of this district which seem capable of improvement, in view of the fact that capable operators have studied the problems and undoubtedly are aware of the solutions of them even if they are not put into practice at the present time. A little criticism, however, may be helpful from a constructive point of view and the few suggestions that I venture to make are offered in a friendly spirit, with a desire only to add a little to the present practice. It is possible that a perspective view may be appreciated by those whose vision has been limited by long contact and short focus.

The first impression is that in few of the operating plants is there any efficient means of estimating with accuracy the tonnage treated. The importance of the point will be readily appreciated by those familiar with the problem, so that it needs no discussion. It will be sufficient to say that mill estimations are not sufficiently accurate upon which to base comparative calculations except in such extraordinary cases as has already been mentioned in the Wasp No. 2 mill. A system of weighing the mill ore, while expensive to install, will repay, in information acquired and in satisfaction, any financial outlay which may be necessary.

The same is true of sampling. Sampling plants are expensive to install but are productive of much good. In some mills in the district samples of mill run are taken by means of a large elevator bucket fixed to a chain belt which periodically crosses the stream of ore falling into the mill bins. This device is more than likely to give erratic results. The area of the bucket opening is too small, and large pieces of ore strike the edges of the bucket and bounce off, leaving a sample which is not representative. Often the capacity of the bucket is not sufficient to hold the entire quantity of ore which belongs to it and it piles up and overflows, again resulting in an erratic sample. I believe it is recognized that to secure a proper sample it is necessary to take the whole stream of ore at regular intervals, the oftener the better, and to reduce the size of the sample by successive operations of the same kind. A part of the stream for all or part of the time is not sufficient and leads to a sample which is not accurate, and this, in the opinion of those who have most carefully studied the subject, is worse than no sample at all.

Crushing Hard Ore with Rolls

The practice of crushing through rolls in this district should be an object lesson to some metallurgists who have maintained that rolls are not adaptable to hard ores. Some of the roll installations here are crushing extremely hard, close-grained ores and doing it efficiently and at low cost. The controversy as to the supremacy of rolls or stamps might receive considerable light if a thorough comparison of the different practices in the camp were made. The greatest difficulty is that only one company, the Homestake, is using stamps, and this is on such an enormous scale that the extremely low costs obtained there cannot be compared with those obtained by rolls on a much smaller scale. The Homestake mills are treating more than 4000 tons daily and by reason of the extent of the operation are able to institute economies which would be impossible in smaller plants, the largest of which treats but 500 tons daily. Comparison of results without a long period of study and analysis is obviously out of the question.

High-speed chilean mills are operated in a number of plants and are giving good results. I have for some time believed that the slow-speed mill is capable of giving more economical results and a comparison of the cost of these and the cost obtained by the slow-speed mills at the Minnesota mill would be of greatest interest. In view of the fact that the latter will probably begin operations soon I hope to see this comparison made.

The use of lime is accompanied by some losses which might possibly be avoided by some slight change of method. This is typified in the case of the Wasp No. 2 which has already been mentioned and a similar procedure is followed at some of the other mills. The use of lime should be carefully watched, as it has been clearly proved at the Homestake that excessive lime has a retarding effect on the solution of gold in the ores of the Black Hills.

On the ores in general it is said to be true that fine grinding increases extraction, and where the ores have sufficient value to justify additional expense it would seem to be good business to determine accurately at just what point grinding can be carried to return the maximum economical extraction.

I wish to express my appreciation of the opportunities which have been unanimously extended to me during my visit to the Black Hills. A personal mention of all those who have facilitated my investigations would look too much like a census of the district. The mills have been freely open to me and information given without reserve. Much of this information has been given in confidence and with the request to avoid publication and all of these requests have been respected.

The World's Iron Ore Reserves

The provisional closing of the Salangen iron mine, following the inactivity in Dunderland, has directed attention to the problem of Norwegian concentrating ores, says the *Mining Journal*, Nov. 9, 1912. Of the large deposits, Sydvaranger ranks first, with about 37% of iron in the ore, Dunderland 36%, and Bogen and Salangen 31 per cent.

Dunderland Ores Carried Too Much Glance

Magnetic separation is, therefore, necessary in order to get rid of impurities, chiefly quartz, before the ore is available for the smelter, and as magnetite has a greatly higher magnetizing intensity than iron glance (180: 1), the separating process to be adopted must depend on the nature of the ore. The trouble at Dunderland arose from the fact that iron glance predominated, about 2½ to 3 times as much glance as magnetite, and to meet the difficulty the Edison magnetic-separation method on the dry principle was adopted; but owing to the dust created was found (so far as the operatives were concerned) to be unsuitable. This trouble is not present with the Sydvaranger, Salangen and Bogen ores, which are pure magnetite, nor with some smaller deposits.

According to Prof. J. H. L. Vogt, the iron ore available by opencast working, from the chief Norwegian iron deposits, is as follows: Sydvaranger, 100,000,000 tons; Dunderland, 110.000,000 to 120,000,000 tons; Salangen, 30,000,000 tons; Bogen, 15,000.000 tons, and all others, from 75,000,000 to 100,000,000 tons; in round figures 350,000,000 tons of ore, of which 200,000,000 tons are magnetite. In depth up to about 100 m. a reserve of 750,000,000 tons can be reckoned with and up to 200 m. about 1,500,000.000 tons of 30 to 36% iron ore.

Apart from concentrating ores there is in the north of Norway a number of occurrences of sorting ore, Sydvaranger alone presenting a reserve of at least 4,000,000 tons, possibly 8,000,000 tons, of 52 to 53% ore; while in the south an effective ore supply of 5,000,000 tons may be reckoned. The successful handling of the titaniferous ore at Rödsand, by the

Gröndal process, has drawn attention to similar deposits in the western district. There is an ilmenite deposit at Ekersund, Soggendal, carrying about 39% TiO_2, and 38% FeO, which places this deposit in a unique position for the production of ferrotitanium, ferrosilicon, titanic acid, etc. Numerous other deposits carry smaller percentages of TiO_2. Some of these ores could be hand-sorted to 52% iron, and most could be magnetically concentrated to 64 to 67% of TiO_2. The potential reserves of the titaniferous ores of Norway are placed by Professor Vogt at about 15,000,000 tons, with a metallic content of about 9,000,000 tons, by which is understood ores with 40% Fe, and below 8 to 10% TiO_2, calculated as a concentrate of 65 to 68% Fe.

THE OLDER IRON MINES FAILING

In regard to the world's supply of iron ore, the production of Belgium has fallen from three-quarters of a million tons in the period 1850 to 1870, to 200,000 tons in the last 10 years, and in Scotland from 2,000,000 tons in the period 1855 to 1880, to less than a million tons in recent years.

The Bilbao mines, in Spain, up to the present have produced about 180,000,000 tons of ore; while it is calculated that the present reserve amounts to only about 70,000,000 tons. Even if this estimate is a low one, it is obvious that the Bilbao exports must within a generation, or even 20 years, exhibit a great decline. The same condition of affairs is to a certain extent apparent in connection with the Krivoi-Rog mines, in South Russia, the most important source of supply in that country.

Against these declines must be considered the unworked deposits which, at present, lack transportation. In this connection, Kirunavaara and Gellivaara may be mentioned, as their annual output in a few years should be 4,000,000 tons, and also Sydvaranger, in Norway.

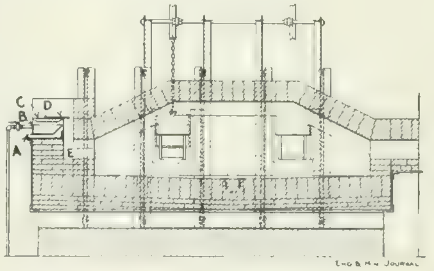
Four-fifths of America's iron production comes from the Lake Superior deposits, with an annual output of a little over 40,000,000 tons, and although the richest and best ore beds will be depleted in a calculable future, there will remain a quantity of somewhat poorer ores sufficient to last for centuries. The world's three largest iron-ore deposits at present being mined are the Lake Superior field, with Mesabi as the most important mining district; Kiruna, with other deposits in Norrbotten, Sweden; the so called minette deposit in Germany and Luxemburg, with adjoining parts of France. From Minas Geraës, Brazil, a number of large iron-ore deposits are reported as available, and it is even mentioned that from these alone, by opencast work, it is possible to take out about 2,000,000,000 tons of ore. From other foreign countries have also come late tidings of gigantic ore deposits, so that Professor Vogt concludes that for generations to come the world will have all that it will require of iron ore, and that the lament about iron-ore hunger should cease.

The Gamm Oil Furnace

The Gamm oil-burner, shown in the accompanying illustration in connection with a reverberatory furnace, is a device for burning oil without forced draft, steam atomizing, or any other aid to combustion, except a stack. The burner consists of four castings, a lower air passage *A*, an oil pan *B*, an upper air passage *C* and a damper plate *D*. They are all of the simplest forms.

A furnace operating on this system was shown recently in Weehawken, N. J. In starting the furnace the oil pan was filled, and a small piece of burlap was lighted and thrown on the surface. The oil began to burn and the flames were carried down passage *E* into the furnace, the air for combustion being furnished by the inlets between the lower and upper castings and the pan, and by the opening left by the damper. The furnace was a 2½x5-ft. reverberatory, and was soon full of flame.

Regulation of the flame was furnished by *D*. When *D* is shoved forward, shutting off the air supply, the flame is long, filling the entire furnace (reducing atmosphere), when *D* is back, the flame is short, and the furnace atmosphere oxidizing. The change from one to the other takes place in about three or four seconds. The oil runs into the pans in a small stream, but through large pipes, so there is little danger of stoppage of the oil by grit, etc. If it does stop, the fire burns for some time on the supply in the pans, then goes out. There is no air, steam, etc., escaping, and if the oil starts again there is no "flare back."



GAMM OIL FURNACE

The experiment was shown of intentionally opening the cocks and overflowing the pans. The oil flowed down *E* toward the furnace, and into the lower air passage, and burned, generated a great volume of flame, but doing no damage. There was no smoke to be seen issuing from the stack at any time.

A bar of steel 1¾ in. in diameter was placed in the furnace and taken out in two minutes, by which time it was at a bright red heat. The furnace quickly melted glass and copper.

The furnaces have already been put into commercial use for melting copper, german silver and nickel, the largest furnace so far built being said to have an 11x25-ft. hearth and to melt a charge of 35 tons of metallic nickel.

A 62-ft. flame is said to have been produced with these burners, but the Weehawken furnace and flue were too small for such a demonstration. The absence of noise was an agreeable feature to one accustomed to the ordinary atomizing or spray burners, and the absence of flames shooting from every opening, as is the case with forced-draft furnaces, makes it agreeable to work with.

Theoretically the advantages over atomizing burners are considerable. No power is required for blowers or boilers, and, as is the case with steam, no heat is lost in warming the atomizing agent. So far as could be seen in one afternoon, the results bear out these considerations.

The furnaces are marketed by the Oil Furnace & Engineering Co., of 60 Liberty St., New York. H. F. E. Gamm, inventor of the furnace, is chief engineer.

Austrian 1911 Mineral Production

According to official reports the mineral production of Austria for 1911 was as follows, the items being arranged in order of descending value: Bituminous coal, 14,379,817 metric tons; lignite, 25,265,334; iron ore, 2,765,815; lead ore, 23,845; silver ore, 24,143; quicksilver ore, 111,016; zinc ore, 32,166; graphite, 41,559; copper ore, 10,974; gold ore, 29,647; pyrites, 15,805; manganese ore, 15,954; mineral paints, 2902; tin ore, 9435; tungsten ore, 45; asphalt, 1740 metric tons.

Metal production was as follows, the items again standing in descending order of value: Pig iron, 1,596,148 metric tons; zinc, 15,766; lead, 18,097 metric tons; silver, 48.036 kg.; quicksilver, 704 metric tons; copper, 1760 metric tons; radium preparations, 14.146 grams (containing 2.647 grams pure $RaCl_2$, valued at $214,928); gold, 205.342 kg.; copper sulphate, 767 metric tons; uranium preparations, 5785 kg.; tin, 15 metric tons.

Bituminous-coal mines employ 63,567 men, 2141 women and 4119 children; lignite, 52,048 men, 2150 women, 704 children; iron mines, 6134 men, 110 women, 65 children; iron works, 5566 men, 86 women, 134 children; lead mining, 2825 men, 533 women, 218 children; silver mining, 2275 men, 7 women, 18 children. In general, women and children each form about 3.3% of the total Austrian mine workers.

Fuller's earth is now chiefly used as an oil clarifier. The United States production equals only about three-quarters of the consumption. About one-half the domestic production comes from Florida.

Labor Conditions at Copper Range

By Claude T. Rice

The paternal policy of the Copper Range Consolidated Co. is characteristic of the Lake Superior copper country and is responsible for stable labor conditions. Cheap rents are possible through company houses; libraries have been established; social organizations are encouraged; injured men are assisted and adequate medical attention provided for employees and their families.

The question of housing employees is a matter much neglected at Western mines, where the superiority of the married miner in work and faithfulness is not appreciated as much as it should be. Lake Superior mining companies always provide houses for their best employees. The houses are rented at a price so low that it does little more than take care of the repairing and other fixed charges, such as taxes and insurance. Western mining companies are prone to attribute this practice to the settled conditions in the Lake Superior district, but even at the new prospect camps, houses for married employees have to be provided before the company can attract the better class of men.

Paternal Policy Results in Stable Conditions

As will be shown by plans and approximate costs of erecting the houses furnished the men by the Copper Range Consolidated Co., these houses do not have to be expensive to be comfortable. Any company that has arrived at the stage of employing a considerable force of miners ought to be able to afford the expense of housing the married miners in its service. If this policy were carried out there would be more married miners in the Western camps, and there would be less discontent and senseless agitation, and in time we would see the son following the father in American mines. Mine accidents would become less frequent, labor troubles and discontent would be less rampant, and efficiency in mining operations would show marked improvements, with wages going to the merchant and the butcher instead of to the saloonkeeper and the gambler, as is so characteristic of Western camps. Provision for families brings families, and families alone beget stable conditions as far as labor is concerned.

Bowling Alleys Provided

The companies in the Lake Superior district generally show some interest in the entertainment of their employees. They help the different baseball clubs and encourage the men to organize bands and other such organizations as will help to make the community self-contained to the greatest degree. If the men are not furnished some legitimate amusement they are either going to spend their leisure hours drinking and gambling or else become discontented. The Lake companies realize this clearly and at each of its different properties the Copper Range Consolidated Co. has erected a bowling alley where the charge for setting up the pins and other such things is just enough to cover the expenses. The men come with their families and rooms are provided for the wives and daughters as well as for the men themselves.

Public School System

In the Lake Superior district most of the taxes are paid by the mining companies. The companies therefore see that the money of the township is properly spent. For this reason the Lake Superior camps have excellent school houses, such as the high school at Painesdale which is capable of accommodating 400 pupils and cost $125,000. This is a building of which any community, no matter what its size, might well be proud. The school is fitted with chemical and physical laboratories; a room is provided for teaching the boys manual training in the form of carpenter work, while instruction in domestic science with a laboratory for cooking practice is arranged for the girls. A gymnasium is provided with baths for boys and girls. In fact, bathing is a special feature of the community, for in the basement of the library near-by are free baths, and in the dry-houses the men and boys of the community can get baths at any time and tubs, as well as showers, are provided.

Paine Memorial Library

The Lake Superior companies usually take a considerable interest in seeing that the employees and their families are able to obtain good reading matter. In this case William A. Paine, one of the largest shareholders in the Copper Range companies, gave the Sarah Sargent Paine library building, costing about $40,000, as a memorial to his mother. The company supports this library as well as the three branches which are maintained at Trimountain, Baltic and Atlantic. In this library and its branches there are about 6000 volumes, some being in Finnish and Croatian, as the people of those nationalities showed especial interest, raising money to aid in providing books. Each year the company adds some new books, while the supply also grows by contribution from friends.

This library is open every day. One room is provided for card playing and other games, where the men can smoke if they desire. In the basement are the baths, while on the top floor is an auditorium that will seat 400 people. This is used for general gatherings, lectures, dances, etc. The library is in charge of a trained librarian, and a certain amount of children's work is done. The library is made to fit in with the work at the schools as much as possible.

Such enterprises are not costly. The company maintains the library and pays the salaries of attendants at a cost of about $2500 per year besides heating and lighting the building. Much interest in the library is shown by all the employees. Indeed, it is the center of the community's life. It seems that if Western mining companies would operate libraries to compete with the saloons it would be good business and in time would have an indirect effect upon the price of the company's shares on the stock exchange, through efficiency among the employees.

Aid Fund Organizations

A characteristic of the Lake Superior district is the interest that the miners show in their "clubs" as they call the aid-fund organizations. Almost as soon as a property begins to produce, the miners come to the manager and ask for the starting of such an organization. These organizations at the Copper Range properties are administered by the mining company, and the surplus funds invested for the men. The officers are the mine captain, the head physician, the company clerk, one surface and one underground employee selected by the company as popular and acceptable among the men. These officers serve without pay. The dues are 50c. per month, and the benefits are paid only in the case of accident, not in the case of sickness, as in the Calumet & Hecla club. Benefits in the case of partial disability are payable beginning six days after the accident, and amount to $1 per day, being payable for a period not exceeding six months. It is because the benefits only apply to accident cases that these organizations prosper without outside aid. The different funds have grown so that they are able to pay $600 in case of death or total disability. Cases of serious partial disability, such as the loss of an eye, a leg or a hand, are settled by the committee according to the individual case, the advice of the company physician being depended upon mainly in determining the degree of disability. These clubs are in operation only at the mines, not at the mills.

The aid given by the club does not affect the company's solicitude for the man and his family. If he is able to go back to work again, he is placed at his old job. If he is disabled so that this is impossible, new work is provided for him, and in the case of accidental death the family is helped according to the circumstances of the case. One young man's arm was cut off while working for the company. When he was discharged from the hospital and was able to return to work, he was given a landing job, at the same time being told to brush up on his education as much as possible. He took a course in book-keeping in a correspondence school, and is now a supply clerk at one of the company's properties. With young men such solutions of the problem of the injured employee are available, and in some instances it is possible even to better their lot financially. With the disabled employee past middle age it is a case of hunting up some makeshift job to help him keep going. Some surface work or tending the change house are the positions most applicable. In many instances, the employee can be transferred from the mine to the mill, where the work is mainly watching and little physical effort is entailed.

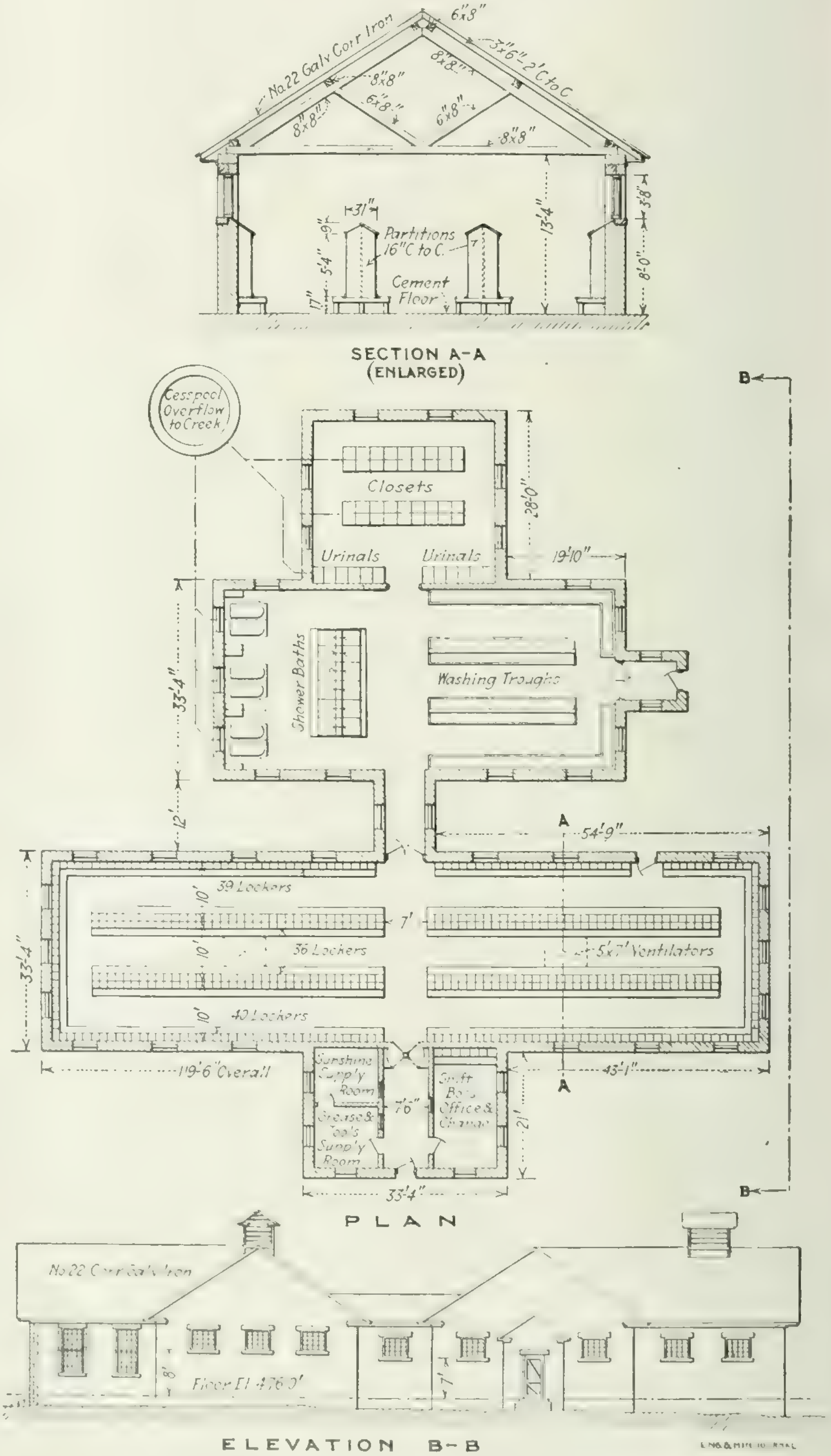
The company feels reluctant to send a disabled miner underground again if the injury be at all serious. Still, in one of the stopes of the Baltic mine there was, for a long time, a man with one hand who worked on a two-man machine. He had an artificial hand and by means of the hook he was able to do his share of the lifting, and even barring down the back. In fact the mine captain says that he was as good a worker as an able-bodied man.

FEE OF $1 PER MONTH COVERS ALL MEDICAL ATTENTION

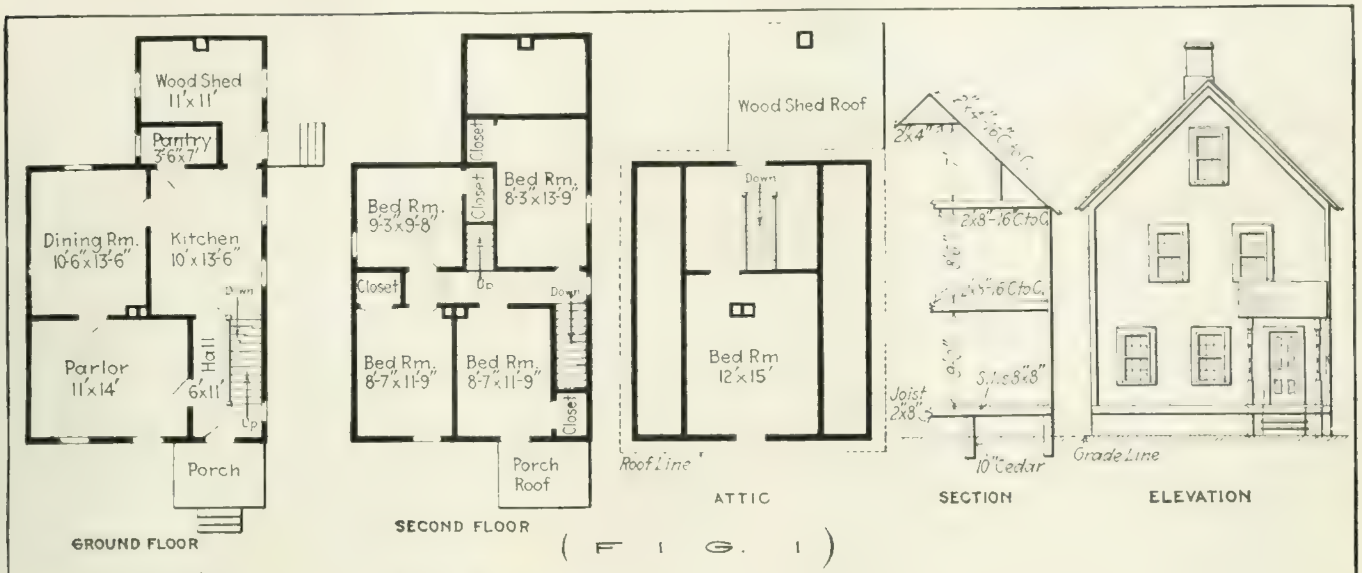
At the Copper Range company the hospital fund is operated on a somewhat different basis from those in other parts of the copper country, in that the men all pay $1 per month. This is done so that the company can provide a service somewhat broader in its scope. No charge is made to any employee of the company for medical or hospital service in cases of either accident or sickness. The members of an employee's family are given free medical attention outside of the hospital and when necessary to treat the patient in the hospital a fee of $1 per day is charged. There is one central hospital at Trimountain, with dispensaries and an ambulance maintained at the different mines. There is one doctor at the mills, which are all near together, and one at each of the mines. The medical corps consists of a head physician and six assistants.

COMPANY HOUSES POPULAR

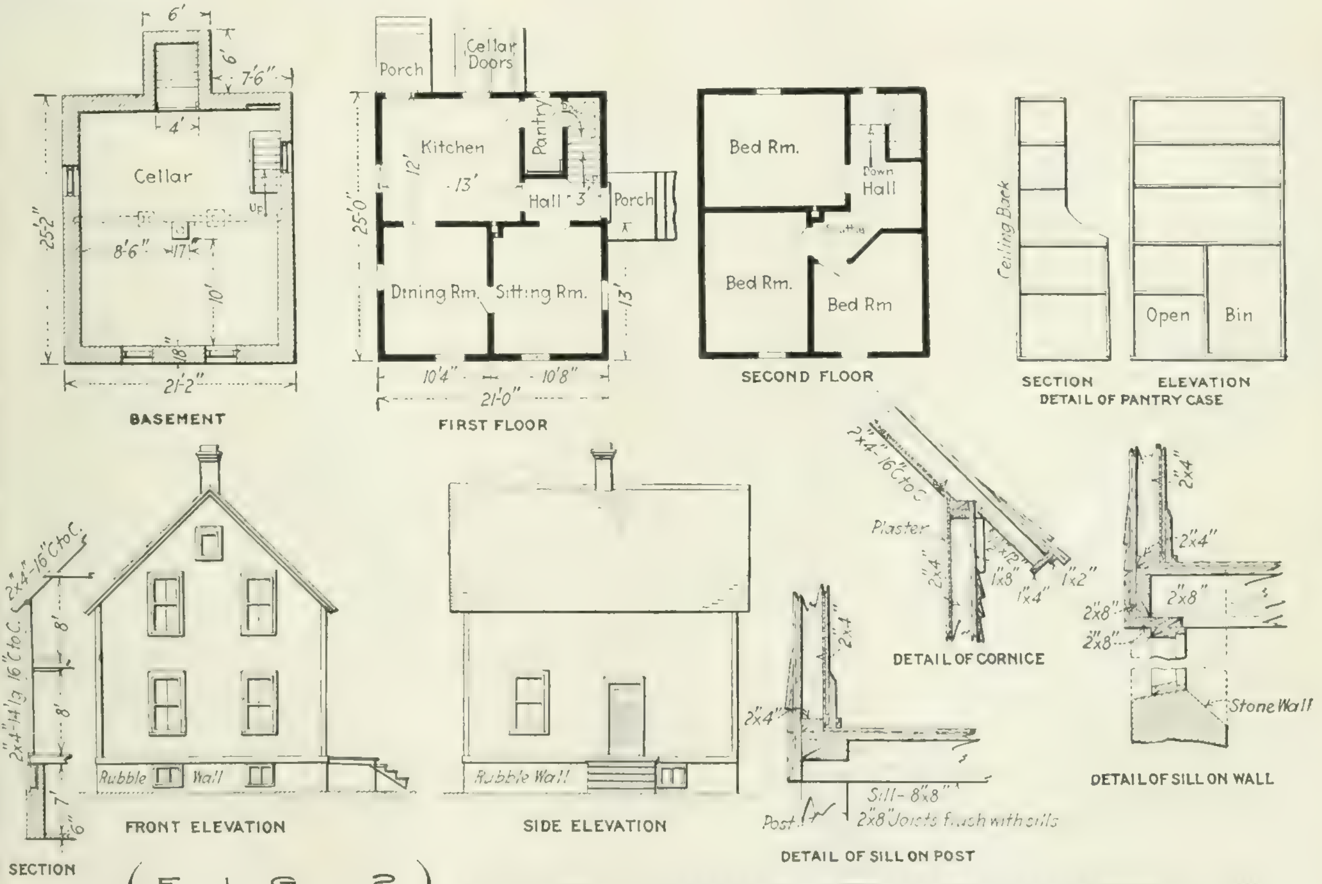
The whole attitude of the company is favorable to the married miners who have the heaviest expenses. Coal is sold to employees practically at cost. Wood from the locations is also sold to the employees at reasonable rates. The greatest aid, however, comes to the married man through the company houses, which are rented at about 75c. per month per room. This includes water, scavenger service and removal of garbage. Only for malicious and unexcusable damage to a house is the man charged anything extra. Wear and tear due to children is, of course, not considered. The trouble is that the company does not have enough houses to go around, and it cannot house all the married employees. As a result there is a scramble to get a company house whenever one is vacated, and when a family does get one, it generally sticks with the company. The 75c. per month just about covers the expenses attached to the maintenance of the houses and the cost of the service, so that the company gets no real income from the houses.



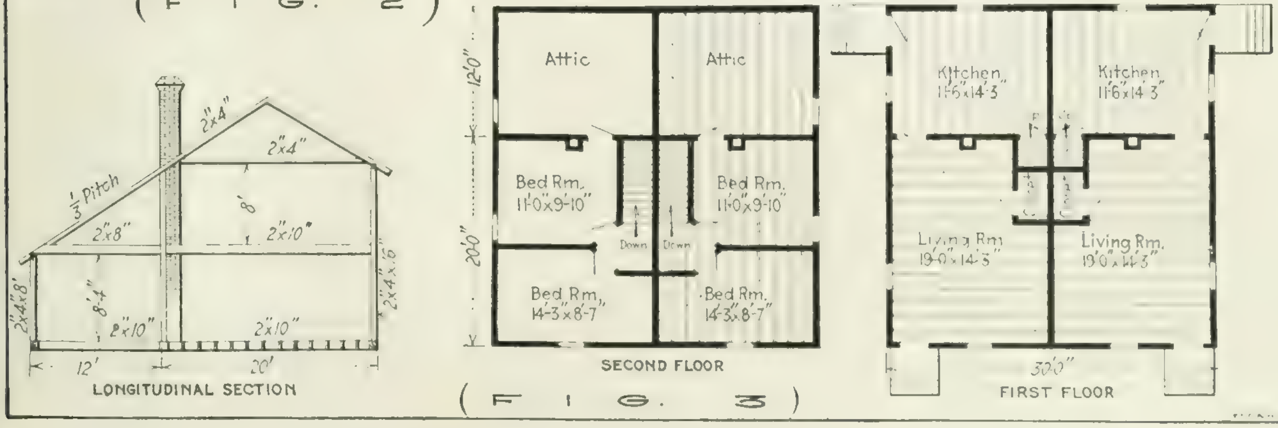
Change House at Baltic Mine



(FIG. 1)



(FIG. 2)



(FIG. 3)

Types of Houses Provided for Employees by the Copper Range Consolidated Co.

Single Houses Most Desirable

Plans for some of the houses constructed by the Copper Range company for its employees are given in the accompanying drawings. A good deal of thought has been devoted to their design so as to get as serviceable a house for the money as possible. The houses, almost all have basements and are all finished inside with plaster; they have to be well built owing to the rigor of the winters. The costs given are based on a cost of lumber varying from $16 per M for rough hemlock to $30 per M for finishing lumber. Carpenters' wages vary from $3 to $4 per day of 10 hours.

Single houses are the most desirable, and if properly designed do not cost much more, proportionately, than a double house. Fig. 2 shows the house that has been found by the company to be the most satisfactory of its single houses. This originated at Trimountain but is now used elsewhere by the company as its standard single house. It has six rooms; the stairs to the second floor are arranged so that, with a minimum of space, separate entrances are provided for all bedrooms. The only drawback is that the entrance is on the side of the house, as the elevation shows. The house alone costs approximately $1000 erected; the basement costs about $200 extra. In Fig. 1 is shown another arrangement of a seven-room house. This house has the entrance on the front, but the position of the hall is poor as regards space economy. Several of these have been erected and are popular with the tenants; the attic can be finished off for a children's room if desired. The cost of this house is about $1300, with basement.

The double house shown in Fig. 3 is the cheapest for a given capacity and is the type best adapted to young properties, as the families of the men who go to work at prospects are generally small. The attic on the second floor also can be finished if desired. This is the type of house that was first used at the Baltic mine. The double house with basement costs $1200 erected, so that it makes the cost of housing the families much less than with the others.

The Baltic Change House

The change house at the Baltic mine is shown in the accompanying drawing. This cost complete $20,000. It has a concrete floor. In it there are 462 lockers of expanded metal and without doors, a watchman being kept on duty all the time. The lockers are 15 in. square inside and five feet high, with a shelf nine inches from the top on which to put wash basin and shoes. There are 12 showers and six tubs. Iron washing troughs 16 in. wide and nine inches deep are also provided. The water closets empty into a large cesspool. The building has a corrugated-iron roof over a covering of wood. The walls are made of sandstone obtained near-by. The men of the community can get free baths at the change house any time of the day, as the use of the building is not restricted to company employees.

It is because of such treatment as this that the miners stay contentedly in these Lake Superior mining camps and let the high-priced camps of the West alone after trying them once. They would rather have families and decent homes than to submit to the living conditions that characterize Western mining camps. A miner gets only about $70 per month but he can live cheaply. The butcher and grocery bill for the miner's family having three children and living well will not come to over $30 per month and plenty of vegetables are available in season. The regular board charged in these camps is $20 per month, including washing. At that price, however, two or three men sleep in a room. One of the reasons for such cheap board is that the company gives the boarding-house keepers cheap rents. Western companies, if they ever wish to get rid of the high wages that they are paying, should study the matter of providing houses for their employees at a reasonable price. They should see to it that early in the life of the company, ground for the future needs is obtained and held so as always to insure cheap living for the mine employees. A little foresight like that which is so commonly displayed by the Lake Superior companies goes a long way toward getting the better of discontent among employees. It is one of the main reasons that wages are lower in the copper country than they are in Western districts.

Doctor Jack Pot Wins Apex Suit

An unusually important apex suit has just been decided by the United States Supreme Court in the case of the Doctor Jack Pot Mining Co. and the Work Mining & Milling Co., of the Cripple Creek district, the course of which has been chronicled from time to time in the columns of the JOURNAL. By this decision the earlier ones of Judge Lewis and the court of appeals have been sustained and it is held that the $2,400,000 worth of ore in dispute belonged to the Doctor Jack Pot company and must be paid for by the Work company. It was held by Judge Lewis and the court of appeals that the ore was under the Work properties, but that the vein from which it was extracted had its apex on the Doctor Jack Pot ground, and that the Doctor Jack Pot could follow a secondary vein extralaterally notwithstanding the absence of a discovery vein or discovery cut, the claim being patented.

Tantalum Electrodes

The price of platinum has steadily advanced during the last 10 years, being now far above that of gold, and has reached a height that makes it burdensome to the chemist to buy apparatus made of this metal, so valuable and in many cases indispensable to him. It is not only the decline in production, but the enhanced consumption of this metal by the jewelry trade that has forced the market upward. Regarded from an esthetic point of view platinum ranks far behind silver and gold, hence there is no reason why it should be sought so much as an ornamental object in jewelry, but the fancy of the public has made it fashionable just on account of its high price.

Substitutes for Platinum

Since there is no prospect that the price of platinum will ever decline in any considerable measure, science and industry have tried hard to procure a substitute for this precious metal. While it does not seem probable that a substance will be found capable of replacing it in every instance, yet it will be of great moment if substitutes can be found for at least part of its applications whereby a portion of the metal would be made available for purposes for which it is indispensable.

Thus, quartz glass at a moderate price offers, for some purposes, a substitute for platinum, although not quite its equivalent. It is perfectly resistant to acids, with the exception of hydrofluoric, and insensible to sudden changes of temperature, but it is breakable and is a poor conductor of heat. Furthermore, chemical utensils have been made of an alloy of 90% gold and 10% platinum. This alloy is harder and tougher than gold, but more difficult to work than either one of the component metals. It might replace platinum entirely if its point of fusion were higher. As this is only little above that of gold crucibles the dishes made of the alloy are apt to fuse over an ordinary bunsen burner. Its scope of application is large enough, but the economy attained is small. The price of utensils made of it, amounts to about two-thirds of that of platinum in consequence of its higher cost of molding.

Tantalum Apparatus Recently Tried

Quite recently the firm of Siemens & Halske has proposed tantalum, which was originally intended only for metal filaments of electric lamps, as a partial substitute for platinum, and has introduced

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Note—Translation by O. H. Hahn, from an article by O. Brunck, in "Chemiker Zeitung," Oct. 19, 1912.

sundry utensils and instruments made out of that metal at a price of 62½c. per gram, including cost of molding.

At temperatures below 200° C., tantalum behaves like a precious metal. It is not attacked by the oxygen of the air nor by acids, with the exception of hydrofluoric acid, but not excepting *aqua regia*. While it is perfectly resistant to aqueous solutions of alkalies, the compact metal is destroyed by fused alkalies. Heated in the air, tantalum begins to oxidize considerably below a red heat and burns, at a higher temperature, to white tantalic oxide, although in a vacuum it will stand the highest white heat. As a material for surgical and particularly dental instruments tantalum has found favor rapidly with practitioners. In chemical laboratories, tantalum dishes are, thus far, the only form in which the metal is used. Its sensibility to oxygen at the higher temperatures and to hydrofluoric acid prohibits a more general use as a substitute for platinum.

EXPERIMENTS ON TANTALUM ELECTRODES

The properties of tantalum described above made it apparent to me, however, that it might be tried appropriately as an electrode material in the electrolysis of metallic salts, especially in electroanalysis, a presumption which experiments have proved to be correct. The electrodes made for me by Siemens & Halske for experimental purposes had the shape and size of the Winkler wire-net electrodes and spirals in general use. However, the cathode was made of a perforated tantalum sheet to suit the convenience of the maker; this practice was, however, discontinued in favor of the wire-net construction.

The experiments reveal that tantalum can be substituted for platinum as cathode material without reserve, while this is not the case with regard to anodes. In the electrolysis of metallic-salt solutions the anode is covered in a short time with dark-blue oxide of tantalum of metallic luster in a tenaciously adhering layer which conducts so poorly that no measurable current will pass through the electrolyte, long before noteworthy amounts of metal have been deposited on the cathode. The increase in weight of the anode amounts to fractions of a milligram; hence the quantity of the tantalum oxide formed only a few milligrams. The blue oxide is insoluble in all acids, including *aqua regia;* hence probably is Ta_2O_4. By rubbing the anode with emery paper the layer of oxide can be removed. If it is desired to use tantalum as anode material and to work with a tantalum cathode and a platinum anode, the tantalum anode may be plated with a thin layer of platinum which can be easily accomplished electrolytically. A coating of a few centigrams of platinum will do. It is even better to use an anode of tantalum wire which is plated with platinum by a process patented by Siemens & Halske.

Silver, copper, platinum and cadmium can be precipitated quantitatively from the usual acid-sulphate solution, zinc from alkaline-zincate solution, nickel and cobalt from ammoniacal-sulphate solution, tin and antimony from their sulphosalt solution, on the tantalum cathode without trouble. The metal precipitates are easily dissolved from the cathode by acid, leaving the tantalum sheet unaltered in luster and weight.

NO ELECTROLYTIC ALLOYING WITH ZINC

Tantalum has even some advantages over platinum as cathode material. For example, zinc and cadmium show no disposition to enter into an alloy with tantalum on its surface, hence, there is no need of the cathode being plated with copper or silver as in the case of a platinum cathode. The insensibility of tantalum to *aqua regia* permits the removal of platinum and gold precipitate by that acid. But even in other cases it is convenient to be able to bring the metals in solution by *aqua regia,* or better, by hydrochloric acid with an addition of a little nitric acid if (for example, for the purpose of separating the electrolytically deposited mixture of nickel and cobalt) it is desired that the metals be present as chlorides.

A further advantage of tantalum over platinum is its greater strength and rigidity which prevents the electrodes from getting out of shape by bending. The difference in price is considerable, that of tantalum being 40% less than that of platinum. Further, the specific gravity of tantalum is 16.6 as against 21.48 of platinum, and the tantalum electrodes may be made much lighter on account of the greater strength of the metal. Hence, there is also a saving in weight of about 30 per cent.

The difference in price between tantalum and platinum electrodes is of importance where, as in metallurgical laboratories, a great number of electrolyses have to be made, side by side, and where a large sum is invested in platinum electrodes. Even in alkali-electrolysis tantalum is not attacked in the least as electrode material; hence it may serve as substitute of platinum in the different types of bleaching electrolyses.

Contractors' Bids

Six bids for improving the Neponsit River in Massachusetts, as stated in the *Excavating Engineer,* were as follows: 32c., 42c., 42.5c., 48c., 48.7c. and 58c. per cu.yd. for moving 130,000 cu.yd. of soft material. For removing 130,000 cu.yd. of hard material, the bids were: 42c. 42.5c., 48.7c., 54c., 55c. and 72c. per cu.yd. There were 100 cu.yd. of boulders to be removed; the successful bidder agreed to do the work for $7.50 per cu.yd., while the other bids were: $6, $8, $10, $13 and $14. The same company agreed to move 800 cu.yd. of "ledge" for $7.50 per cu.yd., as compared with other offers of $8.90, $10, $12, $13 and $14 per cu.yd. of rock.

Colorado Mining Men Make Recommendations

DENVER CORRESPONDENCE

A committee of prominent mining men of Colorado, selected by Governor-elect Ammons, at a meeting of the Chamber of Commerce, reported on Dec. 7, 1912. The report recommends that the governor appoint a state board of mining, consisting of one member from each of the metalliferous mine-inspection districts as now established by law, with the state commissioner of mining as president. This board, if appointed, will have full power to inquire into details of every branch of the industry, and will be required to make an annual report to the governor. An appropriation will be made adequate for the needs of the board.

The committee thinks the Colorado legislature should act in harmony with the legislatures of other states to make a protest against the forest service interfering in mining matters. The assistance of the American Mining Congress is promised in this line.

A "blue-sky" law is favored to prevent unscrupulous promoters from discrediting the mining industry.

A law is favored making it a misdemeanor for any mill operator or smelter to mix, discolor or in any way disguise ore before its value has been agreed upon by buyer and seller.

The present mechanics' lien law was condemned, inasmuch as it makes the owner of a property responsible for all debts contracted by persons working leases on his property. Amendments were recommended doing away with this condition.

Uniform mine taxation throughout Colorado was recommended.

A "drainage district law" was recommended, requiring all parties who profit by new drainage tunnels to pay their share of the cost of the improvement.

A law was also favored extending the principle of eminent domain to aërial trams, electric lines and pipe lines.

Provision was asked for continuing the work of the state geological society.

The committee asked that there be added to the School of Mines a plant for experimental ore dressing, with particular facilities for experimenting upon the treatment of low-grade ores. This school should then be required to make a free analysis of all ores sent in by Colorado miners or prospectors.

The committee favored the bill introduced in Congress by Representative Taylor, seeking the establishment of a plant in the San Juan district for experimenting with low-grade ores. The report was signed by the following: Victor C. Alderson, Philip Argall, John T. Joyce, Arthur H. Roller, S. D. Nicholson, W. G. Swart, Bulkley Wells, T. R. Hendhen, D. W. Brunton, A. P. Aidowel, James T. Smith.

Revision of the Mineral Laws

The American Mining Congress has been attempting for some time to secure a complete revision of the mining laws, and has had a committee in Washington three times during the last year to confer with Senator Smoot, chairman of the Senate Committee on Public Lands.

It appears from the report made by this committee at the Seattle meeting that while Senator Smoot is in favor of revision, unexpected opposition developed in the Senate, and that he felt without the administration's support behind him, he could not push the measure. Attempts to interest Secretary Fisher proved fruitless, except that he recommended the abolition of the apex law in Alaska.

The chief problems to be taken up are: The uncertainties of title and litigation caused by it. The latter includes not only the conflicts caused by the extralateral right, but also those occasioned by the consequent shapes of claims and the overlapping of lines; the creation of a definite procedure for acquiring rights to those claims in which the mineral is not near the surface and where discovery must in consequence be long deferred; tunnel locations and the uncertainties of title caused by them in neighboring claims; the present nonobservance of the law of discovery; the partial or complete nonobservance, through various expedients, of the law of assessment; the location of an unlimited number of claims by one individual; locations by proxy.

A general revision now will be particularly timely because of the public interest in conservation and the new legislation now under consideration, for timber, oil, phosphate and coal lands, and also power sites. To omit the mining code from any program for the betterment of laws relating to natural resources, would be to pass by the field where relief is most urgently needed.

The hope of the Committee of the American Mining Congress is to induce Congress to appoint a committee to investigate the present state of the mining laws. The committee reported on the proposed procedure as follows:

> After Congress has empowered a committee to act, the commitee of the American Mining Congress hopes to have the opportunity of presenting to the committee at Washington, such detailed information and suggestions as may aid in preparing a plan whether for a commission or otherwise, which will be satisfactory to Congress and accomplish the ends desired. It is believed that this may be secured through a wisely selected commission, authorized to draft a revised code for the use of Congress. This commission should hold public hearings in the principal mining centers of the West and Alaska. It should call before it men prominent for their knowledge of prospecting, of claim locations, of mine operating, mine litigation and the history of mining laws and should invite opinions from the public bearing upon the specific points at issue. The authorities and experience of other mining countries should also be consulted and made public and the final recommendations of the commission should be presented to Congress in the form of a fully drafted code.
>
> It is clear that there is a best practical solution for each one of the difficult problems involved in a general revision of the mineral land laws, but in order to determine these best solutions, all opinions must be brought to a focus before some authoritative body which has the power of decision. Moreover, in order to assure the general approval and acceptance of reforms affecting so many varied interests, the personnel of this body should be such as to command confidence and the mining communities should have full opportunities to present their views before it. There is a wealth of learning and practical experience in the country, which is available for the work of framing a revised code, but it is distributed among many men and must be focused by the plan indicated.

Platinum Analysis

The following method is recommended by E. V. Koukline (Rev. Mét., p. 815, 1912; abstr. *Journ.* Soc. Chem. Ind., p. 1036, 1912), who states that none of the methods ordinarily employed will give a complete separation of the platinum from the base metals. Two grams of the ore, contained in a small crucible previously glazed with borax, are heated with a known weight (seven to 10 grams) of pure granulated silver and 10 grams of fused borax; a small piece of charcoal is placed upon the charge which is then maintained at a temperature just above the melting point of silver, until the gangue of the ore is dissolved by the borax, and the metallic particles are inclosed by the molten silver.

When cold, the metal is separated from the borax, heated with dilute hydrofluoric acid to detach the last particles of the latter, washed with water, calcined at a low temperature, and weighed, the difference between this weight and that of the ore plus silver representing the gangue originally present. The silver having been removed from the metallic "button" by treatment with nitric acid, the insoluble residue is treated with *aqua regia*, at 70° C., in a tubulated retort until no further action occurs, the solution is then evaporated practically to dryness, the distillate—which may contain osmium—being collected in a well cooled receiver.

The dry residue having been extracted with hydrochloric acid (sp. gr. 1.12), the insoluble portion is re-treated with *aqua regia*, etc., as described, the process being repeated until the hydrochloric-acid extract of the residue in the retort is no longer colored. The combined hydrochloric-acid solutions plus the final insoluble residue are several times evaporated nearly to dryness with strong hydrochloric acid to expel the last traces of nitric acid, the concentrated solution being finally diluted with hydrochloric acid (sp. gr., 1.12) and filtered through a weighed filter; the insoluble residue—consisting of osmiridium and a portion of the iridium originally alloyed with the platinum—is washed with hydrochloric acid and then with alcohol, after which it is dried and weighed.

Through the filtrate, heated nearly to boiling, a current of pure acetylene is passed for 45 min. to effect a preliminary separation of palladium; the precipitate is filtered off, washed and (the filter having been moistened with ammonium-nitrate solution) ignited; the precipitate is dissolved in *aqua regia,* the solution evaporated just to dryness, the residue taken up with a little water containing one drop of hydrochloric acid, and the palladium re-precipitated from the solution by the addition of mercuric cyanide; the resulting precipitate is successively washed, dried, strongly ignited in air, heated to redness in hydrogen, cooled in carbon dioxide and weighed as palladium. The filtrate from the mercuric-cyanide precipitation having been evaporated to dryness, ignited, re-dissolved in *aqua regia,* evaporated with hydrochloric acid and added to the filtrate from the acetylene treatment, the latter is evaporated nearly to dryness, diluted with water and heated to about 70° C.

A concentrated solution of sodium nitrite (sufficient to form double nitrites with the metals of the platinum group present) is then added, followed by a solution of sodium carbonate, and the liquid boiled for 45 min.; the gold is thus precipitated as metal together with the carbonates or oxides of copper, iron and other common metals present. After filtration the precipitate is treated upon the filter with cold hydrochloric acid, the residue of metallic gold being subsequently ignited and weighed. To the filtrate from the sodium nitrite and carbonate treatment (now containing only the metals of the platinum group) sodium hydroxide is added, the solution is placed in a retort and heated to 70 to 80° C., while a current of chlorine is passed through it to expel the ruthenium (as anhydride) which is collected in hydrochloric acid contained in the receiver.

The ruthenium is determined by evaporating the latter solution to a syrup, diluting with water and precipitating with metallic magnesium which is added a little at a time; the resulting precipitate is washed first with water, then with 5% sulphuric acid and again with water, the filter and contents being finally dried and burned in air at the lowest possible temperature. The residue is subsequently heated to redness in hydrogen, cooled in carbon dioxide and weighed.

The solution from which the ruthenium has been distilled is neutralized with hydrochloric acid and evaporated somewhat, when sufficient sodium nitrite is added to reconvert the double chlorides into nitrites; rhodium and iridium are then precipitated by the addition of nitrite and chloride of potassium, and the precipitate filtered off and washed with a 5% solution of potassium nitrite. The solution obtained by dissolving this precipitate in *aqua regia* is evaporated several times with hydrochloric acid to eliminate nitric acid, and a slight excess of magnesium is added; the precipitated metals (mixed with the excess of magnesium) are washed with water containing hydrochloric acid and subsequently calcined in hydrogen; the magnesium is then removed by treatment with dilute sulphuric acid, the residue is washed with water, and the filter and contents incinerated; the residue is finally heated to incipient redness in hydrogen, cooled in carbon dioxide and weighed as rhodium plus iridium.

The latter are separated by fusing the residue with 50 times its weight of pure lead in a porcelain crucible; the fusion is continued for two hours, the charge being covered with potassium cyanide and stirred occasionally with a glass rod. After removal of the cyanide by solution in water, the lead is dissolved in nitric acid and the insoluble residue treated with boiling *aqua regia* which dissolves the rhodium. The insoluble iridium is filtered off, and after incineration of the filter paper, is ignited in hydrogen, cooled in carbon dioxide and weighed; the rhodium is obtained by difference. The filtrate from the precipitation by potassium nitrite, containing only platinum, is evaporated to dryness with hydrochloric acid, the residue taken up with boiling water, the solution rendered slightly alkaline with sodium hydroxide and then boiled with formaldehyde to precipitate the platinum (as metal) which is finally ignited and weighed.

Ignition of Gas by Incandescent Lights

The Bureau of Mines has been investigating the ignition of gas by standard incandescent lamps (*Tech. Paper* 28). The general method of testing was to bring a mixture of natural gas and air in contact with a hot incandescent filament by smashing the electric bulb by a sudden shock; by snipping off the tip; or by puncturing a hole in the neck. A few tests were made by removing the glass, surrounding the filament with gas, and then impressing the rated potential upon the filament. The tests were made on from 8-cp., 50-volt carbon lamps to 190-watt, 220-volt carbon lamps; and 20-watt, 110- and 220-volt tungsten lamps. The general deduction to be drawn is that while an accident to an incandescent-light bulb may not ignite explosive mine gases, there is great danger that it will, and this likelihood must be recognized in mine legislation.

Dead End Support for Trolley Wires

At dead ends of trolley wires it is customary to connect with the wire, a turnbuckle for pulling out the slack. A wooden or composition strain insulator separates the trolley wire, electrically, from the turnbuckle and hook bolt. The accompanying illustrations show methods of support, described in *Coal Age*, Nov. 16, 1912, which are in use at the Penn Mary coal mines. Fig. 1 shows a ⅝-in. hook bolt, screwed into an expansion anchor in the roof. The hook bolt is made by welding a piece of ⅝-in. diameter stock to a ¾-in. rod. The end of larger diameter is then bent into a hook, the other end being threaded. Because the pull on the expansion anchor is a side strain, the anchor does not tend to pull out. Hence the attachment is reliable and permanent. Another method of dead-ending is shown in Fig. 3, where the pull on the expansion bolt is direct. This is rarely used and is not a desirable form of construction.

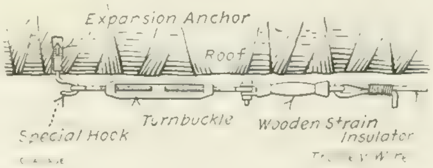

FIG. 1. A DEAD-END WHICH DOES NOT PULL OUT UNDER THE STRAIN

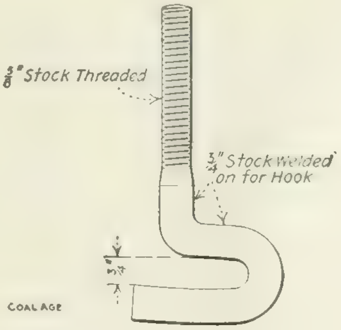

FIG. 2. A HOOK BOLT USED IN SECURING THE ENDS OF TROLLEY WIRES

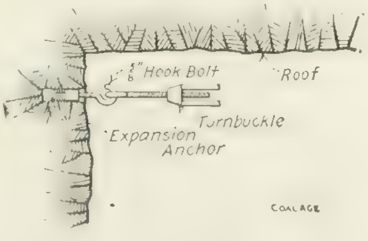

FIG. 3. AN UNRELIABLE DEAD END; PULL ON BOLT DIRECT

Rand's Historic Mines

By A. COOPER KEY*

The government mining engineer for the Union of South Africa has recently prepared a table, showing the record of such Rand mines as have been exhausted or which have, when approaching exhaustion, been absorbed by other companies. The table has no pretentions at being complete, for it takes no account of such historic mines as the Crown Reef and the Henry Nourse, which were absorbed in amalgamations that have constituted so important a phase of recent policy. The difficulty of getting figures in such cases must be recognized.

Ten mines are, however, included in the list of defunct mines, the principal among them being the Ferreira; the Bonanza, well named, as in its palmy days it was the richest mine of the Rand; the Jubilee, named in celebration of Queen Victoria's Jubilee, having been incorporated in 1887; the Salisbury, after Great Britain's prime minister; the Champ D'Or, a somewhat extravagantly named venture, the record of which has scarcely borne out its eloquent title.

CENTRAL RAND RESULTS

What have these mines done? The record for tonnage of ore yielded per claim is held with a large margin by the Jubilee, which extracted nearly a million tons from its 9¾ claims[1], equal to 102,500 tons per claim, thanks largely to the great work of the Main Reef. Second comes the Bonanza, which secured 773,000 tons from 11 claims, or at the rate of 70,137 tons per claim. Consequent upon its greater richness, however, the Bonanza is easily first in the direction of gold recovery and dividends per claim exhausted. The figures for these two mines, as well as for the Pioneer and Ferreira mines, practically adjoining and situated in the heart of the central section of the Rand, are given in the accompanying table.

RECORD OF FOUR DEFUNCT RAND MINES

	Gold per claim	Dividends per claim
Bonanza	£257,656	£126,890
Jubilee	167,318	50,975
Pioneer	202,064	101,508
Ferreira	178,186	71,926

The Pioneer did best in respect of dividends per ton milled, paying to its fortunate shareholders 35s. 9d., as compared with 34s. 3d. distributed by the Bonanza. It should be explained, however, that the Pioneer was an outcrop concern while the Bonanza was a shallow deep-level, its vertical shaft cutting the reef at 770 ft. Neither the Pioneer nor Bonanza figures include the whole of the ore won from the ground. As far back as 1903 the former was sold to the Crown Reef, while the Bonanza was acquired by the Robinson Central Deep; the assets of the purchasing companies have since passed to the Crown Mines. When transactions of this nature have taken place it is difficult to obtain absolute figures. Similarily the Ferreira, after acquiring the Worcester company, was in March last purchased by the Ferreira Deep. The Jubilee and Salisbury have retained their identity up to the time of exhaustion.

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*Editor, South African Mining Review, Johannesburg, South Africa.

[1] A Transvaal mining claim is 100x150 ft., and holders are not entitled to follow the reef beyond these limits

So much for Central Rand data. To the east the Geldenhuis Main Reef produced 38,000 tons, equal to £62,349, and the Stanhope, 40,000 tons, representing £78,374 per claim exhausted. Since 1903 the Stanhope has been worked under the names of the Burham, the Cotteswold and the Celine. A Rand mine may be said to die hard; this one was finally closed down in January last, and the figures given apply to that date.

MARKET AND INTRINSIC VALUATIONS

The inquiry is pursued into a comparison of the market values of shares at each year end, with intrinsic values calculated by capitalizing on a 6% remunerative and a 3% accumulation rate, all dividends paid on or subsequent to such dates. Such is, of course, an exact determination after the facts are known, obviously a different matter to the calculation of present value at a date years anterior to the exhaustion of the area.

The glamor of initial returns caused the public to overvalue Bonanza shares. It made its first distribution in 1897, and in 1902 paid no less than 115%, but its last dividend was in 1906. On the strength of satisfactory distributions, the shares were in 1901 and 1902 valued at £6, whereas the intrinsic values were just under 4 and about 3⅛, respectively.

FLUCTUATIONS FOLLOWING THE ANGLO-BOER WAR

One must not forget that the conclusion of the Anglo-Boer War hoisted the price of shares for reasons which were largely sentimental in character. From a market value double the intrinsic in 1903, there came a sharp appreciation of the mines' more reasonable possibilities, a realization that this state of splendor could not last indefinitely. For four years there was a remarkable approximation in the two sets of figures. The margin was only one of pence, until the price fell to 30s. In 1907 the quotation was 40% below the intrinsic value.

In 1902 the shares of the Jubilee mine were changing hands at 6¼, which meant that the 50% dividend was being purchased on an 8% basis, life considerations being overlooked, although the company had less than 10 claims to start with, and had been working and paying good dividends for a dozen years. For seven afterward, it paid 50% per year. When people were giving the price quoted, the intrinsic value was but 52s. 6d. Even with the quotation dropping, a sovereign or more a year after a distribution of 10s., the price in 1905 was half as much again as the intrinsic value; in 1908 it was more than twice as great, though there had been a fairly close approximation a year previous. In 1909, the price was no less than 36s. 3d., whereas the intrinsic value was a paltry five shillings.

In 1903, 1904 and 1905, the market price of Salisbury shares was substantially above that justified on intrinsic merits. Later a reversal took place. But another swing of the pendulum occurred in 1908. There were hopes of making good profits out of low-grade ore left in earlier working and the quotation advanced to 26s., or double the intrinsic value of eventual dividends. Later on the price was four times the intrinsic appraisement. It is true that both the Jubilee and Salisbury have outside assets, which represent about 13s. 6d., and 6s. per share on cost, but this fact does not account for the disparity.

THE HISTORIC FERREIRA MINE

Comparison of prices of the historic Ferreira mine is of particular interest. It must be explained that the intrinsic value is based on dividends, and thus ignores the interest of 95,000 shares in the Ferreira Deep constituting the purchase price. This represented about £4 per share, and would go far to justify the difference in the two sets of figures last year. A full comparison is given in the accompanying table.

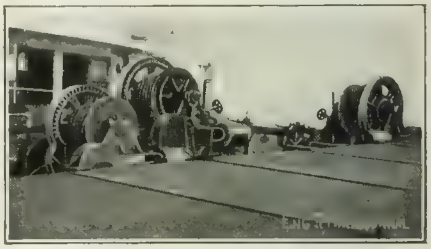
COMPARATIVE DATA OF FERREIRA MINE

	Market Value		Intrinsic Value		
	£	s	£	s	d
1902	24	5	19	9	8
1903	19	15	19	3	6
1904	24	0	18	6	7
1905	19	5	17	0	9
1906	19	15	15	7	10
1907	16	15	13	19	9
1908	16	0	11	8	10
1909	19	10	7	1	11
1910	10	5	3	8	0
1911	4	15	1	0	0

It will be observed that the price of Ferreira was higher in 1909 (when there was great share-market activity) than in 1905, and virtually the same as in 1903. But in the four years, to take the shorter period, the intrinsic value had dropped no less than £10, upward of £14 having been paid in dividends. In 1909 came the sharp awakening. The lesson of all these figures is that in times of market excitement, intrinsic values go "by the board," and that shareholders in comparatively short-lived mines do not start early enough to write down their capital. It is a great lesson in mining finance and should be thoroughly learned by purchasers of shares.

Safeguarding Machinery

Although a good deal has been said recently about the general movement underway to safeguard employees around mine plants and mills, perhaps a general impression exists that such precautions only are taken around mining machinery proper. It will be remembered that within the last few months the United States Steel Corporation has been making special efforts in this direction at its various works. The accompanying illustration shows to what extent the idea has been carried out. The battery of steam winches shown are on the deck of one of the Corporation's largest lake ore carriers. Most parts are in some way covered. A wide band of stiff steel covers the geared wheel, and metal housings cover such parts as cranks, piston rods, etc. Such protection as these afford, could easily be applied to many small pieces of mine machinery, without appreciably adding to the cost.



GUARDS AROUND MOVING PARTS TO PROTECT WORKMEN

Prospecting Waning in Transvaal

Statistics issued by the Union Department of Mines and published in the *South African Mining Journal,* Nov. 16, 1912, seem to indicate that prospecting activity is on the wane in the Transvaal. At the end of 1911 there were 925 prospecting permits in force in the province. At the end of June, 1912, this number had declined to 814, and during the succeeding three months was further reduced to 690. Similarly the number of claims held under prospecting title exhibits a decline from 89,577 at Dec. 31, 1911, to 79,796 at June 30, 1912, and 77,754 at Sept. 30, 1912. This decline may be only temporary, but the mineral discoveries of recent years have been most disappointing.

Nodulizing Iron Ores

According to experiments tried by the late Tom Cobb King (U. S. pat. 995,542), a temperature of about 1500° F. is required for the complete desulphurization of pyrite cinder, while a temperature of over 2000° F. is required for the nodulizing sintering. Moisture is said to assist in the process, and he advised moistening all fines before nodulizing.

Mining and Metallurgical Patents

A Classified List of New Inventions

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by "The Engineering and Mining Journal" upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COPPER

CONVERTERS—Repairing Converters. E. A. C. Smith, Baltimore, Md. (U. S. No. 1,044,587; Nov. 19, 1912.)

REFINING—Improvements in Manufacturing and Refining Copper Alloys. W. S. Rockey and H. Eldridge, New York. (Brit. No. 4409 of 1912.)

REFINING—Improvements in the Process of Fusing and Purifying Copper. W. S. Rockey and H. Eldridge, New York. (Brit. No. 4410 of 1912.)

GOLD AND SILVER

CLASSIFIER. Philip Argall, Denver, Colo. (U. S. Nos. 1,044,844, and 1,044,845; Nov. 19, 1912.)

CYANIDING — Filtering Apparatus. James Millar Neil, Toronto, Ont. (U. S. 1,045,095; Nov. 19, 1912.)

CRUSHING—Quartz Mill. Hiram S. Rankin, Cripple Creek, Colo., assignor to Rankin Quartz Mill Co., Indianola, Neb. (U. S. No. 1,044,571; Nov. 19, 1912.)

DRY CONCENTRATOR. Jacob Wagner, Los Angeles, Calif., assignor of one-half to Max Factor, Los Angeles, Calif. (U. S. No. 1,045,478; Nov. 26, 1912.)

IRON AND STEEL

ALLOY of Iron, Copper, Nickel and Aluminum. John Frederick Duke, Manchester, England. (U. S. No. 1,044,761; Nov. 19, 1912.)

CRUCIBLE FURNACE. Wilhelm Buess, Hanover, Germany. (U. S. No. 1,044,012; Nov. 12, 1912.)

FURNACE — Metallurgical Furnace. Horace E. Smythe, Pittsburgh, Penn., assignor to S. R. Smythe Co., Pittsburgh, Penn. (U. S. No. 1,042,047; Oct. 22, 1912.)

FURNACE-CHARGING BOX. John Allison, Dravosburg, and Gustav A. Hassel, McKeesport, Penn., assignors to Pittsburgh Steel Foundry, Pittsburgh, Penn. (U. S. No. 1,044,842; Nov. 19, 1912.)

FURNACES—Improvements in Reversible Regenerative Gas Furnaces. A. Reynolds, London, Eng. (Brit. No. 16,041 of 1911.)

GAS PURIFICATION—Method of and Apparatus for Treating Gases. Ambrose N. Diehl, Duquesne, Penn. (U. S. No. 1,045,003; Nov. 19, 1912.)

OPEN - HEARTH FURNACE — Air-Cooled Open-Hearth Furnace. Henry Knoth, Monterey, Mexico. (U. S. No. 1,044,788; Nov. 19, 1912.)

REGENERATIVE FURNACE. Moritz Weiss, Resica, Austria-Hungary. (U. S. No. 1,045,650; Nov. 26, 1912.)

TUYERES—Eyesight-Plate for Tuyeres. James B. Rogers, Ashland, Ky., assignor of one-half to Patrick Meehan, Lowellville, Ohio. (U. S. No. 1,045,189; Nov. 26, 1912.)

VANADIUM CASTINGS—Manufacture of Vanadium Cast Iron. Frederick W. Stickle, Newington, Conn. (U. S. No. 1,046,232; Dec. 3, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINUM—Treatment of Surfaces of Aluminum or Its Alloys for the Deposition of Metals Thereon. Quintin Marino, Golders Green, London, England. (U. S. No. 1,045,718; Nov. 26, 1912.)

MANGANESE—Improvements in the Treatment of Manganese Ores with a View to the Metal Therein Contained. Isabellen-Hutte, G. m. b. H., Dillenburg, Germany. (Brit. No. 8400 of 1912.)

ZINC—Filtering Apparatus. Percy Claude Cameron Isherwood, Leytonstone, Eng., assignor to Refractory Zinc-Ore Treatment Co. (U. S. No. 1,043,939; Nov. 12, 1912.)

NONMETALLIC MINERALS

ABRASIVE—Composition for Making Grindstones, Consisting of Cement, Ground Quartz and Washed Sand. Robert Irving Dowd, Beloit, Wis. (U. S. No. 1,045,531; Nov. 26, 1912.)

CRYOLITE-RUTILE Composition. Ernest Kraus, Lynn, Mass., assignor to General Electric Co. (U. S. No. 1,045,985; Dec. 3, 1912.)

PHOSPHATE—Electric Furnace for Producing Oxides of Phosphorus from Natural Phosphates. Frank S. Washburn, Nashville, Tenn. (U. S. No. 1,044,957; Nov. 19, 1912.)

MINING—GENERAL

CONVEYOR. Thomas A. Edison, Llewellyn Park, Orange, N. J. (U. S. No. 1,041,756; Oct. 22, 1912.)

DRILL-CHUCK. Robert M. Reay, Massillon, Ohio. (U. S. No. 1,045,886; Dec. 3, 1912.)

DRILLING — Rock-Drilling Machine. Paul Lange, Brieg, near Breslau, Germany. (U. S. No. 1,044,790; Nov. 19, 1912.)

DUMP CAR. Frank S. Ingoldsby, St. Louis, Mo., assignor to The Ingoldsby Automatic Car Co., Cleveland, Ohio. (U. S. No. 1,046,191; Dec. 3, 1912.)

DUMPING CAR. John Karhu, Calumet, Mich., assignor of one-half to Richard T. Looney, Hancock, Mich. (U. S. No. 1,046,602; Dec. 10, 1912.)

EXCAVATING DIPPER. Albert E. Park, Minneapolis, Minn. (U. S. No. 1,047,135; Dec. 10, 1912.)

EXCAVATING MACHINE. Le Roy K. Sherman, Chicago, Ill. (U. S. No. 1,044,090; Nov. 12, 1912.)

EXCAVATION — Clam-Shell Bucket. Lewis J. Robb, Pittsburgh, Penn., assignor to Heyl & Patterson, Inc., Pittsburgh, Penn. (U. S. No. 1,046,334; Dec. 3, 1912.)

EXCAVATOR—Slack-Cable Excavator. Alvah D. Hadsel, Philadelphia, Penn., assignor to Cable Excavator Co., Philadelphia, Penn. (U. S. No. 1,045,973; Dec. 3, 1912.)

GRAB BUCKET. Albert J. Albrecht and Samuel H. Conklin, Florence, N. J. (U. S. No. 1,043,749; Nov. 5, 1912.)

HOISTING—Safety Appliance for Pit Cages, Lifts, and the Like. George William Lester, Bangor, England. (U. S. No. 1,043,323; Nov. 5, 1912.)

LAMPS — Improvements Relating to Miners' Lamps. T. Heaton, Wigan, Eng. (Brit. No. 239 of 1912.)

MINE POST. Reinhold H. Weber, Athens, Ohio, assignor to Jeffrey Manufacturing Co. (U. S. No. 1,046,517; Dec. 10, 1912.)

PROPS—Improvements in Props or Stemples for Mines. W. Reinhard, Crefeld, Germany. (Brit. No. 27,415 of 1912.)

PROSPECTING BY WIRELESS WAVES—Method of Locating Subterranean Strata. Heinrich Löwy, Göttingen, Germany. (U. S. No. 1,045,575; Nov. 26, 1912.)

SAND SEPARATOR for Pumps. Arthur P. Silliman and John F. Lindberg. (U. S. No. 1,044,091; Nov. 12, 1912.)

SHAFT-BORING OR TUNNELING MACHINE. William F. Wittich, Erie, Penn. (U. S. No. 1,046,927; Dec. 10, 1912.)

ORE DRESSING—GENERAL

CLASSIFIER. Harry L. Neall, Medford, Ore. (U. S. No. 1,047,106; Dec. 10, 1912.)

CONCENTRATOR — Pan-Motion Belt-Concentrator. Karl Senn, Alameda, Calif. (U. S. No. 1,044,697; Nov. 19, 1912.)

CRUSHER. Oscar Clarence Beach, Los Angeles, Calif., assignor to F. W. Braun, Los Angeles, Calif. (U. S. No. 1,045,499; Nov. 26, 1912.)

CRUSHER. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. No. 1,044,596; Nov. 19, 1912.)

CRUSHING—Improvements in Crushing Machines. E. B. Symons, Milwaukee, Wis. (Brit. No. 25,137 of 1911.)

CRUSHING—Ore Crusher. Enos A. Wall, Salt Lake City, Utah. (U. S. Nos. 1,044,832 and 1,044,833; Nov. 19, 1912.)

CRUSHING—Roll Crushing Machine. Thomas Leggett Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,045,454; Nov. 26, 1912.)

FLOTATION PROCESS—Separation of Metallic Sulphides from Sulphide Ores. Thomas John Greenway, Armadale, near Melbourne, Victoria, Australia, assignor to Potter's Sulphide Ore Treatment, Ltd., Melbourne, Australia. (U. S. No. 1,045,970; Dec. 3, 1912.)

MAGNETIC SEPARATOR. George Ullrich, Broken Hill, N. S. W., Australia. (U. S. No. 1,046,685; Dec. 10, 1912.)

SEPARATION—Machine for Separating Metal from Ores. Charles Ross, Denver, Colo. (U. S. No. 1,045,083; Nov. 19, 1912.)

SEPARATION—Process of Separating Ores. Alfred Arthur Lockwood, London, Eng., assignor to Murex Magnetic Co., Ltd., London, Eng. (U. S. No. 1,043,850; Nov. 12, 1912.)

SEPARATION—Process of Separating Ores, Etc. Alfred Arthur Lockwood, London, Eng., assignor to Murex Magnetic Co., Ltd., London, Eng. (U. S. No. 1,043,851; Nov. 12, 1912.)

METALLURGY—GENERAL

BAFFLE PLATE for Chimneys. Zigler Hoenstine, Anaconda, Mont. (U. S. No. 1,043,837; Nov. 12, 1912.)

CHARGING Device for Gas Producers and Other Furnaces. Heinrich Bittmann, Frankfort-on-the-Main, Germany, assignor to Corporation of Metallbank & Metallurgische Gesellschaft A. G., Frankfort-on-the-Main, Germany. (U. S. No. 1,045,768; Nov. 26, 1912.)

CRUCIBLES—Improvements in Crucibles Used in Metallurgical and Similar Furnaces. S. N. and E. R. Brayshaw, Manchester, Eng. (British No. 15,628 of 1912.)

ELECTRIC FURNACES—A Process for Carrying Out Gas Reactions in an Electric Furnace. A. Helfenstein, Vienna, Austria. (Brit. No. 2637 of 1911.)

GASES—Treating Furnace Gases. Utley Wedge, Ardmore, Penn. (U. S. No. 1,046,915; Dec. 10, 1912.)

PRODUCER GAS—Method of Making Hot Producer Gas. Emil Fleischer, Dresden-Altstadt, Germany. (U. S. No. 1,041,058; Oct. 15, 1912.)

REDUCTION FURNACE. Arvid W. Ekstrom, Los Angeles, Calif. (U. S. No. 1,044,763; Nov. 19, 1912.)

ROASTING — Metallurgical Furnace. Utley Wedge, Ardmore, Penn., assignor to The Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,040,071; Oct. 1, 1912.)

ROASTING — Ore Roasting Furnace. Thomas Edwards, Ballarat, Victoria, Australia. (U. S. No. 1,036,814; Aug. 27, 1912.)

SINTERING FURNACE. Milton Henry Kauffman, Denver, Colo. (U. S. No. 1,045,853; Dec. 3, 1912.)

SMELTER SMOKE—Means for Recovering Dust and Other Materials. Charles Ebenezer Goodrich, Daggett, Calif. (U. S. No. 1,041,617; Oct. 15, 1912.)

SULPHATES—Process for the Reduction of Sulphates. Vittorio Bollo and Ettore Cadenaccio, Genoa, Italy. (U. S. No. 1,045,769; Nov. 26, 1912.)

SULPHIDE ORES—Improvements in or Relating to the Treatment of Sulphide Ores. E. A. Ashcroft, Balestrand, Norway. (Brit. No. 24,170 of 1911.)

WATER JACKET. Henry C. Holthoff, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,047,055; Dec. 10, 1912.)

WELDING—Portable Electric Welding Tool. John W. Sheffer, Berwick, Penn., assignor to American Car & Foundry Co., St. Louis, Mo. (U. S. No. 1,045,332; Nov. 26, 1912.)

Alabama Consolidated Coal and Iron Co.

The reorganization plan of the Alabama Consolidated Coal & Iron Co. is based on raising $750,000 from the present stockholders, $375,000 from each class. The balance of the cash necessary to wipe out the floating debt will be raised by the sale of a new first preferred stock (the present preferred becomes a second preferred), and new 6% 20-year bonds. Each preferred stockholder will pay $30 per share and on deposit of 100 shares of stock and payment of $3000 would receive:

First preferred	$2,500
New Bonds	500
New second preferred	10,000
New common	4,000

Each common stockholder is to pay $15 per share and on deposit of 100 shares of common stock and payment of $1500 would receive:

First preferred	$1,250
New Bonds	250
New common	10,000

Under the present bankruptcy proceedings the assets of the company will shortly be put up at auction, and the committee hopes to have enough money to bid in the property for the benefit of the present stockholders.

The financial position before and after reorganization is shown in the accompanying table.

CAPITAL LIABILITIES OF THE ALABAMA COAL & IRON CO.

	Before Reorganization	After Reorganization
First 6% Bonds (Overdue)	$406,000	$406,000
First Consol. 5's (Issued)	1,663,000	1,663,000
Floating Debt	1,150,000	
New 6%, 20-Year Bonds	....	800,000
First Preferred Stock	....	625,000
Second Preferred Stock	1,250,000	1,250,000
Common Stock	2,500,000	3,000,000
	$6,969,000	$7,744,000

A Sulphur Operation in New Zealand

A correspondent of the London *Mining Journal* writes that a syndicate, representing Australian, British, Canadian and other capital, has purchased White Island, a conical island in the Bay of Plenty, New Zealand, for sulphur mining purposes. The island is the summit of a dormant volcano, arising out of deep water. It is on one of the lines of weakness which strike transversely across the North Island, through the Hot Lakes district, and the pumice zone. The activity, extending seaward about 30 miles (if not more), found a vent in what is now White Island. On it is a lake of strong mineral water, which is fed by geysers and boiling springs; it is the crater of the old volcano. Various attempts have been made to work the sulphur deposit, but the new owners evidently mean business, and will import all the necessary plant. The former owner states that it is estimated that there are 750,000 tons of sulphur on the island.

November Oil Dividends

The dividends paid by California oil companies for the month of November total $673,448. Adding the Mexican Petroleum, Ltd., preferred and common, swells the total to $1,073,448. The accompanying table shows the list as made public, says the San Francisco *Chronicle*.

Amalgamated	$1 00	$50,000
American Pet. pfd	0.005	8,755
American Pet. common	0 00 1–3	39,607
Caribou	0.00 1–3	8,070
Central	0.0075	7,500
Claremont	0.01	5,000
Del Rey	0.005	3,928
Empire	0.40	80,000
Home	0 01	5,000
Monte Cristo	0.025	12,500
Mount Diablo	0.015	7,500
New Pennsylvania	0.005	5,000
Paraffine	0.01	3,000
Record	0.01	5,000
Republic	0.12	60,000
S. F. and McKittrick	0.01	5,000
Sauer Dough	0.0075	2,992
Section Twenty-five	0.50	20,000
State Consolidated	0.01	5,000
Traders	0.006	9,000
Union Oil	0.006	194,743
Union Provident	0.006	91,402
United Petroleum	0.006	48,457
W. K	0 02	10,000
Western Union	0.005	5,000
Total Cal		$673,449
Mex. Pet. Ltd. pfd	0.00 2–3	80,000
Mex. common	0 001	320,000
Grand total		$1,073,449

George Burnham

George Burnham, Sr., Philadelphia, Penn., formerly a partner in Burnham, Williams & Co., Baldwin Locomotive Works, and an associate of Matthias W. Baldwin, the founder of the works, died Dec. 10, aged 95 years. Mr. Burnham became identified with the Baldwin Works in the early days of locomotive building, and in 1867, following the death of Mr. Baldwin, became a member of the firm, then styled M. Baird & Co. On Mr. Baird's retirement, in 1873, Mr. Burnham became senior member of the firm then known as Burnham, Parry, Williams & Co., and later as Burnham, Williams & Co., which continued until the incorporation of the business in 1909 as the Baldwin Locomotive Works. Mr. Burnham's connection with the industry covered 73 years. He was born at Springfield, Mass., and when about 15 years of age went to Philadelphia. He leaves two sons and a daughter.

Zinc-Barium Paints

As is well known, lithopone is produced by the double precipitation of zinc sulphide and barium sulphate. In the *Revue des Produits Chimiques*, Sept. 1, 1912, G. Krüger calls attention to the fact that zinc sulphide and barium sulphate when precipitated separately and then mixed, do not give the same results as the lithopone. He says the compounded pigment is not of as uniform a white as the lithopone; has a greater tendency to blacken, does not work so well under the brush, has not so great a covering power, and does not last so well.

Wolverine Copper Co.

The report of the Wolverine Copper Mining Co. for the year ended June 30, 1912, shows a production of 9,408,960 lb. of copper, which sold for $1,327,031. The working expenses at the mine were $635,148; melting, freight and all other New York expenses, $78,702, leaving a net profit of $613,181. From this $540,000 dividends were paid, leaving $73,181 to be carried to surplus account, which now stands at $746,520.

The rock hoisted amounted to 414,544 tons; the rock stamped to 401,308 tons, from which 12,164,780 lb. of mineral were produced, giving the 9,408,960 lb. of copper as above mentioned. The yield of copper was consequently 23.45 lb. per ton. The cost per ton of rock hoisted was $1.53; the cost per ton of rock stamped, $1.58. The cost per pound of refined copper at the mine was 6.75c., while the total cost of refined copper was 7.586c. per lb. Shaft sinking in 1912 amounted to 541 ft.; drifting to 3779 ft. and crosscutting to 514 ft. Openings on the Kearsarge lode were in about the same grade of ground as in previous years, except on the 35th and 36th levels, between Nos. 3 and 4 shafts, where the vein was not so continuously mineralized as in the levels above. Work on the Osceola lode, consisting of 516 ft. of shaft sinking, 669 ft. of drifting, and 795 ft. of diamond drilling, was disappointing, as nothing of value was encountered. The vein is wide and well defined, but is mineralized in spots too widely scattered to give it commercial value. A drift was driven 82 ft. north of the Old Colony amygdaloid lode, but nothing of value was disclosed by this work. However, more work must be done at this point before any definite conclusion as to commercial value can be reached. General conditions of the mine and reserves of stoping ground created during the last year give promise of satisfactory returns for the year to come.

Manufacture of Mangano-Silicon

Mangano-silicon is manufactured now from rhodonite, according to *l'Echo des Mines*, Nov. 21, 1912. Three thousand kilograms of rhodonite are heated with 500 kg. of coke. Ninety kilograms of electrodes are consumed in the process, and 5400 kilowatt-hours of electric energy are required per metric ton of mangano-silicon produced. The slag, it is said, can be employed for the production of a 50% ferrosilicon containing some manganese.

PERSONAL

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

H. C. Miller, of Saginaw, Mich., is now at Berkeley, Calif.

C. T. Nicholson, of San Francisco, is in the East on business.

Corey C. Brayton has returned to San Francisco from Nome, Alaska.

Franz Cazin, of Denver, Colo., has left for Mexico on professional work.

C. P. Perin sails this week for India, where he has professional engagements.

L. F. S. Holland has returned to Telluride, Colo., from Arizona and Nova Scotia.

John G. Kirchen, manager for the Tonopah Extension Co., has been visiting in San Francisco.

C. H. Macnutt is visiting some of the principal mining districts in the United States, Canada and Mexico.

F. H. Pettingell, of Colorado Springs, will make his headquarters at Los Angeles, Calif., during the winter.

Robert E. Cranston sails on Dec. 28 for Brazil, where he is going to direct an extensive exploration of mineral resources.

A. Hulshoff Pol left San Francisco for the Dutch East Indies on Dec. 7, and will visit the mining districts of Sumatra and Celebes.

Frank H. Johnson, supervisor of labor for the Illinois Steel Co., at its South works, has resigned and will remove to Pittsburgh.

Arthur W. Burgren is with the American Smelters' Securities Co., as engineer of the Dolores mines at Matehuala, San Luis Potosi, Mexico.

C. B. Lakenan, general manager of the Nevada Consolidated and the Steptoe Smelter, McGill, Nev., was married Dec. 17 to Mrs. Floribel White.

M. N. Colman has returned to San Francisco from Costa Rica, where he has been constructing a cyanide plant for the Panama & Costa Rica Mining Co.

W. Weston, Denver, Colo., has gone to Arizona and California on professional business. He will make his headquarters at La Jolla, Calif., for the next 30 days.

A. R. Campbell, formerly superintendent of the Needles Smelting & Refining Co., at Needles, Calif., is now assistant manager of the American Zinc, Lead & Smelting Co., at Dearing, Kan.

W. W. Johnson, president of the Union Construction Co., has returned to San Francisco from Alaska, where he has been during the past mining season superintending the operation of the York Dredging Co.'s tin dredge.

J. N. M. Shimer, late of L. & R. Wister & Co., Philadelphia, and general manager for the receiver of the Dunbar Furnace Co., has associated himself with Shimer & Co., having offices in Philadelphia and Pittsburgh.

Ambrose G. Todd, Dr. J. R. Jacoby and Sidney Abenheim were recently elected directors of the New York & Honduras Rosario Mining Co., to succeed L. F. Valentine, William Kengel and Ernest Shernikow. The annual report will be issued in the near future.

J. Nelson Nevius, after attending the meeting of the California Miners' Association at San Francisco, left for Kennett to study the bag-house system of fume control at the plant of the Mammoth Copper Co., in the interest of the Los Angeles Chamber of Mines and Oil.

Howard C. Holmes, of San Francisco, has been appointed consulting engineer of docks and waterfront construction for the Panama-Pacific Exposition. Mr. Holmes was formerly chief engineer of the California State Board of Harbor Commissioners, and has been a director of the Mechanics' Institute of San Francisco.

W. H. Lewis, general superintendent of the Aliquippa works of the Jones & Laughlin Steel Co., will retire Jan. 1 and will be succeeded by F. B. Hufnagel, at present general superintendent of the company's South Side works in Pittsburgh. Mr. Lewis will leave for California about Jan. 15 to take a much needed rest and recuperate his health.

Okura Okoshi, chief electrical engineer for the Japanese government on the island of Formosa, recently spent two days in an inspection of the work being done in the electrification of the Butte, Anaconda & Pacific R.R. between Butte and Anaconda. Mr. Okoshi is making a tour of the United States for the purpose of gathering data to be used in building an electric railroad in Formosa.

OBITUARY

Thomas E. Jones died, Oct. 27, at Round Valley, Inyo County, Calif. He was born in Wales in 1836, came to America in 1858 and worked in coal mines in Pennsylvania. He went to California by way of Nicaragua, arriving in 1863, and was a member of the Walker filibuster expedition. He mined on the Comstock, and also in California mining districts, but since 1870 had been engaged solely in farming. He planted the first wheat in Inyo County.

William O. Madden died at Goldfield, Nev., Dec. 17, aged 61 years. He had been a miner for many years, and was one of the pioneers of the Goldfield district. In the boom days of the Comstock he was employed on the Consolidated Virginia, and later went to Grass Valley, Calif., where he was superintendent of the Brunswick. At Goldfield he was superintendent of the Florence and Little Florence. Several years ago he retired from active work on account of failing health. He leaves a widow and five children.

Isaac Copeland died at Alameda, Calif., Nov. 17, aged 68 years. He was born in Nova Scotia and went to California about 44 years ago. He was for many years engaged in mining in Calaveras, Tuolumne, Plumas and Sierra Counties.

Elias Crandall died at Jackson, Ohio, Dec. 8, aged 82 years. He was born in New York and went to Ohio when a young man. In 1851 he secured employment with Empire and Junior charcoal furnaces in Scioto County, Ohio. Some years afterward he became superintendent of those furnaces, continuing in that capacity until he removed to Jackson, Ohio, in 1873. At that time the Globe Iron Co. was organized and purchased Globe and Fulton furnaces, of which Mr. Crandall became superintendent. He continued in the active management of the business until the time of his death. His long experience had covered the manufacture of pig iron with charcoal, with raw bituminous coal and with coke. He served in the Ohio State Senate for two terms. He leaves a widow and two daughters.

Cyrus Elder, at one time prominent in politico-economical circles and widely known by American manufacturers, died at Philadelphia, Penn., Dec. 14, aged 79 years. He was born in Somerset, Penn., in 1833, admitted to the bar in 1856, served in the Union army in 1861-2, and engaged in the practice of law at Johnstown, Penn., in 1863. He became solicitor and general agent of the Cambria Iron Co., now Cambria Steel Co., and continued as such until 1901, when he retired from business. During this period, he was interested in political economy and for several years was secretary of the Industrial League, whose headquarters were in Philadelphia, and acted as editor of its publications. He was an advocate of the protective policy and wrote numerous pamphlets as well as a few more ambitious arguments in its support. He also wrote many poems, some of which were collected and published in book form. He took a deep interest in local affairs and organized the Johnstown Savings Bank, Cambria Mutual Benefit Association, Cambria Public Library, and Union Benevolent Association. He lost his wife and daughter in the memorable Johnstown flood of 1889. His wife was a sister of James M. Swank, the eminent statistician. For the past few years he resided in Philadelphia. He leaves two sons and a daughter. His eldest son, George R. Elder, Easton, Penn., is vice-president and general manager of the Ingersoll-Rand Co.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Dec. 18—The farmers' protective associations in Shasta County and in Amador, Calaveras and San Joaquin Counties have renewed their complaints against the copper smelteries. The Shasta County association has elected new officers because it was contended that the former officers had been derelict in duty. The new officers will endeavor to close the Mammoth smeltery permanently, unless, possibly, a demand for damages may be met satisfactorily. The farmers in Amador, Calaveras and San Joaquin Counties who complain of the Penn Mining Co. smeltery at Campo Seco are not satisfied with the results of the experiments that are still in progress, and declare they are suffering damages the same as caused their complaints a year ago.

In the agreement of sale of the controlling interest in the Union Oil Co. of California to the General Petroleum Co. it is stated that the minority stockholders will be protected, the personnel of the Union organization will remain unchanged and the policy maintained. The head office will remain in Los Angeles. None of the majority shares covered by the option are to be delivered to the purchaser until all the minority shares, which are not a part of the option, shall be afforded equal opportunity to participate in the sale. The Stewart family shares are not included in the option, but will continue to be a part of the corporation. The same price will be paid by the purchasers for the minority as for the majority shares. The United Petroleum and the Union Provident are included in the deal, the latter company being the holder of more than 50% of the stock of the Union Oil Co. of California; $500,000 of the purchase price has been paid, and the agreement calls for payments of $100,000 on Apr. 1, 1913, and an equal amount every three months thereafter until $1,000,000 is paid, when the purchasers are to pay the balance, $19,000,000, of the price. Robert Watchorn is said to receive $1,000,000 for the option.

The reported strike of high-grade ore in the Chipps mine at Sierra City, Sierra County, is worthy of attention for the twofold reason that it is in a producing district and in a community not easily excited by rich finds of gold-bearing quartz. The mine has been a producer, but was allowed to remain idle for a number of years, as has been the case with many producing mines in Sierra and other counties through lack of proper methods of operation and inability to economically take care of low-grade while exploring for richer ore. The Chipps mine is now owned by the Swastika Mining Co., composed of Eastern men, for whom Lawrence Holley, of Sierra City, is superintendent. The new shoot of ore was found in the lowest workings and at some distance from the old pay shoot. Sierra County has long been handicapped by lack of transportation, and the whole county is practically shut in during the winter season, though neither fact has wholly discouraged development and production. Should the present strike prove to make a permanent mine, there will be some encouragement for the hope of improved transportation facilities. If the find is a mere pocket, the people of Sierra County will not be long in making the fact known. A fake boom is not likely to be started.

Denver

Dec. 20—A curious enactment happened at the recent election in Colorado wherein the people voted overwhelmingly for one law for miners, and then killed it by passing another measure by a small majority. One measure was the "eight hours for miners," a referred bill; the other was "to limit the hours of employment in mines," an initiated bill. The former passed by a vote of nearly two to one, while the second received a majority of only 3751. The former provided that an employer who required an employee to work more than eight hours in 24 should be subject to fine and imprisonment, but it appears that the latter bill also passed and while practically a duplicate of the eight-hour law, it has two additions to it. One of these is a qualification making the law applicable only to those underground workers who are in constant contact with noxious fumes. The other is a sentence included in the enactment paragraph, stating, "This bill shall repeal the so called eight-hour law for miners passed by the last General Assembly."

Mine operators declare that the enforcement of the eight-hour law would mean the reduction of the output of coal mines, etc., by 20%, or a 20% increase in the number of employees, with a resultant increase in the cost of the product to the consumer.

For more than a year plans have been made for merging some of the big producing mines of the Cripple Creek district into a $30,000,000 holding corporation, the El Paso Consolidated Gold Mining Co. being the leader in the movement. It is now announced that the preliminaries have been definitely arranged. Other mines talked of as being acquired by the new company are the Mary McKinney, Henry Adney and Golden Cycle. Last summer Pierre Eugene Caplane, vice-president of the Bank Intermediare of Paris, and A. Ehlinger, of Switzerland, became interested in El Paso and visited the property. The capital stock was changed from $1 to $5 par value and the headquarters of the company was moved from Colorado Springs to Denver; the stock was listed on the New York Exchange, Joseph Walker & Sons being named as the brokers for the company. The company's engineer has just completed a report on the mine, the collecting of the data for which took him and eight assistants two months to make. On this report, it is stated, depends the erection of a mill of 500 tons daily capacity.

The Denver & Salt Lake R.R. Co., with a capitalization of $10,000,000, has now been incorporated under the laws of Colorado with powers to acquire all the properties and franchises of the Denver Northwestern & Pacific Ry., better known as the "Moffat Road" and now being operated between Denver & Steamboat Springs on the eastern edge of the Yampa coal field of Routt County, comprising 1160 square miles of bituminous coal and 40 square miles of anthracite area.

Butte

Dec. 18—Notwithstanding the fact that as the result of the labors of the state railroad commission fair and reasonable freight rates are now in effect on coal between places in Montana, the price of coal continues to advance. In November the commission began an investigation to ascertain the cause of this condition, and found that the mines of the Bear Creek district, the largest source of supply in the state, have been unable to ship at full capacity at any time since the autumn business began. The mine operators allege as the cause of the high prices and their inability to fill orders, a lack of service and cars on the Montana, Wyoming & Southern R.R., the only line into the Bear Creek district, causing spasmodic and intermittent operation of the mines, with consequent higher prices of coal production.

Acting Governor W. R. Allen, in the

absence of Governor Norris, has communicated with Senators Meyers and Dixon in the interests of 1500 small mining operators in Montana. He urgently requested them to use their influence to have reinstated in the list of government appropriations, the usual amount for the maintenance of the government assay office at Helena. At the time that the appropriations were made the assay offices of Montana, Utah and Idaho were not allowed for. The small operator is largely dependent upon these offices for a ready and convenient market for his bullion, and the loss of time and expense of shipping to a greater distance would mean the discouragement of many of those upon whom the development of the mining industry largely depends.

Salt Lake City

Dec. 18—With announcement that a normal surface force was handling 20,000 to 21,000 tons of ore daily at the Utah Copper, came another of an increase in wages, affecting unskilled labor chiefly, and dependent on an average monthly price of 17c. per lb. of copper. This went into effect Dec. 1, applying to track men, pit men, other classes of labor, and employees in mechanical departments. The last mentioned receive an increase of 25c. per day, and the rest 20c., their wage per 10-hr. day being $2.20. This increase is similar to that granted Sept. 1 to underground workmen, and Nov. 1 to Garfield employees and trainmen, the rate of increase being in both these cases 25c. per day, also dependent on the price of copper.

Negaunee, Mich.

Dec. 20—In reference to the record shipment of 47,500,000 tons of iron ore from the Lake Superior region, the figures on the Iron River district are especially interesting, as that district has been enjoying a boom during the last year. The Iron River shipment was by far the record one in its history, totaling 1,750,000 tons, and thus passing the Crystal Falls and Iron Mountain districts on the same range. Practically all the ore came from 13 mines, and by next season there will probably be 20 shipping mines, an unusual number for one district. The following mines shipped during the past season: Caspian, Hiawatha, Zimmerman, Dober, Chicagon, Chatham, Davidson Nos. 1 and 2, Baltic, Fogarty, Youngs, James, Wickwire and Berkshire. Of these the Caspian has the record for the district at 306,720 tons; Pickands, Mather & Co., owning the Caspian, Baltic and Fogarty mines, shipped nearly 500,000 tons. The Munro Iron Mining Co., a Rogers-Brown subsidiary, is next with 220,105 tons from the Hiawatha mine and 141,258 tons from the Chicagon mine. Five years ago the Chicagon mine was supposed to have no ore and to be a "lemon" mine, and the Hiawatha was supposed to be exhausted. Next year, the Munro Iron Mining Co. will add its Rogers mine to the shipping list, and Pickands, Mather & Co. will add the Bengal mine.

The Zimmerman mine ranks next to the Hiawatha with 188,591 tons; this property was explored and abandoned by the Munro Iron Mining Co. before the Spring Valley Iron Co. found the ore. Fourth in the list is the Dober, the only one of these mines owned by the Oliver Iron Mining Co., with 175,942 tons. The Chatham mine, of Oglebay, Norton & Co., was a heavy shipper with 135,000 tons, and the Davidson shafts of the New York State Steel Co., which have only recently been sunk, shipped 126,000 tons. The Youngs mine, of the Huron Mining Co., and the James mine, of the Mineral Mining Co., were not very active with 83,077 tons and 75,000 tons, respectively.

The Wickwire mine, of the Wickwire Steel Co., accounted for 70,000 tons; at the Berkshire mine, of Oglebay, Norton & Co., only the stockpile of 33,000 tons was shipped, as this mine was closed down until a few weeks ago.

Following the action of the state tax commission at Crystal Falls in radically raising the valuation of real estate and lowering that of mining property, a determined protest is being made by the local taxpayers' association. The citizens contend that the value of the real estate in a mining community varies directly with the value of the mines that support the community, whereas the tax commission appraised the business houses and residences just as it is done in the lower peninsula of Michigan, where real estate always has a comparatively stable value. The taxpayers' association argues that if developments in the Bristol mine showed that its value as an asset to the company had decreased over $200,000, then dependent local property should be lowered in the same proportion. In many cases at Crystal Falls and Iron River the assessed valuation of real estate was this year increased several hundred per cent.

Deadwood, S. D.

Dec. 20—The directors of the Homestake Mining Co. have placed before the stockholders a proposition to increase the capital stock of the company 15%, the stock to be distributed *pro-rata* among present holders. This will undoubtedly be approved at the next meeting of stockholders. The property of the company is more valuable today than ever before; it is producing at a greater rate, and has a brighter future, so that with the good expectations, a stock dividend of this size is warranted. Among other items contributing to greater worth of the mine, was the acquisition this summer of nearly 1000 acres of ground adjoining the main holdings on the north. Edward H. Clark, of New York, managing director of the company, was recently in Lead, and made a thorough inspection of the property. The annual report of the state mine inspector, R. L. Daugherty, shows that for the year ended Oct. 31 the company milled 1,529,474 tons of ore, recovering bullion to the value of $6,596,000, an average of $4.312 per ton. All three of these items are higher than previous reports. It is confidently expected that the annual report of the company, covering the calendar year, will show that the surplus has greatly increased during the year, and such a showing would warrant paying the regular 6% dividend on the capital stock increased by 15%.

The Hearst Mercantile Co. and the First National Bank of Lead, each closely allied with the Homestake, have followed the lead of the latter and announced a bonus to all employees that will amount to 7% of the wage earned by each individual during 1912. This will affect about 200 persons.

Toronto

Dec. 22—The report of R. O. Wynn-Roberts, commissioned by the provincial government of Saskatchewan to investigate the feasibility of developing gas and power from the lignite-coal deposits of the province, states that there are 2,000,000,000 tons of lignite in the fields south of Regina and Moose Jaw, in addition to extensive deposits reaching from Estevan to North Battleford. The development of both power and gas and the manufacture of briquettes from lignite would be not only practicable but economical and would prove an important factor in the building up of the cities, both in the southern and the northern parts of the province.

Cobalt

Dec. 21—At a meeting of the Cobalt Lake shareholders, held Dec. 20, the option of the English syndicate to purchase control of the mine, was favorably received. Sir Henry Pellatt made a full statement in regard to the scheme, pointing out that when he had been approached to sell his controlling interest, he had insisted on every shareholder being given an opportunity to participate on terms similar to those offered to him and that this has been embodied in the agreement. Any shareholder, by depositing his stock with the British & Colonial Land & Securities Co., Ltd., can participate in the agreement.

It is understood that W. R. P. Parker, president of the Cobalt Townsite, and Casey mining companies, and J. P. Watson, vice-president, will be added to the directorate of the Cobalt Lake, representing the Rose Van Cutsen syndicate. No public statement has as yet been made regarding the terms of the agreement.

The Mining News

The Current History of Mining

Alaska

McCarty-Furseneau—The little Giant mill, owned by these men, is reported to be giving excellent satisfaction.

Kuskatina Copper Co.—This company is opening a deposit of chalcopyrite through which run seams of copper sulphate.

Regal Mines Co.—This company has just completed a 4½-mile trail connecting the mine with the trail across the Kennecott glacier to the railroad at Bonanza.

10 *Below*—It is the intention of O. P. Gaustad and A. C. Troseth, owners of this mine, on Cleary Creek, to employ a crew of 20 men this winter while opening up a new block of pay gravel and they hope to have between 140,000 and 150,000 wheelbarrows of gravel on the dump by the time the water runs.

Alaska Gold Mines Co.—David C. Jackling recently inspected the Perseverance mine and announced that the recently burned stamp mill would be rebuilt on Sheep Creek to receive ore when the 10,000-ft. tunnel from the Perseverance mine to Sheep Creek is completed.

Hallum—Another deal for the development of free-milling quartz properties in the Juneau district has been consummated and involves the consolidation of the Lemon Creek lode claims and placers and the Hallum properties, embracing 13 quartz claims, halfway up the slope of Mt. Juneau. E. R. Chapman, president of the Hudson Trust Co., of New York, closed the deal and George R. Noble attended to the details of the purchase of the Lemon Creek properties; water rights were also secured for developing 1500 hp. It is planned to begin to extract ores on the Gold Creek side where millsites have been located, and sufficient electric power will be transmitted from Lemon Creek to operate the mine and mill machinery.

Arizona

GILA COUNTY

Black Warrior—Lessees Fisk & Snell are shipping daily about 60 tons of ore to the old Dominion smeltery. All parts of the mine are being worked and about 50 men are employed in the extraction of the ore.

Idaho Group—Lyman Wood, of Globe, and associates are developing this property in the Dripping Springs country, between the Miami and Ray districts. A whim and three months' supplies have been sent to the property. The property is near the Renfro and is in lime and diabase formation intruded by porphyry. Development work has shown copper ore along the contact.

MARICOPA COUNTY

Placer mining on an extensive scale will soon be under way on a number of claims near the Hassayampa River, below the Brill ranch, south of Wickenburg. The property is owned by J. C. Reed, Dr. J. W. Foss and C. T. Willis, of Phœnix, and A. J. Kellis, of Wickenburg. Water for sluicing will be obtained from the pipeline of the Monarch Mining Co. Much coarse gold has been found on this property.

Red Dog—At this mine, in the Winnifred district, much coarse gold has recently been found in a heavy iron-stained porphyry. Active development work on the property has been started by D. W. Steele. A mill will probably be built in the near future.

SANTA CRUZ COUNTY

Conquest—This group, in the Agua Caliente region, in the Santa Rita mountains, has been bonded by the owner, James Cunningham.

Austerlitz—Woodworth & Layne have made a new strike on claims adjoining the Austerlitz.

World's Fair—This mine has been examined by the engineers of the Copper Queen company, and it is now reported that they have made the owners an offer for the mine. Frank Powers, the owner, is shipping a carload of silver ore, which makes the record for this mine. There will be 1000 sacks of this ore, or about 50 tons, and the average value of the lot is a little more than $100 per sack. The ore is brought under guard to Patagonia, and while locked in the cars, is guarded by three shifts of armed guards, reminding one of the old bonanza days; armed guards will likewise accompany the shipment to the Selby smeltery on San Francisco Bay. This ore has been taken out of the mine during the last year or so.

Grady—It is reported that this group of claims has been bonded by George Grady to the Calumet & Arizona Mining Co.

Wieland—George Wieland will ship another carload of ore from his mine; there is an immense amount of lower-grade ore developed in this mine and plans are being considered for a mill to treat the ore locally; an occasional shipment of the higher-grade ore has more than paid all expenses.

Black Cap—The Mansfield company has started up again on this mine and is employing six men. On the adjoining group, belonging to August Yarick, a number of men are employed on a good showing of copper-silver ore.

Augustus—This mine, which was under bond to A. G. Fraser and Colonel Posey, is now shipping its regular run of ore to El Paso. The shipments average about $50 per ton.

R. R. R.—This mine has increased its daily shipments to nearly 125 tons per day and another increase will be made in the near future.

Arizona-Pittsburgh—A strike of high-grade copper ore has just been made on this property, in Bond Cañon, in the Santa Ritas. This ore is found in the South vein, which is now showing six feet of shipping ore. Driving is in progress on this strike.

California

AMADOR COUNTY

South Eureka—The ditch and flume built to take care of the stamp-mill tailings are completed. The tailings are distributed on flats so situated as to prevent the filling in of a natural stream, and overflowing farm lands. A new oreshoot has been opened on the 2800-ft. level.

Central Eureka—A good vein was recently encountered in an east crosscut on the 2500-ft. level. A winze is being sunk on good ore from the 2800-ft. level.

Mountain King—High-grade ore continues in the shaft, which is only 40 ft. deep. Although only a prospect, the property produced $4200 in October. It is in Pine Grove district, and is owned by B. W. Pitts.

Hardenburg—A station and 300-ton ore bin have been made at the 1000-ft. level, and another ore bin and station will be made at the 850-ft. level.

Kennedy—A wheel elevator for disposing of the mill tailings is being built. The tailings will be impounded on company land.

CALAVERAS COUNTY

Campo Seco Copper Mining & Development Co.—This is a new company, organized to develop and operate copper claims near the Penn copper mine. Robert S. Brown is president and Elvus Brandon is secretary, both of Petaluma.

Fazzi—A good vein of ore is reported in this property, north of Altaville. The ore is similar to that in Angels Camp, two miles south. An extension of the find has been disclosed on an adjoining ranch; Andrew Fazzi, owner.

Hardy-McCreight—A large amount of ore is on the dump and preparations are being made for the installation of a five-stamp mill. The mine is an old one, recently reopened on Charral Hill, south of Angels; James C. Maltman, superintendent.

South Carolina—The new 10-stamp mill is nearing completion at this mine, near Carson Hill. The property was idle for a number of years and was recently reopened by Joseph Peitano & Co.

Eldorado County

China Hill—Preparations are being made for starting the five-stamp mill. Some new machinery is being installed. The mine is being developed by W. H. Noy, of Alameda.

Hayes—A shipment of pipe preparatory to reopening this gravel mine has been received at Auburn. The mine is situated in Indian Diggins district; John Graham and Eugene Avery, of Sacramento, owners.

Humboldt County

Horse Mountain—About 500 sacks, weighing 150 lb. each, of concentrates, are ready for shipment to the Tacoma smeltery. The Huntington mill has been in operation about one month, and the concentrates about two weeks. This initial run is said to have been entirely satisfactory. The mine has been extensively developed and the indications are that it will prove a large copper producer; George Wilson, of Eureka, manager.

Kern County

Consolidated Mines Co.—A five-stamp mill, ore crusher and 25-hp. electric motor will be installed. The water for the mill will be taken from the Wedge shaft, to be raised by an electric pump. There are 45 tons of ore in the bins and 25 tons in the chutes underground, which will be held with additional ore that may be extracted, until the new mill is ready. A contract is said to have been made with the Southern Sierra Power Co. to furnish electric power upon completion of the mill in January. The supply of water in the Wedge shaft, which was recently encountered, is reported to be practically inexhaustible and can be pumped at low cost. This is said to be the first water found in the mines near Randsburg.

Placer Gold Co.—A reservoir 90x60 ft. has been built south of the sluice plant for the dumping of tailings from the sluices. Two elevators, 30 ft. high, have been installed for raising the tailings into the steel sluices, which are 150 ft. long. A second pump has been installed at the settling tanks to pump water into the tailings sluices. The tailings are flushed into the reservoir and the water is drained back into the settling tanks. The gold, scheelite and black sand are separated in a Cummings separator.

Diamond Salt Co.—This company, recently organized, is reported to have acquired the salt lands at Kene Springs, 25 miles west of Randsburg. The brine is pumped and the salt is separated by solar evaporation.

San Bernardino County

Atolia Mining Co.—Of the nine claims owned only two, the Churchill and East Union, are at present being worked. The tungsten occurs in association with white scheelite. The ore is hauled by team a distance of about one mile to the plant at Atolia. The plant is composed of a 5-ft. Huntington mill and six Wilfley tables. Water is shipped from the wells at Hinkley, a distance of 37 miles by the Santa Fé Ry. About 100 men are employed.

Mariposa County

Whim Shaft Lease—A two-drill compressor has been installed. The old shaft has been cleaned out 200 ft. to the bottom and a 2-ft. vein uncovered. The shaft is believed to be in the hanging wall of the Mariposa mine. If this theory is proved and the ore warrants, the Mariposa will be unwatered by the Mariposa Commercial & Mining Co. A 75-hp. electric motor has also been installed at the Whim shaft.

Melvina—The concrete foundations for the compressors are being built and timbers hauled for reopening the tunnel.

Nevada County

Birchville—A new Straub mill has been built at this mine, near Graniteville. The mill is of new design, built by the Straub Manufacturing Co., of Oakland. It has a rated capacity of 30 tons in 24 hr. The mill is at present operated by water power. The compressors are driven by electricity generated by water power. The power house is of corrugated iron, the foundations of concrete; John A. Bunting, of Oakland, general manager.

Plumas County

Crescent Mills Gold Mines Co.—The installation of the chilean mill and Wilfley tables is completed, and crushing of ore was begun about the middle of December. The mill is of 20-tons capacity and is driven by a West Coast gasoline engine. The concentrators are operated by Westinghouse motors. Should the results warrant, the present capacity will be increased or the necessary changes will be made in the plant if the method is not adapted to the ore. Mr. Oddie, of Crescent Mills, is manager.

Shasta County

Mammoth—The break of the fan blower at the baghouse caused a shutdown of the smeltery for several days, but the repairs have been made and the operation resumed.

Siskiyou County

John B. Farish and associates have taken a bond on the copper claims of W. J. Brown, of Happy Camp. It is expected that operations will be started in January.

Sunshine—The recent strike of rich gravel in this mine, at Gottville, on Klamath River, is reported to have caused the sale of the property to J. W. Liley, of Butte, Mont. H. S. Crane and C. R. Whitten, of Klamath Falls, were former owners.

Tuolumne County

Columbus—A drift is being driven on the vein at the 200-ft. level, and will be advanced to a distance of 700 ft. from the shaft. The ore is low grade, but the oreshoot is large. The mine is equipped with an electric hoist; T. G. Winwood, of Tuolumne, superintendent.

Cosmopolite—This property of four claims and mill site, machinery, buildings and other improvements, has been purchased at sheriff's sale by H. M. De Farrari, of Groveland.

Colorado

Clear Creek County

Bellevue-Hudson—On Dec. 10 the compressor plant at the mine was completely destroyed by fire, probably caused by defective wiring.

Gem—A 5-ft. streak of $40 ore has been opened on the 13th level by lessees Bradley & Erickson. A crosscut 150 ft. long is being driven from the Gem vein to the Freighter vein, by lessees Shaffer & King.

Idaho-Bride—A contract has been let to sink the shaft an additional 50 ft., at which depth levels will be driven each way on the vein. The company contemplates letting a contract for 800 ft. of work on the Seaton vein on the Newhouse-Tunnel level. During the week ended Dec. 14, the company shipped one car of smelting ore and two cars of concentrates.

Vindicator—The crosscut tunnel has intersected the Tom Tuck vein at a distance of 850 ft. from the portal. A drift on the vein has been advanced 75 ft. in ore of a milling grade. The drift will be advanced to intersect the Gold Leaf vein; Mr. Hoban, manager.

Lake County-Leadville

Robert E. Lee—This mine, on Fryer Hill, keeps up its usual tonnage and grades of iron ore. Zinc-carbonate ore is also being opened, but too low grade for shipment.

Leadville District Mill—The power contracts have been signed and the power brought into the mill. Contracts have been signed with lessees on the Ibex, the Hopemore, etc., and it is understood that other contracts will be secured from the California Gulch region. Some material from the Resurrection dumps will be run through the mill as a test and if successful a large tonnage will come from that part of the district.

Result—This mine, on Carbonate Hill, near the Emmert, is shipping four carloads per week of iron-silver ore of good grade.

SAGUACHE COUNTY

Rawley Mining Co.—A drainage and development tunnel more than 6000 ft. long was recently completed at this property, near Bonanza. The silver-copper lode was cut 1200 ft. below the surface or 600 ft. below the lowest workings from the surface. The recession of water in the upper workings is 5 ft. per day and when drained these workings will be connected with the tunnel. W. C. Russell is the engineer in charge.

SAN JUAN DISTRICT

The shipments from the Ouray station of the Denver & Rio Grande R.R. for November amounted to 71 carloads or about 1600 tons. The shipments for the year to date amounted to 16,600 tons, 84 carloads of concentrates were shipped from the Telluride station in November, and from Lake City during the year, 1868 tons of ore have been shipped.

SUMMIT COUNTY

The Wellington Mines Co., Breckenridge, shipped from Dec. 1, 1911, to Dec. 1, 1912, 15,225 tons of ore. The Colorado Gold Dredging Co. has ceased operations for the season of 1912. The boat dredged on the rich pay streak in Swan Valley, at and above Summit Gulch, with excellent results. It is understood the boat took out more than twice as much placer gold this season as it did last year.

TELLER COUNTY-CRIPPLE CREEK

Acacia—A strike of gold ore is reported from the South Burns claim of this company by lessees, Hammond and Le Barge. It was opened in a raise from the fourth to the third level on the same property. Lessee Kushman opened ore said to average $60 per ton in gold and already developed for 30 ft. in length.

Free Coinage—A carload per week of fair-grade ore is being shipped by Berry & Co., lessees, in the Pinto shaft on Bull Hill.

Isabella—Three carloads per week of good-grade gold ore are being shipped by Kellum & Co., lessees on Emma No. 1, of the Isabella estate.

Jerry Johnson—A new discovery on the third level is reported and shipments of ore are being made by J. Dwark, lessee, operating through the Damar shaft.

Hoosier—This mine, on Tenderfoot Hill, owned by the Grafton Gold Mining Co., is shipping again and active operations have been resumed. It is stated that a large shoot of ore has been opened by Lessee Conby.

Sratton Estate—This estate, owning more than 400 acres of Bull Hill, Ironclad Hill and other mining ground in Victor and Cripple Creek, offers extremely favorable royalty terms to lessees. The output for November was: American Eagles, under lease to the Colorado Mines & Investment Co., six cars; Abe Lincoln, leased to the Hahnewald Bros., of Avan, four cars; Deerhorn, Globe Hill, operated by William Fitts, three cars, and Six Points, worked by Chillson & Polly, 11 cars of medium-grade ore.

Idaho

BLAINE COUNTY

Arkoosh-Comet — The Boise Credit Men's Association has taken over this property and plans to resume operation after liquidating old claims against the former company. Considerable new equipment will be installed, all of which will be electrically operated.

IDAHO COUNTY

C. B. & Q.—A good strike of milling ore is reported from the 200-ft. level of this mine on Clark's Fork.

Center Star—A new shoot of ore has been struck in the lower level and a raise to the surface commenced on it.

KOOTENAI COUNTY

Idaho Continental—The electric drill equipment is installed.

LEWIS COUNTY

Deer Creek—A 1000-ft. flume has been built to operate a sawmill and compressor.

SHOSHONE COUNTY

Copper King—The vein which was lost for a time has been found again and shows a width of five feet.

Blue Bell—The 800-ft. crosscut has cut the vein at a depth of 450 feet.

Missoula Copper—Arrangements have been made with the National company for the use of its tunnel for further exploration work on the Missoula property. This tunnel attains a depth of 1700 feet.

Federal—A process for the recovery of zinc by flotation recently devised by George H. Wyman, of the University of Idaho, is to be tried out in the mills of the Federal Mining & Smelting Co.

Empire—In driving the crosscut toward the main lead-silver vein a 5-ft. vein of commercial antimony ore has been disclosed and will be prospected further.

Hunter—Clean galena 2½ ft. wide and 25 ft. of milling ore have been encountered on the 400-ft. level.

Blue Star—The force at this property has been doubled.

East Hercules—Work has been resumed at this property near Burke.

Stewart—Since stoping was begun in the lower level the force has been increased steadily until now 336 men are employed. The property now ranks third in the district in number of men employed.

Michigan

COPPER

Superior—The railroad connections to afford this company shipping facilities to the stamp mill at Point Mills are about completed and as soon as they are ore shipments will go forward to the Lake Milling, Smelting & Refining Co. mill for treatment, which will result in an increased production and greater saving. The company has curtailed shipments to the Atlantic mill, devoting attention to the putting of the West lode in shape to meet the new conditions.

New Arcadian—In cutting a station at the 250-ft. level for the establishing of a sump, a copper-bearing lode was encountered showing good copper contents. The shaft is being sunk between two formations exposed in the drilling and at a depth of 500 ft. crosscuts will be extended and the formations opened at this depth.

Mohawk—The foundation for the new structural-steel rock house have been completed. The other buildings for the permanent equipment have been erected and this shaft will be ready in the early spring to maintain a large tonnage, which will materially benefit the property, as the ore coming from these openings is highly mineralized. The shaft is down over 1000 ft. and will have an ultimate depth of about 3000 feet.

IRON

Purcell—Hoisting with steam has been started at this new mine of the McGreevy Steel Co. Three eight-hour shifts are being worked in shaft sinking.

Buckeye—This mine of Oglebay, Norton & Co., at Commonwealth, Wis., has been reopened and is now in operation. The stockpile of 50,000 tons was shipped during the last season, but the mine has been closed for more than a year.

E. J. Longyear Co.—These interests are exploring the old Banner property at the eastern end of the Gogebic range. Diamond drills have been brought in. Low-grade ore is known to be in the vicinity.

Sherwood—The Republic Iron & Steel Co. has been diamond drilling this property, at Iron River, for two years. The uncertainty as to what the company has found is dispelled by the action of the state tax commission in raising the assessment from $75,000 of last year to $740,000 this year. With the property still in the exploratory stage, this is a large assessment for the nonbessemer ore of the Iron River district.

Republic Iron & Steel Co.—This company, operating mines in Michigan and Minnesota, is paying taxes on about 90,000,000 tons of ore.

Hiawatha—An electric-haulage system will shortly be placed in the seventh level where development by drifts and crosscuts has been proceeding for over a year. Electric-haulage systems are at present in use on the fifth and sixth levels. Baldwin-Westinghouse locomotives are used. The electrical power is generated by steam in the company's engine house. This mine was a heavy shipper during the past season.

Missouri

JOPLIN DISTRICT

Crane & Miller have begun drilling their 75-acre tract between the Betsy Jane and Mary C. mines, at Thoms Station.

South Shoal Creek—A rich strike of "cog" lead has been made at a depth of 54 ft. Pieces weighing up to 200 lb. having been taken out. A drift has been driven in 20 ft. with good ore prevailing.

Athletic Mining Co.—Extensive improvements have been made recently by this company, operating in the north Webb City sheet ground. Oil burners have been installed under the boilers because of weakened gas pressure. Fine grinding of the tailings and subsequent sludge treatment has been found to give an increased recovery due to the chatty character and thinness of the ore. An efficient sludge plant consisting of 8 slime tables and settling tanks has been developed to handle 100 tons of sludge per day.

Oronogo Circle—A new compressor plant consisting of three units of 880-cu.ft. capacity each, each driven by a 150-hp. motor, has just been installed; 24 drills are operated and the full compressor capacity is required only in the middle of the day. This is one of the few mines in the district where the ore is concentrated at a central plant of 1000 tons capacity.

National Zinc Co.—This company, a steady purchaser of Joplin ores, has taken over the properties of the United Zinc & Chemical Co., which includes a zinc roaster at Argentine, Kan., and a smeltery of five blocks at Springfield, Ill.

Parshley—A new 150-ton concentrating plant is being erected near Parshley, 12 miles southeast of Carthage. It will be ready to operate in about two weeks on a 30-ft. face of ore, extent not known. The mine is in virgin territory.

Picher Lead Co.—Improvements estimated at several hundred thousand dollars are being made by this company at its plant, which will materially increase its production of litharge and red lead. A modern two-story brick laboratory is being built and equipped, as well as new office space, reinforced-concrete warehouses, furnace buildings, etc.

Montana

BUTTE DISTRICT

Butte-Minnesota—At a meeting of the stockholders, held recently at Butte, plans were made to begin operations shortly after the first of the year at this property, consisting of seven claims situated about a mile south of Rocker. New financing has been completed, assuring the company sufficient funds to complete the development work begun some time ago, but discontinued for lack of money. A strong vein has been traced across the claims, in granite. A shaft was sunk 45 ft. and a tunnel driven 400 ft. in oxidized ore. It is planned to continue the shaft to the 300-ft. level, and crosscut south to the vein at that depth.

DEER LODGE COUNTY

Hidden Lake—At this property, in the Georgetown district, a force of men is now engaged in sinking a shaft from the tunnel, the intention being to reach a depth of 300 ft. by next spring. As the result of last summer's operations there is about $30,000 worth of gold ore on the dump. The company is preparing to begin the erection of a 50-ton cyanide plant early in the spring.

Bonanza—Thomas McGraw, owner of this property, at Silver Lake, has recently driven a tunnel 200 ft. on the vein. Samples taken in the breast gave returns of 62 oz. silver, and $7 gold per ton. Mr. McGraw intends to thoroughly develop the mine, and will continue work in the tunnel.

FERGUS COUNTY

Barnes-King—At the North Moccasin property, near Kendall, recently acquired by this company, the crosscut on the 500-ft. level has reached the vein about 100 ft. from the Santiago winze, and a raise has been started on the vein. A sump has been sunk in the shaft below the 500-ft. level and a skip chute is being cut at that level. The mill is ready to be used to a limited extent, and it is planned to begin the treatment of a small tonnage daily in a short time.

LEWIS & CLARK COUNTY

North Star—This mine, eight miles from the town of Jay Gould, has just been closed for the winter, after a run of six months under the direction of George Edwards. A vein of copper and silver ore, 4 ft. in width, has been opened, and the company is now contemplating the erection next summer of a 50-ton concentrating plant.

MADISON COUNTY

Broadway—Since the recent death of F. R. Merk, at Twin Bridges, W. W. Merk, his son, has been making preparations to reopen this mine, in the Silver Star district. This property produced a large amount of high-grade gold ore in the early days, but in recent years it has not been operated, except spasmodically by a few lessees. It is proposed to reorganize the company and issue stock, proceeds from the sale of which will be used for development work and the erection of a mill.

Dead Beat—At this claim, in the Rochester district, owned by Dr. H. H. Hanson, of Butte, a vein has just been opened, assaying from $12 to $14 per ton in gold, for a width of 2½ ft. William McLeay is doing the development work on the property.

Butte-Virginia—Some members of this company, which is operating the Bell mine near Virginia City, spent several days in that vicinity recently. Ore has been treated in the Grant mill, leased for that purpose, and numerous changes have been made toward the more economical treatment of the ore. In addition to their interest in this property, members of the company have, during the last few months, been having a thorough examination of the Alder Gulch district made by experts, with the intention of erecting a custom mill at a central point in the district. There are many quartz properties in that region which the owners are unable to operate profitably on account of the expense of wagon-haulage to Alder and shipment by railroad from there to the Washoe smeltery at Anaconda. As the result of the experts' report a syndicate is about to be formed at Butte for the erection of a stamp mill at Virginia City, the work probably to begin in the spring. The intention is to purchase direct from producers all ore yielding $4 or more per ton.

Nevada

COMSTOCK LODE

Ophir—The annual election occurred Dec. 18, at which the old officers were chosen for another year, including Franklin Leonard, Jr., of New York, president; B. F. Shaw, of San Francisco, vice-president; John W. Twiggs, of San Francisco, secretary; Thomas F. McCormick, superintendent. The annual report of the superintendent upon mine conditions was favorable, showing that during the year, 8436 tons of second-class ore was mined, and 9495 tons of ore shipped to the Kinkead mill of an average assay value per battery sample of $28.40 per ton. During the year, a new 100-ton cyanide plant was built and placed in operation. Tailings impounded during the year included 9183 tons of an average value of $6.51 per ton. There was stored previously 13,519 tons of tailings, all of which is now being treated at the new plant.

Consolidated Virginia—At a recent

meeting of the directors a resolution was unanimously passed ordering Superintendent McCormick to submit a report at once on all work as far as can be ascertained from maps and records, that has been done in the company's ground on and above the 1200-ft. level, with the purpose in view, should the report warrant, of starting prospecting work there or on the 1000-ft. level. The big Bonanza extended only a few sets above the 1200-ft. level, at least it was not followed up further on account of the fire. A drift is being considered from the 1200 station of the shaft, to pick up the east vein, which has proved as profitable in the deep levels, but which has never been prospected to any extent, as far as is known on the levels above. This work, if undertaken, will not interfere with the search for new oreshoots on the 2300, 2500 and levels below.

Sierra Nevada—Improving conditions are reported from the raise in the vein on the 2500-ft. level, where excellent milling ore is being saved. The raise is being carried up three sets wide, and from two to three feet of good ore is on the hanging wall, at a place 15 to 20 ft. above the sill floor. The pay streak is apparently widening above, late car samples showing ore assaying as high as $40 per ton.

Humboldt County

The latest strike of note was made at Rochester Cañon, where silver ore is found about 10 miles east of Oreana, a station on the Southern Pacific Ry. The rush to the new strike is so great that a post office has been asked for.

Barber Cañon Placer Mines—There has been a revival of the old Chinese placer-mining property in Barber Cañon, which Denver men have acquired, and are about to install a five-table concentrating mill, a pumping plant and pipe line. The property consists of 23 claims, about four miles east of Dun Glen, in Barber Cañon.

Kennedy Consolidated Mines Co.—This property, 65 miles south of Winnemucca, will be worked again.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Dec. 14, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3400	168,019
Tonopah Belmont	3182	127,360
Montana-Tonopah	980	51,048
Tonopah Extension	1080	50,548
West End	1050	39,177
Midway	45	910
MacNamara	610	19,342
North Star	....	401
Mizpah Extension	....	40
Jim Butler	300	5,300
Tonopah Merger	350	855
Totals	11,297	463,000
Estimated value	$211,908	

Jim Butler—A new shoot of good ore has been opened on the sixth level.

A. S. Ross, manager of the Pittsburg-Idaho Mining Co., has purchased a large interest in the Tonopah Mining & Leasing Co., operating a lease on the Cash Boy claim.

Tonopah Mining Co.—This company has resumed the sinking of its Sand Grass shaft from the 520-ft. level. This is its most western claim and has not yet been prospected. Crosscutting on the 800-ft. level of the Red Plume claim has been started, all work having hitherto been done above that level.

Tonopah-Belmont—The ore in the winze at a depth of 90 ft. below the 13th level averages $100 a ton across a width of seven feet.

Tonopah Merger—Shipments have been increased to 50 tons daily. On the 1070 level the vein is 20 ft. wide and 16 ft. average over $30 per ton.

West End—The capacity of the mill has been worked up to 150 tons of ore per day. Sinking of the main shaft from the 600- to the 1000-ft. level has been resumed.

MacNamara—The output of the mill has been worked up from 65 tons to 80 tons daily.

Tonopah Extension—The North vein has been opened on the 660-ft. level where the ore is of good grade. This is 160 ft. deeper than the other ore workings.

Boston-Ely—In crosscutting on the 1200-ft. level a new vein was recently discovered.

New Mexico

Socorro County

Ernestine—This company treated 680 tons of ore in a recent week. The first two cleanups in November yielded 1500 oz. of gold and silver bullion and 16,700 lb. of concentrates were also produced. The installation of 10 new stamps is nearly completed. This will give the mill a 40-stamp battery. Mine developments are showing up well throughout.

Oaks Co.—The winze and raise between the upper and lower tunnels were connected, Dec. 1, in the Pacific mine, giving excellent ventilation in all of the workings. The lower tunnel will now be pushed with the shifts to the end line and connections made with the south shaft. It is expected that this work will be completed in five months. During November, 500 tons of ore were sent to the Deadwood mill from November development. The Johnson, F. A., and other claims of the company are also producing good milling ore.

Socorro—At these mines over 5000 tons of ore were treated during the month of November.

Deadwood—The mill is running steadily, handling about 50 tons per day. Rich ore is coming from the winze below the third level, some specimens assaying over $1000 per ton.

Mogollon Gold & Copper Co.—This company is now stoping over 1000 tons per month from the Little Charlie mine.

Banner Group—It is reported that good ore has been opened on the Olympian claim of this group.

Oregon

Josephine County

County Line—George E. Howland, of Grants Pass, and other Oregon men, owners of this mine, have just found a vein for which they have been hunting for two months. They have exposed the ore in three different places, and picked up the vein at a depth of 100 ft. in the old workings. The vein is exposed in places on surface.

Ramsay—W. H. Ramsay, of Grants Pass, owner, operates an arrastre in which the ore, a decomposed porphyry, yields well in gold. Mr. Ramsay expects to put in modern machinery in the spring as soon as heavy hauling can be done, the roads now being impassable. He also owns a placer mine which he is working.

Malheur County

Reports of rich gold strikes in the vicinity of Malheur City are causing considerable excitement in this region. D. K. Worsham, F. L. Johnson and others, of Vale, have brought in specimens weighing from 2 to 10 lb. each, showing free gold. For many years this has been a gold-producing region supporting such mines as the Golden Eagle, Red White & Blue, Black Eagle and others, but owing to difficulties which have involved lawsuits they have been closed for several years.

Worsham — Claude Worsham and others, owners of this property, have bonded it to Baker City men.

Utah

Juab County

Tintic shipments for the week ended Dec. 13, amounted to 208 cars.

East Crown Point—A statement to stockholders from the president and secretary gives the holdings of the company as 125 acres lying east of the Iron Blossom and Chief Consolidated, and between the Crown Point on the north and the East Tintic on the south. Drilling carried on in the eastern part of the property was abandoned, and the drilling equipment sold. Shaft sinking was then undertaken in the western end, and the shaft completed for 335 ft. Returns from the sale of the drilling machinery paid the debts of the company, and funds for development were provided from an assessment of 2½c. per share.

Eagle & Blue Bell—It is stated that this company will declare a dividend of 5c. per share, amounting to $45,000. Connections between the upper workings and the bottom of the shaft sunk to the 1350, the lowest level in the mine, are making possible an increased tonnage. Shipments for the week ended Dec. 13 were 15 cars. This mine is owned by the Bingham Mines Co., which is controlled by Boston men.

Summit County

November shipments amounted to 6473 cars of an estimated value of about $260,000; those for the week ended Dec. 7 were 3,100,620 lb., the shippers being the Silver King Coalition, Daly-Judge, Daly West, and American Flag.

Silver King Coalition—A dividend of 25c. per share, amounting to $312,000, has been declared, payable Dec. 24. November shipments amounted to 2520 tons.

Mines Operating Co.—In its trial runs, when the roasting capacity of the newly remodeled mill was found to be insufficient, the company produced about 1500 lb. of bullion. Since then, two new roasters of 35 tons capacity each have been completed, and the plant will soon be ready for continued operation.

Canada

British Columbia

Granby Consolidated—Contracts aggregating $700,000 have been let for equipment for the Hidden Creek mines and machinery for the smeltery. The Pelton Water Wheel Co. secured the contract for a waterwheel; Traylor Engineering & Manufacturing Co., the furnaces, converters, settlers, ore crushers and sampling machinery; Connersville Blower Co., the blowers; Nordberg Manufacturing Co., equipment for the compressor plant; Hallidie Co., traveling cranes and similar machinery; Brown Hoisting Machinery Co., hoisting apparatus, and the Westinghouse Electric & Manufacturing Co., the rolling stock, consisting of two 43-, six 12- and eight 6-ton electric locomotives and twenty-five 25-ton steel ore cars. Development at the Hidden Creek mines and construction of the smeltery and power buildings at Granby Bay are progressing on schedule, and there is assurance of enough ore being blocked out for treatment by the time the smeltery is completed to provide material for a number of months in advance of its needs.

Phoenix—Matt Trewhella, lessee, recently began to ship ore to the Trail smeltery.

Utica—Shipments will continue regularly all winter. A find of native silver is reported in the stopes on the east vein.

Leadville—Lead-silver ore has been crosscut for 27 ft. and it is the intention of the management to increase the force and install a compressor.

Lucky Jim—The working force has been increased in order to open up ore as rapidly as possible for the contemplated concentrator which will be installed in the spring.

Levina—Work has been resumed and the management plans to do extensive development before attempting production, though several cars of high-grade ore have been shipped from the property.

Van Roi—Tunnel No. 10 was started recently.

Yankee Girl—Proposals for bids on the new 100-ton mill have been submitted to contracting companies.

McAllister—Ore of milling grade has been struck in the north drift in the new lower level.

Kirkpatrick-Coulthard Group — Engineers representing Victoria men recently examined this property with a view to purchase.

Trilby—Work has been resumed and as soon as the mine is unwatered extensive development work will be undertaken.

Standard—The force has been increased to 120 men and new work has been begun on the No. 7 tunnel. Most of the ore being shipped or milled is being taken from the orebody opened up between the No. 4 and No. 5 levels.

Goodenough—Average assays of $175 per ton for lead and silver are reported to have been obtained from a series of samples taken from this mine at Sandon. The ground from which the samples were taken is in a 120-ft. strip near the Dundin property. A tunnel has been advanced to a point with 30 ft. of the Dundin lines.

Ontario

Homestake—A carload of electrical machinery, including four large transformers and two motors, has been received at this mine in the Lake of the Woods district, which will enable putting the power line from Kenora into commission at an early date.

Ontario-Cobalt

Peterson Lake—It is understood that Sir Henry Pellatt is negotiating a deal for this property similar to the one just completed for the Cobalt Lake shareholders.

Seneca-Superior—It is understood that an initial dividend of 5% will be declared shortly.

Twentieth Century—The plant was damaged to the extent of $3500 by the recent fire.

La Rose—A dividend of 2½% with a 2½% bonus has been declared. The net profits for the year will be over $1,000,000. The surplus now amounts to $1,788,000.

Sterling Silver Mines—This company has been organized with a capital of $1,250,000, and has taken over the claims of Dr. C. W. Haentschal and Samuel Tongue in the Hubert Lake section of Elk Lake district. B. A. Schoerke is president, and E. E. Hale secretary-treasurer.

Ophir—This company is being financially reorganized. After the first of the year operations will be resumed at the No. 2 shaft now down 160 ft. on a cobalt and calcite vein. The shaft will be put down to the 300-ft. level.

Ontario-Porcupine

Rea—The water is being pumped out of this mine and it is expected that a new deal leading to its reopening will shortly be negotiated.

Mexico

Chihuahua

American Smelting & Refining Co.—The Chihuahua smeltery has been closed for 10 days, dating from Dec. 4, on account of a shortage of coke, and it is not likely that the furnaces will be blown in for at least 10 days more, by which time it is anticipated that ample coke will have been received to insure of an extended run. Shipments of fuel are now *en route* from the United States *via* both the Mexico Northwestern and National Rys., the damage recently done by rebels to the latter road having just been repaired. Regular train service between Chihuahua and El Paso has been resumed over the National since the guarantee of federal military protection. The Chihuahua smeltery has received ore interruptedly, so that the Santa Eulalia mines have not been affected by the shutdown, but it is not certain that this policy will be maintained for a much longer period by the smeltery management. The mines also have an abundance of fuel for several weeks.

Alvarado Mining & Milling Co.—This company is operating continuously and handling a constantly increasing tonnage at the cyanide plant, at Parral.

The El Rayo and Tecolotes properties, in the Santa Barbara region of the Parral district, are operative at partial capacity.

Sonora

Press reports state that 750 miners went out on strike, Dec. 18, at the Cananea and Democrata mines, demanding an increase in pay of 25 centavos per day and an 8-hr. day. Later dispatches state that the strikers have surrounded the Americans in the camp and will endeavor to starve them out.

Creston-Colorado—The cyanide plant is now being operated continuously at a capacity of 350 tons per day. Several veins have lately been opened and pay ore mined. Yaqui Indians are frightening the woodcutters employed by the company, but so far have made no attack.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Dec. 24—Colder weather has given some impetus to the coal trade, but the continued absence of storms which would interfere with transportation has been a favorable feature. There is still a scarcity of cars in the West, but conditions in this respect are slightly improved. The Seaboard bituminous trade remains in the same condition as for some weeks past. Supplies are hardly up to the demand yet, especially in the coastwise trade. Prices have eased off, but only a little, and the year is closing with quotations at a fair level.

The anthracite trade is still behind in deliveries. Work at the collieries has been active through December, but this week the holidays are cutting into production. Cold weather is putting quite a strain on local dealers in domestic sizes. Steam sizes, however, seem to be in sufficient supply. A heavy snowstorm set in today, which will undoubtedly cause a delay in deliveries.

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships engaged in foreign trade, 11 months ended Nov. 30, long tons:

	1911	1912	Changes
Coal	58,805,355	58,747,636	D. 57,719
Coke	948,883	928,612	D. 20,271
Briquettes	1,481,829	1,394,032	D. 87,797
Total exports	61,236,067	61,070,280	D. 165,787
Steamer coal	17,696,757	16,734,586	D. 962,171
Total	78,932,824	77,804,866	D. 1,127,958

The later months almost, but not quite, made up for the losses during the strike early in the year.

Iron Trade Review

New York, Dec. 24—The conditions remain unchanged, and there are still differences of opinion as to whether the slackening in new orders is due only to the season, or is likely to continue into the new year.

Some large orders from car works for plates and shapes have improved the reports of new business for the week just closed. The railroads, in fact, have been the heaviest buyers and orders for new cars and for rails on a large scale. The mills are still very busy, and are getting some chance now to work up to time. Structural work also promises well, as a number of large contracts are under negotiation for spring work. Upon the whole there seem to be fair chances for an active half-year at any rate.

Export business is good, and promises well. Several large foreign orders for rails are on the market, and are likely to come here, owing to the high prices abroad and the congested condition of German and British rail mills.

The pig-iron market is quieter and new orders have not been individually large, though making a fair total. In the Central West prices are firm. In Seaboard territory, some resales of speculative iron —chiefly Southern—have given the market an appearance of weakness which is not wholly justified by underlying conditions. The coke question continues a point of difficulty.

Statistical Work of the Iron Trade—A circular letter from James M. Swank, formally announcing his retirement from the position of the American Iron & Steel Association, and the pending transfer of its work, has been issued. The essential portion of the letter is given below:

A special committee of the directors of the American Iron & Steel Institute called at the office of the American Iron & Steel Association on Dec. 9, to inquire personally into the details of the work of the association and to consider the advisability of continuing this work with the present clerical force of the association and with its existing office facilities. The gentlemen composing the committee who represented the institute were Hon. E. H. Gary, E. A. S. Clark, E. C. Felton, Powell Stackhouse and J. G. Butler, Jr. James T. McCleary, secretary of the institute, was also present.

The gentlemen present decided to recommend to the full board of directors of the institute that the institute will, on Jan. 1 next, establish a Statistical Bureau in the present office of the American Iron & Steel Association, the bureau to be controlled absolutely by the institute and to be devoted to the collection and publication of the statistics of the American iron trade, the publication of a "Directory to the Iron and Steel Works of the United States," and the maintenance of necessary correspondence. All other work heretofore performed by the association will be attended to by the institute at its office in New York.

It was further stated that the institute would retain for an indefinite period and for such a time as may be mutually satisfactory, such members of the present clerical force of the American Iron & Steel Association as have had charge under Mr. Swank of the work of the association, placing William G. Gray in charge of this work and making him solely responsible. Mr. Gray has been principal statistical assistant for many years. Mr. Swank will transfer all statistical records of the American Iron & Steel Association to the new Statistical Bureau of the Institute, and will give it the benefit of his advice.

Birmingham

Dec. 23—Quiet rules the pig-iron market in the Southern territory so far as the sales go, but there is much activity in the delivery line. Considerable iron is moving out for export; several cars of the product went this week to Chile. Some inquiries are still being received for iron for delivery during 1913. The quotations are rather firm, $14.25 being a minimum price mentioned for first-quarter delivery, with $14.50@15 for second-quarter iron. Reports that some iron had sold as low as $13.50 per ton, No. 2 foundry, are not to be verified. Special brand iron as well as basic and other special analysis iron carry the usual premium. For instance, a few days ago one of the companies sold iron as high as $16 per ton, $2 above the regular foundry prices. The shipments of pig iron from Southern territory, together with the local melt, are larger than the production.

Steel activities in Southern territory are still attracting attention, and there is a healthy outward movement of the various products. Cast-iron pipe production and demand are active.

As anticipated, there will be less time lost at plants through the holidays this year than ever before.

Chicago

Dec. 23—With the shadow of the coming holiday over it, the market remains quiet, but is firm as it has been for some time past. Most large consumers are well covered for the first quarter at least, many for the first half, and sales are mainly of a small order, to melters who have not yet covered, or whose business has run ahead of anticipations. The local furnaces are well sold up, orders covering most of their probable make for the first half of 1913. They are not hunting for business, and neither sellers nor buyers are ready yet for business over the second half of the year.

Prices are firm at $14@14.50, Birmingham, equal to $18.35@18.85, Chicago, for No. 2 Southern foundry. Northern No. 2 foundry brings $18@18.50, at furnace, or $18.50@19, delivered. Lake Superior charcoal is in some demand, but prices are irregular, $19 being the lowest, while for some lots over $20 has been paid. Sales of this iron have been limited to small lots.

Finished products are in good demand. Railroad supplies are still the strongest feature. Structural steel is being taken for spring deliveries in a way which promises building activity in the spring. Bars, both steel and iron, are firm; local mills are full for some time ahead and are not in position to take orders for early delivery. Plates, sheets and other lines are in much the same position, and no early deliveries can be had. Prices are firm all around.

Cleveland

Dec. 23—Talk about Lake carrying rates for next season is going on. It is fairly certain that there will be an advance of 5c., possibly 10c., per ton.

Pig Iron—There is a steady run of orders of moderate size. Most large buyers are supplied for the present. Prices are firm, but with no quotable change.

Finished Material—Pressure for deliveries is strong still. New orders are slower than they were. Jobbers report business very good.

Philadelphia

Dec. 24—The pig-iron market has quieted down. The larger consumers are very well covered, some being supplied into mid-summer. Several lots of pipe iron have been arranged for, but most of the buyers are for small lots. Southern irons are the subject of much talk and correspondence, but only small lots have sold. Mills are cautious about buying for further delivery. Basic has been less active and could remain so, as many consumers are well supplied into the second quarter. Current production is considerably divided around to keep all supplied, but many urgent requests are made for compliance with terms. Basic fell back a little from its high-water mark and the belief is expressed here and there that other kinds will weaken, and that the excited conditions of the autumn months will be followed by conservative winter months. Prices, as a rule, are about the same as a week ago, but there is an impression that the highest level has been reached. Close inquiry fails to disclose solid reasons for this belief. One reason is that forward foundry commands the highest price of the season; 2X foundry is $18.50@18.75; forge, $18.25, and basic, $18.25 per ton.

Steel Billets—The sales late last week denote an anxiety to secure large dependable stocks. While there are signs that consumers regard as weakness, there are no facts in the market to make a foundation for such hopes. There are many inquiries for steel billets on both domestic and foreign account, and most of this business will go through. Basic openhearth, $32 per ton.

Bars—Bars are on the eve of another advance. Business is done at outside figures. Many mills sold iron ahead of capacity, and a good deal of kindly forbearance has to be eventually exercised.

Sheets—Mills are still gaining in their volume of business and prices have again been practically advanced.

Pipes and Tubes—Tubes are exceptionally active. Early deliveries are urgently insisted on where possible. Large consumers keep their purchases well to the front.

Plates—Buyers are crowding manufacturers for promptest delivery. Manufacturers are unable to keep strictly to terms in isolated instances. The week reports a good volume of business, some of it being in large orders for latter part of first-quarter delivery. Plates have about reached their highest level according to large buyers, but the continued payment of premiums and the knowledge of much pending business gives but little encouragement to this view.

Structural Material—A very large volume of business has shaped up for closing, but it may be early January before the last details are closed. Much of the material wanted is for mid-winter delivery throughout the South and Southwest. Work for early spring delivery is urgent.

Steel Rails—Some of the heaviest orders of the year for domestic requirements have been placed and two heavy orders for export are now under consideration.

Scrap—All lines of scrap are held at top prices and ready scrap commands premiums. Heavy melting steel and railroad scrap command high prices. The supply is below the needs of the trade.

Pittsburgh

Dec. 24—Mills report no diminution in the demand for delivery of finished-steel products. Open weather has permitted the continuance of outside work at practically the fall rate, and as such work had largely fallen behind schedules on account of congestion at mills, shipments of material for outside work are as heavy as ever. The slowing down in pressure upon mills, which usually occurs upon the opening of winter, tends in general to be less marked as the proportion of steel used in inside work is increasing, as compared with half a dozen years ago.

While in some directions there is a decrease in specifications against old contracts, in some departments there is an actual increase. For instance, the leading interest has been booking record tonnages of sheet specifications, breaking all records in November, and this month running 25 or 30% heavier in specifications than in shipments.

Premiums for early shipment continue to be paid freely in several lines, particularly for sheets, plates and merchant bars. In these products the markets for early and for far forward delivery are quite distinct from each other.

New records by large margins have been made in the year just closing in nearly all departments of the iron and steel industry. Lake Superior iron-ore shipments, with about 48,500,000 tons moved out of the region, show a gain of 5,000,000 tons over the best previous year, 1910. Pig-iron production has been about 29,600,000 tons, against 27,300,000 tons in 1910. Sheets, tinplates and wire have made large gains over previous records, and it is possible that plates and rails will prove to have made new records.

The local iron and steel market has shown practically no change from conditions of a week ago. While pig iron has been extremely dull, prices are firmly maintained and the operating furnaces seem to be very well sold up. Contract business in finished-steel products continues relatively light, but the pressure for deliveries is, if anything, accentuated. Consumers of partly finished steel are complaining more than ever about inability to obtain all the steel they want. Rivet makers, for instance, assert they are getting only half the steel they could use, while the sheet and tin mills are losing time from insufficient supply of sheet bars. This condition affects the leading interest as much as the independents, or possibly more.

Pig Iron—The market on foundry iron is not well defined. In some quarters it is claimed $18, Valley, can readily be obtained for No. 2, but it appears that in some circumstances there is iron to be had at $17.50. There is a moderate inquiry for steel-making iron, but transactions are very light. The Valley furnaces appear to be well sold for the first half of the new year, and are not making any effort to sell at this time. We quote: Bessemer, $17.25@17.50; basic, $16.50; No. 2 foundry, $17.50@18; malleable, $17@17.50; forge, $17@17.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The scarcity of ferromanganese continues and prospects are for a more serious shortage early in the new year. The market is not quotably changed: Prompt carloads, $75@80; Contracts, first half, $70@75; second half, $65, f.o.b. Baltimore, freight to Pittsburgh being $1.95 per ton.

Steel—The mills are practically out of the market as sellers of billets or sheet bars for any delivery, and quotations are purely nominal. Brokers appear to have limited supplies of steel for first quarter, but are evidently rather indisposed to sell. Occasionally quotations are made as high as $29 or $30, Pittsburgh. It is reported that the Steel Corporation has bought some billets in Alabama for use at the Pencoyd plant, in eastern Pennsylvania. We repeat former quotations: Bessemer billets, $27; sheet bars, $27.50; openhearth billets, $28; sheet bars, $28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are quotable at $30, Pittsburgh, but are not easy to secure at the price.

Sheets—Probably more than half of the independent sheet mills are now quoting prices above the regular figures of the leading interest, which are applicable to contracts for second quarter, but cannot be done for an early delivery. Such mills have been slow to book contracts and their specifications are now considerably smaller than they were 30 days ago, as their contract business is being worked off. The leading interest, on the other hand, is in receipt of very heavy specifications, materially exceeding its current shipments. This interest is operating its sheet mills at about 85% of capacity, being unable to do better on account of steel shortage, and the independents which do not make their steel are not doing any better, while independents making their own steel are running practically full. We quote, depending on delivery: Black sheets, 28 gage, 2.25@2.40c.; galvanized, 28 gage, 3.40@3.60c.; blue annealed, 10 gage, 1.65@1.80c.; painted corrugated, 2.45@2.50c.; galvanized corrugated, 3.45@3.50c. per pound.

St. Louis

Dec. 22—The pig-iron market is about the same. No large orders are reported, and probably none will come in until after the turn of the year. There is, however, a pretty steady run of small orders from mills and foundries. Makers are not soliciting orders, having plenty of work on hand. No. 2 Southern foundry is quoted $14, Birmingham, or $17.75, St. Louis, for early deliveries; for 1913, the quotations are $14.50, Birmingham, or $18.25, St. Louis, and some sellers ask $15, furnace, for second quarter. Northern No. 2 is steady around $19, St. Louis.

The demand for finished material, especially railroad supplies, is strong and mills are getting all the business they can handle.

Coke is scarce and high; good Connellsville foundry is $7, St. Louis, but higher prices have been paid for spot lots. Byproduct coke is higher and is being taken wherever it can be had.

Iron Ore Trade

The figures compiled by the Cleveland *Marine Review* show that the stock of iron ore on Lake Erie docks on Dec. 1 were 9,494,628 tons, the largest ever reported. The shipments to furnaces during the season were as follows:

Stocks, May 1, 1912	5,881,245
Receipts for the season	38,624,108
Total on dock	44,505,353
Stocks, Dec. 1	9,494,625
Shipments to furnaces	35 010,728

The shipments to furnaces compare with 23,178,370 tons in 1911, and 30,060,096 in 1910. The receipts at Lake Erie docks for the season were 81.4% of the total Lake movement. The balance went chiefly to Lake Michigan ports, principally South Chicago and Gary.

British Imports—Imports of iron ore into Great Britain, 11 months ended Nov. 30, were 5,850,335 tons in 1911, and 5,931,119 in 1912; increase, 80,784 tons.

Baltimore

Dec. 23—Exports for the week included 660 lb. selenium to Hamburg; 723,600 lb. steel pipe to Rotterdam; 3,425,520 lb. billets and sheet bars to Liverpool; 1,121,160 lb. skelp steel to Glasgow. Imports included 5900 tons pyrites from Huelva, Spain; 15,700 tons iron ore from Cuba.

Foreign Iron Trade

British Iron Trade

The scarcity of pig iron in Great Britain, says the *Iron Trade Review*, is more manifest than ever, with the result that every consumer is complaining of short deliveries. It is impossible to satisfy the demand for material. In the Sheffield district, the position has been aggravated by insufficient transit facilities. Many furnaces would be started, but for the high cost and scarcity of fuel. Prices eased a little during the week, apparently in response to European political complications. Yesterday's selling price for Cleveland warrants was 67s. 3d. ($16.46), a shilling below the highest of the year, which was on Nov. 18, sales then being on the basis of 68s. 3d. ($16.70). This is exactly 20s. above the figure of a year ago. Sales have been made for the first half of the next year at 68s. A very heavy demand is expected in the first quarter. Manufacture is carried on with great difficulty, owing to the great scarcity of coke. Small lots command fancy prices, and in the north of England, the probability of a fuel famine is being seriously discussed. There has been a considerable addition to warrant stock, during the past few days, but taking the month as a whole, the addition to stocks was only about 80 tons. The shipments have been considerably affected by the weather. They amounted in November to 90,000 tons, as compared with 110,000 tons a year ago. The amount in store at Cleveland is 250,000 tons. At some of the blast furnaces, great inconvenience has been caused by inability to get fuel and ore to meet daily requirements. At present there is practically no prompt iron available, though the nominal quotation has been 82s. ($20.08). Next year's contracts are on the basis of 82s. 6d. ($20.20), and buyers count themselves fortunate if they can find furnacemen to accept orders for a long period at this price.

Austrian Iron Trade

At the meeting of the Austrian Iron Cartel, it was decided to leave unaltered the price of iron prevailing at present, as far as sales over the first quarter of 1913 were concerned, the uncertainty of the general situation being considered as justifying a waiting policy. During the course of the meeting, members of the Cartel reported a slight decline of fresh orders in Galicia, where credit is stated to be somewhat strained. From other districts of Austria, however, no diminution of orders was reported, wars and rumors of wars not having, as yet, exercised any restraining influence on the employment of capital.

French Iron Trade

The Comptoir des Aciers Thomas has put up prices for the first half of 1913 by 10 francs ($1.90) per ton. The makers of finished and half products have thus the basis for their own price levels and will now be more disposed to accept orders for delivery next year. The market generally has undergone no material change, remaining active and firm almost throughout; and political developments, apart from making buyers somewhat cautious and limiting fresh business, have had no effect, late prices being fully maintained.

Bar iron is now quoted 2.50 francs higher (47½c.) in the Centre and Loire district at 207.50 francs ($39.42½) and 2.50 francs (47½c.) to 5 francs (95c.) higher, in the Meurthe and Moselle at 210 francs ($30.90) per ton.

German Iron Trade

The make of pig iron in Germany in October, as reported by the German Iron & Steel Union, was 1,589,262 metric tons, being 109,998 tons more than in September. For the 10 months ended Oct. 31 the total production was, in metric tons:

	1911	1912	Changes
Foundry iron	2,520,116	2,715,161	I. 195,045
Forge iron	436,910	445,608	I. 8,698
Steel pig	1,434,666	1,794,539	I. 359,873
Bessemer pig	296,278	318,463	I. 22,185
Thomas(basic)pig	8,154,720	9,174,867	I. 1,020,14
Total	12,842,690	14,448,638	I. 1,605,948

Total increase this year, 12.5%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

German Foreign Trade—Exports and

imports in the German Empire, nine months ended Sept. 30, in metric tons:

	Exports	Imports	Excess
Iron and steel...	4,392,917	499,287	Exp. 3,893,630
Machinery.......	385,788	64,036	Exp. 321,752
Total...........	4,778,705	563,323	Exp. 4,215,382
Total, 1911......	4,238,994	502,445	Exp. 3,736,549

The increase in exports this year was 539,711 tons; increase in imports, 60,878 tons.

British Foreign Trade—Exports and imports of iron and steel, and of machinery, in Great Britain, 10 months ended Oct. 31, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel	£39,523,957	£10,489,972	Ex. £29,033,985
Machinery...	27,502,255	5,645,823	Ex. 21,856,432
Hardw're, etc.	10,491,337	6,787,805	Ex. 3,703,532
New ships....	5,673,942	....	Ex. 5,673,942
Total...... ..	£83,191,491	£22,923,600	Ex. £60,267,891
Total, 1911..	73,972,952	19,345,691	Ex. 54,627,261

Increase in exports, £9,218,539; increase in imports, £3,577,909. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports............	3,681,253	4,015,661	I. 334,408
Imports.	1,442,942	1,623,189	I. 180,247

Exports of tinplates to the United States decreased from 13,312 tons in 1911 to 1684 tons this year.

METAL MARKETS

New York, Dec. 24—The metal markets remain rather quiet, in view of the approaching holidays and the end of the year.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Nov. 1912..	$ 2,709,594	$ 4,474,480	Imp. $1,764,886
" 1911..	13,941,443	3,458,321	Exp. 10,482,772
Year 1912..	46,768,138	55,151,765	Imp. 8,483,627
" 1911..	36,188,397	52,737,854	Imp. 16,549,457
Silver			
Nov. 1912..	5,823,845	3,417,397	Exp. 2,406,448
" 1911..	5,052,238	3,338,956	Exp. 1,713,282
Year 1912..	64,343,611	44,402,933	Exp. 19,940,678
" 1911..	59,667,286	40,439,844	Exp. 18,227,442

Exports from the port of New York, week ended Dec. 2: Gold, none, silver, $1,663,532, chiefly to London. Imports: Gold, $2,805,970, principally from London; silver, $261,857, from Mexico and Soth uAmerica.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for Germany; also some for Brazil and India.

Iridium—This metal is still rather scarce and prices continue high, $73@75 per oz. being asked.

Platinum—The market is quiet and prices unchanged, both here and abroad. Dealers here ask $45@46 per oz. for refined platinum, according to quantity; $47.50@48.50 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent reports, under date of Dec. 12, that the market and prices are unchanged. Speculators are buying freely all the small lots offered by miners, although they are already carrying large stocks. The quotations for crude metal, 83% platinum, are 9.80 rubles per zolotnik at Ekaterinburg and 37,700 rubles per pood at St. Petersburg—equal to $36.85 and $36.95 per oz., respectively. The high prices this year have caused an increase in prospecting and exploration, and additional deposits have been found. Of especial importance is the discovery of platinum in the Irbit district south of the known fields of the Ural region.

Silver—The cessation of India Mint buying and the approach of the Christmas holidays has had the effect of causing a slack market and decline to 28¾d. in London. At this price there seemed to be good buyers and with the resumption of moderate buying by the India Mint in the near future we may look for some improvement in prices.

SILVER AND STERLING EXCHANGE

Dec.	19	20	21	23	24	25
New York....	63¼	63	62¾	62¼	62½	....
London .	$29\frac{3}{16}$	29⅛	29	28¾	$28\frac{13}{16}$	....
Sterling Ex..	4.8535	4.8545	4.8550	4 8550	4.8520	....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to Dec. 12, reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India...	£8,542,000	£11,469,000	I. £2,927,000
China	990,300	1,674,500	I. 684,200
Total......	£9,532,300	£13,143,500	I. £3,611,200

Exports of gold to India were £113,250 for the week.

Imports of gold into France, nine months ended Sept. 30, were 186,113,000 fr.; exports, 28,793,000 fr.; excess of imports, 157,320,000 fr., which compares with an excess of exports of 15,799,000 fr. last year.

Imports of silver into France, nine months ended Sept. 30, were 204,779,000 fr.; exports, 206,972,000 fr.; excess of exports, 2,193,000 fr., which compares with an excess of imports of 43,990,000 fr. last year.

Coined silver in the United States, Dec. 2, as estimated by the Treasury Department: Standard dollars, $565,065,020, of which $489,978,000 are held in treasury against silver certificates outstanding; subsidiary coins, $173,340,766; total, $758,405,786, an increase of $1,285,222 during November.

Gold in the United States, Dec. 2, as estimated by the Treasury Department: Held in treasury against gold certificates, $1,068,346,169; in treasury current balances, $177,795,980; in banks and circulation, $621,206,112; total, $1,867,248,261, an increase of $10,513,104 during the month.

Imports of silver into Great Britain, 10 months ended Oct. 31, were £14,333,391; exports, £13,372,020; excess of imports, £961,371. This compares with an excess of exports of £2,099,092 last year.

Imports of gold in Great Britain, 10 months ended Oct. 31, were £41,884,763; exports, £37,222,996; excess of imports, £4,661,767, which compares with £7,589,696 last year.

Sales of gold bars at the United States Assay Office, in New York, in November, amounted to $2,948,647, comparing with $3,862,641 in October, and $2,971,692 in September. The total for the 11 months ended Nov. 30, was $28,523,387, or only $250,024 less than the total for the full year 1912. These sales are almost entirely for use in the arts.

Foreign commerce of the United States 10 months ended Oct. 31, as valued by the Bureau of Foreign and Domestic Commerce, Department of Commerce and Labor:

Merchandise	1911	1912
Exports	$1,665,866,850	$1,870,857,254
Imports..............	1,265,522,936	1,511,129,557
Excess, exports	$400,343,914	$359,727,697
Add excess of exports, silver..........		17,534,230
Total..................................		$377,261,927
Deduct excess of imports, gold.......		6,618,741
Net export balance......................		$370,643,186

The gold and silver movement in detail is given in the table at the head of this column.

Copper, Tin, Lead and Zinc

LONDON

Dec.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
19	74½	75⅝	80	226¾	227	18⅛	26½
20	75½	76⅝	80½	227⅛	227⅜	18⅛	26½
21	..	.	. . .	.	.	..	.
23	75¾	76⅞	81¼	228⅜	228⅝	$18\frac{1}{16}$	26½
24	75⅞	77	81½	227½	228	18	26½
25	....	...	...	..	....	....	....

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; ± £25 = 5.44c.; £70 = 15.22c. Variations, £1 = ± 21¾c.

Copper—The market has continued dull but the improvement in the London standard market has created a better sentiment. The cheap lots of copper recently offered

NEW YORK

	Copper		Tin	Lead		Zinc	
Dec.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
19	17½ @17¾	17.35 @17.40	49⅞	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
20	17½ @17¾	17.35 @17.40	50	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
21	17½ @17¾	17.35 @17.40	50⅛	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
23	17½ @17¾	17.35 @17.40	50⅛	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
24	17½ @17¾	17.35 @17.40	50	4.25 @4.30	4.10 @4.15	7.10 @7.20	7.05 @7.10
25							

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgment, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

seem to have been well cleaned up, and there has been a better inquiry from buyers. Copper has been offered at 17½@17⅝c., delivered, usual terms, but there is an increasing confidence that the big producers will ere long realize their pegged price of 17¾c. Under these conditions there has been more business done in the last week than for some time past. Most of it has been for early shipment to Europe, thus confirming the general impression that the stocks in the hands of European consumers are depleted. It appears as though the business consummated has about absorbed the copper in second hands and the smaller producers, and as if any further demand would have to be filled by the larger producers.

There has also been some business done in this country, and as a whole, the market closes more cheerful, in what we might call a Christmas spirit.

Lake copper is quoted 17½@17¾c.; electrolytic in cakes, wirebars or ingots 17.35@17.40c.; casting is quoted 17@17⅛c. as an average for the week.

The London standard market has been strong and advancing. On Dec. 19 it was £74 10s. for spot and £75 12s. 6d. for three months prompt. On Dec. 20 it advanced £1. On Dec. 23 it advanced further 5s., spot being £75 15s. and three months £76 17s. 6d. It closes on Dec. 24 at £75 17s. 6d. for spot and £77 for three months.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for large quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Exports of copper from New York for the week were 3596 long tons. Our special correspondent gives the exports from Baltimore at 4629 tons.

Tin—A very satisfactory business developed for future delivery tin. These orders were placed both in the London and Far Eastern markets, imparting a firmer tone to the same. Consumers, however, refrained from buying near-by material, partly on account of the pending holidays, and also for the reason that they are fairly well covered. The close is somewhat easier at £227 10s. for spot and £228 for three months, while January tin in this market is quoted at about 50⅛c. It will be noticed that three months' tin was higher than spot all the week, the backwardation which has prevailed for a long time having disappeared for the present.

Lead—The lower prices that have ruled are attracting the attention of consumers, who have been buying more liberally. The demand has been freely met and a fair volume of business has resulted. The market as a whole is somewhat firmer, St. Louis being quoted 4.10@4.15c. and New York 4.25@4.30 cents.

The European market is unchanged, cables reporting a considerable business at about last prices. At the close, Spanish is quoted £18, and English 7s. 6d. higher.

The average price of lead for the week was 4.275c., New York.

Spelter—The market is unchanged in price, but there seem to be more supplies available and producers who offer January metal at 7.10c., St. Louis, report that they fail to get the business. Otherwise the market is without special feature. There is a fair volume of business doing at last price, 7.05@7.10c., St. Louis. The New York market is quoted 7.10@7.20 cents.

The market abroad is unchanged and quiet. Good ordinaries in London are quoted £26 10s., specials 12s. 6d. higher.

Zinc dust is quoted at 7⅝c. per lb., New York.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—The market has not been especially active, and prices are firm, though not quotably higher. The current price continues 25½@26c. per lb. for No. 1 ingots, New York. More activity is looked for after the holidays.

Antimony—Only a small business has been done this week, chiefly owing to the holiday. Most buying is postponed until after the New Year. The underlying conditions here are good and the foreign markets are very firm. Cookson's is unchanged, at 10@10.25c. per lb.; in Hallett's there is an unusually wide range, 10.25@10.75c. being quoted. Chinese, Hungarian and the outside brands are unchanged, 9@9.25c. per lb. being asked.

Quicksilver—Business has been quiet and prices remain about the same The New York quotation is $40 per flask of 75 lb., with 58@59c. per pound asked for retail lots. San Francisco, $40 for domestic and $37.50 for export orders. London price is £7 7s. 6d. per flask, with £7 5s. named from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The latest quotation from Germany is 725@750 marks per 100 kg., f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

Nickel—Shot, blocks and plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Selenium—Producers of this metal quote large lots at $2.75@3.50 per lb., according to size of order; while as high as $4.50@5.50 is paid for retail lots.

Spanish Metal Exports

Exports of metals and minerals from Spain, nine months ended Sept. 30, as reported by the *Revista Minera*, in metric tons:

Metals	1911	1912	Changes	
Pig and manuf. iron	31,156	28,646	D.	2,910
Copper	11,207	17,598	I.	6,391
Copper precipitate..	10,183	10,524	I.	341
Lead	124,671	140,483	I.	15,812
Zinc..................	1,717	2,454	I.	737
Quicksilver.....	1,480	1,489	I.	9
Minerals				
Iron ore.............	5,640,791	6,408,520	I.	767,729
Manganese ore	24,500	23,198	D.	1,302
Copper ore.	231,449	110,601	D.	120,848
Lead ore............	2,177	2,786	I.	609
Zinc ore	95,145	81,114	D.	14,031
Pyrites.....	2,043,820	2,264,828	I.	221,008
Salt....	426,528	461,337	I.	34,809

Pyritic ores are not classed as copper ores unless they carry 2.5% or over in copper; below that they are classed as pyrites. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 21—The high price paid for zinc sulphide ore was $59, the base per ton of 60% zinc, $52@56 per ton. Zinc silicate sold at $28@32 per ton of 40% zinc. The average price, all grades of zinc, is $52.12. The high price of lead ore is $53.20, sold on a base price of $53 per ton of 80% metal content. The average **price, all grades** of lead, is $52.74 per ton.

SHIPMENTS WEEK ENDED DEC. 21

	Blende	Cal-amine	Lead Ore	Value
Webb City-Carterville	5,352,120	......	593,740	$160 240
Joplin	2,975,270	......	432,650	93,285
Miami......	703,300	......	403,620	26,770
Galena.	648,290	......	162,270	21,800
Duenweg.	[illegible]	....	27,150	21,325
Jackson	518,660	....	23,030	14,363
Granby . ..	26,300	727,140	13,900	12,745
Alba-Neck....	387,920	. .	36,610	11,812
Spurgeon	244,740	257,360	30,770	11,146
Oronogo...	301,130	. . .	83,930	9,634
Carl Junction	320,610	. . .	......	9,137
Cave Springs	278,810	.....	......	7,667
Carthage ...	275,800	....	....	7,446
Lawton	131,310	.	......	3,499
Aurora......	62,700	62,050	......	2,620
Totals.	12,990,680	1,046,550	1,807,670	$413,489
51 weeks...	565,516,940	36,323,200	92,015,340	$18,369,082

Blende val. the week, $349,235; 51 weeks, $15,180,451
Calamine, the week, 16,585; 51 weeks, 579,035
Lead value, the week, 47,669; 51 weeks, 2,609,596

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January...	$41 85	$44.90	$40.55	$43 54	$55 68	$58.92
February .	40 21	45.75	39 16	43 31	54.46	52 39
March.	39 85	51 56	38.45	49.25	54.57	54.64
April ...	38 88	52 00	37 47	50.36	56 37	54 18
May	38 25	55 30	36 79	53.27	55.21	52.45
June	40 50	55 88	38 18	54 38	56 49	55.01
July. ...	40 75	58 85	38 36	56 59	58.81	58 83
August	42 50	55 13	41 28	53 27	60 74	57 04
September	42 63	59 75	41 29	57 07	59 33	61.26
October....	42 38	57 00	40 89	55 97	54 72	63 22
November...	45 40	55 69	43.25	53 98	57 19	56 55
December.	44 13	..	40.76	..	62 03	.
Year.....	$41.45	.....	$39.90	.....	$56.76	....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60% of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less. These prices are delivered.

Manganese Ore—Late quotations for manganese ore in Great Britain are, for ores, c.i.f. United Kingdom ports; Indian and Brazilian, 50%, 24@25c. per unit; 45%, 22½@23c. Caucasian, 50% manganese, 21@21½c.; 48%, 20½@21c. per unit.

Chemicals

New York, Dec. 24—Trade has been quiet generally, owing to the approaching end of the year.

Arsenic—Prices continue at $4.87½ per 100 lb. on small business.

Copper Sulphate—Trade is dull and prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is small for the present. Quotations remain at 2.60c. per lb. for spot and futures up to Apr. 30. Futures are 2.57½c. for May, 2.55c. for June and 2.52½c. for July and later deliveries.

Petroleum

Exports of petroleum and its products from the United States, 11 months ended Nov. 30, were: Crude petroleum, 165,741,784 gal.; illuminating oils, 942,166,661; lubricating oils and paraffin, 197,130,983; naphthas, gasoline, etc., 164,028,296; residuum and fuel oils, 232,048,515; total, 1,701,116,239 gal., an increase of 101,175,911 gal., or 6.3%, over last year.

MINING STOCKS

New York, Dec. 24—Dec. 19 the Exchange was rather unsteady at the outset, but rallied toward the close. Mining stocks on the Curb were quieter, with only small changes in quotations.

Dec. 20 and 21 the Exchange rallied and was stronger. On the Curb a rather active business was done in copper stocks, at irregular prices. Other mining stocks were quiet.

Dec. 23 and 24 the Exchange was affected by the holiday influences. There was less liquidation, but the market was still affected by the high rates for money and the uncertain conditions abroad. Dealings on the Curb were in fair volume, but quotations were not strong, except for a few of the copper stocks. Such declines as appeared in mining stocks were of the fractional order entirely.

Boston, Dec. 23—The market for mining shares has taken a right-about-face attitude since the last writing, and although there is little animation, there is a degree of strength following some rather sharp advances in prices during the week. Amalgamated set the pace with a $7.37½ advance to $78, although not all of this advance has been retained. As usual, the so called Cole-Ryan issues have been in the fore. Calumet & Arizona is up $4.50 from last week's low to $71, while North Butte rose $3 to $33.50 per share.

There has been no special news to account for the advances during the week, except that the demoralization witnessed last week has ended and market conditions have once again become normal. Money continues high at this center and will likely continue so until the turn of the year. Sentiment is hopeful, even though the copper-share market has been disappointing the greater part of the year, in that prices did not reach the levels justified by the high price for the metal.

Calumet & Hecla, after making a low price of $512 per share, came back to $540, although it is under the latter price now. The management of this company announces that it will soon issue state-

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Sept.	October	Nov
Alaska shipments	1,726,715	1,435,235	....
Anaconda	24,500,000	25,250,000	24,250,000
Arizona Ltd. ...	3,340,000	3,200,000	3,000,000
Copper Queen......	9,103,861	8,184,575	8,807,940
Calumet & Ariz....	4,462,000	4,404,000	4,918,000
Chino.	3,217,369	3,638,500	3,911,169
Detroit...	1,881,668	1,934,828	1,968,020
East Butte.	1,250,000	...	... .
Mammoth	1,834,937	1,883,283	.
Giroux.	1,005,208	. . . .	...
Mason Valley	1,200,000	1,563,700	..
Nevada Con . ..	5,607,578	850,741	. .
Ohio	635,000		. .
Old Dominion	2,204,000	2,523,000	2,758,000
Ray	2,978,404	....	3,201,500
Shannon	1,142,000	1,210,000	1,436,000
South Utah.........	225,568	.	....
United Verde* ...	2,750,000	2,750,000	....
Utah Copper Co....	6,616,887	2,022,352	.. ..
Lake Superior*....	19,250,000	21,500,000	20,400,000
Non-rep. mines*...	8,094,792	8,250,000	8,250,000
Total production	103,025,987	....	....
Imports, bars, etc..	25,149,329	....	....
Total blister.....	128,175,316	....	....
Imp. in ore & matte	7,142,232	....	....
Total American..	135,317,548	....	....
Miami†	2,949,150	2,577,750	2,972,000
Brit. Col. Cos.:			
British Col. Copper	....	1,022,904	....
Granby	2,083,118	2,018,424	....
Mexican Cos.:			
Boleo†	....	2,612,400	2,315,040
Cananea	3,500,000	4,248,000	5,064,000
Moctezuma	771,844	3,045,667	2,112 377
Other Foreign:			
Cape Cop., S. Africa	678,720	757,120	907,200
Kyshtim, Russia.	1,750,000	....	....
Spassky, Russia..	981,120	974,400	.. ..
Tilt Cove, Newf'd	.	86,785	.....
Exports from			
Chile ..	6,048,000	8,512,000	4,816,000
Australia	7,616,000	9,520,000	10,752,000
Arrivals in Europe‡	8,518,720	13,771,520	12,976,320

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
XI, 1911 ..	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912..........	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII............	137,161,129	71,094,381	60,121,331
VIII..........	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796
X..............	145,405,453	84,104,734	47,021 342
XI.............	134,695,400	69,369,795	55,906,550

VISIBLE STOCKS

	United States	Europe	Total
XII, 1911.....	111,785,188	164,281,600	276,066.788
I, 1912.........	89,454,695	158,323,200	247,777,895
II....... ...	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV.	62,367,557	136,819,200	199,186,757
V.............	65,066,029	134,176,000	199,242,029
VI.............	49,615,643	117,801,600	167,417,243
VII............	44,335,004	108,186,000	152,521,004
VIII...........	50,280,421	113,299,200	163,579,621
IX.............	46,701,374	113,568,000	160,269,374
X..............	63,065,587	107,408,000	170,473,587
XI.............	76,744,964	103,801,600	180,546,564
XII...........	86,164,059	96,947,260	183,111,259

ments summarizing estimated profits and costs for its dividend-paying subsidiaries for the second half of the year.

Trading on the Curb has been in specialties, notably Mexican Metals. which is up $1.87½ to $3.87½ on very heavy trading. Alaska Gold rose to $13, which is its record price. Goldfield Consolidated is up from its recent low price.

Assessments

Company	Delinq	Sale	Amt.
Butte & Anaconda, Mont...	Jan. 1	Feb. 1	$0 01
Consolidated Imperial, Nev.	Jan. 8	Jan. 29	0 01
Copper Hill, Ida......	Jan. 5	Feb. 5	0 002
East Crown Point, Utah.	....	Dec. 30	0 01
East Hercules Ext., Ida.	Dec. 15	Jan. 3	0 001½
Echo, Ida	Dec. 11	Jan. 8	0 001
Ely Consolidated, Nev	....	....	0.05
Evergreen, Utah	Nov. 30	Dec. 30	0 01
Genevieve, Calif....	Dec. 10	Dec. 31	0.01
Hider Nevada, Utah	Dec. 20	Jan. 11	0 0½
Hypotheek, Ida	Dec. 18	Jan. 10	0 005
Montana Clinton, Mont.	Nov. 30	Dec 20	0 15
Moon Creek, Ida	Dec. 4	Jan 4	0 002
Moonlight, Ida	Nov. 32	Jan. 2	0 005
North Star, Ida	Nov. 0	Dec. 30	0.001
Royal, Ida	Dec. 16	Jan. 26	0 00½
Ruby Mountain, Utah	Dec. 10	Dec. 28	0.001½
Seg. Belcher & Midas, Nev..	Jan. 7	Jan. 31	0.02
Seven Troughs Mon., Utah.	Dec. 15	Jan. 6	0.0¼
Sunset, Ida.	Dec. 21	Jan. 14	0.002
Superior & Boston, Mont...	Jan. 4	....	1.00
Tarbox, Ida....	Nov. 19	Jan 28	0.002
Union Consolidated, Nev..	Jan. 8	Jan. 30	0.15
Washoe, Nev	Dec. 1	....	0.20
Western Pacific, Utah......	Dec. 10	Jan. 3	0.001
Wilbur, Ida....	Dec. 23	Jan. 23	0 00½

Monthly Average Prices of Metals

SILVER

Month	New York 1910	New York 1911	New York 1912	London 1910	London 1911	London 1912
January	52 375	53 795	56 260	24 154	24 865	25 887
February	51 534	52 222	59 043	23 794	24 081	27 190
March	51 454	52 745	58.375	23 690	24 324	26.875
April	53 221	53 325	59 207	24 483	24.595	27.284
May	53.870	53 308	60 880	24 797	24.583	28 038
June	53 462	53 043	61 290	24 651	24 486	28 215
July	54 150	52 630	60 654	25 034	24 286	27.919
August	52 912	52 171	61 606	24 428	24 082	28 375
September	53.295	52 440	63 078	24 567	24 209	29.088
October	55 490	53 340	63.471	25 596	24 594	29 299
November	55 635	55 719	62.792	25 680	25 649	29 012
December	54 428	54 905	..	25 160	25 349	
Year	53 486	53 304	......	24 670	24 592	....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	NEW YORK				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12 295	14 094	12 680	14 337	55 600	62 760
February	12 256	14 084	12 611	14 329	54 974	62 893
March	12 139	14.698	12 447	14.868	54 704	65.884
April	12 019	15 741	12 275	15 930	54 034	70 294
May	11 989	16 031	12 214	16 245	54 313	72 352
June	12 385	17 234	12 611	17 443	56 365	78 259
July	12 463	17 190	12 720	17 353	56 673	76 636
August	12 405	17.498	12 634	17 644	56 266	78 670
September	12 201	17 508	12 508	17 698	55 253	78.762
October	12 189	17 314	12 370	17 661	55 170	76 389
November	12 616	17.326	12 769	17 617	57 253	76 890
December	13 552	.	13 768	.	62 068	
Year	12 376	.	12 634		55 973	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41 255	42 529	July	42 400	44 519
February	41 614	42 962	August	43 319	45 857
March	40 157	42 577	September	39 755	49.135
April	42 185	42 923	October	41 185	50 077
May	43 115	46 053	November	43 125	49 891
June	44 606	45 815	December	44 655	
			Av. Year	42 281	..

Prices are in cents per pound.

LEAD

Month	New York 1911	New York 1912	St. Louis 1911	St. Louis 1912	London 1911	London 1912
January	4 483	4 435	4 334	4 327	13 009	15.597
February	4 440	4.026	4 266	3 946	13 043	15 738
March	4 394	4.073	4 238	4.046	13 122	15 997
April	4 412	4 200	4 262	4 118	12.889	16 331
May	4 373	4 194	4 223	4 072	12 984	16 509
June	4 435	4 392	4 292	4 321	13 260	17 588
July	4.499	4 720	4 397	4 603	13 530	18 544
August	4 500	4 569	4 406	4 452	14 260	19 655
September	4 485	5.048	4 356	4.924	14 744	22.292
October	4 265	5.071	4 139	4 894	15 332	20 630
November	4 298	4.615	4.181	4.463	15.821	18 193
December	4 450	.	4.332	......	15.648	
Year	4 420	..	4 286	.....	13 970	.

New York and St. Louis, cents per pound. London, pounds sterling per long ton

SPELTER

Month	New York 1911	New York 1912	St Louis 1911	St Louis 1912	London 1911	London 1912
January	5 452	6.442	5 302	6.292	23.887	26 642
February	5 518	6.499	5 368	6.349	23 276	26 661
March	5.563	6.626	5 413	6.476	23 016	26.048
April	5 399	6.633	5.249	6 483	23 743	25 644
May	5.348	6 679	5 198	6.529	24.375	25 790
June	5 520	6.877	5 370	6 727	24 612	25.763
July	5 695	7.116	5 545	6 966	25.006	26 174
August	5 953	7.028	5 803	6 878	26 801	26 443
September	5 869	7.454	5 719	7 313	27 750	27.048
October	6.102	7.426	5.951	7.276	27 256	27 543
November	6 380	7 371	6 223	7.221	26.795	26.804
December	6.301	....	6.151	.....	26.849	.....
Year	5 758	....	5 608	......	25.281	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer 1911	Bessemer 1912	Basic 1911	Basic 1912	No 2 Foundry 1911	No 2 Foundry 1912
January	$15 90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15 90	15.03	14 50	13.28	14 81	14.01
March	15 90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13.90	15 00	14 15
May	15 90	15.14	14 30	13.90	14 72	14.12
June	15 90	15.15	14 06	14.11	14.56	14.22
July	15 90	15.15	14 03	14.38	14 53	14 38
August	15 90	15 43	14 00	14 90	14 47	14 85
September	15 90	16.86	13 57	16.03	14 40	15.63
October	15.43	17 90	13.44	17.18	14.34	17 22
November	14.92	18 07	13.30	17 09	14 25	18.00
December	15 15	......	13.10	......	13.90	.....
Year	$15 72	....	$13 94	.....	$14.49	......

STOCK QUOTATIONS

COLO. SPRINGS Dec. 23

Name of Comp.	Bid.
Acacia	.03½
Cripple Cr'k Con.	01
C. K. & N.	15½
Doctor Jack Pot	.06
Elkton Con	.63
El Paso	5.90
Findlay	03½
Gold Dollar	17¾
Gold Sovereign	.02¾
Isabella	.16⅛
Jack Pot	05¼
Jennie Sample	.05
Lexington	005
Moon Anchor	01
Old Gold	03
Mary McKinney	66
Pharmacist	01¼
Portland	1.00
Vindicator	86¼
Work	.002

SALT LAKE Dec. 23

Name of Comp.	Bid.
Beck Tunnel	08
Black Jack	‡ 10
Cedar Talisman	01
Colorado Mining	.16
Columbus Con	‡ 12
Crown Point	03
Daly-Judge	6.25
Grand Central	71
Iron Blossom	1 30
Little Bell	22
Lower Mammoth	04
Mason Valley	10.00
May Day	‡ 23½
Nevada Hills	1 30
New York	‡ 01½
Prince Con	1 57½
Silver King Coal'n	2 75
Sioux Con	04
Uncle Sam	.10
Yankee	.14

TORONTO Dec. 21

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	‡7 40	Foley O'Brien	.15
T. & Hudson Bay	‡60 00	Hollinger	15 00
Temiskaming	40	Imperial	‡ 03
Wettlaufer-Lor.	25	Pearl Lake	‡ 21
Am. Goldfield	‡ 40	Porcu. Gold	18
Apex	‡ 00½	Preston E. D.	04
Crown Chartered	‡ 02	Rea	‡ 25
Doble	‡ 25	Standard	‡ 00½
Dome	‡19 00	Swastika	‡ 09
Dome Exten	‡ 06	West Dome	‡ 10

SAN FRANCISCO Dec. 23

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.04	Belmont	8.00
Belcher	.23	Jim Butler	63
Best & Belcher	.05	MacNamara	.17
Caledonia	.95	Midway	32
Challenge Con	.06	Mont.-Tonopah	1.72½
Chollar	.03	North Star	20
Confidence	31	West End Con	1 25
Con. Virginia	28	Atlanta	17
Crown Point	25	Booth	.03
Gould & Curry	01	C O.D. Con	.07
Hale & Norcross	08	Comb. Frac	.08
Mexican	1 30	Jumbo Extension	27
Occidental	70	Pitts.-Silver Peak	72
Ophir	.22	Silver Pick	.06
Overman	40	St. Ives	30
Potosi	.03	Tramp Con	‡ 02
Savage	07	Argonaut	‡2.00
Sierra Nevada	26	Bunker Hill	‡4 50
Union Con	18	Central Eureka	.28
Yellow Jacket	.30	So. Eureka	2 40

N. Y. EXCH. Dec. 23

Name of Comp.	Clg
Amalgamated	75¾
Am. Agri. Chem	54½
Am.Sm.&Ref.,com	72
Am. Sm. & Ref., pf.	105¼
Am Sm. Sec., pf. B	83¾
Anaconda	39
Batopilas Min	1¼
BethlehemSteelpf	66
Chino	43¼
Federal M. & S., pf.	40
Goldfield Con	2
GreatNor., ore. ctf	41
Guggen. Exp	50¼
Homestake	108
Inspiration Con	18
Miami Copper	26
Nat'nalLead,com.	55¾
National Lead, pf.	107
Nev. Consol	19⅜
Phelps Dodge	210
Pittsburg Coal, pf.	90
Ray Con	20⅞
RepublicI&S,com.	26⅝
Republic I & S. pf.	85⅞
SlossSheffi'd.com	40
Sloss Sheffield, pf	93¼
Tennessee Copper	38⅜
Utah Copper	58⅛
U. S. Steel, com	67⅜
U. S. Steel, pf.	109¾
Va. Car. Chem	43

N. Y. CURB Dec. 23

Name of Comp.	Clg.
Barnes King	73
Beaver Con	.40
Braden Copper	10⅜
B. C. Copper	4¾
Buffalo Mines	2
Caledonia	‡ 40
Con. Ariz. Sm	½
Davis-Daly	1½
Diam'field-Daisy	‡4
Ely Con	10
Florence	60
Giroux	4 1/16
Gold Hill Con	1¼
Greene Cananea	9⅛
Greenwater	‡ 04
Internat S. & R.	‡124
Kerr Lake	2 11/16
Keystone	‡2
La Rose	2 13/16
McKinley-Dar-Sa.	1 15/16
Min. Co. of A. new	3
Motherlode Gold	‡.60
Nev. Utah M. & S.	02
Nipissing Mines	8¾
Ohio Copper	1⅛
Pacific Sm. & M.	‡3/16
Puebla S. & R.	2⅛
South Live Oak	2
South Utah M. & S.	‡⅜
Standard Oil (Old)	1110
Stand'd Oil of N.J.	393
Stewart	1 13/16
Tonopah	6 9/16
Tonopah Ex	2⅜
Tonopah Merger	.83
Tri-Bullion	½
Tularosa	1
Union Mines	⅛
United Cop., pfd.	10
Yukon Gold	3⅛

LONDON Dec. 24

Name of Com	Clg.
Camp Bird	£1 2s 9d
Dolores	‡1 10 0
El Oro	0 18 0
Esperanza	1 18 9
Mexico Mines	7 7 6
Oroville	0 6 6
Stratton's Ind.	‡0 3 1½
Tomboy	1 8 9

BOSTON EXCH. Dec. 23

Name of Comp.	Clg.
Adventure	5
Ahmeek	‡325
Algomah	‡2⅝
Allouez	38
Am. Zinc	29
Ariz. Com., ctfs.	3¾
Bonanza	‡ 30
Boston & Corbin	5⅜
Butte & Balak	3⅛
Calumet & Ariz	69
Calumet & Hecla	‡517
Centennial	‡17
Cliff	‡3
Copper Range	50
Daly West	3¾
East Butte	14¼
Franklin	8
Granby	66½
Hancock	23
Hedley Gold	‡27
Helvetia	‡ 80
Indiana	15¼
Island Cr'k, com.	‡54
Island Cr'k, pfd.	‡85½
Isle Royale	31¼
Keweenaw	‡2
Lake	25
La Salle	5
Mass	‡5
Michigan	‡2
Mohawk	59
New Arcadian	‡2¼
New Idria Quick	‡7
North Butte	32
North Lake	2½
Ojibway	‡2¼
Old Dominion	53
Osceola	102
Quincy	77
Shannon	13⅜
Shattuck-Ariz	28½
Superior	37¼
Superior & Bost	1¼
Tamarack	34
Trinity	4¼
Tuolumne	‡2¾
U. S. Smelting	42½
U. S. Smelt'g, pf.	49⅜
Utah Apex	2
Utah Con	11
Victoria	‡1¾
Winona	‡3½
Wolverine	69½
Wyandot	‡1

BOSTON CURB Dec. 23

Name of Comp.	Last
Alaska Gold M.	12¾
Bingham Mines	4½
Boston Ely	1 1/16
Boswyocolo	01
Butte Central	6½
Cactus	07
Calaveras	2¼
Chief Cons	1¾
Corbin	08
Cortez	55
Crown Reserve	3½
First Nat. Cop	1 11/16
Majestic	56
Mazatan	‡⅜
Moneta Porc	‡ 03
Nevada-Douglas	‡2 7/16
New Baltic	1½
Oneco	1⅞
Raven Copper	20
Portsmouth Coal	‡ 05
San Antonio	‡3⅛
Smokey Dev	2¼
S W Miami	3
South Lake	6
Trethewey	.40
United Verde Ext.	.62

‡Last quotation.

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